МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
імені В. Н. КАРАЗІНА

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ENGLISH for GEOLOGISTS

Навчальний посібник з англійської мови
для студентів геологічних спеціальностей

Харків – 2012

УДК 811.111(075.8)
ББК 81.2 Англ-923
Ч 45

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Ч 45 English for Geologists / Черкашина Н. І., Ужик В. О., Авдєєнко І. М. – Харків, 2011. – 335 с.

Навчальний посібник «English for Geologists» являє собою університетський курс англійської мови для підготовки фахівців з напрямків «Гідрогеологія» та «Геологія».

Навчальний посібник призначено для розвитку навичок читання, перекладу, анотування, реферування аутентичних текстів англійською мовою з історії геології, загальних напрямків геології та споріднених з нею наук, а також формування знань і вмінь професійного та повсякденного спілкування.

Структура посібника дає можливість викладачеві вибрати оптимальні шляхи організації як аудиторної, так і самостійної роботи студентів з урахуванням рівня їх знань.

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ПЕРЕДМОВА

Навчальний посібник являє собою університетський курс англійської мови для підготовки бакалаврів зі спеціальності «Геологія», «Гідрогеологія» і складається з трьох взаємопов'язаних частин. Перша частина містить основний лексико-граматичний матеріал з тем: 1. Earth Sciences. 2. The Earth's Crust and Useful Minerals. 3. Rocks of the Earth's Crust. 4. Rocks. 5. Metamorphic Rocks. 6. Weathering of Rocks. 7. Soil. 8. The Hydrologic Cycle. 9. World's Water Supply. 10. Ground Water. 11. Lakes. 12. Glaciers.

Друга частина містить короткий граматичний довідник з основних граматичних тем курсу, матеріал для розвитку професійного та побутового спілкування англійською мовою у вигляді діалогів та тексти для додаткового читання. У цьому розділі є також рубрика «Вони зробили великий внесок у розвиток наук про Землю». Тут представлено науково-популярний матеріал з життя відомих вчених, які зробили внесок у розвиток геології та інших наук про Землю. Ці тексти є основою для доповідей, рольових ігор та проектних завдань.

Третя частина – додаток, який містить таблицю хімічних елементів англійською мовою, таблицю неправильних дієслів, також глосарій термінів наук про землю. Цікавим є розділ «Обговорюємо професійну літературу», в якому даються основні кліше для написання рефератів, резюме, анотування текстів професійного спрямування.

Посібник має 12 уроків (Units). Кожен урок складається з основного тексту, лексичних вправ до нього, певної граматичної теми та вправ для її закріплення, додаткового тексту для реферування і закінчується тестом.

Навчальний посібник розраховано на 120 годин аудиторної та 120 годин самостійної роботи студентів.

Посібник також можуть використовувати аспіранти, пошукачі та науковці відповідного профілю.

CONTENTS

PART I

Unit 1
The Earth Sciences

Grammar
Word order
Types of questions
Present Simple vs Present Continuous

I. ACTIVE VOCABULARY

application (n) – застосування; заява
attempt (n) – спроба
breakthrough (n) – значне наукове або технічне досягнення, прорив
clue (n) – ключ
collect (v) – збирати
complicated (adj) – складний
cover (v) – покривати
determine (v) – визначати
destruction (n) – руйнування
discovery (n) – відкриття
enormous (adj) – величезний
environmental pollution (n) – забруднення навколишнього середовища
examine (v) – обстежувати
exist (v) – існувати
field (n) – поле, галузь
harm (n,v) – шкода; завдавати шкоди
include (v) – включати
investigate (v) – вивчати, досліджувати
observe (v) – спостерігати
origin (n) – походження, початок
order (v) – упорядковувати, наказувати

outdated (adj) – застарілий
prove (v) – доводити, надаватися
revise (v) – переглядати
search (n) – пошук
set apart (v) – відокремлювати
shortage (n) – нестача
solve (v) – вирішувати
test (v) – перевіряти
unify (v) – уніфікувати, об'єднувати
universe (n) – всесвіт
update (v) – обновляти
variety (n) – розмаїтість, множина
verify (v) – підтверджувати
weapon (n) – зброя

II. LEXICAL EXERCISES

Exercise 1. Translate into Ukrainian:

Applicable, various, searching, universal, original, investigator, solution, collection, explorer, observer, determination, replacement, revision, existence, enormously, destructible, harmful.

Exercise 2. Translate the word-combinations into Ukrainian and learn them:

to determine whether knowledge helps or harms society; to cover the broad field of knowledge; to revise ideas held by earlier scientists; breakthrough in nuclear research; weapons of mass destruction; cells of living plants; to unify related facts; knowledge verified by studies of the subject; to set apart from other branches of science; enormous influence on lives; to destroy a computer; to determine scientifically;	variety of subjects; to search for clues; repeated observations; outdated theory; varieties of plants; to investigate why; to explore the world; application of science.

Exercise 3. Match the synonyms:

1. *application*	a. crush
2. *to observe*	b. lack
3. *to search*	c. to gather
4. *clue*	d. update
5. *harmful*	e. to make clear
6. *to investigate*	f. to decide

7. *complicated*	g. to explore
8. *to solve*	h. key
9. to collect	i. to watch carefully
10.to explain	j. usage
11.to verify	k. to look for
12.advanced	l. dangerous
13.to determine	m. difficult
14.enormous	n. to prove
15.shortage	o. to define
16.destruction	p. huge

Exercise 4. Match the opposites:

1. environmental pollution	a. outdated
2. harmful	b. to set apart
3. to solve a problem	c. creation
4. complicated	d. stagnation
5. to unify	e. to die
6. enormous	f. well-known facts
7. advanced	g. small-scale
8. to exist	h. environmental protection
9. discovery	i. to separate
10.breakthrough	j. easy
11.destruction	k. to cause a problem
12.to include	l. useful

Exercise 5. Fill in the gaps using the words in the box in the correct form:

observe, universe, harmful, investigate, collect, verify, expand, replace, revise, outdated, shortage, breakthrough, weapon, destruction.

1. The astronomer ... natural phenomena taking place in the ...
2. They ... the ... influence of radiation on our organisms.
3. New facts ... that he was right.
4. His knowledge of the subject ... as he ... many new data.
5. This scientist had to ... his opinion because he got some new information.
6. They ... the tool because the new one was much better.
7. The equipment of the laboratory was ..., that’s why it was impossible to make a ... in physics using such old facilities.
8. The … of mass … is the most inhuman thing in the world.

Exercise 6. Translate the word combinations into English and make up questions or sentences of your own with them.

застосування різноманітних методів;
спостерігати за рухом планет;
вивчити множину фактів;
пошук найкращого рішення;
ключ до відповіді на питання;
доводити свою точку зору;
розширювати межі знань;
застарілий засіб;
безкрайній всесвіт;
існувати в космосі;

переглянути програму досліджень;
походження нового поняття;
викликати забруднення навколишнього середовища;
вирішувати складне завдання;
досліджувати місяць;
збирати й упорядковувати дані;
спроба зробити наукове відкриття (прорив);
підтверджувати теорію;
відкриття світового значення;
величезний простір;
шкідливий вплив;
нестача повітря;
руйнування матерії;
перевіряти зброю;
складатися з клітин;
відокремлювати факти за важливістю

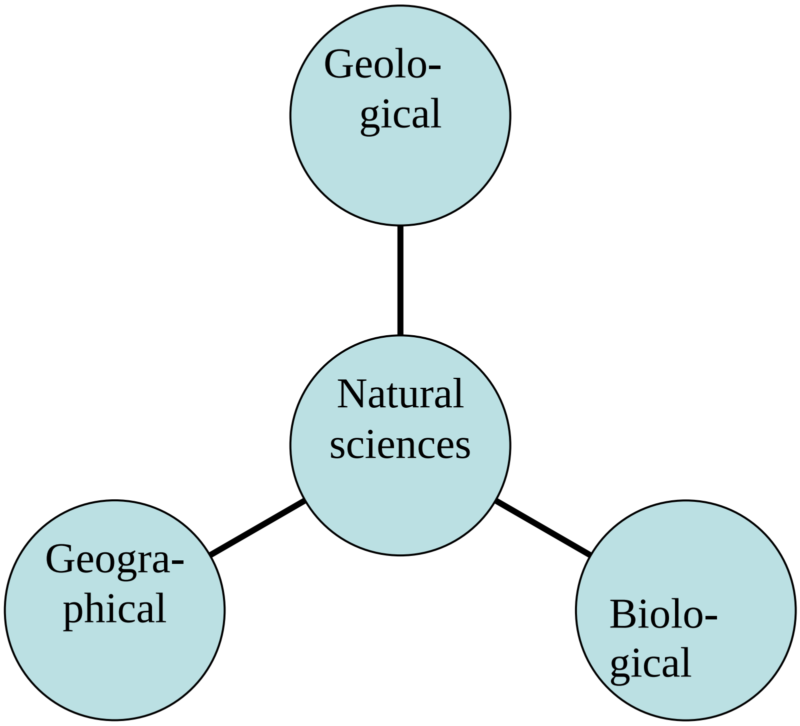
Exercise 7. ***Identify the morphemes. Match up the morphemes to form words.***

geo		scien		bio		hydro		morph
	atmo		meter		logy		graph	
sphere		phys		Phon(o)		Dem(o)		eco
	planet		cosmo		astro		Chron(o)	
cyto		Gen(e)		sediment		litho		seismo
	cryo		petro		ocean		paleo	
mineral		crystal		strat		Anthropo		zoo
	Clim(a)		meteoro		tele		micro	
photo		thermo		socio		psycho		sophy
				philo				

Exercise 8. Identify the GEO-/Bio-sciences and their branches.

Paleoichthyology, photobotany, primatology, exobiology, ethnomusicology, hydronautics, cytochemistry, crystallography, bioenergetics, astronautics, biospeleology, cryobiology, astrodynamics, paleoanthropology, radioecology, morphophysiology, paleobiochemistry, psychopharmacology, ecophysiology, cytogenetics, endocrinology, immunobiochemistry.

GEO ***GEOLOGY*** ***GEOLOGICAL***



Exercise 9. Draw a tree/trees to illustrate the information below. Describe the tree in 1) separate sentences; 2) one sentence.

Geology, biogeography, geometry, astrophysics, biology, paleontology, biochemistry, oceanography, physics, cryology, chronology, cytology, hydrogeology, geography, geophysics, algebra, cybernetics, meteorology, radiophysics, paleogeography, crystallography, geomorphology, geochemistry, climatology, zoology, biophysics, mechanics, electronics, genetics, lithology, hydrology, mineralogy, optics, petrography, programming, physiology, botany, immunogenetics, cryobiology, cytomorphology, seismology.

Geology		evolutionary processes
Geography		volcanic activity
Chemistry		living organisms
Biology	deals with	chemical reactions
Physics		climatic changes
Astronomy		evolution of animals and plants
		distant galaxies and stars
		energy resources
		radioactive elements
		mechanical systems
		elementary particles
		crystal structures

Using the above information say what geological, geographical, physical, biological sciences deal with. Use connectives: *first, second, moreover, as well as, not only…but.

***Give a possible definition of:**

Microbiology
Crystallography
Mineralogy
Climatology

*** Compare any two of the sciences/branches of science. Use connectives: *like, unlike, while, whereas.***

A SCIENTIST is one who does a SCIENCE.
TO DO a science is to STUDY a science.

TO STUDY=?

Identify	facts
Accumulate	figures
Systematize	data
Specify	information
Generalize	ideas
Typify	observation
Demonstrate	conclusions

Summarize tendencies
Verify correlations

- **Identify the words in both columns. List the verb-forming suffixes.**
- **By correlating the words on the left with those on the right say what a SCIENTIST DOES.**

Thus,
to study is to observe
to analyse
to systematize
to generalize…

- **Now say what scientists study the following:**

Evolutionary processes
Constructive forces
Industrial complexes
Volcanic activity
Statistical data
Polar regions
Marine organisms
Atmospheric conditions
Primitive atmosphere
Migratory processes
Distant galaxies
Elementary particles

are (is)

classified
analysed
observed
identified
studied

by?

- **The guessing game.**

I classify…
I observe…
What am I?

I am a student.
I study…
What am I?

Exercise 10. Write a mini-text on any natural science. Use connectives:
First, second, moreover, as well as, not only…but, on the one hand…, on the other hand…as well, too, besides, both…and.

Chemistry

1. Synthesis of organic compounds. Degradation reaction.
2. Recovery of rare elements from minerals.
3. Arrangement of atoms in inorganic molecules.
4. Influence of arrangement and electronic structure of the atoms upon physical and chemical properties of molecules.

Physics

1. Atomic and nuclear physics. Kinetic theory. Relativity. Elementary particles.
2. Electricity and magnetism. Thermodynamics and statistical physics.

3. Electromagnetic fields. Electronics, currents and magnetic fields. Motion of charged particles.
4. Radiation.
5. Mechanical, thermal, electric and magnetic properties of solids, crystal structure, semiconductors.

Geology

1. The Earth in the Solar System.
2. Earth materials. Earth processes. Nature and origin of structural features of the earth's crust. Mechanics of deformation.
3. Connections between geologic time, earth materials, and geologic forces that create and modify minerals, rocks, landforms, continents, etc.
4. Igneous, sedimentary, and metamorphic rocks.
5. Formation of minerals and mineral deposits. Origin, geologic occurrence, and distribution of important mineral deposits of the world.
6. Water resources. Hydrologic cycle.
7. Physical, chemical, biological and geological features and processes operating in the oceans.

Geography

1. Physical characteristics of the earth's surface and their interaction. Land forms, vegetation, soils, weather, climate.
2. The Earth and its atmosphere.
3. Systematic and regional study of world climates.
4. Economic nature of resources.
5. Industrial location.
6. Transport facilities and patterns of movement.
7. Mapping. Topographic, thematic maps. Map classification.

III. GRAMMAR REVIEW

Exercise 1. Make up sentences using the following words:

1. Major gases because activities human concentrations atmospheric of long-lived greenhouse increasing are of.
2. Account for power stations per cent 34 emissions current of dioxide carbon.
3. The UK are currently emissions carbon dioxide of are around 2.7 per cent total global of from combustion fuel fossil the.
4. Why increasing is greenhouse of concentration gases?
5. A tree in the corner of the garden he planted.
6. The UK is stable emission carbon of dioxide in the?
7. There a lot of people are at the bus-stop.
8. What to lead will global warming?
9. Is covered Earth's by surface the rock of called thin crust layer a.
10. Above sea Rocky level crust islands forms and continents.

Exercise 2. Fill in question words.

1. "…calories do you consume every day?" "About 1,800."
2. …do you go to the gym? "About once a week".

3. …is your favourite colour?
4. …are you going on holiday this year?
5. …is the fastest way to get to Poltava from here?
6. …do you leave home in the morning?
7. …didn't you call me earlier?
8. …your lessons start?
9. …is the weather forecast for tomorrow?

Exercise 3. Complete the sentences using the correct form of the verbs in brackets:

1. The earth (to go) round the sun.
2. Laterite soils (found) in South America.
3. World population (to reach) critical level.
4. The environmental crisis we are facing today (to destroy) even a tiny corner of the earth.
5. If we (not take) action soon, the environmental crisis may cause irreversible damage to the entire planet.
6. Since the soil is porous, it (subject) to leaching.
7. Government (to have) an impact on the population growth.
8. Many people prefer a small car now because it (to be) economical to operate and it (to conserve) energy.
9. Animal fat (contain) cholesterol.
10. Geology (to be) an ancient science.

Exercise 4. Put the verbs in brackets into the correct tense (Present Continuous or Present Simple):

1. You (see) the house on the corner? That is where I was born.
2. I (notice) the weather (to change) now.
3. She (not understand) what you mean.
4. A lemon (not contain) much sodium.
5. California (to be) a large state with large population.
6. It still (rain), but it (look) as if it will soon stop.
7. Ask him what he (want).
8. Japanese people (not to consume) a lot of fat, but Americans (to do).
9. You (to think) fruit juice (to be) nutritious?

Exercise 5. Complete the following proverbs and saying using the correct form of the verbs in brackets:

1. Actions ……… louder than words (to speak).
2. Still tongue ……… a wise head (to make).
3. Birds of a feather ……… together (to flock).
4. A watched pot never ………(to boil).
5. All work and no play ………Jack a dull boy (to make).

Exercise 6. Translate into English. Mind the correct use of tense forms.

1. Геологія вивчає матеріали землі, її фізичні та хімічні властивості.
2. Вирішення проблем навколишнього середовища дуже важливе для майбутнього всього людства.

3. Видобуток нафти скорочується, бо її запаси вичерпуються.
4. Молоді люди повинні дбати про збереження лісів, бо вони є легенями нашої планети.
5. У Китаї з кожним роком зростає виробництво автомобілів, які забруднюють атмосферу.
6. Вчені стривожені тим фактом, що льодовики на полюсах швидко зменшуються.
7. Велосипед – найекологічніший вид транспорту.
8. Нестача води у світі може бути причиною нових війн.
9. Екологічна катастрофа Чорнобиля вивела великі площі орної землі з сільськогосподарського використання.
10. Гідросфера включає воду рік, озер, морів, океанів.

IV PRE-TEXT DISCUSSION

Do you know that:

…the word *science* comes from the Latin word *scientia* which means *knowledge...?*

…the ancient Greeks were the first to begin a systematic separation of scientific ideas from superstition (марновірство)?

…some theologians of the 1660's supported science because they believed that it helped reveal the wonders of God's creation?

…Leonardo da Vinci studied astronomy, anatomy, botany and geology?

…in A.D.800's and 900's Arab astronomers made major advances in mathematics, medicine and optics?

V. READ AND TRANSLATE TEXT 1A.

Text 1A
THE EARTH SCIENCES

The earth sciences, also known as geosciences, are the focus of scientific understanding about this and other planets, embracing an enormous range of topics, including the evolution of the Earth, exploring the Earth's geologic history, fossil record, structure and motion, rocks and minerals, atmosphere, weather and water resources.

Geology (Greek. "geo" – earth, "logos " –study) is one of the most important sciences about Earth. It studies the composition, structure, history of the earth's development and the processes occurring in its interior and on its surface. Modern geology uses up-to date achievements and methods of a number of natural sciences, such as mathematics, physics, chemistry, biology, geography. Significant progress in these fields of sciences and geology has lead to the appearance and development of important interdisciplinary sciences about Earth – geophysics, geochemistry, biogeochemistry, crystallochemistry, paleogeography which enable us to obtain data on composition, state and properties of a substance in deep parts of the Earth's crust and its bottom layers. A special attention should be paid to multilateral relation of geology to geography (landscape study, climatology, hydrology, glaciology, oceanography) in understanding of different geological processes occurring on the Earth's surface. Interrelation between geology and geography is especially important in the study of the Earth's surface relief and laws of its development. In its study of the Earth's relief, geology uses the data from geography and geography is supported by the history of geologic development and interrelation between various geologic processes. Thus, the science on relief –geomorphology – is, in fact, also an interdisciplinary science. According to geophysical data there are several covers in the Earth's composition: earth's crust, mantle and nucleus. The subject of the direct study of geology is the Earth's crust and underlying solid layer of the upper mantle – lithosphere (Greek "lithos " – stone). Difficulty in the object under study has led to significant differentiation between geological sciences, their unity together with interdisciplinry sciences (geophysics, geochemistry, etc) explains various aspects of its composition, history of development, the essence of the occurring processes, etc.

One of the main directions in geology is the study of elemental composition of the lithosphere: rocks, minerals, chemical elements. Some rocks are from molten magmatic silicate and are called plutonic or igneous rocks, others by sedimentation and accumulation in marine and continental conditions and are called sedimentary rocks, the third type of rocks are formed by modification of different rocks under the influence of temperature and pressure, liquid and gaseous fluids, and are called metamorphic rocks. The elemental composition of the lithosphere is studied by a number of geological sciences united under the name of geochemical sciences. Petrography (Greek "petros " – stone, rock, "grapho " – write, describe), or petrology – the science which studies magmatic and metamorphic rocks, their composition, texture, formation conditions, degree of modification under the influence of various factors and laws of their distribution in the Earth's crust, belongs here. Lithology (Greek "lithos " – stone) is a science which studies sedimentary rocks. Mineralogy is a science which studies minerals, i.e. natural chemical compounds or individual chemical elements making up rocks. Crystallography and crystal chemistry study crystals and crystalline state of minerals. Geochemistry is a generalizing synthesizing science about composition of the lithosphere basing on the achievements of the above sciences which studies the history of chemical elements, their laws of distribution and migration in the earth's entrails as well as on its surface. With the birth of isotope geochemistry, a new page was open in geology which concerns restoration of the Earth's historic geologic development.

Elemental lithospheric composition, as well as other processes, is studied using different methods. First of all, these are direct geological methods –direct study of rocks in natural crops on the river banks, lakes, seas, mine cross-cuts, quarries, sidewall cores. All this is limited to relatively small depths. The deepest, and unique in the world today, the Kola well has reached only 12.5 km. But deeper layers of the earth's crust and adjoining parts of the upper mantle are also accessible for direct study. This is promoted by eruption of volcanoes, bringing us debris of upper mantle rocks embedded in the flown magma – lava flows. Similar picture can be seen in explosion diamond pipes, their depth being 150-200 km. Apart from the mentioned above direct methods of lithospheric elements study, optical methods are widely used as well as other physical and chemical investigations - X-ray diffraction study, spectrographic study, etc. Moreover, mathematical methods on computer basis are widely used for the assessment of chemical and spectral analyses reliability, building of rational classifications of rocks and minerals, etc. A number of experimental methods, including computer methods, which model geological processes, giving us the opportunity to obtain different man-made minerals, and rocks, to reconstruct huge pressure and temperatures and to observe the substance behaviour directly under these conditions, to forecast the movement of lithospheric plates and even, to some degree, to present our planet's surface in millions of years ahead have been widely used for the last decades.

VI. COMPREHENSION CHECK

Exercise 1. Find answers to the questions:

1. What do the earth sciences study?
2. What is geomorphology?
3. What does mineralogy study?
4. What is a border science?
5. What are plutonic rocks?
6. What methods do scientists use in their research of the lithosphere?

Exercise 2. Match a word in A with its definition in B:

A	B
1. structure 2. branch 3. knowledge 4. observation 5. law 6. idea 7. invention 8. boundary 9. shortage 10. nature	a. a statement expressing what always happens in certain conditions. b. action of noticing. Ability to notice things. c. a picture in the mind. An opinion, a thought. d. understanding. Information about. e. making up, thinking or producing for the first time. f. the outer limit of something. g. division of something. h. the condition of having less than needed. i. everything that exists in the world irrespective of human beings. Character. j. the way in which parts are formed into the whole. Anything formed of many parts.

Exercise 3. Divide the words into three groups:

Science	Object to research	Action

Matter, structure, determine, logic, chemistry, examine, cell, galaxy, accept, physics, explore, society, consider, organism, humanities, environment, psychology, collect, accumulate, individual, concentrate, plant, physiology.

VII. LOOK THROUGH TEXT 1 B AND GET READY TO SPEAK ABOUT THE METHODS OF SCIENTIFIC RESEARCH.

Text 1B
HOW SCIENTISTS WORK

Scientific research is a creative process that can involve a variety of techniques. Important advances may result from patient hard work or sudden leaps of imagination. Even chance can play a role in the scientific process. Scientists use a number of methods in making discoveries and in developing theories. These methods include: 1) observing nature; 2) classifying data; 3) using logic; 4) conducting experiments; 5) forming a hypothesis (proposed explanation); 6) expressing findings mathematically. Most scientific research involves some or all of these steps.

Observing nature is one of the oldest scientific methods. For example, in the 1830's, Charles Darwin carefully observed plants and animals in many parts of the world serving as a naturalist with the British scientific expedition. Study of the *specimens* collected on the voyage helped him develop his theory that modern *species* had *evolved* from a few earlier ones.

Classifying data can reveal the relationships among observed facts. In the mid-1800's, Dmitri Mendeleev, a Russian chemist, classified the elements into families or groups in a chart called the periodic table. On the table, elements with similar properties appeared at regular intervals. *Gaps* in the table indicated elements that were nor yet known. Scientists soon proved the importance of Mendeleev's systematic classification when they discovered the existence and chemical properties of new elements that filled the gaps.

Using logic enables scientists *to draw conclusions* from existing information. In the late 1800's, a German physicist named Wilhelm Wien studied the relationship between temperature and the energy radiated from the *solids* and *liquids*. After studying many specific examples, he noted that *multiplying* the temperature of a heated solid or liquid by the wavelength of greatest intensity radiated at that temperature always produced the same figure.

Conducting experiments is a major tool in developing and testing scientific theories. The Italian astronomer and physicist Galileo was one of the first scientists to recognize that systematic experimentation could help reveal the laws of nature. In the late 1500's, Galileo began performing carefully designed experiments to study the basic properties of matter in motion. By rolling balls of different weights down inclined planes, he discovered that all objects fall to the ground with the same acceleration, unless air *resistance* or some other force slows them down.

Forming a hypothesis requires talent, skill, and *creativity*. Scientists base their proposed explanations on existing information. They try to form hypotheses that help explain , order or unify related facts. They can use experimentation and other means to test their hypotheses. The discovery of the planet Neptune in the mid-1800's resulted from the formation of a hypothesis. Astronomers noticed that Uranus, which they thought was the most distant planet, was not always in the position *predicted* for it by the laws of gravitation and motion. Some astronomers hypothesized that the force of gravity from an unknown planet might cause the variations in the orbit of Uranus. By calculating where such a planet could be, they eventually discovered Neptune.

Expressing findings mathematically can express how the world works. Galileo and Newton and Einstein expressed the results of their work using mathematics.

Exercise 1. Make up questions to which these sentences are answers:

1. Observing nature.
2. In many parts of the world.
3. Dmitri Mendeleyev, a Russian chemist.
4. In the late 1800's.
5. That systematic experimentation could help reveal the laws of nature.
6. Yes, it is. Because it requires talent, skill and creativity.

Exercise 2. Say whether the statements are true or false.

1. Scientific research is a creative process.
2. Scientists use a number of methods in making discoveries.
3. Dmitri Mendeleyev, a Russian chemist, classified the elements into families or groups in a chart called the Periodic Table.
4. Galileo was one of the last scientists to recognize that systematic experimentation could help reveal the laws of nature.
5. Scientists use experimentation and other means to test their hypotheses.

Exercise 3. Translate into English

ПОНЯТТЯ ПРО МІНЕРАЛОГІЮ ТА НАУКИ, ПОВ’ЯЗАНІ З НЕЮ

Мінерали, які залягають самостійно або як складові частини гірської породи, мають однаковий хімічний склад, кристалічну форму, питому вагу, властивість спричиняти ті чи інші явища, якщо пропусати через них поляризоване світло. Вище наведені властивості мінералів постійні і дозволяють точно визначати та вивчати їх за усіма напрямками.

Ми, однак, не можемо детально розглядати такі способи, бо вони досить складні, а встановлення кожного з них становить об'єкт окремих дисциплін. Найточніший же хімічний склад можна встановити кількісним аналізом, а якісний склад і питома вага визначаються методами фізико-хімічної кристалографії. Дослідження форм кристалів є об'єктом геометричної та фізичної кристалографії і, нарешті, дослідженням кристалів у цілому займається мінералогія. Таким чином, замість детального розвитку кожної із згаданих наук, ми наведемо тільки їхні висновки, що можуть знадобитися у подальшому викладі, відсилаючи того, хто цікавиться, до відповідних курсів.

Отже, якщо мінерал мав властивість кристалізуватися й не наражатися на зовнішні перешкоди, то він кристалізується, даючи звичайно ту саму геометричну форму. Бувають, правда, нерідко випадки, коли за однакового хімічного складу речовина кристалізується в декількох геометричних формах, але тоді це будуть також різні матеріали, які мають різні оптичні властивості, твердість, питому вагу й таке інше.

Така кристалізація не дозволяє, щоб мінерал мав довільно обрані площини, у величезній більшості випадків площини розміщуються за суворими законами симетрії, залежно від числа і порядку осей та площини симетрії. У геометричній кристалографії доводиться, що для мінералів кристалічної форми можуть існувати осі симетрії тільки 2, 3, 4 й 6 порядку, а не будь-які інші.

Крім осей симетрії в кристалічному тілі є ще площини симетрії, тобто такі уявні площини, які ділять фігуру на дві рівні й навпаки.

TEST I

Task 1. Fill in the gaps with a word from the box and translate the text into Ukrainian in writing.

Outstanding	centres	capital	rare elements	prospected
Founder	elected	research	theory	forecast

V.I. Vernadsky (1863-1945) is known as the ……mineralogist and crystallographer, the ……. of geochemistry, biochemistry and radiogeology. Many research …… were established by him. He was ……… president of the Ukrainian Academy of Sciences in 1919. At that time he lived and worked in Kharkiv which was the …….. of the Soviet Ukraine. He conducted …… in the geochemistry of………. Vernadsky advanced a revolutionary ……. of the origin of minerals which was described in his work “ *An Experiment in Descriptive Mineralogy and History of Minerals in the Earth’s crust”***.** He …....for the radioactive minerals. The role of such minerals as radium and uranium was ………. by him.

Task 2. Match the verbs from A with the nouns from B.

A	B
1. to advance	a. a deposit
2. to make up	b. a view
3. to head	c. to solve the problem
4. to lay	d. the academy
5. to elect	e. a detailed map
6. to understand	f. a chairman
7. to create	g. the foundation of
8. to try	h. a new branch of geology
9. to design	i. the theory
10.to forecast	j. effective machinery

Task 3. Read the sentences and decide which of the given options is correct.

1. During the development, we stopped to think about the difficulties.

a) we stopped thinking about the difficulties and we don’t think about them now.

b) for a short time, during the development, we did not think about the difficulties

c) we did think about the difficulties during the development phase.

2. I like to call customers, to check that they are happy a few weeks after buying a machine from us.

a) I think it is a good policy to check that the customer is happy

b) I really enjoy calling customers to check that they are happy

c) I would like to call customers, to check that they are happy.

3. I was trying to contact the firm last week.

a) I attempted to call the firm last week.

b) I succeeded in contacting the firm last week.

c) I did not attempt to call the firm last week.

Task 4. Insert prepositions where necessary (at, for, on, with, in, to, of).

1.Our faculty trains specialists….different specialities.

2.Students are provided…everything necessary…their study.

3. Diploma paper is submitted…the end…the fifth year.

4.Geology is the study…Earth, …particular, its history, structure and processes going on it.

5.Geology has contributed a great deal…civilization.

Task 5. Choose the correct option.

1 .When Michael arrived, the Johnsons______dinner, but stopped in order to talk to him.

a) were having c) had been having

b) had d) was having

2. While Tom______a book, Martha______TV.

a) was reading, watched c) was reading, was watching

b) read, watched d) read, was watching

3. The food that Ann is cooking in the kitchen______delicious.

a) is smelling c) smelt

b) smells d) will smell

4. We called our friends in London yesterday to tell them about the reunion that we______.

a) will plan c) plan

b) were planning d) have planned

5. Catherine is studying law at the university, and so______Nick.

a) is c) was

b) does d) were

6. I feel terrible. I think I______to be sick.

a) will c) am going

b) go d) will be going

7. My colleagues usually______four days a week, and this week they______five days.

a) work, are working c) are working, are working

b) are working, work d) work, work

8. It______outside; I do not like to walk in such weather.

a) rains c) is raining

b) is rain d) is rained

9. I______a very difficult day tomorrow. I need to prepare for the exam.

a) will have c) have

b) am having d) would have

10. At 10 o'clock in the morning on Wednesday Tom______a delegation in the office.

a) will receive c) will be receiving

b) is receiving d) would receive

11. Although the sun was shining, it was still cold, because it ______hard for two hours.

a) had been raining c) had rained

b) was raining d) is raining

12. She______at the parcel long enough, before she______that it was for her brother.

a) had been looking, had understood

b) had been looking, understood

c) was looking, understood

d) was looking, had understood

13. I_____to the cinema but my friend persuaded me to stay.

a) am not going c) did not go

b) was going d) had been going

14. We were good friends, we______each other for years.

a) had known c) were knowing

b) had knowing d) know

15. We were extremely tired at the end of the journey. We ____for more than 24 hours.

a) had travelled c) had been travelling

b) were travelling d) travel

16. How long______this book? How many pages of this book______?

a) have you been reading, have you been reading

b) have you read, have you read

c) have you read, you read

d) have you been reading, have you read

17. We always go to the Crimea for our holidays. We ______there for years.

a) have been going c) go

b) are going d) were going

18. I have lost my key again. I______things. I lose things too often.

a) always lost c) have always lost

b) am always losing d) was always losing

19. The economic situation is already very bad and it______worse.

a) is getting c) got

b) gets d) would be getting

20. What time______your friend______tomorrow?

a) will arrive c) will be arriving

b) is arrived d) will arriving

Task 6. Make the following sentences negative.

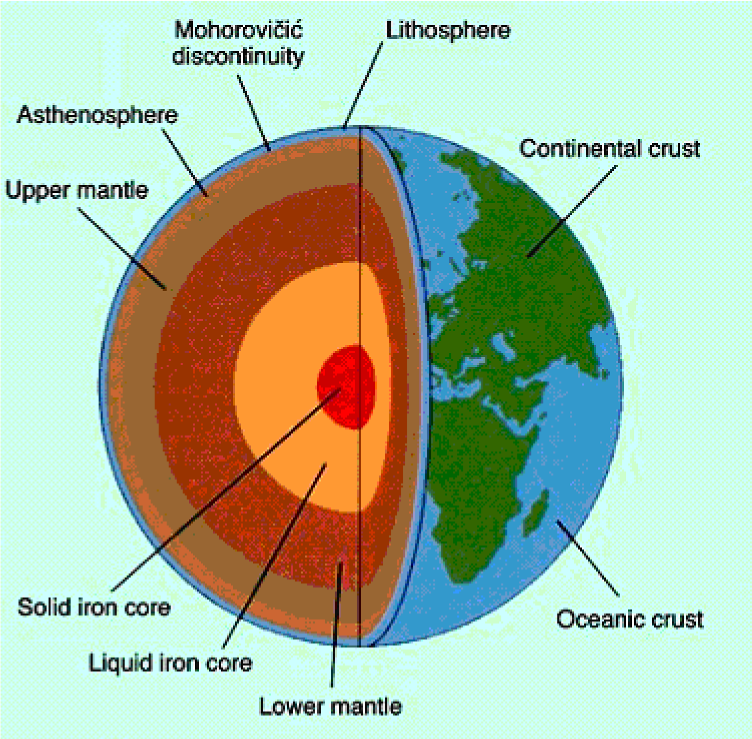
1. Modern ecology began with Charles Darwin.
2. Nature has always served man.
3. Water pollution is a very serious problem.
4. Water reservoirs are drying up.
5. Oil is called “black gold”.

Task 7. Translate into English.

1. Мої улюблені предмети - топографія, хімія і кристалографія.
2. Вчора ми перекладали статтю відомого англійського науковця з геології морських покладів мінералів.
3. Кращі випускники мають можливість продовжити навчання в аспірантурі.
4. Геологія вивчає континенти, океан, атмосферу, магнітні та радіаційні поля.
5. Студенти мають можливість користуватись інтернетом і сучасною бібліотекою.

Unit 2

The Earth's Crust and Useful Minerals



Grammar
Plural of nouns
Present Perfect vs Present Perfect Continuous

I. ACTIVE VOCABULARY

cause (v) – викликати, бути причиною
clay (n) – глина
consolidate (v) – затвердіти
crust (n) – кора
decay (v) – гнити
derive – походити
destroy (v) – руйнувати
dissolve – розчиняти
expose(v) – виходити на поверхню
extrusive – ефузивний
glacier (n) – льодовик
grain – зерно
gravel (n) – гравій
internal – внутрішній
external (adj) – зовнішній
iron – залізо

layer (n) – пласт
lime – вапно
loose (adj) – розсипчастий
particle – частка
peat (n) – торф
sandstone – пісковик
sediment (n) – осадова порода
schist – кристальний сланець
schistose (adj) – сланцевий, пластовий
shale – сланець , сланцева глина
siltstone (n) – алеврит
stratification – залягання
substance (n) – речовина, матеріал
thickness – товщина, потужність
vary (v) – змінюватися
value – величина, значення

II. LEXICAL EXERCISES

Exercise 1. a) Translate the words with un-:

Unconsolidated, uncemented, unusual, undeformed, unsatisfactory, unnecessary, unlike.

b) Translate the sentences intoUkrainian:

1. The results of the experiments were unsatisfactory.
2. Gravel, sand and clay are unconsolidated mechanical sediments.
3. They are called so because they are composed of loose uncemented particles.
4. The geologists found the old structures which were unusual and undeformed.

Exercise 2. Read the following word combinations and translate them into Ukrainian:

valuable minerals	various discoveries
the accumulation of sediments	the Earth's crust
the destructive action of water	pre-existing rocks
available resources	the internal structure of rocks
consolidated and unconsolidated sediments	
fire damp	successful prospecting
exposed rocks	organic decay
solidified rocks	stratified deposits
firmly cemented particles	mineral substances
surface exposure	loose sediments
igneous rocks	sedimentary rocks

III. GRAMMAR REVIEW

Exercise 1. Underline the correct verb form:

1. Geology is/are my favourite subject.
2. Wood come/comes from trees.

3. The news was/were interesting this evening.
4. His advice was/were useful.
5. Your furniture is/are made from precious wood.
6. Butter contain/contains a lot of fat.
7. Your knowledge on hydrogeology is/are quite impressive.
8. Japanese is/are difficult to learn.
9. Most people is/are worried about the future.
10. Water is/are necessary for survival.

Exercise 2. Write the correct form of the verbs in brackets:

1. The people of Asia … (believe) in various religions.
2. 20 years … (be) a long time.
3. Hathaway Pacific … (be) an Asian airline.
4. Flu … (make) you feel miserable.
5. A loaf of bread … (cost) more now than it did ten years ago.
6. I think olive oil … (add) a lot of flavour to cooking.
7. Half the sheep … (be) killed because there was so much snow in the mountains.
8. Some people think French … (sound) so romantic.
9. Physics … (involve) a lot of theoretical study.
10. Gravity … (pull) things towards the centre of the Earth.

Exercise 3. Underline the correct verb form:

1. Life expectancy is/has been growing in modern world.
2. She has made/has been making three business trips to Kyiv this month.
3. Recently the ozone layer over the poles depletes/ has been depleting .
4. She has travelled/has been travelling to the UK many times since 1999.
5. Some countries have made/have been making a lot of efforts to reduce CFCs emissions since 1992 when the Kyoto protocol was signed.

Exercise 4. *Put the verbs in brackets into the correct form.*

An Exciting Trip

I just (to receive) a letter from my brother. He (to be) in Australia. He (to be) there for six months. He (to be) an engineer. He (to work) for a big firm and he already (to visit) a great number of different places in Australia. He (to go) to Alice Springs, a small town in the centre of Australia. He soon (fly) to Perth. My brother never (to be) abroad before, so he (to find) this trip very exciting.

Exercise 5. Error correction.

Look at the text below. Some of the lines are correct, so put a tick (√)next to them. Some others include an extra word which you must cross out. The first two lines have been done as an example**.**

0 Los Angels is well known for both the high
00 level of its air polution and the efforts made to control√
1. it. However, the “City of Angels” is not neither
2. unique nor the worst one example of a polluted
3. city. Tokyo has such a serious air poluution

4. problem that oxygen masks are been supplied to
5. policemen who they direct traffic on busy roads. Milan,
6. Ankara, Mexico City and Buenos Aires face
7. their similar problems. The task of cleaning up
8. air pollution, though yet difficult, is not
9. impossible. Use of fuels that are low in
10. pollutants and a change to very less polluting
11. forms of power generation are methods
12. currently being in used. The example
13. of London, as well as to other cities,
14. has shown that major improvements in
15. air quality can be achieved in ten of years or less.

Exercise 6. Translate into English.

1. Сьогодні дуже холодно; цілу ніч ішов сніг.
2. Ми познайомились місяць тому, але відтоді я нічого про нього не чула.
3. Ви коли-небудь були в Австралії? – Ні, але я завжди мріяла там побувати.
4. Потепління клімату змінює рівень світового океану.
5. Дякую вам за все, що ви зробили для мене.
6. Вирубка вологих тропічних лісів веде до знищення крихкої рівноваги у природі.
7. Багато цінних порід дерев були винищені заради людської пихи.
8. Коли ви останній раз їздили до Криму? – Я взагалі ніколи не був у Криму.
9. Дощ закінчився, і знову світило сонце.
10. Аральське море майже наполовину висохло через людську діяльність.

IV.PRE-TEXT DISCUSSION

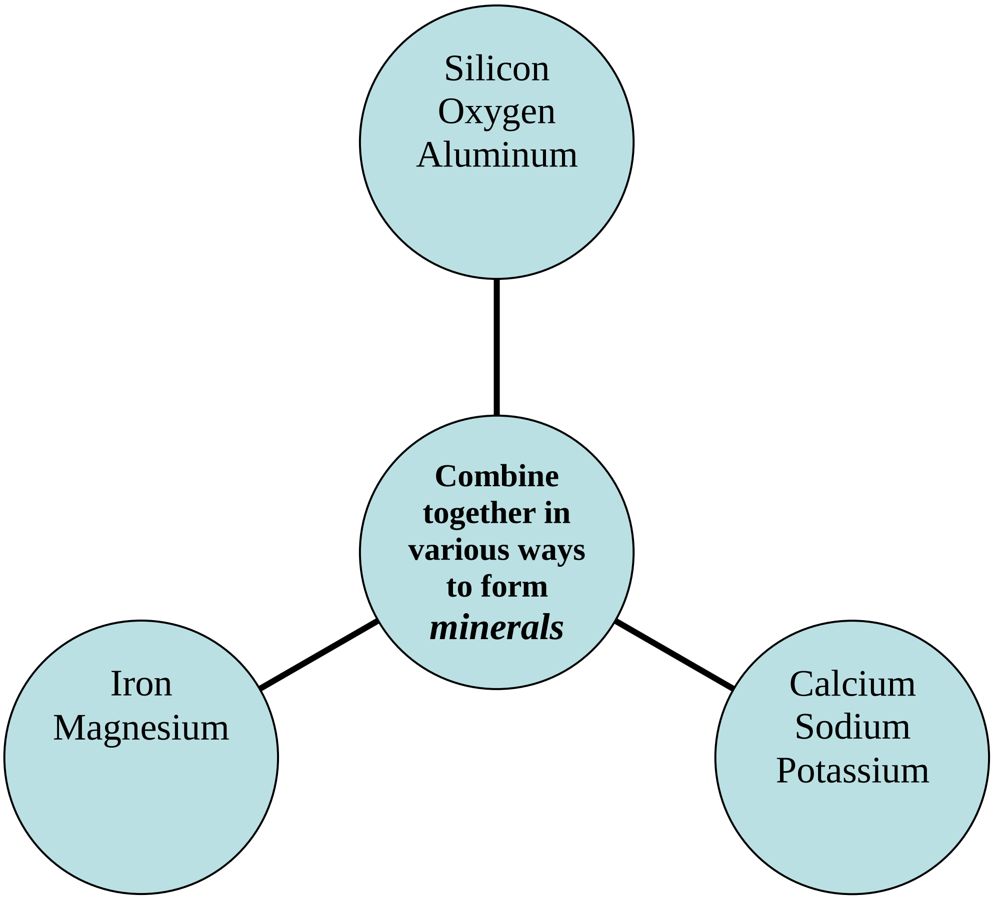
What is a mineral?

ELEMENTS	+	ELEMENTS	=	MINERALS
	combine with (unite)		to form	
MINERALS	=	ELEMENTS	+	ELEMENTS
	are formed		by combination of	

Thus, minerals are formed by the combination of the elements**.**
The elements combine (unite) to form minerals.
Elements are unit constituents of minerals.
Minerals are chemical compounds.

Possible variables to characterize minerals

Elasticity	sectility	solubility	specific gravity	radioactivity
Hardness	rigidity	transparency	crystal form	streak
Cleavage	ductility	colour	flexibility	magnetism
Luster	malleability	fluorescence	brittleness	



HARDNESS

Moho's scale of hardness

1. talc (softest)	6. orthoclase
2. gypsum	7. quartz
3. calcite	8. topaz
4. fluorite	9. corundum
5. apatite	10. diamond (hardest)

So, topaz has a hardness of 8. It means that it scratches quartz but does not scratch corundum. That is it is too soft to scratch corundum, but hard enough to scratch quartz.

*** Now, describe the hardness of these:**

gypsum
fluorite
orthoclase

*** Identify the variables which denote TENSILE STRENGTH .**

The following examples may be of some help. Make use of: *because, therefore*.

- It breaks easily. It is *brittle.*
- What is it? (Glass)
- It bends easily. It is flexible.
- What is it? (Wire)
- It stretches and returns to the same shape. It is elastic. What is it? (Rubber)
- It is easily cut into sections. It is sectile. What is it? (Cheese).

Properties of some minerals

mineral	Colour/lustre	Tensile strength	hardness	Crystal structure	Relative density
Diamond	**…**	…	**…**	cubic	3.5
Graphite	**…**	…	1	hexagonal	2.1
Halite	**…**	brittle	2.5	cubic	2.2
Beryl	green/yellow	brittle	8	hexagonal	2.7
Calcite	white	brittle	…	tetragonal	2.7
Fluorite	colourless	brittle	…	cubic	3.2
Gold	…	…	2.5	cubic	17.0
Barytes	white	brittle	3	orthorhombic	4.5
Zircon	brown	brittle	7.5	tetragonal	4.3
copper	…	…	3	cubic	8.8

**** Complete the table.***

**** Read these descriptions of minerals and name them using the scheme.***

a) It breaks easily and is white in color. It has a tetragonal structure and is harder than gypsum but softer than fluorite. It has a relative density of 2.7.
Therefore, it is…
b) It is fairly hard and is brown in colour. It has a tetragonal structure.
Therefore, it is…
c) It is red in colour. It has a cubic structure and can be made into wire.
Therefore, it is…

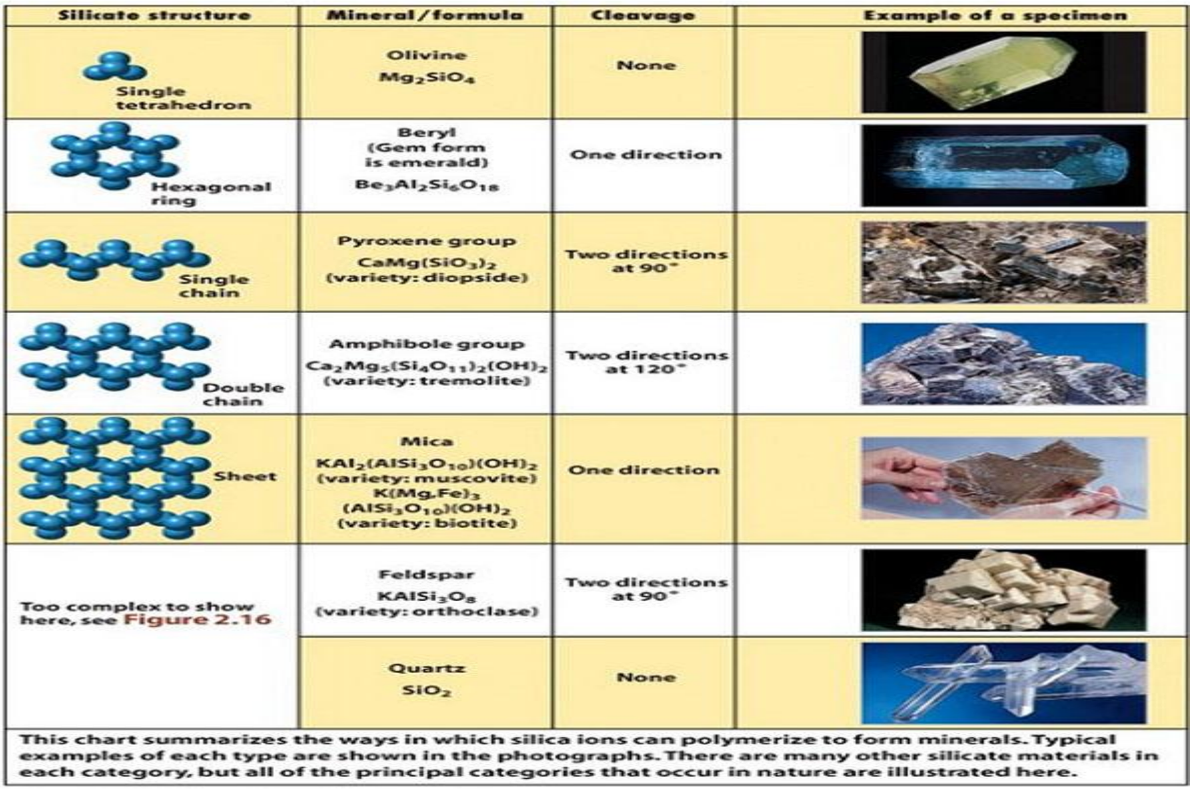
- **Now write similar descriptions for these minerals:**

d) Gold ; e) halite; f) beryl.

Thus,
a mineral may be described according to its physical properties and chemical composition.

V. READ AND TRANSLATE TEXT 2A. NAME MAIN WAYS OF FORMATION OF SEDIMENTARY ROCKS.

Text 2A.
ROCK-FORMING MINERALS



Silicate structure	Mineral/formula	Cleavage	Example of a specimen
Single tetrahedron	Olivine Mg_2SiO_4	None	
Hexagonal ring	Beryl (Gem form is emerald) $Be_3Al_2Si_6O_{18}$	One direction	
Single chain	Pyroxene group $CaMg(SiO_3)_2$ (variety: diopside)	Two directions at 90°	
Double chain	Amphibole group $Ca_2Mg_5(Si_4O_{11})_2(OH)_2$ (variety: tremolite)	Two directions at 120°	
Sheet	Mica $KAl_2(AlSi_3O_{10})(OH)_2$ (variety: muscovite) $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ (variety: biotite)	One direction	
Too complex to show here, see Figure 2.16	Feldspar $KAlSi_3O_8$ (variety: orthoclase)	Two directions at 90°	
	Quartz SiO_2	None	

This chart summarizes the ways in which silica ions can polymerize to form minerals. Typical examples of each type are shown in the photographs. There are many other silicate materials in each category, but all of the principal categories that occur in nature are illustrated here.

Since most rocks contain minerals, some knowledge of minerals is necessary to identify rocks. Because minerals are chemicals, they have special properties which aid in their recognition. Minerals are easily identified by chemical analysis.

One of the properties of minerals which depends on their chemical composition is the **specific gravity** or relative weight of the mineral. When molecules are packed together with a minimum of waste space, as in the metals, the mineral weighs more. The specific gravity of minerals is compared to water, which has a specific gravity of 1. Common minerals range from 1.7 specific gravity, for borax, to 19.3, for gold.

Most minerals also have a distinct crystal form. This, in turn, depends on the arrangement of the molecules in each mineral. Mineral crystals fall into six systems, and these can be identified by the angles of the crystal. Even a small fragment of a crystal is enough to give a clue to its structure and its crystal form.

The way a mineral breaks in flat planes is called its *cleavage.* This, too, can be used in identification. Mica is an example of perfect cleavage. Minerals also break in an irregular way. This kind of breakage is called *fracture* and it also helps to identify a mineral.

All minerals have a definite *hardness*, which is the mineral's ability to scratch or be scratched. Hardness is generally measured on an arbitrary scale of 10.

The colour of minerals is not important in identification because the colour may be due to impurities or surface changes. Streak is the colour of powdered minerals, and luster is the way the structure of a mineral reflects or breaks up light. Besides these properties, certain minerals respond to ultra-violet light and give off brilliant colours. This fluorescence is also used in identification. Other minerals are magnetic. Some have electrical radioactive properties. These and many other properties of minerals help identify them in the field and in the laboratory.

The rock-forming minerals are a group of little importance as gems or as sources of metal. But they have great importance in the overall history of the Earth. The rock-forming minerals are the ones which make our land on which we live.

Of all the rock-forming minerals, the simplest and most widespread is the mineral *quartz-silicon dioxide*. Quartz occurs in many forms, some of them are beautifully coloured. These are used as gems. Ordinary quartz is a colourless, glassy mineral which may form a six-sided crystal. It breaks in the same kind of shell-like surface you find in broken glass. Large crystals of quartz are rare and are valued for their use in radio and electronics. Crystalline quartz is found in rocks which were once melted, though this kind seldom forms good crystals.

Under certain conditions quartz will dissolve in alkali water and will reform as non-crystalline quartz. These forms of quartz are called agate, onyx or chalcedony. Crystalline quartz is the usual rock-forming mineral. Non-crystalline quartz is not.

Gypsum, calcite, dolomite, and halite (rock salt) are occasionally rock-forming minerals, too, but, by and large, the rest of the rock-forming minerals are silicate minerals. Probably the most important of the rock-forming minerals are *the feldspars*. This is a difficult family of minerals to understand because they grade off one into another, and are hard to tell apart. All feldspars contain aluminium, silicon and oxygen. They also contain one or two metals such as sodium, calcium and potassium. In general, potash or potassium feldspars are put with the calcium feldspars into another group.

Another family of the rock-forming minerals is the zeolites, a group comprising two dozen minerals which are chemically similar to feldspars. Most zeolites are soft, light minerals. Some have attractive crystal form.

The way minerals form rocks is a complicated process. It involves chemical reactions at high temperatures and pressures. These different conditions, which may occur within or beneath the crust of the Earth, produce a variety of rocks. While these rocks are quite alike chemically, they differ greatly in their physical and mineral characteristics.

All minerals are founding rocks. Diamonds are found only in a volcanic rock called kimberlite. Other minerals, like quartz and calcite, may be found in many different rocks. The chance of finding gold in limestone is practically zero, but the chance of finding it in rocks which were once melted is much greater.

VI. COMPREHENSION CHECK

Exercise 1. Answer the following questions:

1. What minerals are called the rock-forming minerals?
2. What properties of minerals are used in their identification?
3. How many minerals do you know?
4. Where are all minerals found?
5. What colours of minerals do you know?

Exercise 2. Give the Ukrainian for:
a) arrangement, fracture, streak, luster, fluorescence, cleavage, gem, heat, mica, hornblende, onyx, zero, amount, to squeeze, to fold, to give the clue, to range, to crush, to scratch, to reflect, to dissolve, similar;
b) waste, space, alkali water, garnet crystal, calcium powder, rock identification, specific gravity;
c) at all, due to, besides, at least, alike.

Exercise 3. Give the English for:
Твердість, риса мінералу, блиск, слюда, злам, дорогоцінний камінь, рогова обманка, шкребти, віддзеркалювати, розчиняти, питома вага, крім того, подібний, порошок, олівін, тальк, агат, гранат.

Exercise 4. Find synonyms among the following words:
Gem, due to, to be alike, because of, to be similar, precious stone.

Exercise 5. Find antonyms among the following words:
Always, colorless, regular, heavy, colorful, irregular, light, never.

Exercise 6. Speak on minerals and the process of their identification. Use the following words:
Property, depend on, specific gravity, to range, crystal, fall into, angle, break, cleavage, hardness, to tell apart, arbitrary scale, streak, powdered mineral, to confuse, to reflect, fluorescence, magnetic, electrical properties.

***Exercise* 7. Describe the class of silicates:**
a) quartz, b) feldspar, c) zeolite. **Speak on their properties and industrial use.**

VII. LOOK THROUGH TEXT 2B AND GET READY TO SPEAK ABOUT THE EARTH.

Text 2B
OUR EARTH

The earth is a huge, slightly lopsided ball of rock, so enormous that we can scarcely imagine how heavy it is.
When geologists talk of the earth as a ball of rock, they do not mean it is solidly made up of the stones you see on a rocky beach. Scientists actually know very little about the rocks deep inside the earth. It is easy to define chemical elements and the minerals they form, but it is not easy to define the rocks of which the earth is made.

All life is spread out in a thin layer on, or the surface of the rocky earth or close to it. Some plants and animals make their homes two or three miles above the sea level. Others can survive at an equal depth below the surface of the sea. But it is within this thin six-mile layer that over 99, 99 per cent of all plants and animals live, grow, and die.

In recent years, astronomers and geologists have shown that the story of the origin of the world is very complicated. Yet everyone agrees that the earth, the planets and the sun are made of matter. Therefore, comprehensionof what is meant by matter is the first step in understanding rocks.

Matter is anything which occupies space, has weight and can be detected by some means or another. Each bit of matter on the earth or in the universe attracts all other bits of matter. This ever present attraction is known as gravity or gravitation.

All matter is made of 105 chemical elements listed in Mendeleyev's Periodical Table. Over 99 per cent of the material in the earth is made of about 30 lightest elements. All our rocks are also made of these 30 light elements. If the sun and the other stars are included, the two lightest elements – hydrogen and helium – make up nearly all of the matter in the universe.

On the hot surface of the sun, most atoms (the smallest particles of an element) are independent of each other. On the earth atoms usually combine to form molecules. Sometimes two or more atoms of the same kind will join together. Atoms of hydrogen and oxygen are usually joined in pairs. More often, two or more different elements unite, forming a molecule made of several kinds of atoms.

A hundred or more kinds of atoms can combine in millions of different ways. In each case a different molecule is formed. Living things contain large, complex molecules. Nearly all of them include atoms of carbon joined with atoms of hydrogen, oxygen, nitrogen, sulfur and phosphorus. In the crust of the earth, 30 or so lightest elements have joined together to make thousands upon thousands of different molecules. These molecules form chemicals which occur naturally in the crust of the earth. When these natural chemicals have a definite crystal structure and are not formed in or by living things, they are then called minerals.

Thousands of kinds of minerals are known, but only a hundred or so are common. These common kinds are made mainly of eight elements: oxygen, silicon, aluminium, iron, calcium, sodium, potassium and magnesium. These eight elements, joined together in various ways, make up nearly 99 per cent of the crust or outer part of the earth.

Exercise 1. Answer the following questions:

1. Is it easy to define chemical elements?
2. What do the earth, the planets and the sun consist of ?
3. When are natural chemicals called minerals?
4. What are the most common minerals made of?

Exercise 2. Give the Ukrainian for:

a) weight, lead, universe, dioxide, nitrogen, hydrogen, silicate, origin, crust, potassium, sulphur, to spread out, to deal with, to make use of, oxygen;

b) sea level, six mile layer, precious metals, rocks age, oil well

b) in spite of, in order to, thus, as soon as, inside, therefore, once, even, in different ways, on the way, by means of.

Exercise 3. Give the English for:
Кора землі, походження, азот, вага, свинець, окисли, двоокис, натрій, калій, виробляти, мати справу з, важити, вуглець, сірка, кисень, не дивлячись на, для того, щоб, таким чином, як тільки, нафтова свердловина.

Exercise 4. Find synonyms among the given words:
To seem, bed, to discover, to appear, due to, to find, layer, because of, piece, matter, bit, substance, combine, join together, stratum.

Exercise 5. Find antonyms among the given word:
Heavy, thick, equal, ancient, high, far, perfect, thin, unequal, recent, imperfect, light, near, low.

Exercise 6. Make up questions of your own using the following words:
To attract, to occur, to detect, to join, to pick up, to seem, to weigh, to define, to include

Exercise 7. Translate into English:

МІНЕРАЛИ

В наш час відомо близько 300 мінералів, і щороку вчені відкривають усе нові й нові їх види. Але лише близько 100 мінералів мають відносно велике практичне значення: одні – завдяки своєму природному поширенню, інші – завдяки особливим, цінним для людини властивостям. І тільки чверть із них відіграють значну роль у складі гірських порід.

Деякі мінерали були відомі ще у Давній Греції. Але науковий спосіб їх пізнання затвердився значно пізніше. Батьком мінералогії справедливо вважають німецького вченого Георга Агріколу (1494-1555). Значний вклад у розвиток вчення про мінерали зробив професор мінералогії Фрейбергської гірничої академії А. Вернер (1750-1817), який розробив класифікацію гірських порід.

Виникнення назв мінералів не підлягає ніякій єдиній системі: декотрі з них запозичені з жаргону гірників або народної назви, інші були придумані спеціально. З часом деякі мінерали одержали нові назви, при цьому їх попередні назви теж часто не виходили з ужитку. Ось чому зараз один і той же мінерал може мати декілька назв. Особливо заплутана номенклатура коштовного та напівкоштовного каміння: їх численні назви можуть вводити в оману.

Frequency adverbs 0% never rarely sometimes often usually always 100%

Exercise 1. Read these examples and complete the grammar rule.
I’m always very busy. They never visit us. We usually drive to work.
He isn’t usually late. I don’t always get up early. They’re never on time.
We write words like **always/usually/never** after the verb to be but…………..other verbs.

Exercise 2. Rewrite the sentences adding frequency adverbs to make true sentences about yourself. Add three more sentences about your daily routine.

1. I get up before 6 a.m.
2. My teacher goes to bed after midnight.
3. I drive to work.
4. I am late.
5. My friend uses a computer.
6. I speak English to my friends.
7. My parents travel on business.
8. We are early for English class

Exercise 3. Fill in the gaps with the appropriate idiom:

at a loose end, put an end to, light at the end of the tunnel, brought to an end, dead end, odds and ends, got the wrong end of the stick, to make ends meet

1. This box contains lots of …..(small worthless articles).
2. They should finally…their constant arguing (stop).
3. I find it hard…, because my salary is so low (to afford everyday expenses).
4. The discussions had come to a(n)…, and negotiations were therefore stopped. (no way out).
5. You shouldn't give up, because there is always …(hope).
6. The meeting was…because it was getting nowhere (stopped)
7. You've …; I didn't cause the accident. He did! (misunderstood).
8. When all the work was finished, we found ourselves…(not knowing what to do)

Exercise 4 .Choose the correct item.

1. You must………..harder if you want to reach Olympic standards. (train, instruct, master, discipline).
2. The twins are so……… that I cannot tell them apart (like, alike, identical, same).
3. Many soldiers were………during the Second World War (damaged, broken, spoiled, wounded).
4. The seating…….…of the stadium is 10,000 (ability, capability, skill, capacity).

Exercise 5. Match the idioms with their definitions.

1. Famous people are always *in the public eye*, and are followed around by reporters wherever they go.
2. We climbed up the mountain to get *a bird's eye view* of the surrounding countryside.
3. Robert is *the apple of his grandmother's eye*. You can see how much she loves him.
4. Is Jane on holiday? I haven't *set eyes on* her for weeks.
5. When we visited the fairground, the children *were all eyes*.
6. *An eye for an eye, a tooth for a tooth* is a saying in the Old Testament.
7. Could you *keep an eye* on my flat while I'm away?
8. She always wears extremely *eye catching* clothes!
9. Angela won't go out with you. She only *has eyes for Rob*.
10. A bacterium is too small to be seen *with the naked eye*.

   a. A view of something from a high position.
   b. The person somebody loves most.
   c. To see without the use of a microscope/telescope.
   d. To see somebody.
   e. Attractive/noticeable.

f. To take revenge.
g. To look after something.
h. Totally fascinated.
i. To be in love with somebody.
j. Well - known (especially by the media).

TEST 2

Task 1. Fill in the gaps with a word from the box and translate the text into Ukrainian in writing.

Solar System	certainty	behaviour	cloud of dust	abundant
Scientists	galaxy	hypothesis	exploding	gravitational

No one can go back in time to view the formation of the …..and the Earth. Therefore, the ….will never be able to describe the sequence of events with …..

The hypothesis given here is based on calculations about the ….. and gas in space and on observations of stars and dust clouds in our …..

The ….. states that about 5 billion years ago the matter that became our Solar System was an immense, diffuse , frozen ……. and gas rotating slowly in space. This cloud formed from matter ejected from an …… star.More than 99 per cent of this cloud consisted of hydrogen and helium, the most …… elements in the Universe. The temperature of this cloud was about 270 C. Small …… attractions among the gas and dust particles caused the cloud to condense into a sphere.

Task 2. Fill in the gaps choosing one of the variants in brackets.

1. There are .... causes of weathering, but ……. depends on the change in temperature, *(many, much)*
2. As is known, only ….... minerals and rocks are resistant to the action of natural waters *(little, few)*
3. The roots of plants developed ……... pressure which did not fracture overlaying rocks *(little, few).*
4. A new geological map of the region will appear in a .... years.*(little, few)*
5. ……. minerals undergo changes. They have already undergone ...transformation. *(many, much).*

Task 3. Choose the correct option.

1. – How long______you______? – Since I was 17.

a) have been driving c) did drive
b) have driven d) do drive

2. She______always______in Kharkiv.

a) _______, lives c) has been living
b) has lived d) has live

3. How long______you______Kate?

a) did know c) have known
b) have been knowing d) do know

4. I______here all my life.

a) have lived c) am living

b) have living d) live

5. Kate has lost her passport again, it is the second time this_____.

a) happens c) happened

b) has happened d) is happening

6. Kate has been working here______.

a) since two years c) for two years

b) two years ago d) two years

7. The boy sitting next to me on the plane was nervous because he______before.

a) has not flown c) had not flown

b) did not fly d) has not been flying

8. I______a lot but I don't any more.

a) was used to eat c) was eating

b) used to eat d) used to eating

9.______next week, so we can go somewhere.

a) I'm not working c) I don't work

b) I won't work d) I shall not work

10. We are late. The film______by the time we get to the cinema.

a) will be already started c) will already have started

b) will already start d) already will start

11. Don't worry______late tonight.

a) if I'll be c) when I'll be

b) if I am d) if I be

12. At first I thought I______the right thing, but I soon realized that I______a serious mistake.

a) did, made c) have done, have made

b) had done, had made d) did, had made

13. I hope Kate is coming soon. I______for two hours.

a) am waiting c) had been waiting

b) have been waiting d) waited

14. At last Kate came. I______for two hours.

a) am waiting c) had been waiting

b) have been waiting d) was waiting

15. She is going on holiday. This time next week she______on a beach or______in the sea.

a) is going to lay, swim

b) will be lying, swimming

c) will lie, swim

d) is lying, swimming

16. —______you______the post office when you're out? – Probably. Why?

– I need to mail the letter. Could you do it for me?

a) are passing c) will be passing

b) are going to pass d) will pass

17. We______for a walk when it______raining.

a) will go, will stop c) are going, will stop

b) will go, stops d) go, stops

18. When you______in Lviv again, you must come and see us.
a) will go c) are
b) will be d) are going

19. I'm going to read a lot of books while I______on holiday.
a) am c) would be
b) will be d) am going to be

Task 4. Put the verbs in brackets into the correct form.

1. Processes that originate deep in the Earth's interior (to be) called internal forces.
2. Ninety-nine per cent of the atmosphere (to be concentrated) within 30 kilometers of the Earth's surface.
3. The biosphere (to be inhabited) by life.
4. The mass of outer planets (to be composed) mostly of hydrogen and helium
5. People (to build) cities along rivers to take advantage of the flat land.

Task 5. Fill in the correct form of the words in brackets.

1. Jenny cares about her ….and is always very smartly dressed (appear).
2. His last employer gave him such a good …that he had no trouble finding another job (refer).
3. Tickets for the last … of the play were completely sold out (perform).
4. I don't have much….in Paul; he seems to be rather irresponsible (confide.)
5. The pilot got ….from the control tower for take-off (clear).

Task 6. Cross out the unnecessary words where necessary. Some sentences are correct.

1. She is a more better driver than I am.
2. He can walk much faster than me.
3. The old lady walked the more slowly than her daughter.
4. Pele is among the best football players in the world.
5. The longer he exercise, the far more tired he gets.
6. Jim is a very more efficient worker than Sam.
7. He spends the half as much money as his wife does.
8. She used to wear the same clothes as with her sister.
9. Jane can sing as well as a bird.
10. I can easily carry this bag. It's so light as a feather.

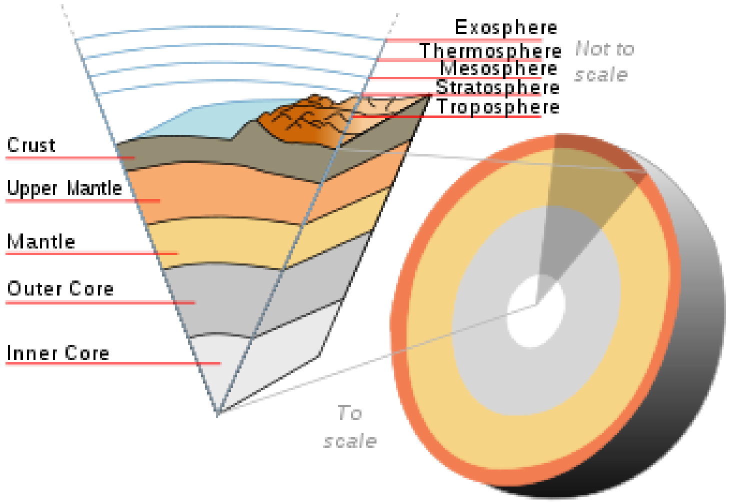
Task7. Translate into English.

Геологія – це наука, що вивчає Землю, її історію, структуру, еволюцію життя і процеси, які сформували Землю та її мешканців. Геологічна наука має академічні та прикладні аспекти. До академічних аспектів належать вивчення історії виникнення життя, землі і планет, а також процеси історичної еволюції.

Вивчення історичної еволюції через давні проміжки часу – це те, що відрізняє геологію від інших фізичних наук.

Прикладні аспекти науки включають взаємодію між людьми і Землею, вивчення мінеральних ресурсів, визначення та прогноз таких явищ, як землетруси, зсуви грунту, виверження вулканів, а також виявлення джерел забрудненої підземної води. Геологи також вивчають проблеми урбанізації.

UNIT 3
Rocks of the Earth's Crust



Grammar
Past Simple vs Past Continuous

ACTIVE VOCABULARY

abyssal (a) – абісальний, глибинний
hypabissal (a) – гіпабісальний
adjacent (a) – суміжний; той, що прилягає
ash (n) – попіл
belt (n) – пояс
body (n) – тіло, речовина
solid (liquid, gaseous) bodies – тверді (рідкі, газоподібні) речовини; масив; родовище; пласти
common (a) – звичайний; спільний; *syn* general; *ant* uncommon
cool (v) – охолоджувати(ся); *ant* heat (нагрівати (ся)
dimension (n) – вимір; *pl* розміри; величина *syn* measurement, size
dust (n) – пил
dyke (n) – дайка
extrusion (n) – витіснення; виштовхування; *ant* intrusion – вторгнення; *геол.* інтрузія (вторгнення у породу виверженої маси)
fine (a) – тонкий; мілкий; дрібнозернистий; високоякісний; тонкий; прекрасний
fine-graded (fine-grained) (adj) – дрібнозернистий, тонкозернистий;
fines (n) – дріб'язок; дрібне вугілля
inclined (a) – похилий
mica (n) – слюда
probably (adv) – ймовірно; *syn* perhaps, maybe
shallow (a) – мілкий; поверхневий; *ant* deep – глибокий
sill (n) –силь, пластова інтрузія
stock (n) – шток, невеликий батоліт
vein (n) – жила, прожилок, пропласток

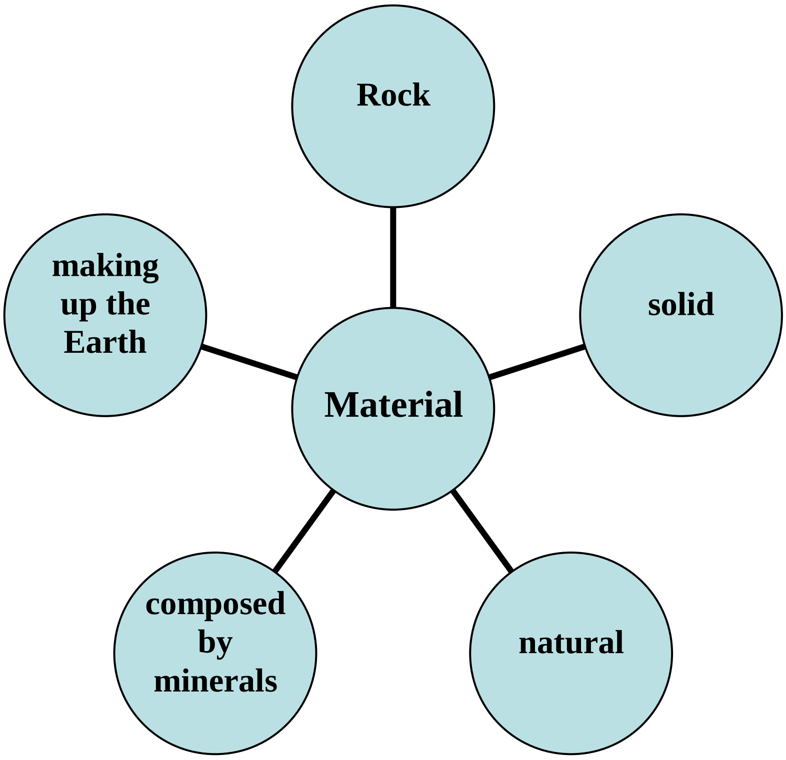
WHAT IS ROCK?

Possible variables to characterize rocks

composition	permeability	origin
texture	porosity	coherence

Possible characteristics of rocks

pure	volcanic	organic
impure	plutonic	inorganic
sedimentary		fine-grained
igneous		medium-grained
metamorphic		coarse-grained
clastic	firm	glassy
fragmental	coherent	stony
non-clastic		cellular
crystalline	loose	intrusive
amorphous		effusive
	porous	
	non-porous	
permeable		stratified
impervious		non-stratified



Thus,

the description of rocks should include all possible information on their

Origin
Composition, and
Texture of the composed mineral.

- **Compare the rocks described below. Use:**

To be	similar		To have	similar	structure
	different			different	texture
	various	in…		various	

to differ mineralogically
to vary texturally

a) volcanic simple
b) volcanic compound
c) plutonic crystalline
d) volcanic crystalline
e) thick loose coarse-grained
f) thin loose fine-grained
g) compound clastic
h) compound non-clastic
i) shade of gray feldspar, quartz
j) pink and red feldspar, quartz
k) pure marble, calcite
l) common granite, feldspar, quartz, mica

Do you know your BIRTHSTONES?

January	Garnet	Dark Red (constancy and friendship)
February	Amethyst	Purple (sincerity and peace)
March	Bloodstone	Dark green with red spots
	Aquamarine	Pale blue
April	Diamond	Transparent, white (innocence and prosperity)
May	Emerald	Bright green (happiness and felicity)
June	Pearl	Cream (health and wealth)
July	Ruby	Red (ease and serenity)
August	Sardonyx	Banded red and white
September	Sapphire	Deep Blue (wisdom and purity)
October	Opal	Variegated (hope and courage)
November	Topaz	Yellow (friend's and lover true)
December	Blue Zirkon	Pale Blue (success and prosperity)

II. LEXICAL EXERCISES

Exercise 1. Read aloud the following words and learn them:

'Magma, mass, 'value, vol'cano, ash, crack, 'rapidly
crust, cut, tuff, come, a'mong, oc'currence, 'upper
'certain, 'surface, first, oc'cur, Earth, term
' lava, glass, 'glassy, part, 'particle
in'trusion, in'trusive, ex'trusion, ex'trusive

Exercise 2. Fill in the gaps with adjectives formed from the nouns.

1. Igneous rocks are those which have crystallized from magma. Magma may rise through fissures to the surface of the Earth as lava.
In geology this process is called *extrusion*. Thus, ... rocks are formed either as lavas or as fragmentary rocks.
2. Igneous rocks, on the other hand, may be cooled among the other rocks of the crust. The process is known as *intrusion* and such rocks are called ....
3. In his Reminiscences of a Mining Engineer Academician Terpigorev gave a *description* of the training of specialists at the Mining Institute in St. Petersburg before the Revolution. Students' specialization was based on ... courses and elementary practical training.

Exercise 3. Read and translate the following word combinations into Ukrainian.

fragmentary rocks	slowly-cooled rocks
intrusive igneous rocks	at shallow depths
exposed igneous rocks	adjacent rocks
coarse-grained minerals	deep-seated rocks
of great scientific value	enormous lateral pressure
of unequal hardness	at a slow rate
different mineral particles	rock fissures
bedded veins	clay veins
flat veins	numerous veins
steep veins	smaller dimensions
coal fines	glassy surface
inclined coal seams	mode of occurrence
different sources of fuel	volcanic ashes and dust

III. GRAMMAR REVIEW

Exercise 1. Put the verbs in brackets into the correct past tense forms.

Last summer some friends and I ……(arrange) to go camping. We……(look) forward to going for weeks when finally the date of departure……(arrive). We……(load) the car with our luggage and……(set off) early in the morning. The weather was perfect, the sun……(shine) brightly and the wind……(blow) gently. There……(not/be) a cloud in the sky! Shortly afterwards, while we……(travel) along the motorway, we ……(notice) that the car……(make) a strange noise. Pete, who…...(drive) very fast, suddenly …….(stop) the car. Everyone……(get out) and

……(go) round to the back of the car. To our surprise the boot was wide open – whoever……(load) the luggage……(not/close) it properly, and everything ……(fall out)!

Exercise 2. Complete the sentences using the words in bold. Use two to five words.

1. Sally went to ballet classes three times a week.

Go Sally used to go to ballet classes three times a week.

2. It was my intention to phone you last night, but I forgot.

Going I……………………………………….you last night, but I forgot.

3. Lying on the beach all day is an unusual experience for me.

Used I………………………………………..on the beach all day.

4. When I was young, I used to visit my grandmother every day after school.

Would When I was young , ………………………every day after school.

Exercise 3. Think of the word which best fits each space. Use only one word in each space. The first one is done for you.

Since the Channel Tunnel opened, getting to France has never been …*so*.. easy. The fastest train arrives……Calais thirty-five minutes after…….departure from England, and from there travellers can easily ……some of the …….picturesque towns in France……Le Touquet and Honfleur. The former is a pleasant resort……was originally created for rich cosmopolitan Britons……the turn of the century. As a ……, it still retains an air of faded, fashionable beauty. The town……numerous boutiques selling the latest designer clothes from Paris. In ……, there is a beautiful beach which makes a good place for a walk or a swim ……the weather is hot enough. Honfleur is another port which is becoming a popular destination……the British. Tourists are attracted ……it because of its quaint atmosphere. The small commercial area is surrounded ……tall narrow houses and outdoor cafes which spread onto the cobbled quays. Honfleur also boasts some of the best restaurants in……north of France, which is another of its attractions.

Exercise 4. Use the words in capitals to form a word that fits in the space in the same line.

There comes a time when not having a car becomes … Choosing your first car is an … experience. Most men's … is so vivid that they see themselves speeding along in a … sports car, attracting … looks from those they pass. In … this does not happen that often. More practical and … aspects have to be considered when choosing a car. The … is normally between a small city car which is … to run and easy to park and a larger family car which would be more … and probably be fitted with more … features.	PRACTICAL EXCITE IMAGINE POWER ENVY REAL FINANCE CHOOSE ECONOMY COMFORT SAFE

Exercise 5. Underline the correct item.

1. I'm sorry, I'm not ready to go out – I haven't finished doing the washing-up *already/yet.*
2. I don't think I've ever met her *yet/before*.
3. He's *still/yet* got a good memory even though he's almost eighty.
4. I used to live here six years *before/ago*.
5. He's lived in Rome all his life and he *yet/still* lives there.
6. I've *before/already* read this book – I don't want to read it again.

Exercise 6. Translate into English.

1. Вони провели експеримент минулого тижня.
2. Цей молодий інженер закінчив інститут два роки тому назад.
3. Після того, як геологи відкрили природний газ, частка вугілля у паливному балансі району зменшилась.
4. Ми приїхали пізно, і вони вже спали.
5. Учені стверджують, що цей район має великі запаси корисних копалин.
6. В.І.Вернадський був відомим ученим, який зробив видатні відкриття у галузі мінералогії і кристалографії, геохімії , біохімії та радіогеології.

Exercise 7. Put the verbs in brackets into the correct past tense forms.

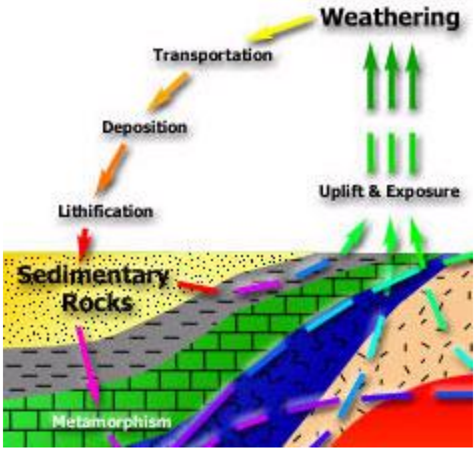
Christopher Columbus……….(be/born) in Italy in 1451. He ………..(work) as a woolen cloth weaver with his father before he………..(begin) his nautical career at the age of 22. After several merchant voyages he……..(settle) in Lisbon, Portugal in 1478. By this time he……..(teach) himself Portuguese and Latin and …………..(read) many geographical and navigational books. In 1481 he…………..(marry) Felipa Parestrell. They……….(have) one son, Diego. They………….(be/married) for two years when his wife……….(die). At this time he………(work) for John II of Portugal. Columbus ……….(always/ wish) to sail around the world westward but John II wouldn't agree. Finally King Ferdinand and Queen Isabella of Spain……….(decide) to finance the voyage. He……..(set off) for the first time in April 1492. There …………..(be) three ships: the Nina, the Pinta and the Santa Maria and a crew of 90 men. They………(have) many false alarms before they finally………..(spot) the "New World" at 02.00 on Friday the 12th of October, 1492. Columbus………(make) another three voyages after this. He …….(retire) to Valladolid 12 years after his first voyage and in 1517 he…..……...(die) there.

IV. PRE-TEXT DISCUSSION

1. List five stages in the formation of sedimentary rocks
2. What is the difference between conglomerate and breccias?
3. How do shale, sandstone and limestone differ from one another?

V. READ AND TRANSLATE TEXT 3 A.

Text 3 A
SEDIMENTARY ROCKS



The rocks of the Earth's crust are divided into three main groups: sedimentary rocks, which consist of fragments or particles of pre-existing rocks; igneous rocks which have solidified from magma and metamorphic rocks. Metamorphic rocks have been derived from either igneous or sedimentary rocks.

Sedimentary rocks represent one of the three major groups of rocks that make up the crust of the Earth. Most sedimentary rocks have originated by sedimentation. They are layered or stratified. Thus, stratification is the most important characteristic of sediments and sedimentary rocks. It is necessary to note that the processes which lead to the formation of sedimentary rocks are going on around us.

Sediments are formed at or very near the surface of the Earth by the action of heat, water (rivers, glaciers, seas and lakes) and organisms.

It should be noted that 95 per cent of the Earth's crust is made up of igneous rocks and that only 5 per cent is sedimentary. In contrast, the amount of sedimentary rocks on the Earth's surface is three times that of igneous rocks.

Strictly speaking, sedimentary rocks form a very small proportion by volume of the rocks of the Earth's crust. On the contrary, about three quarters of the Earth's surface is occupied by sedimentary rocks. It means that most of sedimentary rocks are formed by sediments, accumulations of solid material on the Earth's surface.

The thickness of the layers of sedimentary rocks can vary greatly from place to place. They can be formed due to the mechanical action of water, wind, frost and organic decay. Such sediments as gravel, sand and clay can be transformed into conglomerates, sandstones and clay schists as a result of the accumulation of materials achieved by the destructive mechanical action of water and wind.

Mechanical sediments can be unconsolidated and consolidated. For example, gravel, sand and clay form the group of unconsolidated mechanical sediments, because they consist of loose uncemented particles (grains).

On the Earth's surface we also find consolidated rocks, which are very similar to the loose sediments whose particles are firmly cemented to one another by some substance. The usual cementing substances are sand, clay, calcium carbonate and others. Thus sandstones are consolidated rocks composed of round or angular sand

grains, more or less firmly consolidated. Like sand, sandstones can be divided into fine-grained, medium-grained and coarse-grained.
On the other hand, chemical sediments are the result of deposits or accumulations of substances achieved by the destructive chemical action of water. The minerals such as rock salt, gypsum and others are formed through sedimentation of mineral substances that are dissolved in water.

Sediments can also be formed due to the decay of the remains of organisms, due to the accumulation of plant relics. They are called organic sediments. Limestones, peat, coal, mineral oil and other sediments may serve as an example of organic sediments.

The most principal kinds of sedimentary rocks are conglomerate, sandstone, siltstone, shale, limestone and dolomite. Many other kinds with large practical value include common salt, gypsum, phosphate, iron oxide and coal.
As it is known, water, wind and organisms are called external forces, because their action depends on the energy which our planet receives from the Sun.

VI. COMPREHENSION CHECK

Exercise 1. Look through the text and say whether the following statements are true or false:

1. The rocks of the Earth's crust are divided into two main groups.
2. Igneous rocks are composed of particles of pre-existing rocks.
3. Sedimentary rocks are stratified.
4. Sediments are formed by the action of glaciers.
5. Igneous rocks make up 75 per cent of exposed rocks.
6. Conglomerates are formed as a result of the accumulation of materials caused by the destructive mechanical action of water.
7. Sandstones are consolidated rocks.
8. Clays are unconsolidated mechanical sediments.
9. Chemical sediments are formed by the destructive chemical action of water.
10. Peat and coal are the organic sediments which are of great practical value.
11. Clay schist was formed at the beginning of the sedimentation period and clay was formed later.

Exercise 2. Answer the following questions:

1. What main groups of rocks do you know?
2. Do sedimentary rocks consist of particles of pre-existing rocks?
3. How were igneous rocks formed?
4. Do you know how sedimentary rocks originated?
5. What is the most important characteristic feature of sediments?
6. Do sedimentary rocks account for 10 per cent of the Earth's crust?
7. Is gravel a consolidated mechanical sediment? And what about sand and clay?
8. What are cementing substances? Can calcium carbonate be used as a cementing substance?

10. What can you say about chemical sediments?
11. Can you give an example of organic sediments? How are they formed?

Exercise 3. Match the words from A with those in B.

A	B
1) земна кора	a) sandstone
2) розчинитися у воді	b)fine-grained sand
3) пісковик	c) the Earth's crust
4) ущільнені осади	d) exposed rocks
5) виверженi породи	e) to dissolve in water
6) дрібнозернистий пісок	f) like gypsum
7) затвердіти	g) consolidated sediments
8) як гіпс	h) igneous rocks
9) відслонені породи	i) to solidify, to consolidate

Exercise 4. Fill in the gaps with the following words:

a) consolidate consolidation consolidated unconsolidated

1.... is the process of cementation of loose fragments of sedimentary rocks.
2. As is known, sedimentary rocks ... under the pressure of overlaying beds.
3. Limestone, for example, is the ... rock which occupies vast areas of the Earth's surface.
4. Gravel, sand and clay form the group of ... mechanical sediments, because they consist of loose uncemented particles.

b) stratify stratification stratified

1. Bedding or ... is the most characteristic feature of sedimentary rocks.
2. Coal is a ... deposit that has been developed from plant remains.
3. Coals ... by the decay of organic material.
4. As a result of physical, chemical or biochemical changes vegetable remains are ... and changed into peat or coal, micro-organisms remains changed into mineral oil, bones into phosphorite, etc.

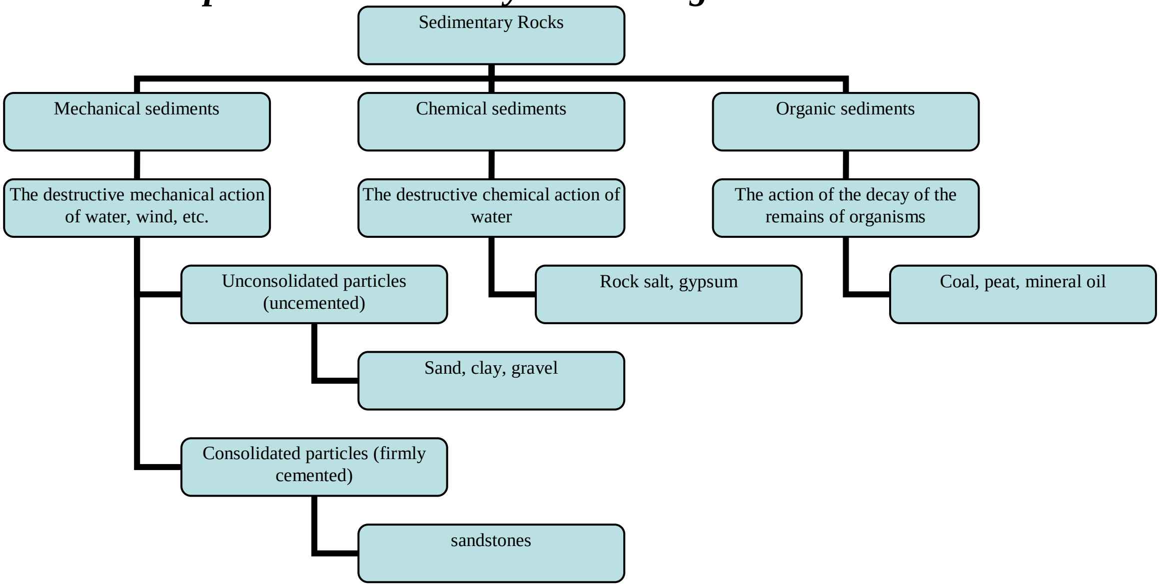
Exercise 5. Match the synonyms from A and B :

A.	B
1) to consist of	a) solidified
2) to differ	b) stratified, layered
3) bedded	c) to realize
4) consolidated	d) to transform
5) to change	e) matter
6) substance	f) to be like
7) to be similar (to)	g) to finish
8) to complete	h) to vary
9) to understand	i) to be composed of

Exercise 6. Translate into English.

1. Земна поверхня складається з осадових, вибухових та метаморфічних порід.
2. Осадові породи формуються під впливом води, тепла, холоду і органічних речовин.
3. Як відомо, кам'яна сіль утворюється в результаті осаду мінеральних речовин.
4. Ці речовини розчиняються у воді.
5. Вугілля використовується як паливо.

Exercise 7. Speak on sedimentary rocks using the scheme:



VII. LOOK THROUGH TEXT 3B AND GET READY TO SPEAK ABOUT THE NATURE OF ROCKS.

Text 3B
THE NATURE OF ROCKS

To the geologist, rock is the natural, solid material that makes up the earth. The definition of a rock means solid at temperatures which normally occur in the earth's crust.

In speaking of rocks, geologists use the word *solid* in its technical sense. A solid is a matter that is not a liquid or gas. What the geologists would sometimes call *solid rock* might seem strange to you. The wet sands on the beach and the shifting sands in the desert are a solid and a rock. This is also true of the layers of mud and muck in the swamps, or the ash and cinders from volcanoes. They are also rocks.

The third word, *material*, brings no additional problems to the definition of a rock. But it should be noted that materials in the crust of the earth may have two distinct origins: *organic and inorganic*. Most of the material in the crust of the earth is inorganic. This means that it is in no way related to life or living things. Lava pouring from a volcano makes an excellent example of inorganic material. So do the great masses of granite pushed miles into the air.

Some rocks are organic – made up by living things. Coal and oil deposits, for example, are the remains of ancient plants. Oil, you may say, is a liquid and therefore is not a rock. However, there are no great underground lakes of oil as some people imagine. The oil is usually soaked up in the pores of sand and other rocks. Under special conditions it drains into wells from where it is pumped to the surface. Millions of gallons of oil are locked up in rocks, especially in the oil shales. Asphalt is another organic rock.

Less well-known are the rocks which have been formed from the remains of sea animals. Shells cemented together form several kinds of limestones. Sometimes these are the shells of microscopic animals, sometimes they are much larger shells.

Coral is another kind of rock made by living things. Coral animals take lime from the sea water and build it into reefs in which millions upon millions of coral animals live. Islands of coral dot the South Pacific.

Diamonds are not rocks, even though they are found in the crust of the earth.
The study of rocks is *petrology*. It is a difficult science, for most rocks are harder to identify than birds, flowers or trees. But the study is important, for rocks and minerals yield the materials that make modern civilization possible. The rock which forms soil is the basis for life on land. Dissolved minerals taken from the rocks by running water make the sea salty and make the existence of ocean life possible.

The identification of rocks is easy when the rocks are made of minerals and when the minerals are large enough to be identified. When the rock is fine-grained and when the minerals all look alike, as they do in some of the dark rocks, it takes skill to identify them. The geologist will often cut a piece of rock with a diamond saw and polish its surface until it is perfectly smooth. He then cements the smooth surface to a glass slide, and polishes the rest of the rock until it is paper thin. This thin layer of rock is examined under a microscope, using Polaroid light. As the light passes through the minerals in the rock, it is altered, producing beautiful colors. These colors depend on the kind of minerals and on the angle at which the crystals have been cut. Such patterns aid much in the process of identification.

The identification of rocks involves many more properties. The texture, color, hardness and relative weight of the rock can also be used as clues. The geologist also looks for the geologic structures in which the rocks occur. Certain rocks are found only in volcanoes, others in caves. Still others are more likely to be found in valleys than on high rides.

Exercise 1. Answer the following questions:

1. What is rock to the geologist?
2. What is solid rock?
3. What rocks can be formed from the remains of sea animals?
4. Is oil a rock?
5. Are diamonds rocks?
6. When is the identification of rocks easy?
7. What can be used as clues in identification of minerals?

Exercise 2. Give the Ukrainian for:

a) man-made, smooth, alive, common, relative, liquid, to polish, desert, pattern, mixture, cement, shale, coal, deposit, to exist, to identify;

b) sea animal, mineral like substance, diamond saw, paper thin, glass slide, ocean life;

c) as, for, however, still, though, until.

Exercise 3. Give the English for:

Пустеля, родовище, суміш, рідина, існувати, болото, полірувати, штучний, гладкий, глинисті сланці, вугілля, звичайний, бархани, хоч, однак.

Exercise 4. Divide the text into logically complete parts, and give each a subtitle. Retell the text.

Exercise 5. Describe the process of rock identification using the following words:

To look alike, fine-grained, skill, to identify, to cut, a piece of rock, diamond saw, to polish, until, smooth, to cement, glass slide, paper thin, to examine, under microscope, to depend on, angle, pattern, texture, color, hardness, relative weight.

Exercise 6. Translate into English:

ГІРСЬКІ ПОРОДИ

Гірські породи, з яких складається земна кора або літосфера, діляться залежно від їх походження на 3 великі групи, а саме:

1. Вибухові.
2. Осадові.
3. Метаморфічні або кристалічні сланці.

Ці три групи гірських порід здебільшого чітко відрізняються одна від одної умовами розташування в земній корі, хімічним та мінералогічним складом і структурою, яка залежить від форми та розмірів складових мінералів.

До вибухових порід зараховують такі, що утворилися при застиганні та кристалізації вогненно-плинної маси (магми), яка міститься всередині. Осадовими звуться ті, що є продуктом різних денудаційних процесів. Нарешті, метаморфічні породи вивітрюються з вибухових та осадових порід під впливом на них тиску, температури, газу та розчинів. Взаємини між цими трьома групами порід, а саме між вибуховими, осадовими та метаморфічними, розгортають картину кругообігу, якому всі ці групи підлягають, чергуючись між собою як ланки безкінечного ланцюга змін. Цей кругообіг виглядає так: вибухова порода, опинившись на поверхні, розкладається, вивітрюється; продукти вивітрення розподіляються далі між осадовими утвореннями, частина яких залишається на поверхні землі, а другу поверхневі води несуть до моря, де вона осідає. У міру накопичення осадів, особливо, якщо вони осідають в геосинклінали, тобто такій частині морського дна, яка опускається все нижче та нижче, входячи в круг дислокаційних процесів і, нарешті, у сферу, де нагрів та тиск газів і води перетворює їх на метаморфічні породи, опускаючись ще нижче, ці шари наближаються до вулканічних вогнищ, де зазнають впливу розпікання й топляться, створюючи магму, яка знову за сприятливих умов застигне як вибухова порода, з часом вивітриться й повторюватиме пройдений цикл.

TEST 3

Task 1. Fill in the gaps with a word from the box and translate the text into Ukrainian in writing.

rock fragments	contain	different	lesser	predominantly
fundamental	processes	abundant	governing	qualitative

Sandstones … appreciable quartz as well as ….. amounts of feldspars, micas, and ….. The claystones consist ….. of phyllosilicates: in addition to mica they contain ….. alkali-free minerals of the chlorite, kaolinite, and montmorilibnite families. Carbonate rocks consist predominantly of calcite and/or dolomite.

Simple …. comparison of the mineralogy of igneous, metamorphic, and sedimentary rocks reveals the …. changes which the former experience as a result of sediment-forming …...The feldspars, which are so …. in igneous and in many metamorphic rocks, are largely lost in sediments, as are the pyroxenes and amphiboles. Accordingly, the phyllosilicates play a ….. role in sediments. Many of these phyllosilicates may originate from metamorphites

Task 2. Find synonyms among the following words.

Man-made, to look for, layer, to change, help, strange, artificial, bed, to search for, odd, stratum, aid, to alter, pure, to eliminate, dirty, to remove.

Task 3. Find antonyms among the following words.

Alive, smooth, wet, possible, fine-grained, likely, thin, rough, course-grained, unlikely, thick, dead, dry, impossible, organic, ancient, inorganic, modern.

Task 4. Form nouns from the following verbs.

To mix, to consider, to alter, to exist, to produce, to identify, to recognize.

Task 5. Choose the correct option.

1. Jack______down on his sofa and______about the day. What a busy day it______ .
a) sat, thought, had been
b) was sitting, thought, had been
c) sat, thought, was
d) sat, was thinking, had been

2. This was his first night in his own flat. He______his entire life in his parents' home.
a) lived c) has lived
b) was living d) had lived

3. No wonder he was tired. He _______ up since six o'clock in the morning.
a) is c) had been
b) has been d) was

4. I was furious because I______and missed the train.
a) had overslept c) have overslept
b) overslept d) haven't overslept

5. She was nervous because she______never______before.

a) has flown c) had flown
b) hasn't flown d) hadn't flown
6. Mary is disappointed because her son______exams.
a) failed c) fails
b) has failed d) had failed
7.I didn't know his name. But I was sure I______him before.
a) saw c) haven't seen
b) have seen d) had seen
8. Mike is a beggar now but he______always______poor.
a) was not c) hasn't been
b) hadn't been d) has been
9. When I got home I was hungry. I______anything to eat all day.
a) haven't had c) have had
b) hadn't had d) had had
10. Jack wants a new job. He______in the same job for three years.
a) has been c) is
b) was d) is being
11. He is broke. He______all his money on entertainment.
a) spent c) had spent
b) has spent d)spend
12. How much money______you______for your retirement?
a) do save c) have saved
b) are saving d) had saved
13. How long______he______his friend?
a) has known c) do know
b) had known d) is knowing
14. This is the first time I______bread with honey.
a) ate c) am eating
b) eat d) have eaten
15. What______ you______last night?
a) have done c) were doing
b) did do d) had done
16. He______his hair. He looks nice.
a) has cut c) is cutting
b) cut d) had cut
17. When______he______his hair cut?
a) has got c) did get
b) had got d) does get
18.______. you______Peter? - I______him yesterday.
a) did see, saw c) have seen, have seen
b) were seen, saw d) have seen, saw
19. He______at me and______into silence.
a) had looked, fell c) was looking, fell
b) looked, fell d) looked, had fallen
20. The train______just now.

a) is leaving c) left
b) had left d) was leaving

21. We had many difficulties but we______them.
a) have overcome c) had overcome
b) overcame d) 'll overcome

22. We______their family for long.
a) knew c) have known
b) are knowing d) had known

23. She left for the South and I______her since.
a) didn't see c) hadn't seen
b) haven't seen d) don't see

24. I______the title of the book.
a) 've forgotten c) forgot
b) 'd forgotten d) am forgetting

25. Mary______French before she came to France.
a) learned c) has learned
b) was learning d) had learned

Task 6. Translate into English.

ТЕМПЕРАТУРА ЗЕМЛІ

Головним джерелом теплової енергії на землі є сонце та власне тепло землі. Сонячне тепло спричиняє багато механічних, фізичних, хімічних та органічних процесів на земній кулі, потрапляючи в середину земної кори хвилястим термічним потоком; добові та річні амплітуди цього потоку швидко завмирають навіть на невеликій глибині (біля 30 метрів), і далі до центру йде вже досить слабкий сталий потік.

З середньої частини землі, що має надзвичайно високу температуру (кілька тисяч градусів), назустріч сонячному термічному потокові йде земний стаціонарний потік, який дуже слабо впливає на температуру поверхні землі.

Нагрів поверхні землі (суходолу) сонячним промінням залежить від її променистості, тепломісткості та теплопровідності ґрунту і зазнає тих самих змін, що й температура поверхні. Як тепер уже доведено, нагрів проходить дуже неглибоко, тож навіть на малій глибині добові коливання температури вже не відбуваються.

UNIT 4
Igneous Rocks

Grammar
Future Simple Tense
Future Continuous Tense

ACTIVE VOCABULARY

deposit(n) – родовище
facility (n) – засіб, устаткування, прилад
fire damp(n) – метан
relate(v) – відноситись
seam (n) – пласт
to make contribution(v) – внести вклад (у науку)
to do one's best (id) – не жаліти сил
mine safety (n) – безпека праці у гірничому виробництві
description (n) – опис
harmful – шкідливий
safety – безпека
success – успіх

II. LEXICAL EXERCISES

Possible variables to characterize elements

Weight	toxicity	flammability=inflammability		colour
aggregate state	odour	chemical activity		corrosity
radioactivity	magnetism	solubility	taste	valency

Possible characteristics of the elements

solid	metallic	light	corrosive
liquid	nonmetallic	heavy	non-corrosive
gaseous	semimetalic	semitransparent	
active	colourless/of some colour	transparent	
inert	odourless/irritating	opaque	
	tasteless/caustic		
flammable	soluble	ferrous	toxic/poisonous
(in)/nonflammable	unsoluble	non-ferrous	non-toxic/harmless

non-magnetic	1,2,3…-multy-valent	radioactive	
magnetic		non-radioactive	

Exercise 1. Match the variables with the corresponding characteristics.

Colours

Exercise 2. The adjectives below refer to the colour of the elements. Find out whether they refer to:

Basic colours.
Shades.
Intensity.
Having the colour of some other element.
Resembling the appearance of some element/substance.

Pale yellow, yellow, yellowish, gold-yellow, deep-yellow, golden yellow, grey, deep grey, silver-grey, greyish, silvery grey, pale grey

Exercise 3. Identify the meaning of the adjectives below.

Grey-white, pale yellowish, blue-white, silvery, deep red, bluish- white, yellow, blackish, tin-white, silvry-grey, greenish- yellow, silver-white, bluish, steel-grey, reddish, greyish-white, silvery-white, blackish-grey.

***Exercise 4. Say*:** what elements are white
what elements have bluish colour
what elements are of silvery colour.

Exercise 5. Compare the colour of the elements both horizontally and vertically. Use proper connectives.

aluminum		like	gold (yellow)
mercury		unlike	copper(reddish)
nickel	silver-white	both…and	bromine(deep red)
iron		while	chlorine(greenish)
sodium		whereas	fluorine (yellowish)

Valency

Exercise 6. Put the following in logical order:

Tetravalent, multivalent, bivalent, polyvalent, univalent, pentavalent, trivalent.

Exercise 7. Complete the table. Make use of the information below.

element	**Aggregate state**	**colour**	**Chemical activity**	**valency**	**weight**	**flammability**	**taste**	**odour**

Водень – найлегший газ, без кольору, без запаху, без смаку, у сполученнях одновалентний, хімічно активний, розчинний у воді, горить.
Кисень – газ без кольору, без запаху і смаку, хімічно активний. У сполуках … валентний.
Бром – важка їдка рідина червоно-коричневого кольору, хімічно активний.
Ртуть – важка рідина, хімічно мало активна, срібно-білого кольору, одно-дновалентна, їдка, не горить.
Арсен (миш'як) – сіро-сталева речовина, що горить, у сполуках 3- і 5-валентна, їдка.

Exercise 8. Describe something/somebody for other student to guess. Use all possible characteristics. See if the following could be of some help:

Gold
A heart of gold
A voice of gold
The golden rule
Golden wedding

Silver
to be born with a silver spoon in one's mouth
to have a silver tongue

Iron
As hard as iron
An iron will
To rule with an iron hand
a man of iron
an iron fist in a velvet glove

Exercise 9. Explain what is

A tasteless person	A lifeless village
An odorless flower	A treeless region
A colourless face	A pointless discussion
A roofless house	An airless room

III. GRAMMAR REVIEW

Exercise 1. You may not agree with these predictions but you can choose the right verb form anyway!

1. By 2020 the first men ……… (land) on the planet Mars.
2. In the next 100 years, the Netherlands ……… (disappear) under water.
3. In the second decade of the 21^{st} century people ………. (eat) more genetically modified food.
4. By 2030 Chinese ……… (become) the language of international scientific communication.
5. Many people ……… (live) to over 100 as medical science advances.

Exercise 2. Complete these sentences using appropriate verb form and connectives such as 'if',' when', 'until', 'as soon as'. (There may be more than **one** possible answer).

1. I ……… (get) in touch when I ……… (return) from the Middle East.
2. If they ……… (shut down) the plant, a lot of people ……… (lose) their jobs.
3. We ……… (start) until everyone ……… (be) here.

4. He can't make a decision until he ……… (see) the president.
5. A project to create a bacterial cell from inanimate chemicals ……… (go ahead) as soon as it ……… (receive) approval from an ethics committee.

Exercise 3. Fill in the correct future form:

Technology has made such dramatic advances in the past decade that by the year 2050 who knows what changes 1) *will have taken* (take) place. It is quite likely that by 2050 we 2)……… (use up) most of the earth's natural resources and so we 3)…..… (rely) on wind power and hydropower for our energy needs. As a result of this shortage of energy, it is quite probable that scientists 4)……... (find) a way for us to live outside the earth. By the next century it's possible that people 5)……… (live) in cities on the Moon or perhaps in cities on the seabed. It is to be hoped that scientists 6)………(discover) cures for fatal diseases such as AIDS and, due to the advancement of genetic engineering, hereditary diseases passed down from generation to generation 7)……… (exist) no longer. It is quite possible that by 2050 life expectancy 8)……… (increase) to 100 and that we 9)……… (be able to) enjoy a healthier existence than is possible now. Another area likely to have been further affected by technology in the year 2050 is education. In schools, computers 10)……… (replace) teachers and many students 11)……… (stay) at home to complete their education. We 12)………(see) changes in the work-place, too. The two main areas of employment 13)……… (be) the so-called creative and caring professions, and the disappearance of jobs in manufacturing 14)……… (result) in massive unemployment.

Exercise 4. Fill in the correct present or future forms:

When you 1) ……… (take) a holiday with our company, you 2) ……… (have) the time of your life. As soon as you 3) ……… (arrive), you 4) ……… (feel) as if you 5) ……… (be) in a different world. While you 6) ……… (stay) with us, we 7)……… (do) our best to ensure that your holiday 8) ……… (run) smoothly and you 9) ……… (not/get) bored. Our company 10) ……… (have) something to offer for all ages and tastes. If you 11) ……… (want) to play golf, ride, sail or fish, our staff 12) ……… (be) happy to make the necessary arrangements, or if you simply 13) ……… (want) to relax and enjoy the breathtaking scenery we 14)……… (be) delighted to organise some guided walks. Before your holiday 15)……… (be) over, you 16) …..…… (already/plan) your next visit.

Exercise 5. Translate into English:

1. Спеціалісти стверджують, що використання вугілля у промисловості буде зростати.
2. Питання енергетичної кризи часто ставиться науковцями.
3. Якщо людство не перестане забруднювати навколишнє середовище, через декілька років нам нічим буде дихати.
4. Згідно з песимістичними прогнозами потепління клімату матиме величезний вплив на життя людей у майбутньому.
5. Будівельний майданчик для атомної станції буде знаходитись на відстані 35 км від міста, він буде добре провітрюватись і не буде затоплюватись під час повені.

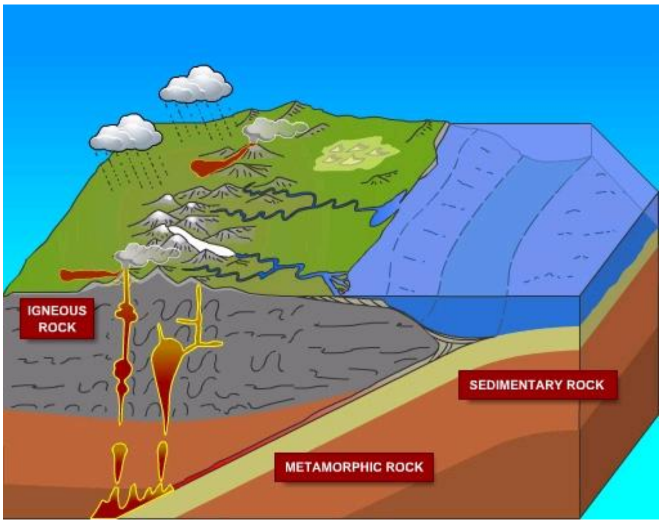
6. Вони побудують новий міст через річку, якщо знайдуть гроші.
7. Увага до невеликих ГЕС буде зростати, тому що потужностей великих станцій не достатньо для забезпечення усіх енергетичних потреб країни.
8. До початку нового навчального року ми будемо змушені закінчити написання звіту.
9. Прогноз погоди на завтра стверджує, що о 3 годині буде йти дощ, часом зі снігом.

IV. PRE-TEXT DISCUSSION

Do you know when an extrusive igneous rock form?
Do you know when an intrusive igneous rock form?
What factors distinguish obsidian from all other types of igneous rocks?
What are the most common minerals in igneous rocks?

V. READ AND TRANSLATE TEXT 4A. NAME CHARACTERISTIC FEATURES OF IGNEOUS ROCKS.

Text 4 A
IGNEOUS ROCKS



Igneous rocks have crystallized from solidified magma. Igneous rocks can be classified in a number of ways and one of them is based on mode of occurrence. They occur either as intrusive (below the surface) bodies or as extrusive masses solidified at the Earth's surface. The terms "intrusive" and "extrusive" refer to the place where rocks solidified.

The grain size of igneous rocks depends on their occurrence. The intrusive rocks generally cool more slowly than the extrusive rocks and crystallize to a larger grain size. The coarser-grained intrusive rocks with grain size of more than 0.5 mm called plutonic or abyssal are referred to as intrusive igneous rocks because they are intruded into older pre-existing rocks. Extrusive or volcanic rocks have even finer grains, less than 0.05 mm, and are glassy.

Exposed igneous rocks are most numerous in mountain zones for two reasons. First, the mountain belts have been zones of major deformation. Second, uplifts in mountain belts have permitted plutonic masses to be formed.

The largest bodies of igneous rocks are called *batholiths.* Batholiths cooled very slowly. This slow cooling permitted large mineral grains to form. It is not surprising that batholiths are composed mainly of granitic rocks with large crystals called *plutons.* As is known, granites and diorites belong to the group of intrusive or plutonic rocks formed by solidification of igneous mass under the Earth's crust. Granites sometimes form smaller masses called *stocks*, when the occurrence has an irregular shape but smaller dimensions than the batholiths.

Laccoliths and *sills*, which are very similar, are intruded between sedimentary rocks. Sills are thin and they may be horizontal, inclined or vertical. Laccoliths are thicker bodies and in some cases they form mountains.

Dykes are also intrusive bodies. They range in thickness from a few inches to several thousand feet. Dykes are generally much longer than they are wide. Most dykes occupy cracks and have straight parallel walls. These bodies cool much more rapidly and are commonly fine-grained. For example, granite may occur in dykes that cut older rocks.

Pegmatites (quartz, orthoclase and mica) also belong to the group of plutonic or intrusive rocks. They occur in numerous veins which usually cut through other plutonites, most often granite, or adjacent rocks.

Extrusive igneous rocks have been formed from lava flows which come from fissures to the surface and form fields of volcanic rocks such as rhyolite, andesite, basalt, as well as volcanic ashes and dust, tuff, etc. As a rule, these rocks of volcanic origin cool rapidly and are fine-grained. It is interesting to note that basalt is the most abundant of all lava types. lt is the principal rock type of the ocean floor.

Igneous rocks are rich in minerals that are important economically or have great scientific value. Igneous rocks and their veins are rich in iron, gold, zinc, nickel and other ferrous metals.

VI. COMPREHENSION CHECK

Exercise 1. Say whether the following statements are true or false.

1. Igneous rocks have been formed by sedimentation.
2. Intrusive rocks have been formed by the cooling of rocks of the Earth's crust.
3. Extrusive rocks have been formed in the same way.
4. The grain size of igneous rocks depends on mode of occurrence.
5. Exposed igneous rocks are numerous in mountain zones.
6. Granites and diorites belong to the group of extrusive rocks.
7. As a rule, granite may occur in dykes.
8. Pegmatites do not belong to the group of plutonic or intrusive rocks.

Exercise 2. Answer the following questions:

1. Have igneous rocks crystallized from magma or have they been formed by sedimentation?
2. Which types of igneous rocks do you know?

3. What does the grain size of igneous rocks depend on?
4. Can you give an example of intrusive or plutonic rocks?
5. Are diorites intrusive or extrusive formations?
6. What do you know about batholiths?
7. Do pegmatites belong to the group of plutonic or volcanic rocks?
8. How do pegmatites occur?
9. What minerals are igneous rocks rich in?

Exercise 3. Find in A Ukrainian equivalents of the following word combinations from B:

A	B
1) adjacent layers	a) спосіб покладу
2) abyssal rocks	b) крупнозернистий
3) dimensions of crystals	c) зони великих зрушень
4) valuable minerals	d) абісальні (глибинні) породи
5) shape and size of grains	e) суміжні пласти (шари)
6) mode of occurrence	f) розміри кристалів
7) coarse-grained	g) викиди
8) uplifts	h) форма і розмір зерен
9) zones of major-uplifts deformation	i) цінні мінерали

Exercise 4. Translate into English.

1. Вибухові породи утворюють велику групу мінералів, які мають велике економічне значення.
2. Вибухові породи утворилися при охолодженні у вигляді інтрузивних або ефузивних порід.
3. Ортоклаз використовується у великій кількості як сировина у виробництві порцеляни.
4. Глиняна маса, яка утворюється при розпаді ортоклазу, має звичайно білий колір і називається каоліном. Отриманий продукт використовується у промисловості.
5. Кварц залягає у вигляді маленьких дуже твердих зерен.
6. Чистий кварцевий пісок використовується у виробництві скла.

Exercise 5. Match the main clause with the subordinate clause.

1. Abyssal rocks belong to the group of intrusive rocks
2. Uplifts in mountains belts have permitted erosion to the depths
3. Granites and diorites occur as batholiths
4. Permatites (quartz, orthoclase and mica) occur in numerous veins
5. Extrusive igneous rocks have been formed as lavas
6. Igneous rocks are rich in minerals
7. Physical weathering occurs in the deserts and in high mountains
   a) that are economically important
   b) which usually cut through plutonites
   c) because they are intruded into pre-existing rocks

d) at which plutonic masses are formed
e) where the changes in temperatures are great
f) which come from fissures to the surface of the Earth's crust
g) which are large irregular masses.

VII. LOOK THROUGH TEXT 4B AND GET READY TO SPEAK ABOUT THREE CLASSES OF ROCKS.

Text 4B

Geologists separate rocks into three classes based on how they form: igneous rocks, sedimentary rocks, and metamorphic rocks. Igneous rocks form when a hot, molten liquid called magma solidifies. Sedimentary rocks form when loose sediments, such as sand and clay, become cemented to form a solid rock. Metamorphic rocks form when older igneous, sedimentary or other metamorphic rocks change because of high temperature and/or pressure or are deformed during mountain building.The rock cycle shows that all rock change slowly over geologic time from one of the three rock types to another.

Three different processes - rising temperature, lowering of pressure, and addition of water - melt portions of the Earth's asthenosphere. These processes form great quantities of magma in three geologic environments: spreading centers, mantle plumes, and subduction zones. The temperature of magma varies from about 600º C to 1400 ºC. Nearly all magmas are silicate magmas. Magma usually rises toward the Earth's surface because it is of lower density than rocks surrounding it.

An extrusive, or volcanic, igneous rock forms when magma erupts and solidifies on the Earth's surface. An intrusive, or plutonic, rock forms when magma cools and solidifies below the surface. Plutonic rocks typically have medium-to-coarse-grained textures, whereas volcanic rocks commonly have very fine-to-fine-grained textures. Porphyry consists of larger crystals imbedded in a fine-grained matrix.

The two most common types of igneous rocks in the Earth's crust are granite, which comprises most of the continental crust, and basalt, which makes up oceanic crust. The upper mantle is composed of peridotite. An igneous rock is classified and named according to its texture and mineral compostion.

A mafic rock is low in silica, high in iron and magnesium, and dark in color. Basalt is a common mafic rock. A felsic rock is rich in feldspar and silicon, low in iron and magnesium, and light in color. Granite is a common felsic rock. An intermediate rock has a composition and color that lie between those of mafic and felsic rocks. The most common intermediate rock is andesite. Unltramafic rocks have the lowest silicon and aluminum content and the highest amounts of magnesium and iron. Peridotite, an ultramafic rock, is rare in the crust but abundant in the mantle.

Exercise 1. Say whether the statements are true or false.

1. Geologists separate rocks into three classes based on how they disintegrate.
2. Igneous rocks form when a hot, molten liquid called magma solidifies.
3. Nearly all magmas are silicate magmas.
4. Peridotite, an ultramafic rock, is abundant in the crust.
5. Granite is a common felsic rock.

Exercise 2 . Match the terms in the table with their English equivalents.

1. порфир	a. felsic rock
2. мафічна порода	b. mafic rock
3. факел	c. subduction
4. рух по розломах	d. mantle plume
5. фельзит	e. porphyry

***Exercise 3. Discuss in pairs or groups*:** what you could learn about the history of another planet if you discovered extrusive igneous rocks but no intrusive ones on its surface?

Exercise 4. Translate into English.

ВИБУХОВІ ПОРОДИ

Вибухові породи сформувались шляхом застигання розтоплених при високій температурі магм, що піднялися з глибини земної кори або застигли всередині її, не дійшовши до самої поверхні (породи інтрузивні або глибинні), абож вилилися на поверхню землі (породи ефузивні або вилиті).

Від осадових порід вони відрізняються розмірами, тобто бувають масивні, не містять останків тварин та рослин і складаються з кількох мінералів, тобто є складними породами. В сучасний період формування вибухових порід можна спостерігати при вибухах вулканів (лави).

Магми, з яких походять різні вибухові породи, є складними силікатними розчинами; мінеральний склад і структура вибухових порід залежать від хімічного складу відповідних магм і тих фізичних умов, за яких магма застигає, наприклад, тиску, а коли ці умови змінюються, то та сама магма може дати різні вибухові породи.

TEST 4

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

magma blanket most millions medium igneous abundant continental classify granite

When..... solidifies within the crust, the overlying rock insulates the magma like a thick ….. The magma then crystallizes slowly, and the crystals may have hundreds of thousands or even ….. of years in which to grow. As a result, …. plutonic rocks are ….. to coarse grained. Granite, the most ….. rock in ……crust, is a medium-or coarse-grained plutonic rock.

Geologists use both the minerals and texture to …. and name igneous rocks. For example, any medium- or coarse-grained …. rock consisting mostly of feldspar and quartz is called ….. Rhyolite also consists mostly of feldspar and quartz but is very fine-grained. The same magma that erupts onto the Earth’s surface to form rhyolite can also solidify slowly within the crust to form granite.

Task 2. Fill in the correct future form.

1. She’s bought some wool; she…(knit) a jumper.
2. By Christmas we….(live) in this house for five years.

3. Nick….(fly) to Rome tomorrow – he …(attend) a meeting there.
4. He's sure he…(save) over a thousand pounds by the end of the year.
5. "Hurry up!" The bus….(leave) in ten minutes and you still haven't got your things ready."
6. "I haven't decided about the day trip yet – I…(tell) you on Wednesday.
7. "I booked my first driving lesson today. I …(learn) how to drive at last!
8. This time next year she….(study) in Spain.
9. The Queen ….(visit) the new children's hospital tomorrow.
10. Your brother …(be) angry when he finds out you've broken his computer.

Task 3. Choose the correct preposition.

1. If you are absent (with, to, from, on) more than two practices, you'll be asked to leave.
2. There's no need to go (in, into, up, to) details, just give me the general idea.
3. These three articles make (up, for, from, out) the whole book.
4. The wing of the plane broke (out, away, back, in) in midair and the plane crashed.
5. I'll pick you (up, with, out, from) at your place at eight o'clock.
6. The writer was absorbed (in, with, on, into) her work.
7. It should be reasonably easy to pick (with, for, up, over) a taxi outside the station.
8. The committee has agreed (from, to, in, up) your request.
9. Don't give (away, in, up, to) without trying.
10. Please, put me (up, in, out, off) the train at the station serving the airport.

Task 4. Fill in the gaps with the correct tense.

1. Before you…(leave) the house, check that the windows are shut and the door is locked.
2. Once you…(know) all the arrangements, phone me and let me know.
3. I doubt if I …(be) ready to go out by six o'clock. Let's meet at 7.30 instead!
4. I…(take) some sandwiches in case we …(get) hungry on the train.
5. She's late! By the time she…(arrive) we ….(eat) everything.
6. You….(lose) weight as long as you….(stick) to the diet.
7. When we….(go) shopping we….(buy) some new shoes for the children.
8.Suppose you….(miss) your train connection in Paris, what….(you/do)?
9. Whener he….(watch) sport on TV he….(shout) at the screen. It's really annoying!
10. I wonder if she….(bring) her dog with her when she ….(visit) us next time?

Task 5. Compose different types of questions.

1. Air travel is relatively expensive in terms of energy (*What …?*).
2. Private automobiles in North America consume over 15 percent of the world's oil production (*How much …?*).
3. Some years ago they faced a population crisis (*Did …?*).
4. The amount of energy for commercial use will increase every year.(*When…?)*
5. Highly industrialized countries use the most of the world's energy (*Disjunctive question).*

Task 6. Translate from Ukrainian into English or vice versa.

1. We will be discussing the problems of mining industry at our seminars.
2. Якщо потепління клімату не зупиниться, льодовики розтануть.
3. He will be easy to deal with as he is a reliable person.
4. Раціональне використання природних ресурсів, вторинна переробка, пошук альтернативних джерел енергії і впровадження енергозберігаючих технологій – це способи вирішення проблем існування людства.
5. OPEC will arrange the meeting of its member countries at the end of the current year.

Task 7. Translate into English using the dictionary.

Спостереження над вибухами вулканів показують, що одночасно з піднесенням магми на поверхню з неї виділяється маса водяної пари та різних газових продуктів, наприклад, вуглекислота, різні сірчані, хлористі та інші сполуки. Роль цих матеріалів у тому, що в магмі вони є мінералізаторами. Під час застигання та затвердіння магми мінералізатори або переходять у повітря, або, якщо охолодження відбувається всередині кори, – в оточуючі гірські породи.

Аналізуючи гірську породу, ми визначаємо склад магми без мінералізаторів.

Мінералогічний склад залежить від складу магми, з якої утворилася порода. Окиси, присутні в магмі, утворюють при кристалізації різні мінерали, переважно силікати, причому ми розподіляємо мінерали за їхньою кількістю в складі породи на головні та побічні.

Роль головних мінералів дуже часто відіграють кварц, скалинці, амфіболи, лосняки та олівін.

Основна магма дає під час розщеплення два типи магми: діоритову та базальтову; з першої походять діорити, порфірити, андезити, а з другої – габро, діабази, базальти та мелафіри.

Подальше розщеплення основної магми дає так звані ультраосновні магми, з яких утворюються перитоніти, пікрити, піроксеніти.

UNIT 5
Metamorphic Rocks

Grammar
Modal verbs

I. ACTIVE VOCABULARY

cleavage distribution – розповсюдження, розщеплення
geological disturbances – геологічні порушення
schistose coal – шарувате вугілля
medium-grade coals – середньосортне вугілля
the most common metamorphic rocks – звичайні метаморфічні породи
chemically active fluids – хімічно активні рідини
rock pressure – тиск породи
excess of water – надлишок води
foliated and non-foliated metamorphic rocks – шаруваті і нешаруваті метаморфічні породи
the definition of rocks – визначення порід
schistose structure – шарувата структура
low-grade metals – низькосортні метали
high-grade oil – високосортна нафта
exposed igneous rocks – відслонені магматичні породи
single orthoclase crystals – окремі кристали ортоклазу
scientific value – наукове значення
water pressure – тиск води
thin sheets of the Earth's surface – тонкі пласти земної поверхні
separate plates – окремі плити

II. LEXICAL EXERCISES

Exercise 1. Define the meaning of the words in bold.

Metamorphic rocks; some changes in **texture;** in mineral composition and structure; the description of metamorphism; schistose **structure;** the **role** of water; four variable **geologically** related **parameters;** flaky **materials;** the **mechanism of metamorphic deformation; crystalline** schists; the great **dislocations** of the Earth's crust; during **normal progressive metamorphism.**

Exercise 2. Match the words from A with their equivalents in B.

A	B
1. as a result of the chemical and physical changes	a. постійно розвиватися
2. constituents of rocks	b. шар вугілля
3. to be subjected to constant development	c. складові частини породи
4. to undergo changes	d. надлишок води
5. excess of water	e. змінюватися
6. low-grade ores	f. розщеплюватися на окремі шари
7. coal band	g. сліди первинної структури
8. to cleave into separate layers	h. низькосортні руди
9. traces of original structure	i. в результаті хімічних і фізичних змін
10.generally speaking	j. взагалі кажучи

Exercise 3. Fill in the gaps using the words a) cleave, cleaves, cleavage.

1. Metamorphic rocks which have a schistose structure can ....
2. As a result of splitting ... is formed.
3. Generally speaking, the constituents of gneisses are distributed in bands or layers and the rock ... easily.

b) relate, related, relationship, relating (to)

1. The ... between rock pressure and temperature is interdependent.
2. The role of water in metamorphism can be characterized at least by four variable geologically ... parameters.
3. These parameters ... to each other.
4. At the university the students study the full range of subjects ...to mining, geology as well as mining mechanics.

III. GRAMMAR REVIEW

Modal verbs

Exercise 1. Match the personal qualities on the left with the abilities on the right:

If you	**you can**
1. are computer literate	a) work well on your own
2. are trilingual	b) use different types of software
3. are good at mental arithmetic	c) solve problems rationally
4. are autonomous	d) be a good leader
5. have a creative personality	e) calculate quickly in your head
6. have a logical mind	f) speak three languages
7. are decisive and people accept your authority	g) bring new ideas to projects

Exercise 2. Complete the sentences using either "could" or "managed to":

1. After a lot of discussion we … strike a deal.
2. He was a brilliant ecologist and … speak over a dozen languages fluently.
3. I thought I was going to miss the plane but I … get to the airport on time.
4. When I was younger I … run several kilometres without feeling tired.
5. She … to find a good job despite her lack of formal qualifications.
6. When we lived near the beach we … go swimming every day.
7. She … have left me a message – how was I supposed to know?

Exercise 3. React to these situations using "could have":

1. Why didn't she ring to tell me she would be late?
2. She had the facts and figures but left me in the dark.
3. It wasn't worth us taking a taxi, the station was within walking distance.
4. It took six days for the letter to arrive and we both have e-mail.

Exercise 4. Complete these sentences so that they are true for your country. Use "have to", "don't have to" and " must":

1. You ……………………… carry a gun.
2. You ……………………... pay to use buses and trams.
3. You …………………… vote if you are over 18.
4. You ……………………… drink alcohol at work.
5. You ……………………….pay to drive on a motorway.
6. You ……………………….wear a set belt when driving a car.

Exercise 5.

This text deals with the likelihood of an earthquake in San Francisco area. Decide where each of the phrases (a-h) fits into the passage:

The next big earthquake in the Bay area may come sooner than you think. There is a 67 percent chance of at least one earthquake of magnitude 7 or larger in the San Francisco Bay area between now and 2020. Such an earthquake ………(1).

Some scientists believe that the 67 percent probability estimate ………(2). They have noted several instances of pairs of earthquakes of magnitude 6.5 or larger in northern California, and they are concerned that the Loma Prieta earthquake ………(3). Other fault segments in northern California ………(4).Therefore it seems prudent to consider the 67 percent chance of a large earthquake within the next 20 years as a minimum estimate. Future studies are also likely to change. Scientists agree that:

*Earthquakes of magnitude 7 and larger are highly likely within the bay area during the next few decades.

- Each of these events ……… (6) because each will probably be located closer to densely populated areas.
- Action is needed now to reduce the damage and the number of deaths that ……… (7) even if this ……… (8).

a) might also be capable of producing large earthquakes

b) may be too low
c) could cause more damage than the Loma Prieta quake
d) will result in changes in probability estimates
e) could strike at any time, including today
f) could be the first quake of such a pair
g) may involve significant expense
h) could result from future major earthquakes

Exercise 6. Decide whether the following are requests for permission, suggestions or offers:

1. Shall we go for lunch?
2. May I sit here?
3. Shall I give you a lift town?
4. Can I borrow the car this weekend?
5. Could I use your mobile phone?
6. You might like to check the exchange rate first.
7. Would you like us to send you a catalogue?
8. In my opinion you should sell your shares now.
9. Are you hot? I'll switch on the air conditioning if you like.

Exercise 7. Translate into English:

1. Це завдання можна вирішити за допомогою математичної моделі.
2. Грінпіс вважає, що Великобританія повинна зменшити викиди шкідливих газів в атмосферу.
3. Держава повинна більше піклуватися про умови праці і здоров'я шахтарів.
4. Навіть невелика кількість CO^2 у повітрі може викликати сонливість, головний біль, запаморочення.
5. Крига в Арктиці швидко тане, і в цьому винні люди.
6. Всі екологічні проблеми взаємопов'язані і повинні вирішуватись державою.
7. У нього так багато книжок. Він, очевидно, любить читати.
8. Він не міг отримати листа у неділю. У неділю пошта не працює.
9. Вам краще зробити цю роботу сьогодні.
10. Я не дуже ретельно готувався до екзамену, хоча мені слід було працювати більше.

IV PRE-TEXT DISCUSSION

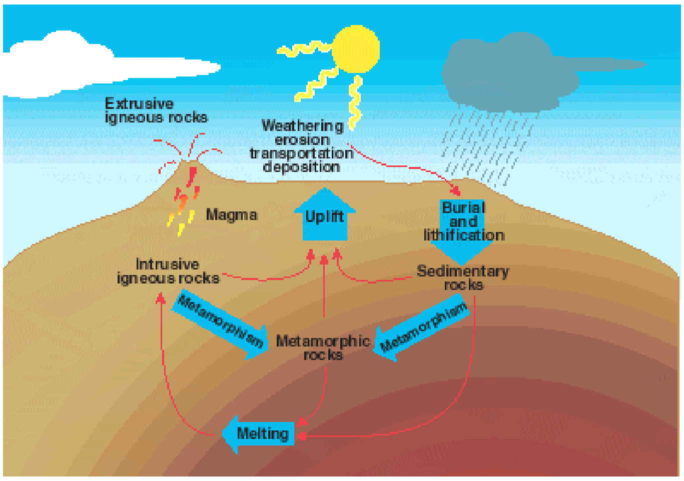
Do you know that:

1. Metamorphism commonly alters both the texture and mineral content of a rock?
2. Many geologists call mineral reactions that occur between 50º and 250º C *diagenesis* and reserve the term *metamorphism* for changes that occur at temperatures above 250º C.

V. READ AND TRANSLATE TEXT 5A.

Text 5A
METAMORPHIC ROCKS

The Rock Cycle



Metamorphic rocks compose the third large family of rocks. "Metamorphic" means "changed from". It shows that the original rock has been changed from its primary form to a new one. Being subjected to pressure, heat and chemically active fluids beneath the Earth's surface, various rocks in the Earth's crust undergo changes in texture, in mineral composition and structure and are transformed into metamorphic rocks. The process described is called metamorphism.

As is known, metamorphic rocks have been developed from earlier igneous and sedimentary rocks by the action of heat and pressure.

Gneisses, mica, schists, phyllites, marbles, slate, quartz, etc. belong to the same group of rocks. Having the same mineral composition as granite, gneisses consist chiefly of quartz, orthoclase and mica. However, unlike granite, they have a schistose structure. It means that their constituents are distributed in bands or layers and run parallel to each other in one direction. If disturbed the rock cleaves easily into separate plates.

The role of water in metamorphism is determined by at least four variable geologically related parameters: rock pressure, temperature, water pressure, and the amount of water present.

During a normal progressive metamorphism rock pressure and temperature are interdependent, and the amount of water and the pressure of water are related to the sediments and to the degree of metamorphism in such a way that, generally speaking, the low-grade metamorphic rocks are characterized by the excess of water. The medium-grade rocks defined by some deficiency of water and the high-grade metamorphic rocks are characterized by the absence of water.

Many of the metamorphic rocks mentioned above consist of flaky materials such as mica and chlorite. These minerals cause the rock to split into thin sheets, and rocks become foliated.

Slate, phyllite, schist and gneiss belong to the group of foliated metamorphic rocks. Marble and quartzite are non-foliated metamorphic rocks.

The structure of metamorphic rocks is of importance because it shows the nature of pre-existing rocks and the mechanism of metamorphic deformation. Every trace of original structure is of great importance to geologists. It gives an opportunity of analysing the causes of its metamorphism.

Being often called crystalline schists, metamorphic rocks such as gneisses and mica have a schistose structure. Metamorphic rocks represent the oldest portion of the Earth's crust. They are mostly found in the regions of mountain belts where great dislocations on the Earth once took place.

VI. COMPREHENSION CHECK.

Exercise 1. Say which sentences correspond to the content of the text. Confirm your answer by the facts.

1. Generally speaking, metamorphic rocks have been developed from ores.
2. Marble, slate and phyllite belong to the group of metamorphic rocks.
3. As is known, unlike granite, metamorphic rocks have a schistose structure.
4. It is quite obvious that the role of water in metamorphism is great.
5. As a rule, low-grade metamorphic rocks are characterized by the absence of water.
6. Flaky materials cause the rock to split into thin sheets.
7. It should be noted that marble and quartzite are foliated metamorphic rocks.
8. The structure of metamorphic rocks shows the nature of older pre-existing rocks and the mechanism of metamorphic deformation as well.
9. All metamorphic rocks are non-foliated.

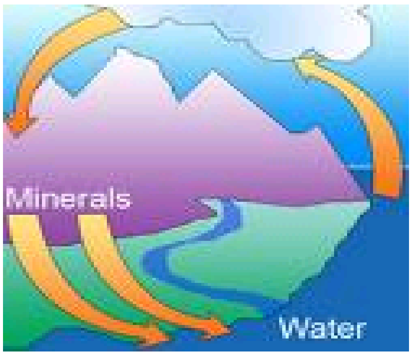
Exercise 2. Answer the following questions.

1. What is metamorphism?
2. Why can metamorphic rocks cleave easily?
3. Why is the study of metamorphic rocks important?
4. Do you know how metamorphic rocks have been formed?
5. Which rocks belong to the group of metamorphic?
6. Does gneiss have the same structure as granite?
7. Is the role of water great in metamorphism?
8. What rocks do we call foliated?
9. What can you say about non-foliated metamorphic rocks?
10. How can geologists trace the original structure of metamorphic rocks?
11. Why are metamorphic rocks often called crystalline schists?

Exercise 3. Make a short report (8-10 sentences), about what you know about rocks in the earth’s crust, their origin, deposition and minerals they are rich in. Use the following speech patterns: *as far as I know; as is known; as for; I'd like to say a few words about ...; it should be noted that...; as a rule; generally speaking, etc.*

VII. LOOK THROUGH TEXT 5B AND GET READY TO SPEAK ABOUT THE PROPERTIES OF MINERALS.

Текст 5B



Minerals that make up rocks are defined as inorganic substances which occur naturally and have a definite chemical composition and physical properties which vary within known limits.

The major properties are colour, crystal form, hardness, cleavage and others. Cleavage is one of the most diagnostically useful mineralogical properties which can be found throughout the mineral.

Minerals of use to man can be grouped into two broad categories: 1) metals, such as aluminium, copper, gold, silver, iron, tin, platinum, chromium, nickel, lead and zinc, and 2) non-metallic minerals, such as diamonds, salt, limestone, cement, sulphur, and asbestos. When minerals occur so that they can be worked at a profit they are called ore deposits. Mineral deposits are seldom equally rich throughout.
Economic minerals are those which are of economic importance and include both metallic and non-metallic minerals.

Most minerals consist of several elements. Such elements are oxygen, silicon, titanium, aluminium, iron, magnesium, calcium, sodium, potassium and hydrogen. They make up more than 99 per cent by weight of all the rock-forming minerals. Of these, aluminium, iron and magnesium are industrial metals. The other metals are present in small quantities, mostly in igneous rocks.

For example, iron is one of the most abundant metals in the Earth's crust. There are three important classes of iron deposits: deposits associated with igneous rocks; residual deposits and sedimentary deposits. Iron deposits associated with igneous rocks are usually small but very rich bodies either of haematite or magnetite. Large concentrations have been successfully mined in Pennsylvania (the USA) and in the Russian Federation.

Residual deposits of iron minerals are formed wherever weathering occurs. Iron deposits formed this way are very widespread. It should be stressed that the residual deposits were among the first to be exploited by man. Sedimentary iron deposits make up most of the world's current production.

As the essential component of every variety of steel, iron is obviously the most important of all industrial metals. It has played a large part in the development of our modern civilization. Iron ores are mainly used for producing cast iron, steels and ferro-alloys. From a scientific point of view, iron's most important property is that it becomes magnetized.

The magnetic iron ore is the main wealth of the Kursk Magnetic Anomaly (KMA). It is necessary to say that only in the last century was the secret of the unusual magnetism of enormous iron ore masses discovered underground.

Iron fields are worked up by surface mining which is more economical. But the KMA is rich not only in iron ores. Its deposits contain bauxite, phosphorite, cement, sand and clays.

Exercise 1. Divide the text into logical parts and entitle each of them. Give its main idea.

Exercise 2. Find in the text answers to the following questions

1. Why is cleavage the most important property of minerals?
2. How can ore deposits be defined?

Exercise 3. Translate into English.

З розвитком науки і техніки невпинно зростає антропогенний вплив на геологічне середовище. До початку XVIII ст. людина використовувала 26 елементів мінеральної сировини, на початку XX ст. – 59, а сьогодні – більше 80.

Найбільш негативно впливають на геологічне середовище гірничодобувна і будівельна галузі промисловості. Лише 10% мінеральної сировини, що добувається з надр планети, перетворюється на готову продукцію, а решта 90% забруднює біосферу. Наприклад, при збагаченні мідних руд майже третина міді викидається у звалища. Крім цього, недостатньо використовуються супутні матеріали – срібло, цинк та інші компоненти руд.

Внаслідок видобування, збагачення та переробки корисних копалин, нагромадження порожньої породи та відходів виробництва відбувається концентрація шкідливих елементів – важких металів, радіонуклідів і т. ін., що призводить до важких захворювань і навіть масової загибелі рослин і тварин.

TEST 5

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

Metamorphism	mineral	shrink	metamorphic	grains	calcite
fossiliferous	larger	texture	mable		

As a rock undergoes metamorphism, some …. grains grow larger and others…. The shapes of the … may also change. For example, fossils give … limestone its texture. Both the fossils and the cement between them are made of small … crystals. If the limestone is buried and heated, some of the calcite grains grow … at the expense of others. In the process, the fossiliferous…. is destroyed.

…. transforms limestone into a …. rock called marble. Like the fossiliferous limestones the …. is composed of calcite, but the texture is now one of large interlocking grains, and the fossils have vanished.

Task 2. Put questions to the sentences.
1. Geology was originally a descriptive science.
2. These processes actively shape the earth's surface features.
3. People began to use coal as a fuel many years ago.

Task 3. Fill in "as" or "like".
1. She can sing …a bird. Her voice is…good …Mariah Carey's.
2. Tom works….a slave. He is regarded ….the hardest -working employee in the company.
3. Although he looked….hard…nails, in fact he was….a child.
4. Lucy's complexion is….soft….a baby's. Her skin feels….silk.
5. She found a job….a clerk at a seaside hotel.
6. Michael Jackson had great success…a professional singer.
7. She's treated…a queen wherever she goes.
8. The ballet dancer lifted the ballerina into the air….a ragdoll.
9. I can easily carry this suitcase. It's…light…a feather.
10. Florence Nightingale is seen….a heroine because of her pioneering work….a nurse.

Task 4. Choose the correct variant.
1. My sight is getting worse. Next year, I am afraid, I______read without glasses.
a) cannot c) could not
b) may not d) will not be able to
2. Police, firefighters, newspaper reporters and radio broadcasters ______work on holiday in the USA.
a) must c) might
b) could d) should
3.______you______get up early to meet the delegation at the airport?
a) did, have to c) have, had to
b) had, to d) must, have to
4. Teenagers who commit crimes______be treated as adults and sentenced to significant punishment.
a) would c) should
b) ought d) have
5. The Senate and the House of Representatives______approve a bill for it to become a law.
a) had to c) was to
b) should d) must
6. When Frank was 13, he______run 100 metres in 15 seconds.
a) must c) can
b) could d) could have
7. Janet and Tom did not want to come with us at first but in the end we ______ persuade them.
a) were able to c) might
b) should d) could have

8. The baseball match was cancelled last week. Craig______ anyway because he was ill.
a) must not play c) should not play
b) could not have played d) cannot play
9. You have got plenty of time. You______hurry.
a) must not c) need not
b) should not d) may not
10. According to the contract, the goods______at the port at the end of the week.
a) will arrive c) should arrive
b) are to arrive d) could arrive
11. The dog started to bark loudly, it______traces.
a) can have found c) must find
b) may have found d) may find
12. There is a child sleeping in the next room. You______be so noisy.
a) ought not c) have not to
b) should not d) do not have
13. Knock again. They______not have heard the first time.
a) was c) need
b) ought d) might
14. My friends______tomorrow in the cafe.
a) are to meet c) ought to meet
b) should meet d) were to meet
15.I cannot find my umbrella: I have a feeling I______have left it on the bus.
a) can c) might
b) ought d) may
16. You have been reading for four hours. This book______ very interesting.
a) must have been c) should be
b) can be d) might have been
17. From what you tell me it sounds as if he______ see a doctor as soon as possible.
a) was able to c) should
b) ought to d) must
18. James______take an educational course next September. It is a required course.
a) has to c) might
b) may d) need
19. The dog behaves strangely. It______its master.
a) could lose c) should have lost
b) must lost d) must have lost
20.I do not think you______go out without a raincoat on; it looks like rain.
a) must c) should
b) ought d) need
21. My friends and I have been waiting for Kostya for a whole hour, and then we decided he______fishing without us.
a) must have gone c) should have gone
b) must go d) would go

22. My friend has a good gift for languages. He______an excellent translator.

a) could become c) was able to become

b) could have become d) had to become

23. If Ann had called at his office at five o'clock yesterday, she______him there.

a) may have found c) can found

b) might have found d) could have found

24. Louise______have left her credit card behind when she paid for the petrol.

a) ought c) had

b) should d) must

25. John______find any reason to refuse the invitation to the party. So he accepted it.

a) could not c) must not

b) cannot d) might not

Task 5. Put the correct noun form of the underlined verb in the gap to complete the definitions.

1. If you <u>invent</u> something important, this……may become famous.
2. Something that <u>arrives</u>, such as a plane flight, is an….
3. You can say you improve something, or that you make an…..to it.
4. Something you <u>publish</u>, such as a book or a magazine, is a….
5. If you <u>explain</u> something clearly, then you are giving a clear….

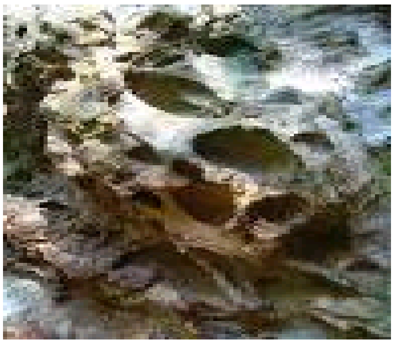
Task 6. Translate into English.

МЕТАМОРФІЧНІ ПОРОДИ

Метаморфічні породи є більш-менш глибоко змінені первинні осадові або вибухові породи, при цьому у природі можна спостерігати найрізноманітніші ступені цієї зміни, що дають картину ступневого переходу первинних порід до глибоко перетворених метаморфічних, наприклад, ланцюг переходів між густо – кристалічними вапняками, гранітами й відповідними їм гнейсами, глинистими та кристалічними сланцями і т. ін.

Нині існує думка, що всяка гірська порода лише тоді довгий час зберігає свій первісний характер, коли умови її існування близькі до тих, за яких вона утворилася; за нових фізичних та хімічних умов, мінерали, що містяться в ній, як складники, можуть набути стану хиткої рівноваги; в такому разі вони починають пристосовуватися до нових умов існування, і тоді відбувається, наприклад, перекристалізація породи, під час якої змінюється її мінералогічний склад внаслідок формування нових мінералів, більше стійких для даних умов. Якщо при цьому проникають ще в породу й хімічні розчини, що залишають у ній нову речовину, то може змінитися також і хімічний склад породи.

UNIT 6
Weathering of Rocks



Grammar
The Conditional Mood

I. ACTIVE VOCABULARY

brittle (adj) – крихкий
brush (v) – чистити
contract (v) – стискати
corrosive (adj) – корозійний
diminish (v) – зменшувати(ся)
drag (n) – драга
eliminate (v) – виключити, ліквідувати
expand (v) – розширятися
fluctuate (v) – коливатися
grind (v) – молоти
halite (n) – кам'яна сіль
harm (n) – шкода
hydrogen (n) – вуглець
hydrolysis (n) – гідроліз
involve (v) – включати, бути присутнім
oxidation (n) – окислення
reduce (v) – зменшувати
rubble (n) – камінь бруківки
removal (n) – переміщення
rust (n) – іржа
thaw (n) – відлига
vanish (v) – щезнути
wedge (n) – клин

II. LEXICAL EXERCISES

Exercise 1. Read and translate the following word combinations.

Rocks's chemical nature, mechanical weathering, parent rock, pressure-release fracturing, frost wedging, abrasion, organic activity, thermal expansion and contraction, overlying rock, to thaw during the day, to freeze at height, daily freeze-thaw cycle, rounded and smooth rocks, to heat and cool granite repeatedly, a small atmospheric temperature fluctuations.

Exercise 2. Define the meaning of the words in bold by their resemblance to Ukrainian words.

active processes; physical or **mechanical** weathering; the change in **temperature;** different **minerals;** varied **forms; chemical agents; complex** changes; the **disintegration** of rocks; cold **climate;** high mountain **peaks;** living **organisms;** to **accelerate** the destruction of rocks.

Exercise 3. Give English equivalents of the following.

Механічне і фізичне вивітрювання; руйнування породи; рух зруйнованої породи; вода, що тече; теплове розширення і стиснення; видозмінювати земну поверхню; піддаватися корозії; змінювати хімічний склад порід і мінералів; відрізнятися від первинного матеріалу.

Exercise 4. Complete the sentences.

1. Decomposition and disintegration of rocks and minerals on the Earth's surface is…. .
2. The removal of weathered rocks and minerals by moving water, wind, glaciers and gravity is…
3. If water accumulates in a crack and then freezes, its expansion pushes the rock apart in a process called…
4. Large piles of loose angular rocks are called…
5. Mechanical weathering and grinding of rock surfaces by friction and impact is called…

III. GRAMMAR REVIEW

Exercise 1. Fill in the gaps with "if" or "when" and a verb in the present tense, then translate the sentences:

Example

***If** we go for a walk tomorrow, we will take take the dog wih us.*

1. We will go for a walk tomorrow. ………, we will take the dog with us.
2. The guests will arrive soon. ………, we will greet them at the door.
3. I am going to phone Sam in a minute. ……… him, I want you to leave the room.
4. I might visit Pamela tomorrow. ……… her, I will buy her a present.
5. The bus comes at eight o'clock. ………, we will all get on it.
6. She might invite us to her party. ……… us, we will go.
7. The film will start soon. ………, I will record it.

Exercise 2. Environmentalists are worried about the greenhouse effect. Make sentences , using "if"…, …"will"…

Example

***If** the earth gets warmer, the sea* **will** *get warmer.*

the earth gets warmer
the sea gets warmer
the ice at the North and South Poles melts
the sea level rises
there are floods in many parts of the world
many people lose their homes and land.

Exercise 3. Rewrite the following as conditional sentences:

1. You need to go to Egypt to see the Sphinx. If ……………………………….
2. John didn't leave early so he didn't get there on time. If …………………….
3. She used factor 12 suntan lotion as she gets sunburnt easily. If ………………
4. The fax machine is broken so I'll have to send it by post. If ………………….
5. Calling her might make her feel better. If ……………………………………..
6. There'll be an election if the president resigns. Providing ……………………
7. More tickets need to be sold, otherwise the concert will be cancelled. If …….
8. You'll have trouble selling your house if you're not prepared to accept a lower offer. Unless……………………………………………………………..
9. He cancelled his trip because he had run out of money. If …………………..
10. Tom didn't wear a coat and caught a cold. If ………………………………...
11. You need to study to pass this exam. Unless ………………………………...
12. You really ought to go somewhere sunnier to get a suntan. Unless …………
13. He doesn't know her. That's why he didn't speak to her. ……………………
14. He lost his job. He's unemployed now. ………………………………………

Exercise 4. Put the verbs in brackets into the correct tense, then identify the types of conditionals:

1. If he ……… (change) jobs, he would be a lot happier.
2. Even if he ……… (ask) them, they wouldn't have agreed to come.
3. I ……… (not/trust) him if I were you.
4. If you're patient for a few minutes, I ……… (be able) to finish this.
5. I wouldn't have been able to do it unless she ……… (help) me.
6. Sometimes if you ……… (take) a chance, it pays off.
7. If he ……… (wake up) earlier, he wouldn't have been late for work.
8. If we ……… (intend) to spend the day in London, we would have bought a day pass.
9. If she ……… (be) more experienced, she would be more likely to get a job.
10. If the food ……… (not/be) so bad, we wouldn't have complained.

Exercise 5. Complete the text by putting the verbs in brackets into the correct tense:

If I were world leader, I 1) ……… (try) to stop the destruction of the earth and 2) ……… (make) the world a better place for all people. If the world's problems had been tackled sooner, the quality of life 3) ……… (improve) long ago. First of all, I would try to bring about peace in the world. As long as there is fighting between nations, millions of people 4) ……… (continue) to suffer and die. If wars continue, children 5) ……… (be left) without parents and 6) ……… (grow up) in a world of misery and fear. But as long as people disagree over land and possessions, the fighting 7) ……… (go on).

Therefore, I would ensure that all people were treated as equals and given the same opportunities in life. It would also help if all countries 8) ……… (stop) producing arms so there would no longer be the weapons with which to fight. In addition, I would introduce laws to reduce pollution. If pollution levels had been controlled earlier, life 9) ……… (not/become) so unbearable. If I 10) ……… (have) the power, I would ban all cars from city centres and increase public transport. If there (be) more trees, the air we breathe 11) ……… (be) cleaner. Unless measures are taken soon, it 12) ……… (be) too late both for ourselves and our children.

Exercise 6. Rewrite the following as conditional sentences:

Example: You felt sick and you missed your friend's birthday party. – If you hadn't fallen sick, you would have missed your friend's birthday party.

1. You got up late and you missed the train.
2. You weren't offered the job because you weren't qualified.
3. You're not a senior staff member so you can't use a car park.
4. You didn't go to the meeting so you didn't hear about the safety inspection.
5. You want to go away for the weekend but you've got lots of homework.
6. You want a pet but you're allergic to animals.
7. You damaged the video because you didn't know how to connect it.
8. You like chocolate but you're on a diet.
9. You enjoy playing tennis but you have twisted your ankle.

Exercise 7. Translate into English.

1. Якби люди менше втручалися у природні процеси, клімат не змінювався би так швидко.
2. Було б добре, якби кількість автомобілів на наших дорогах зростала повільніше.
3. Я був би дуже радий, якби літо було довшим і теплішим.
4. Вони допомогли б мені, якби були зараз тут.
5. Води у наших водоймах були б набагато чистішими, якби підприємства подбали про очисні споруди.
6. Кількість бідних на планеті зменшилась би, якби багаті думали не тільки про свої власні інтереси.
7. Якщо не будуть винайдені засоби щодо зменшення викидів парникових газів, озоновий шар може зникнути.
8. На вашому місці я б завершив цей проект якнайшвидше.
9. Наші діти і онуки відчують на собі результати потепління клімату, якщо ми не докладемо належних зусиль.
10. Я б ніколи не погодилася на цю роботу, якби вони не запросили мене.

IV PRE-TEXT DISCUSSION

Most substances contract when they freeze, but water expands. How would weathering be affected if water contracted instead of expanded when it froze?

V. READ AND TRANSLATE TEXT 6A AND SAY HOW WATER INFLUENCES ROCKS DURING WEATHERING. GIVE EXAMPLES FROM THE TEXT.

Text 6A
WEATHERING OF ROCKS

All rocks which are exposed on the Earth's surface (high mountain peaks, deserts) are decomposed to a certain degree. The process of rock disintegration by the direct influence of local atmospheric conditions on the Earth's surface is called *weathering.* This phenomenon is often referred to in geology because weathering is an active process. It takes place in the upper layers of the Earth's crust.

The main cause of *physical weathering* is the change in temperature that takes place with the succession of day and night. This phenomenon can best be observed in the deserts and high mountains where the changes in temperature are common.

During the day under the influence of heat, rocks expand whereas at night they begin to contract. As rocks are generally composed of different minerals, their expansion and contraction do not occur uniformly. As a result of this rocks crack. At the beginning these cracks or fissures are hardly noticeable but gradually they become wider and deeper until the whole surface of rock is finally transformed into gravel, sand or dust.

In the regions of a moderate or cold climate, where the temperature in winter goes down to below 0 (zero), the decomposition of rocks is greatly facilitated by the action of water. When water freezes it increases in volume and develops enormous lateral pressure. Under the action of water, rocks decompose to pieces of varied forms and sizes.

The decomposition of rocks under the direct influence of heat and cold is called *physical weathering.*

Rocks are subjected not only to physical decomposition but also to *chemical weathering,* i.e. to the action of chemical agents, such as water, carbon dioxide and oxygen. In a general way, chemical weathering is an acid attack on the rocks of the Earth's crust, in particular an attack on the most abundant minerals — quartz (sand) and aluminosilicates (clays). Only few minerals and rocks are resistant to the action of natural waters. The solvent action of water is stronger when it contains carbon dioxide. Water causes more complex and varied changes. With the participation of oxygen and carbon dioxide up to 90 per cent of rocks is transformed into soluble minerals, which are carried away by the waters.

Organisms and plants also take part in the disintegration of rocks. Certain marine organisms accelerate the destruction of rocks by making holes in them to live in. The action of plants can often be even more destructive. Their roots penetrate into the fissures of rocks and develop the lateral pressure which fractures and destroys rocks.

VI. COMPREHENSION CHECK.

Exercise 1. Say which sentences correspond to the meaning of the text.Confirm your answers by the facts from the text.

1. The process of sedimentation is called *weathering.*
2. The change in temperature causes physical weathering.
3. As a rule during the night rocks expand.
4. When freezing water decreases in volume it develops enormous lateral pressure.
5. The decomposition of rocks is due to the influence of heat and cold.
6. As a rule water contains dissolved mineral substances.
7. The solvent action of water is stronger when it does not contain carbon dioxide.
8. It should be noticed that the action of organisms and plants is destructive.
9. Certain marine organisms accelerate the destruction of rocks.

Exercise 2. Answer the following questions:

1. What process is called weathering?
2. What process is called physical weathering?
3. Where can the phenomenon of physical weathering be best observed?
4. What process is called chemical weathering?
5. What substances can act as solvents?
6. Are all minerals and rocks resistant to the action of natural waters or only few of them?
7. How do organisms act on the destruction of rocks?

Exercise 3. Express your disagreement with the following statements using the speech patterns given below:

it seems to be wrong; I can't agree with you; on the contrary; in my opinion; as far as I know; that's wrong.

1. Physical weathering is not caused by the changes in temperature.
2. In the regions of a moderate or cold climate, the decomposition of rocks is not facilitated by the action of water.
3. The difference in physical and chemical weathering is that physical weathering causes great changes in the chemical composition of rocks.
4. It is quite obvious that plants and organisms do not affect the destruction of rocks.

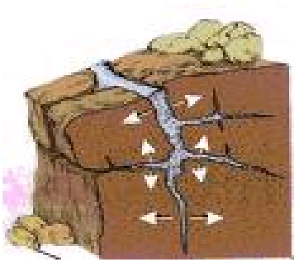
Exercise 4. Summarize text A using the words in brackets.

1. The main cause of physical weathering, *(the change in temperature, to observe, to expand, to contract, to crack, to be hardly noticeable, to be facilitated by).*

2. The main cause of chemical weathering, (to *be subjected to, to contain, to act as, to cause changes, to be transformed into)*
3. The effect of organisms and plants on the disintegration of rocks, *(to accelerate the destruction of rocks, to penetrate into, to develop lateral pressure, to destroy rocks)*

VII. LOOK THROUGH TEXT 6B AND GET READY TO SPEAK ABOUT CHEMICAL WEATHERING.

Text 6B
CHEMICAL WEATHERING



Of two types of weathering the chemical weathering of rocks involves more serious aIterations than the mere comminution produced by physical weathering. As a result of these changes certain minerals disappear wholly or partially and material of secondary origin which is formed differs markedly from the parent minerals.

The processes fulfil themselves in an aqueous medium and depend on the decomposing action of water forced by the presence of dissolved carbon dioxide and, in some cases, organic acids formed from the decay of plants. Since chemical weathering takes place at the surface of rock minerals, it is evident that it is intensified where physical weathering has preceded it. But since most rocks are formed of an irregular mosaic of different minerals with various degrees of susceptibility to attack, chemical weathering alone is capable of producing disintegration particularly where there is a certain degree of jointing or porosity in the weathering rocks.

Essentially, chemical weathering involves two phases, namely, the disappearance of certain minerals, and the formation of secondary products.

Some of the secondary products may originate by alteration at the seat of the parent minerals, whilst other products may originate by precipitation from solutions. Sometimes the material precipitated at the place of weathering may be mixed or even enter into combination with residual products.

Water is of such profound importance from the standpoint of rock alteration and soil development that it has been compared with the blood of an organism. Chemical weathering is closely associated with water; in very dry or very cold regions chemical weathering is slight. Since practically all compounds are attacked by water, it is sometimes referred to as the universal solvent. The presence of carbon dioxide in water adds materially to its activity.

Temperature relations are also important, since they influence the activity of solutions in the rocks and soil; as a general rule, the higher the temperature, the more rapid the alteration. Particularly important from the standpoint of chemical weathering is the length of time during the year when temperatures are above 0°C. Going from high to low latitudes involves passing from regions of minimum to regions of maximum chemical weathering. In the tropics the zone of weathering may extend as deeply as 600 feet.

Exercise 1. Explain what is meant by.
materials of secondary origin;
the parent minerals;
susceptibility to attack;

Exercise 2.
What is opposed to "whilst"?
List the points to illustrate the cause - effect relationship and the corresponding connectives.
Find the cause - effect relationships introduced by "since"
Find the contextual equivalents for
as regards
is called
to effect
•Is 600 feet regarded as many or few in the text?
•What are the key points of the text?
•Speak about water as an agent, using the points as a plan

Exercise 3. Complete the sentences.
1.The decomposition and disintegration of rocks and minerals on the Earth's surface is…
2. The removal of weathered rocks and minerals by moving water, wind, glaciers and gravity is…
3. If water accumulates in a crack and then freezes, its expansion pushes the rock apart in a process called…
4. Large piles of loose angular rocks are called…
5. The mechanical wearing and grinding of rock surfaces by friction and impact is called…

Exercise 4. Translate into English.

ВИВІТРЮВАННЯ ГІРСЬКИХ ПОРІД

Розрізняють три основні типи вивітрення, а саме: фізичне, хімічне та органічне.

Фізичне вивітрення розкришує маси твердих порід, розбиває їх на окремі частини, але не змінює хімічного складу окремих мінералів.

Причини фізичного вивітрення такі: зміна температури внаслідок нерівномірного нагріву породи сонячним промінням і, отже, нерівномірного розширення порід, а надто тих, які складаються з матеріалів, що мають неоднаковий коефіцієнт розширення.

Друга причина фізичного вивітрення – це вплив морозів на породу за наявності води, що замерзає і розширюється в розколинах гірської породи.

Вплив цього виду вивітрення можна добре виявити лабораторним шляхом через так звану спробу заморожування.

Зовнішні ознаки породи, що легко піддається фізичному звітренню, такі: великозерниста будова породи, її потрісканий вигляд і поруватість. Уважний огляд породи за допомогою лупи, а ще більше мікроскопа, часто дає змогу досить справедливо оцінити схильність породи до фізичного вивітрення ще до того, як її випробують через заморожування, тобто – в лабораторії.

TEST 6

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

decomposition	surface	movement	rocks	bedrock
material	eroded	large	weathered	sediment

Weathering is …. and disintegration of …. and minerals at the earth's ….. Weathering itself involves little or no … of the decomposed rocks and minerals.This …. accumulates …where it forms and overlies unweathered …..
Erosion is the removal of …. rocks and minerals by moving water, wind, glaciers, and gravity. After a rock fragment has been …. from its place of origin, it may be transported to…. distances by those same agents: flowing water, wind, ice and gravity. When the wind or water slows down and loses energy or, in case of glaciers, when the ice melts, transport stops and …. is deposited. These four processes - weathering, erosion, transportation, and deposition – work together to modify the Earth's surface.

Task 2. Put the verbs in brackets into the correct form.

1. The most common clastic rocks (to originate) through weathering, transporting, and depositing processes.
2.The earth's surface (to change) continuously.
3. If you examine the layers closely, you (to find) that they are built up of fragments of varying sizes.
4. People believed that the Earth (to be) the center of the Universe many centuries ago.
5. The shape of the sand grain (to depend) on its origin and the treatment it has received.

Task 3. Match the words in (1) with the words in (2) and translate the word combinations into Ukrainian.

1. flowing, raw, clastic, plant, loose, hard, dark, main, flat, microscopic
2. component, sediment, surface, material, grains, rock, water, remains, examination, in color.

Task4. Choose the correct variant.

1. Before you______, don't forget to lock the door.

a) are leaving c) leave
b) will leave d) shall leave

2. Please do not speak to anyone before the police______.
a) come c) 'll come
b) are coming d) came
3. His parents will be very glad if she______the university.
a) enter c) enters
b) 'll enter d) entered
4. When you______my brother, you______him.
a) 'll see, won't recognize c) saw, recognize
b) see, won't recognize d) 'll see, don't recognize
5. We won't discuss the matter until the headmaster______.
a) 'll arrive c) doesn't arrive
b) won't arrive d) arrives
6. If I______any help I______my friend.
a) need, 'll phone c) 'll need, phone
b) 'll need, 'll phone d) needed, 'll phone
7. Let's______before it______raining.
a) to go out, starts c) go out, 'll start
b) go out, starts d) going out, 'll start
8. I want to go shopping but if you______to come, you ______
a) want, need c) don't want, needn't
b) not want, needn't d) do want, needn't
9. If you______on this tram it'll take you downtown.
a) 'll get c) got
b) have got d) get
10. He______to the country tomorrow if the weather is fine.
a) go c) 'll go
b) goes d) 'd go
11. You'll understand nothing unless you______the book yourself.
a) read c) don't read
b) won't read d) 'll read
12. You'll understand this rule after your teacher______it to you.
a) 'll explain c) explains
b) explain d) don't explain
13. I______the room till I see my brother.
a) 'll leave c) leave
b) shan't leave d) don't leave
14. I______at home till you______me up.
a) am, 'll ring c) 'll be, ring
b) is, ring d) 'll be, 'll ring
15. You______English fluently if you______hard.
a) speak, work c) 'll speak, work
b) speak, 'll work d) 'll speak, 'll work
16. He______for Moscow as soon as his father______.
a) 'll leave, arrive c) leave, 'll arrive
b) 'll leave, 'll arrive d) 'll leave, arrives

17. If I______my exams, my mother______me go to a disco.
a) don't pass, won't let c) won't pass, let
b) won't pass, won't let d) won't pass, doesn't let
18. If he______well, he'll always be tired.
a) sleeps c) 'll sleep
b) doesn't sleep d) won't sleep
19.I'll feel really sorry for her if she____-__all the work without any help.
a) has done c) does
b) did d) has to do
20. He'll be fired if he______improve his work.
a) doesn't c) won't
b) will d) has to
21.When I______short of money I ask my parents for help.
a) was c) is
b) are d) am
22. Don't trouble trouble until trouble______you.
a) 'll trouble c) troubles
b) won't trouble d) trouble
23. You'll have to make a speech in case the chairman ______late.
a) 'll be c) isn't
b) is d) won't be
24. We'll make a good progress in English provided we ______hard.
a) 'll study c) study
b) are studying d) won't study
25. I don't know when they______.
a) 'll come c) came
b) come d) are coming

Task 5. Translate into English.

ХІМІЧНЕ ВИВІТРЕННЯ .

Більш-менш повільне вивітрення гірських порід відбувається під впливом води й повітря, а також агентів, що містяться в них (O, CO_2, $8O_2$, N і різних карбонатних солей, переважно тугуватих).

При цьому, без сумніву, одні породи вивітрюються дуже повільно, другі швидше, а треті досить швидко. Чинниками, що впливають на швидкість вивітрення (крім часу впливу, площі, яка перебуває під впливом, включаючи розколини, і кількості агентів, що містяться у воді й повітрі), слід вважати участь у складі порід тих чи інших мінералів, бо, як ми знаємо з їхнього опису, вони неоднаково протистоять звітренню.

З цього виходить, що міркуючи про стійкість породи до вивірення, треба виявити її мінералогічний склад, що найлегше зробити за допомогою лупи або мікроскопу.

Вплив на породу води, надто такої, що має в розчині діяльних агентів, може бути: 1) в безпосередньому розчиненні, 2) у хімічній зміні, 3) в механічному пом’якшенні та збільшенні обсягу.

UNIT 7
Soil

Grammar
Direct and Indirect Speech

I. ACTIVE VOCABULARY

acid climate (n) – засушливий клімат
beneath (adv) – знизу
barren (n) – пуста порода
cereals (n) – злакові культури
crucial (adj) – основний, важливий
deluge (n) – злива, потік
deplete (v) – виснажувати, вичерпувати
disease agent (n) – той, що розносить хвороби
failure (n) – невдача
fertilizers (n) – добрива
food chain (n) – харчовий ланцюг
hookworm (n) – глист
horizon (n) – шар, відкладення шару
humus (n) – чорнозем, перегній
infest (v) – кишіти, роїтися
livestock (n) – худоба, поголів′я худоби
moisture (n) – волога
overgrazing (adj) – надмірний випас худоби
parent rock (n) – материнська порода
pedologist (n) – ґрунтознавець
perennial (adj) – багаторічний; який триває цілий рік
perennial irrigation (n) – багаторічне зрошення
protein (n) – білок
residue (n) – осад
resurgence (n) – відродження
rodent (n) – гризун
rot (v) – гнити, псуватися
soil (n) – ґрунт
solid waste disposal (n) – звалище сміття

shelter (n) – сховище
subsoil (n) – підґрунт
sustain (v) – підтримувати, підпирати
thrive (v) – квітнути, процвітати, пишно рости
topsoil (n) – верхній шар ґрунту
vulnerable (adj) – уразливий
water table (n) – дзеркало ґрунтових вод
weed (n) – бурʼян
yield (n) – збір врожаю
yield (v) – давати врожай

II. LEXICAL EXERCISES

Exercise 1. Give English equivalents of the following.

1. фізичне (хімічне, біологічне) вивітрювання
2. коріння рослин
3. поглинати вологу
4. злакові культури
5. бобові культури
6. засолення ґрунту
7. підтримувати життя
8. руйнувати органічну матерію
9. важливі нітрати
10. нові іригаційні проекти
11. поживний

Exercise 2. Give Ukrainian equivalents of the following.

1. handful of soil
2. fertile soil
3. intensive farming techniques
4. to deplete the quantity
5. ecologically bankrupt
6. intensive farming
7. cash crop
8. subsistence farming
9. huge deluge
10. greenhouse effect
11. nourishing substances

Exercise 3. Match the following words with their explanations.

1. humus	a. a process by which the biological productivity of the land is so reduced as to lead to the spread of desert- like conditions in arid and semiarid regions
2. erosion	b. a brown or black amorphous mass of decayed organic material found in soils

3. desertification	c. the weathering down and removal of soil, rock fragments and bedrock through the action of rivers, glacier, sea and wind
4. salinisation	d. any material added to the soil to supply essential nutrients for crop growth
5. fertilizers	e. the accumulation of highly soluble sodium, magnesium and potassium salts in a soil
6. eutrophication	f. to lessen greatly in quality, contents, power or value
7. deplete	g. the process of nutrient enrichment of an aquatic system
8. decay	h. to give or provide (smth. needed or asked for)
9. supply	i. to lose power, health and go bad

III. GRAMMAR REVIEW

Exercise 1. Fill in 'say', 'tell' or 'ask' in the correct form

1. Please… me what you think of this problem.
2. He… that he couldn't reply to any of these questions.
3. He promised to … no more about the matter.
4. She stopped to …the time because she thought she was late.
5. He had taken an oath so he had to …the truth in the court.
6. She couldn't … for certain whether or not she would be staying.
7. "Could you help me with these bags?" she …me.
8. My parrot can …a few words in English.

Exercise 2. Turn the following sentences into the Reported Speech.

1. "I am visiting Greece", says the professor.
2. "I've never been to Paris before", says John.
3. "I don't speak Spanish", says Maria.
4. "My house is not far from the town centre", he says.
5. "Water boils at 100C^{o}", he said.
6. "Australia is a big country", he said.
7. "If I see him, I'll invite him to the party", he said.
8. "I saw a really bad car accident yesterday", he said to me.
9. "If I were rich, I would buy a house in Beverly Hills", she said.
10. "I've been living here for five years", she said.

Exercise 3. Turn the following sentences into Indirect Questions.Omit question marks where necessary.

1. Where did I leave my glasses? (I wonder…)
2. Is he planning to call a meeting? (Did you know…)
3. Have they ever been abroad? (Do you know…)
4. When are you leaving? (I want to know…)
5. Who left that message on our answerphone? (She wondered…)

Exercise 4. Turn the following into Direct Speech.

Mr. Brown said good morning to everyone and thanked them all for coming. He said that he expected that they were all wondering why he had called the meeting, and promised that he wouldn't keep them in suspense much longer. He explained that a large multinational company had offered to buy the factory for $10 million and he went on to invite people to give their views on whether or not they should sell. He warned them that it was a very important decision they had to make and urged them to think about the matter very carefully as everyone‘s future could depend on it.

Exercise 5. Translate into English.

1. Вони запитали нас, чи всі проблеми, пов'язані з нашою участю у програмі, вже вирішені.
2. "Скажіть нам, будь-ласка, які з парникових газів найменш шкідливі?"
3. Він поцікавився, котра година.
4. "Я можу попросити вас не шуміти так сильно?" – запитала вона.
5. Вона порекомедувала мені не приходити так пізно, тому що їй потрібно було вставати рано.
6. Він пояснив, як він став мільйонером.
7. "Я можу допомогти тобі написати реферат", – сказав він після уроків.
8. "Ну, гаразд. Я зробив помилку. Тепер шкодую. Вибачте", – сказав наш одногрупник.
9. Вони хотіли знати, чи ми маємо якусь інформацію, яка б допомогла їм скоротити витрати.
10. Викладач пояснив нам, що ми повинні регулярно працювати над собою.

IV. PRE-TEXT DISCUSSION

Do you know that:

- Soil is the result of the weathering of rocks.
- All living things are made of protein containing nitrogen.
- Intensive farming methods deplete the soil from nitrogen.
- The earth is losing 24 billion metric tons of topsoil every year through intensive farming methods.
- All soil contains some salt.
- Salt contained in soil is washed away when it rains.
- Evaporation from reservoirs and irrigation channels increases the salinity of the water.
- Fertilizers improve the quality of soil.
- Pesticides are absorbed by the crops.
- Pesticides often become concentrated on the food.

V. READ AND TRANSLATE TEXT 7A.

Text 7A
SOIL

We know that soil has been formed over thousands of years from the weathering of rock.

There are three types of weathering: physical weathering (where temperature changes cause the rock to expand and contract until it shatters into pieces), chemical weathering (where carbon dioxide and water form a weak acid that dissolves rocks such as limestone) and biological weathering (where the rock is broken down by the action of living things such as plant roots and bacteria).The composition of a typical soil is as follows: the top layer of the soil (topsoil) is rich in humus – a dark, fibrous material formed from decaying organic matter. Humus contains micronutrients such as nitrogen, minerals such as iron, and microorganisms that break down the organic matter. Humus absorbs moisture and binds the inorganic particles together. The quality (or fertility) of soil depends on the amount of humus in it – the organic content. Good quality topsoil is dark, moist and crumbly. The middle layer of the soil contains less organic material, but it is rich in minerals because these get washed down with the rain. The lower layer (subsoil) is made of inorganic material, similar to the parent rock which originally formed the soil. All living things are made of protein, which contains nitrogen. Without nitrogen, plants and animals cannot grow, because they cannot build new tissue. Traditional farming methods rotate cereal crops (which remove nitrogen from the soil) with leguminous plants (which replace the nitrogen). Intensive farming methods, where cereals are grown every year, tend to deplete the soil of nitrogen. Repeated cropping and overgrazing (that is, putting too many cattle on a small area of grassland) cause erosion of the top layers of the soil. The essential nitrates are removed with the topsoil so the nitrogen cycle, which is crucial to the balance of nature, is broken.

The earth is losing 24 billion metric tons of topsoil every year through intensive farming methods and deforestation. The end stage of this loss of topsoil is desertification, where all the organic and mineral content of the soil has disappeared, leaving only poor quality subsoil, which cannot support plant growth. About 20 million hectares of productive land become barren every year because of soil erosion. Thirty percent of the world's land surface is threatened with desertification. Another hazard of intensive farming is salinization, which is caused by perennial irrigation (that is, irrigation year after year without a break) in arid climates. All soil contains some salt, which is washed away when it rains. Where rainfall is minimal, the salt content of the soil is very high. Evaporation from reservoirs and irrigation channels increases the salinity of the water. When a new irrigation scheme raises the water table, salt from the soil dissolves in the water and rises to the surface. Unless the area is left fallow and unirrigated for a season so that the salty water can drain away, the land will become permanently salinized and unable to support plant life.

The quality of soil can be improved by adding fertilizers. But they cause environmental damage by a process called eutrophication. Excess nitrogen is washed out of the soil with the run-off after it rains. It passes into rivers and lakes, and encourages the growth of algae (seaweed) in the water and of wild plants on nearby land. Overgrowth of algae upsets the balance of nature in lakes and seas. Overcrowding on the banks causes the plants to rot and die. The air becomes contaminated with nitrous oxide which contributes to the greenhouse effect. Like nitrates, phosphates and potash are taken up by growing plants and returned to the soil in animal excreta. Artificial fertilizers add a few selected micronutrients, but because they cause rapid plant growth they deplete the soil of other nutrients. Plants grown in artificial fertilizers are often tasteless and have a low nutritional value. They may be contaminated with chemical residues from the fertilizer manufacturing process. For both environmental and health reasons, many consumers today prefer to buy organic vegetables – that is, vegetables grown without any artificial fertilizers.

Organic vegetables are also grown without pesticides. These chemicals kill insects and other pests but they are poisonous to many other living things as well – including man. Pesticides are absorbed by the crops and washed into the rivers and the sea. They often become concentrated by the food chain. Some pesticides accumulate in the human body and are secreted in breast milk. About 20,000 people in the world, including many children, die each year from accidentally drinking or inhaling pesticides.

Intensive farming methods which successfully increase crop yields in temperate zones often fail in tropical climates. There are several reasons for this. First, tropical countries usually have poor soil. Tropical heat kills microorganisms, so tropical soil has a lower organic content. This reduces its capacity to absorb water and makes it particularly vulnerable to erosion. When rain comes in the tropics, it usually arrives in a huge deluge after several months of no rain at all. The sandy topsoil is easily washed away, leaving soil of even poorer quality beneath. Second, there are more pests. In temperate areas, the cold winter kills off many of the weeds, fungi, insects and other pests. In tropical zones, there is no cold season. The pests thrive in the constant heat and frequently cause failure of crops. They spread easily from one field to another, so they cause particular damage when a single crop is grown intensively on a vast area of land. In general, tropical regions are more suited to subsistence farming (where a variety of small-scale crops is grown) than to the large-scale, intensive production of cash crops. Third, livestock in the tropics is heavily infested with parasites. The yield from both arable and cattle farming in tropical regions is usually one-quarter to one-third that of temperate regions, if the people try to introduce intensive farming methods, yields may increase temporarily, but they eventually fall still further and soil erosion accelerates.

A handful of soil looks inert and uninteresting. But good quality fertile soil contains all the basic building blocks of life. Beneath the thin layer of soil lies a planet as lifeless as the moon.

VII. COMPREHENSION CHECK

Exercise 1. Do the false/true activity

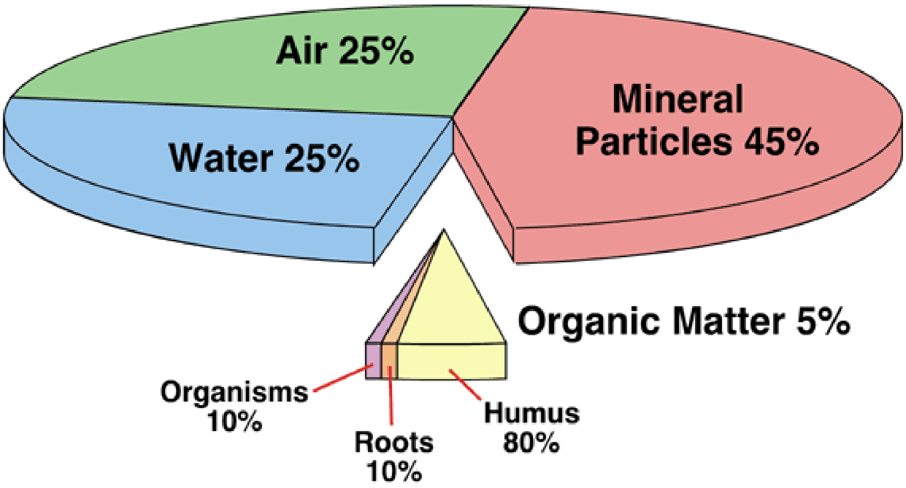
1. Plants and animals need nitrogen for growth.
2. Too much nitrogen causes too much growth of seaweed and wild plants nearby.
3. Intensive farming doesn't increase crop yield.
4. Plants grown in artificial fertilizers are usually tasty.
5. Pesticides are not absorbed by crops and washed into the rivers and seas.
6. Salinization occurs when perennial irrigation is undertaken in arid climates.
7. The pests thrive in the constant heat and cause failure of crops.
8. Livestock in the tropics isn't infested with parasites.
9. The quality (or fertility) of soil depends on the amount of humus in it.
10. Ten percent of the world's land surface is threatened with desertification.

Exercise 2. Look through text 7A carefully. Then complete the following to make suitable sentences according to the meaning of the text.

1. The effect of repeated cropping and overgrazing on the soil is ________________________________.
2. Good quality soil contains ________________________.
3. Desertification means that ________________________________.
4. Organic fertilizers can be either ______________________________.
5. Pesticides are chemicals which _________________________.
6. Although intensive farming increases crop yield, ___________________.
7. Salinization occurs when ________________________.
8. Plants and animals need nitrogen so that ___________________________.
9. The amount of topsoil being lost every year because of deforestation and intensive farming ________________________________.

VII. LOOK THROUGH TEXT 7B AND GET READY TO SPEAK ABOUT THE SOIL.

Text 7B.
HOW SOIL IS FORMED



Soil is an important natural resource that covers much of the earth's land surface. Most life on earth depends upon the soil as a direct or indirect source of food. Plants are rooted in the soil and obtain nutrients (nourishing substances) from it. Animals get nutrients from plants or from animals that eat plants. Certain microbes in the soil cause dead organisms to decay, which helps return nutrients to the soil. In addition, many kinds of animals find shelter in the soil.

Soil contains mineral and organic particles, other plant and animal matter, air and water. The contents of soil change constantly. There are many kinds of soils and each has certain characteristics, including color and composition. The kind of soil in an area helps determine how well crops grow there. Soil forms slowly and is destroyed easily, it must be conserved so it can continue to support life.

Soil scientists, called pedologists, use the term “polypedons” for the bodies of individual kinds of soil in a geographic area. Polypedons can be indefinitely large but some have a surface area of only about 10.8 square feet (1 square meter). Some polypedons measure less than 5 inches (13 centimeters) deep. Others are more than 4 feet (1.2 meters) deep.

Soil begins to form when environmental forces break down rocks and similar materials that lie on or near the earth's surface. Pedologists call the resulting matter parent material. As soil develops through the centuries, organic material collects, and the soil resembles the parent material less and less. Glaciers, rivers, wind, and other environmental forces may move parent material and soil from one area to another.

Soils are constantly being formed and destroyed. Some processes, such as wind and water erosion, may quickly destroy soils that took thousands of years to form.

Soil formation differs according to the effects of various environmental factors. These factors include (1) kinds of parent material, (2) climate, (3) land surface features, (4) plants and animals, and (5) time.

Soil formation depends on several factors that act together. They include (1) the rock from which the soil forms, (2) the climate, (3) plants and animals, and (4) time. Soils form slowly and continuously. The illustrations below show how a typical soil forms and develops through the centuries.

Soil begins to form when rain, ice, freezing and thawing, and other environ-mental forces break down rocks and similar materials. The resulting matter, called *parent material,* breaks down further into mineral particles.	**Simple organisms** live on rocks that are *decomposing* (decaying). Plantlike *lichens* produce acids that help decompose the rocks. When the organisms die, organic matter collects among the mineral particles.	**Layers called *horizons*** appear as soil develops. The top layer, or *A horizon*, has more organic matter than the others and becomes deep enough to support plant roots. The lowest layer, or *C horizon*, resembles the parent material	**A well-developed soil** can support a healthy cover of vegetation. It also may include a middle layer, called the *B horizon.* This horizon contains minerals that have been washed down in drainage waters from the soil's surface.

Characteristics of soils

The method and rate of soil formation differs throughout a body of soil. As a result, the soil develops layers. These layers are called soil horizons. Soil horizons may be thick or thin, and they may resemble or differ from the surrounding horizons. The boundaries between the layers can be distinct or barely noticeable.

Most soils include three major horizons. The upper two, called the *A* and *B* horizons, are the most highly developed layers. The A horizon is also known as topsoil. The lowest horizon, called the C horizon or the subsoil, is exposed to little weathering. Its composition resembles that of the parent material. Pedologists describe soils by the characteristics of the soil horizons, including (1) color, (2) texture, (3) structure, and (4) chemical conditions.

Color. Soils range in color from yellow and red to dark brown and black. The color of a soil helps pedologists estimate the amounts of air, water, organic matter, and certain elements in the soil. For example, a red color may indicate that iron compounds are present in the soil.

Texture of a soil depends on the size of its mineral particles. Sands are the largest particles. The individual grains can be seen and felt. Silts are just large enough to be seen, and clays are microscopic. Pedologists divide soils into textural classes according to the amounts of sand, silt, and clay in a soil. For example, the mineral portions of soils classified as loam contain from 7 to 27 per cent clay and less than 52 per cent sand. In silty clay, more than 40 per cent of the mineral particles are clay, and more than 40 per cent are silt. Texture helps determine how thoroughly water drains from a soil. Sands promote drainage better than clays.

Summary writing.

Exercise 1. Rearrange and write the following sentences in a paragraph that summarizes the text.

1. A well-developed soil can support a healthy cover of vegetation.
2. Pedologists are scientists studying the soil.
3. Soil formation differs according to the environmental factors effects.
4. Soil is an important natural resource that covers much of the earth’s surface.
5. Soil is formed due to the decay of the rock.
6. The term “polypedons” is used for the bodies of individual kinds of soil in different geographical regions.
7. The color of a soil helps to estimate the amount of air, water, organic matter.
8. The red color of a soil indicates the presence of iron compound in it.
9. The lowest layer resembles the parent material.

Exercise 2. Translate into English using the dictionary.

Природно-ресурсною базою розвитку сільського та лісового господарства є земля – найціннюще та незамінне багатство країни.

Ґрунтом називаються видозмінені під впливом живих організмів, перш за все – зелених рослин, поверхневі шари земної кори, котрі відрізняються від гірських порід складом мінеральної маси, значним вмістом специфічних органічних речовин (гумусу) і мають важливу відмінність – родючість, тобто здатність постачати рослинам необхідні для їх росту поживні речовини, воду і повітря. Ґрунти є одночасно і результатом життєдіяльності зелених рослин, і умовою їхнього існування. На Україні налічується багато різновидів ґрунтів, які відрізняються між собою мінералогічним складом, вмістом гумусу та поживних елементів, фізичними і хімічними властивостями.

Шкідливий антропогенний вплив, а також стихійні природні явища, посилені людською діяльністю, завдають ґрунтам величезної, інколи непоправної шкоди. Це, насамперед, водна і вітрова ерозія, погіршення ґрунтової структури, механічне руйнування та ущільнення ґрунту, постійне збіднення на гумус та поживні речовини, забруднення ґрунту мінеральними добривами, отрутохімікатами, мастилами та пальним, перезволоження та засоленість земель.

Project work.
Prepare projects on the following topics.

1. Composition of soils in different parts of Ukraine and its influence on vegetation.
2. Soil conservation problem in Europe and Ukraine.
3. Soil pollution by radiation (The influence of Chernobyl tragedy on soil pollution and its future).

TEST 7

Task 1. Choose the correct word to complete the sentences.

1. The professor underlined that soil … the result of the weathering of rocks.

A) is C) will
B) was D) had been

2. He knew that all living things … of protein containing hydrogen.

A) will be C) were
B) is D) was

3. She says that salt contained in soil … away when it rains.

A) was washed C) are washed
B) is being washed D) will be washed

4. They excused themselves and said they … to see our ecology experiment.

A) want C) would want
B) wanted D) are wanted

5. She asked where the nearest drugstore ….

A) is C) are
B) will D) was

Task 2. Give English equivalents of the following.

1. Поглинати вологу.
2. Злакові культури.
3. Засолення ґрунту.
4. Нові іригаційні проекти.

5. Бобові культури.
6. Надмірний випас худоби.
7. Харчовий ланцюг.
8. Збір врожаю.
9. Скільки Вам потрібно часу?
10. Ви дуже люб’язні.
11. Банк за аптекою.
12. Чи є тут заправка?
13. Він дістається туди на метро.
14. Зупинка автобуса там.
15. Мені потрібна година.
16. Методи утворення ґрунту.
17. Земля різниться за кольором.

Task 3. Turn the following sentences into indirect questions.

1. The quality of soil can be improved by adding fertilizers. (He was interested)
2. Soil has been formed over thousands of years from the weathering of rock. (He asked when …).
3. Fertilizers improve the quality of soil. (The professor asked what …).
4. I heard you had moved to a new apartment. (I wanted to know).
5. How long does it take you to get there by car? (I asked).

Task 4. Translate from Ukrainian into English. Total 15

1. “Скажіть, будь ласка, де інститут ґрунтознавства?” – запитала вона.
2. “Я можу допомогти тобі написати реферат з теми «Ґрунт»” – сказала вона, після того як він не склав залік.
3. Він запитав: “Від чого залежить структура ґрунту?”.
4. Моя подруга запитала: “ Чи є у тебе геологічний словник?”.
5. Вона запитала: “Що ти знаєш про інтенсивне землеробство?”.

Task 5. Give three forms of the following irregular verbs.

1. їхати (лишати)
2. знати
3. тримати
4. рости
5. давати
6. сваритися
7. мести (замітати)
8. рвати
9. мати справу
10. битися об заклад

Task 6. Put the verbs into correct form.

1. Soil (to contain) mineral and organic particles.
2. Scientists studying soil (to be called) pedologists.
3. Soil (to be) constantly being formed and destroyed.
4. Soil formation (to depend) on several factors that (to act) together.

5. There (to be many) kinds of soils.

Task 7. Compose sentences with the following words.

1. Black, brown, dark, and, to, yellow, from, in, color, range, soils.
2. 5, is, within, the, station, minutes, underground, walk.
3. How, it, long, will, to, do, our, tourists, shopping, take?
4. Horizons, layers, these, called, are.
5. Clays, better, than, promote, sands, drainage.

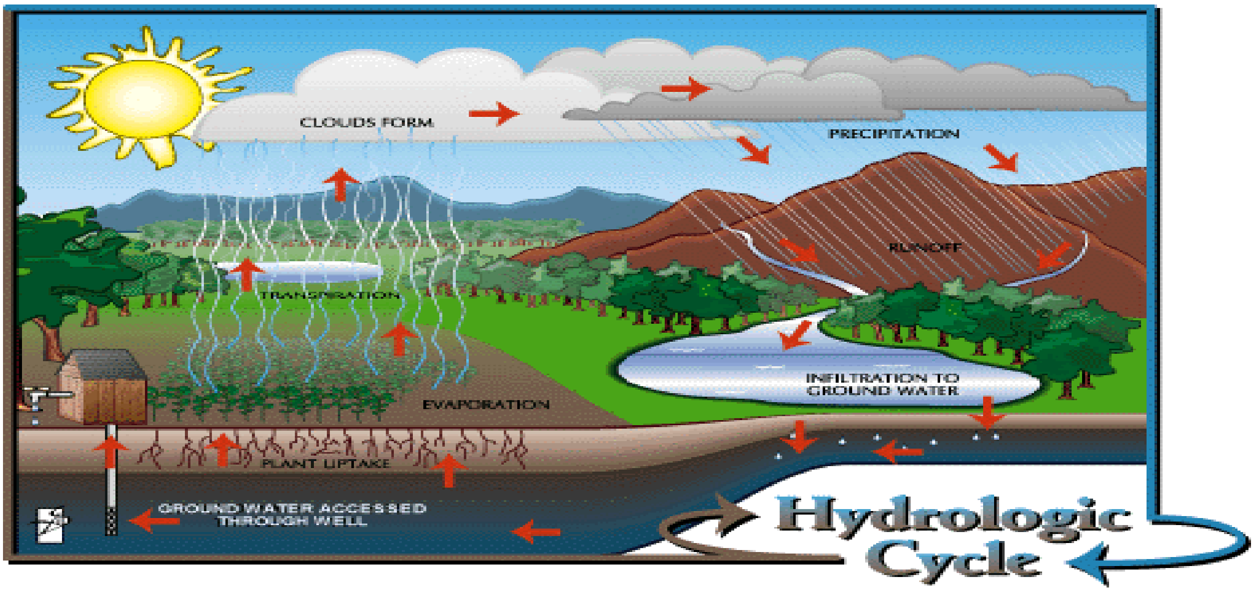
Task 8. Translate in writing without a dictionary

Soil and land

Soil and land are often thought of as being the same, but they are not. Land is the part of the world not covered by the oceans, while soil is a mixture of minerals, organic material, living organisms, air and water that together support the growth of plant life. Soil is a thin covering over the land. Farmers are particularly concerned with soil because the nature of the soil determines the kinds of crops that can be grown and which farming methods must be employed. Urban dwellers should also be concerned about soil because its health determines the quality and quantity of food they will eat. If the soil is so abused that it can no longer grow crops, or if it is allowed to erode, degrading air and water quality, both urban and rural residents suffer. To understand how soil can be protected, we must first understand its properties and how it is formed.

A combination of physical and biological events forms soil. Soil building begins with the physical fragmentation of the parent material, which consists of ancient layers of rock or more recent geologic deposits from lava flows or glacial activity. The kind of parent material and the climate determine the kind of soil formed. Factors that can bring about fragmentation or chemical change of the parent material are known as weathering. Temperature changes and abrasion are two primary agents of mechanical weathering.

UNIT 8
The Hydrologic Cycle



Grammar
Passive Voice

I. ACTIVE VOCABULARY

hydrologic cycle – гідрологічний цикл
evaporation (n) – випаровування
unceasing (adj) – безперервний
trade (winds) – пасатні вітри
precipitation (n) – опади
seep (v) – просочитись
runoff (n) – витік
humidity (n) – вологість
surplus (n) – надлишки
deficit (n) – дефіцит
water balance – водний баланс

II. LEXICAL EXERCISES

Exercise 1. Insert the missing letters:
vaporatio…, we…terl…es, …eg…tation, la…i…ude, p…eci…itation, in…erior…, s……page, mea…ura…le, an…ua…, …udge…, c…rr…nt, e…orm…us, con…en…e, equ…tori…l, scien…is…s, unc……sing, s…re…ms, ru…o…f, hu…idi…y, disco…ery, atom…phe…e, o…erspre…d.

Exercise 2 .Fill in the gaps witht words from the list below:
rises, severe, moisture, passes, circulates, droplets, level, smoke, fuels, blown, cools, fog.

Clouds

Air …… as it warms, as it ……… over mountains, or when it is ……… upwards by cool air. Rising air ……… condenses, and forms clouds of water ………

There are three cloud levels: cirrus form at the highest level, alto in the middle, and stratus at the lowest ……… Clouds that form at ground level are known as ……… Fog, mixed with smoke from burning ………, produces smog. Earlier this century, London, England, suffered from ……… smog.

Cloud formation

1. The land warms. The Sun warms the land on a clear day. Air near the ground is warmed and rises.
2. A cloud is formed. As the warm air rises, it cools. The moisture it contains condenses and forms a cloud.
3. Growing clouds. Fleecy clouds appear in the sky. They get bigger and cool air circulates inside them.

Cloud types:

Cirrus – wisps of cloud made of ice crystals, about 12,000 m high.
Cirrocumulus – forms at about 9,000 m, rippled ice crystal cloud.
Cumulonimbus – dark, storm cloud with rain.
Altocumulus – layers or rolls of fluffy cloud.
Altostratus – grey or white sheet of cloud forms between 2,000m and 6,000m.
Stratocumulus – layer at the top of cumulus cloud.
Cumulus – large, white, heaped, fluffy cloud.
Nimbostratus – low, rain cloud under 2,000 m.
Stratus – low-level, flat, grey sheet of cloud.

NOTE:
Cloud cover is measured in oktas. On weather maps a partially shaded circle represents cover.

Exercise 3. Match the word with its explanation:

1. Drizzle	a. an area of permanent snow in high latitudes or mountainous regions from which glaciers originate;
2. Lightning	b. fine rain where the water droplets have a diameter of less than 0.5 mm;
3. monsoon	c. visible flash of electrical discharge within the clouds of a thunderstorm;
4. hail	d. the seasonal reversal of winds and air pressure systems over continental landmasses and adjacent oceans;
5. snowfield	e. precipitation in the form of small pellets of ice with diameters usually ranging from between 5 and 50 mm.

III. GRAMMAR REVIEW

Exercise 1. The following passage describes the production of paper. Put the words in brackets into the appropriate form, using the passive where necessary:

From trees to pulp

The trees … (transport) to the paper mill by lorry, train or ship. First the bark … (remove). This … (burn) at a later stage so that energy can … (generate) for the paper-making process. Then the logs … (cut) into chips and … (cook) under high pressure for four hours to make paper pulp. Next the pulp … (bleach) to … (remove) dirt sports and … (improve) its ageing properties.

From pulp to paper

The manufacturing process also … (require) chemicals to strengthen the paper. The fibres … (mix) with additives and … (dilute) with water. This mixture … (spray) onto the paper machine where it … (press), then … (dry) and … (wind) onto one large reel which … (weigh) up to 20 tons. Each part of the process … (control) by computers which automatically … (correct) any errors.

Exercise 2. Look at the note and write a report .Use the passive:

Yet again we experienced an earthquake last night

A remote area in northern Spain *shake* by an earthquake last night. Several villages totally *destroy* and many people *leave* homeless. The total extent of the damage still not *known* but luckily few casualties *report* as people *warn* of the danger earlier and many villages *evacuate*. Victims of the earthquake now *offer* shelter in local churches where food and drink *provide*.

Exercise 3. Translate into English:

1. У 1963 році, коли алюміній вперше використали для виготовлення одноразових банок для напоїв, в США випустили більше 2 мільярдів банок – по п'ять на людину.
2. Води озера Байкал – найбільшого прісноводного озера у світі – постійно забруднюються шкідливими викидами паперово-целюлозного комбінату.
3. Величезна кількість енергії потрібна для випуску алюмінію.
4. Крім того, більша частина алюмінію добувається з бокситових покладів, які знаходяться у тропічних країнах.
5. Величезні площі вологих тропічних лісів знищуються зараз тільки для видобутку бокситів.
6. Викопне паливо, яке дуже забруднює повітря, у майбутньому буде замінено новими чистішими видами палива.
7. Кількість сміття у великих містах катастрофічно збільшується, і з цим потрібно боротись.
8. Сучасні сміттєспалювальні високотехнологічні заводи скоро будуть будуватись в Україні.

Exercise 4. Complete the following passage with appropriate passive forms of the verbs in brackets:

A new campaign … (launch) earlier this year by the UK government, which aims to reduce the amount of domestic waste. Households … (encourage) to recycle certain waste products and to sort and prepare others for collection at specific sites. From there they … (take) to special waste treatment plants where special machinery will process them for reuse as recycled material. In Britain today, when the contents of the average household dustbin … (analyse), we find that, in terms of weight, 35% of the total … (compose) of paper and cardboard, 22% of kitchen waste, 12% of plastics with glass, dust and ashes each representing a further 10%.

There are in fact only a few items of domestic waste that cannot … (recycle). One common example is disposable nappies which, as their name suggests, … (design) to be thrown away after use. However, a lot of progress could … (make) to reduce the amount of kitchen waste most of which can … (transform) into a useful garden fertiliser. Indeed, if more people chose to do this then the weight of the average dustbin … (reduce) quite significantly.

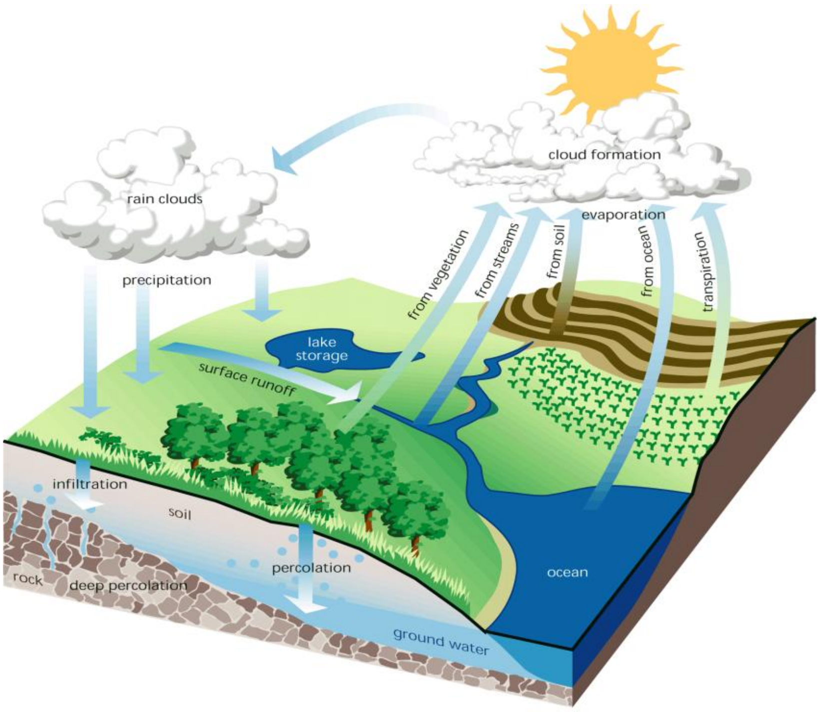
IV. PRE-TEXT DISCUSSION

Do you know that:

1. Geologic work done by running water accounts for most of the erosive features on the earth's surface.
2. Plants, which use soil moisture in their life processes, return water to the atmosphere through the processes of transpiration.

V. READ AND TRANSLATE TEXT 8A

Text 8A
THE HYDROLOGIC CYCLE



The water of the oceans and the air of the atmosphere combine to deliver enormous quantities of moisture to the landmasses in an unceasing system called the hydrologic cycle. The hydrologic cycle could not take place if water could not change from the liquid state to the vapour state and back again to the liquid state (and even, as ice, to the solid state). When the surface of the ocean is in contact with an air mass, evaporation takes place, and water in the vapour state becomes part of the atmosphere. Evaporation rates are higher where temperatures are high, and warm air can contain much more moisture than cold air can, so that air masses in equatorial zones are typically humid, whereas polar air masses are dry. Once the water vapour has entered the air mass and the air continues its movement in the trades, westerlies, or some other pressure system, it may reach a landmass and overspread it. By various processes the moisture in the air now condenses and falls on the land as precipitation. On reaching the land surface, some of this precipitation evaporates back into the air again–from the leaves of vegetation, from the soil, and from the surfaces of lakes and rivers. Part of it seeps into the soil to become ground water, but much of this eventually drains into lakes and streams and even back into the ocean itself. And part of the precipitation becomes runoff, flowing directly into streams that carry it back to the ocean as well. As the water drains back into the ocean it mixes with the passing current, and eventually it may evaporate back into the air again. Then the whole circulation system is renewed.

In this way the hydrologic cycle serves as a giant, worldwide pumping system that brings life-giving water to even the deepest interiors of the continents.

The hydrologic cycle is a global system, and it is difficult to measure its components. When climate scientists began to record precipitation, humidity (moisture in the air), seepage in soils, runoff in streams, evaporation, and other measurable processes in various areas on land and sea, they made an important discovery: some areas have what may be called a water surplus, others have a deficit. This in itself is not surprising – the landscape and vegetation give strong indications of this. But what was surprising was that large areas that would seem to have a surplus actually do not or have it only seasonally. This gave rise to the concept of water balance, the annual (or seasonal) water budget of a locale.

Equatorial zones are best supplied with water and have a favourable water balance. But moving north and south from the equatorial zone into the tropics, we find large areas between 10° and 40° latitude that have a negative balance – and not just desert areas.

VI. COMPREHENSION CHECK

Exercise 1. Answer the following questions:

1. What is the hydrologic cycle?
2. What is the necessary condition for hydrologic cycle to happen?
3. When does evaporation take place?
4. Where are evaporation rates higher?
5. What happens with precipitation when it reaches the land surface?
6. What is the function of hydrologic cycle?
7. What important discovery did climate scientists make?
8. What zones are best supplied with water?

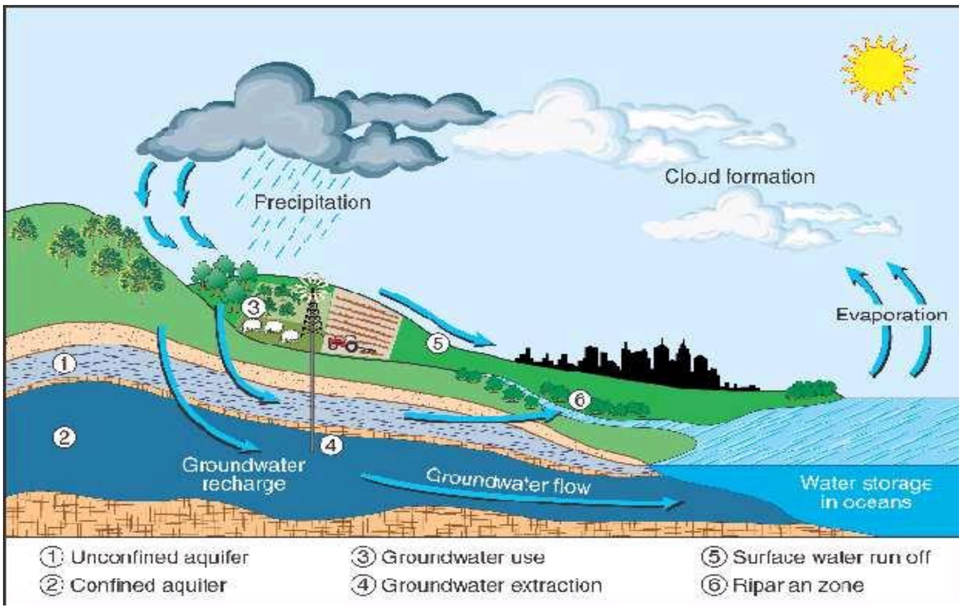
Exercise 2. Put questions to the following statements:
1. The water of the oceans and the air of the atmosphere combine to deliver enormous quantities of moisture to the landmasses.
2. The hydrologic cycle could not take place if water could not change from the liquid state to the vapour state and back again to the liquid state and even to the solid state.
3. Air masses in equatorial zones are typically humid.
4. Equatorial zones are best supplied with water and have a favourable water balance.
5. The hydrologic cycle serves as a giant, worldwide pumping system that brings life-giving water to even the deepest interiors of the continents.

Exercise 3. Find synonyms among the following words:
Keep in mind, collect, remember, to soak, to account for, to get together, man-made, to penetrate, artificial, to explain, via, through.

Exercise 4. Find antonyms among the following words:
Slowly, natural, deep, high, thick, artificial, shallow, low, thin, direct, like, in the present, credible, temporary, internal, indirect, incredible, in the past, constant, unlike, quickly, external.

VII. LOOK THROUGH TEXT 8B AND GET READY TO SPEAK ABOUT AQUIFERS.

Text 8B
GEOLOGIC FORMATIONS AS AQUIFERS



A rock formation or material which will yield significant quantities of water has been defined as *an aquifer*.
Probably 90 per cent of all developed aquifers consist of unconsolidated rocks, chiefly gravel and sand. The sand and gravel beds of these aquifers produce large quantities of water, most of which is replenished by seepage from streams into alluvial fans at mouths of mountain canyons.

Limestones vary widely in density, porosity, and permeability, depending upon degree of consolidation and development of permeable zones after deposition. Those most important aquifers contain sizable proportions of the original rock which have been dissolved and removed. Openings in limestone may range from microscopic original pores to a large solution caverns forming subterranean chan nels sufficiently large to carry the entire flow of a stream. The term *lost river,* has been applied to a stream which disappears completely underground in a limestone terrane. Large springs are frequently found in limestone areas. The solution of calcium carbonate by water causes prevailingly hard ground water to be found in limestone aquifers; also, by dissolving the rock, water tends to increase the pore space and permeability with time. Ultimate development of a limestone terrane forms a karst region, where subterranean drainage through the limestone creates large ground water reservoirs. Although uncommon, *gypsum* is another soluble rock that has been developed to a limited extent as a aquifer.

Volcanic rocks may form permeable aquifers. Basalt flows are very permeable, corresponding to limestones in this regard. Other permeable zones in volcanic rocks include flow breccias, porous zones between lava beds, lava tubes, shrinkage cracks, and joints.

Sandstone and conglomerate are cemented forms of sand and gravel. As such, their porosity and yield have been reduced by the cement. The best sandstone aquifers are those which are only partially cemented, or those which yield water through their joints. Conglomerates have limited distribution and are unimportant as aquifers.

Crystalline and metamorphic rocks are relatively impermeable and are poor aquifers. Where such rocks occur near the surface under fractured and decayed conditions they have been developed with small wells for domestic purposes.

Clay and coarser materials mixed with clay are generally porous, but their pores are so small that they may be regarded as relatively impermeable. Clay soils have provided small domestic water supplies from shallow wells.

Exercise 1. Answer the following questions:

1. What is aquifer? 2. What kinds of aquifers do you know? 3. How do limestones vary? 4. What is found in limestone areas? 5. What rocks are poor aquifers? 6. Are porous rocks good aquifers?

Exercise 2. Give the Ukrainian for*:*

a) aquifer, yield, gravel, seepage, limestone, sand, density, permeability, degree, deposition, to replenish, to cause, to reduce, to contain, to develop, to create
b) rock formation, solution cavern, limestone terrane, shrinkage crack, sandstone aquifer, water supply, calcium carbonate, ground water, reservoir
c) although, in this regard.

Exercise 3*. *Find in the text English equivalents for the following words:

Водоносний горизонт, вапняк, щільність, відкладення, гравій, проникність, просочування, інфільтрація, розчин, тріщина стиснення, карстові порожнечі.

Exercise 4. Speak on your first hydrogeologic practice.

Exercise 5. Translate into English.

ГЕОЛОГІЧНА ДІЯЛЬНІСТЬ ВОДИ, ЩО ТЕЧЕ

Текучі води, що течуть по земній поверхні, живляться з багатьох джерел: атмосферні опади, що не встигли випаруватися та увійти в землю, вода, яка з'являється, коли танугь сніги або лід, джерела, що виходять на денну поверхню підземною циркуляцією, і, нарешті, ґрунтові води – ось усе те, що живить текучі води. Одержуючи живлення на значній площі, води, що течуть, спершу є не що інше, як сила – силенна дрібних струмочків. Поволі з'єднуючись між собою, ці струмочки створюють невеликі струмені або річки, які течуть далі, впадають одна в одну і, нарешті, творять суцільні потоки, або ріки. Головну ріку з усіма річками, що впадають у неї, називають річною системою, а площу, яку ця система обіймає, річним басейном. Тільки в найнижчі частини земної поверхні ріки добігають моря та озер або ж губляться в пухкому ґрунті, приміром, у пісках, що й дало привід поділити ріки на океанічні і континентальні. В такий спосіб із сили поодиноких потоків врешті-решт ріки з'єднуються у велику кількість головних водяних артерій; цими артеріями атмосферні води знову повертають до свого вихідного місця, тобто в океан.

Під час цього руху текуча вода, що є в ріках, захоплює тверді частинки й ними стирає та шліфує твердіші породи, переносить ці частинки на значні відстані й, нарешті, відкладає їх.

TEST 8

Task 1. Choose the correct word to complete the sentences.

1. Industrial mining, physical and chemical pollution….irreversible harm to geological environment and disturbed the dynamics of natural processes.

A) caused C) will cause
B) was caused D) had been caused

2. The criteria of estimation of ecological conditions of Ukraine …through gradation in conventional numbers.

A) define C) will be defined
B) was defined D) have been defined

3. Diamonds ….only in a volcanic rock called Kimberlite.

A) are found C) to be found
B) was found D) have been found

4.Before the eruption of Ratinai the floor of this valley … covered by a white-hot mass of volcanic sand.

A) covered C) had been covered
B) is covering D) will cover

5. All the materials of variable porosity near the upper portion of the earth's crust can ….as a potential storage place for ground water.

A) be considered C) is considered
B) is being considered D) will be considered

Task 2. The passive is often used to describe processes.Complete the passage by changing the verbs in brackets into the passive.

It is hardly a hundred years since the first sounds ….(record) by Thomas Edison onto a wax-covered cylinder. The recording principle has essentially remained the same although it…..(develop) with each leap in technology. Wax cylinders ….(replace) by vinyl records, tape recording, and more recently, CDs.

CDs are the result of a complex process. First of all a glass master copy….(produce) by coating a glass disc with a special sunstance. Tiny indentations ….(cut) into the disc using a gas laser. After that it….(give) a metal coating to form a father disc. From this disc , other father and mother discs….(generate) and used to stamp the CD we buy. Discs….(treat) with metallic coating and lacquer.

Nowadays, CDs….(threaten) by digitally recorded tapes. However, technology is changing so fast that in ten years, time they….(overtake) by something even more advanced.

Task 3. Make these active sentences passive. Begin with the words in italics.

1. They use *special plastic* instead of metal.
2. We have to solve *this problem* first.
3. They have produced *a solar-powered notebook computer*.
4. We can't start *drilling for water* yet.
5. He should patent *his invention* immediately.

Task 4. Choose the correct variant.

1. The famous actress______now for the "HELLO" magazine.

a) is interview c) is being interviewed
b) interview d) was interviewed

2. All tickets______before we got in the theatre.

a) were sold c) are sold
b) have sold d) had been sold

3. Students______next Friday.

a) will be examined c) are examined
b) will examine d) have been examined

4. "A Farewell to Arms"______in 1929.

a) was published c) published
b) were published d) has published

5. The dinner______by five o'clock tomorrow.

a) will be served c) will have been served
b) is served d) will serve

6. He______to tidy the garage.

a) was helped c) are helped
b) were helped d) have helped

7. She______practicing the piano yesterday.

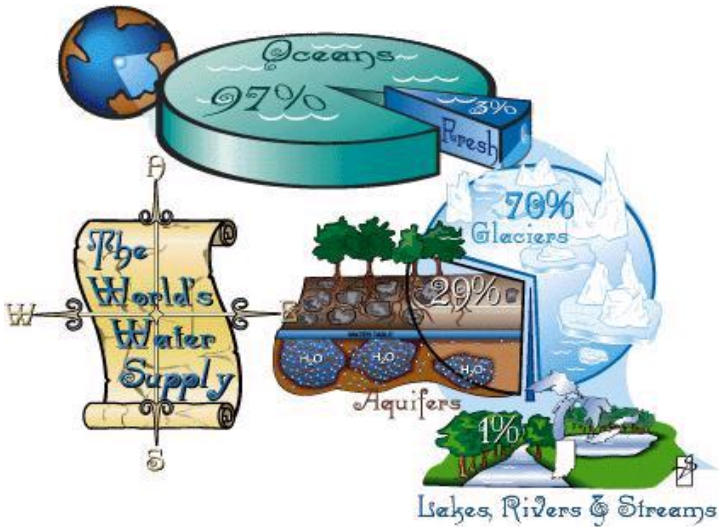
a) is heard c) hear
b) was heard d) hears

8. The jam sandwiches______with white bread.
a) made c) are made
b) makes d) is made
9. Most children______strongly______their parents.
a) are, influencing on c) has, influence with
b) are, influenced by d) have, influenced by
10. All information______to me, before I found her address.
a) had given c) was given
b) had been given d) is given
11. The Loch Ness monster______to exist.
a) is told c) is said
b) tells d) says
12. About 50 people______to the party yesterday.
a) were invited c) was invited
b) invite d) are invited
13. Trained dogs______by the police to find drugs.
a) use c) used
b) are using d) are used
14. Lisa is at the beauty parlor. She is______.
a) having her nails painted
b) had her nails
c) painting her nails
d) painted her nails
15. Mike ______ to clean his room.
a) was make c) was made
b) are made d) is being made
16. Oxford______by Manchester United in the Cup Final yesterday.
a) beaten c) has been beaten
b) was beaten d) was beated
17. Fruit juice______by her over the white table cloth.
a) had spilt c) had been spilt
b) spilled d) has been spilt
18. The book______by the lecturer.
a) was referred c) has referred
b) referred to d) was referred to
19. Mr. Smith______the letter______.
a) make, typed c) has, typed
b) have, typed d) is, typed
20. Such a dress______.
a) can sat down in c) can't sit down in
b) can sit down in d) can't be sat down in
21. Many people______to be homeless after the floods.
a) is reported c) reported
b) are reported d) report

Task 5. Translate into English.

Водопроникністю ґрунтів називають їх здатність пропускати через себе воду під дією сили ваги або градієнтів гідростатичного тиску. Водопроникність залежить від розміру і форми часток ґрунту, від розміру і кількості пор і тріщин у ґрунті, його гранулометричного складу. Кількісно водопроникність визначається величиною коефіцієнта фільтрації, який відображає швидкість фільтрації води при напірному градієнті, що дорівнює одиниці і виражається в м/добу, см/с, м/с. Розуміння суті цього коефіцієнта базується на законі Дарсі, за яким кількість води (Q), що просочується крізь породу за одиницю часу, прямо пропорційна коефіцієнту фільтрації (к), падінню напору (h), площі поперечного перетину породи (F) та обернено пропорційна довжині шляху фільтрації (L).

Unit 9
WORLD'S WATER SUPPLY



Grammar
Infinitive

I. ACTIVE VOCABULARY

assets (n) – майно, актив
cesspool (n) – стічна яма
claims (n) – вимоги
clog (v) – засмічувати
condemn (v) – осуджувати, бракувати, засуджувати
cripple (v) – калічити, нівечити, робити непридатним
dike (n) – дамба, гребля, стічна канава
dike (v) – захищати дамбою, осушувати каналом
disaster (n) – лихо, нещастя
effluent (adj) – той, що витікає, просмоктується
effluent (n) – стік, стічні води, річка, потік
endanger (v) – наражати на небезпеку
enforce (v) – підсилювати, підсилювати
float (v) – плавати, триматися на поверхні води
grassland (n) – пасовище, луки
plow (plough) (v) – орати
pottery (n) – гончарні вироби
precious (adj) – дорогоцінний, коштовний, вишуканий
restrict (v) – обмежувати, ставити межу
revenue (n) – дохід
salvation (n) – спасіння
scarce (adj) – недостатній, бідний
seaweed (n) – морська водорість
sewage (n) – стічні води
shelter (n) – покрівля, притулок
sludge (n) – шлюз, водовід, водосховище, канал

soak (up, in) (v) – всмоктувати(ся), просочувати(ся)
spring (n) – джерело
wash off (v) – змивати(ся)

II. LEXICAL EXERCISES

Exercise 1. Give Ukrainian equivalents for the following:

1. lavish lifestyle
2. sewage dumping
3. sewage sludge
4. sewage pollution
5. brain damage
6. coastal water
7. dumping ground
8. endanger plants
9. extensive plowing
10. civil engineering
11. grazing of cattle
12. magnificent feat

Exercise 2. Give English equivalents for the following:

1. розкішне життя
2. сильна ерозія
3. екстенсивне землеробство
4. тиск (навантаження) осадової породи
5. споживання на душу населення
6. затори зі стічних вод
7. питна вода
8. сприймати як належне

Exercise 3. Match the following words with their explanations and try to give synonyms or antonyms.

1. shortage	a. water plant of very simple structure
2. algae	b. amount of deficiency; condition of not having enough
3. silt	c. waste material and water carried in sewers
4. sediment load	d. material carried along and then left in a place by moving water or ice
5. to irrigate	e. to break up or turn over land with a plough; to force a way or make a track
6. scarce	f. loose land, mud, soil, etc. carried in running water, then dropped
7. plowing	g. to supply water to (dry land) by providing with man-made stream

8. lavish	h. not much or many compared with what is wanted; hard to find, not plentiful
9. sewage	i. very free, generous or wasteful in giving or using

III. GRAMMAR REVIEW

Exercise 1. Put the questions to which the following sentences are the answers.

1. Stress is a force exerted against an object.
2. Tectonic plates move at rates between 1 and 16 centimeters per year.
3. Yes, they do. Earthquakes and explosions produce seismic waves.
4. An earthquake is caused by the abrupt release of slowly accumulated energy in rocks.

Exercise 2. Put the words in the correct order to make sentences. Rewrite them in the correct order.

1. me she to in myself taught believe.
2. dirty they me to their do work paid.
3. we atmosphere still know the don't results effect gases of greenhouse the on.
4. allow smoke don't they you to work at.
5. should be car encouraged makers gas with CO^2 less to produce less with.

Exercise 3. Write the appropriate form of the infinitive.

1. She finished _____________*to have finished*
2. He was driving _______________________
3. It has been taught______________________
4. They had become______________________
5. She tries_____________________________
6. It is brought___________________________
7. They are studying_____________________
8. It will be accepted_____________________

Exercise 4. Fill in the correct form of the infinitive or the –ing form. Mind the tenses.

1. He is not likely………………(return) before five o'clock.
2. They might not …………….(complain) about the meal if the service hadn't been so dreadful.
3. Man is said……………….(invent) the wheel about ten thousand years ago.
4. They hope ………………(make) a lot of money in their new business.
5. She's too tired ……………(concentrate) on her work today.

Exercise 5. Use the elements in brackets to complete the following sentences with the infinitive.

1. I don't want (he/to stay). I want (he/to leave) my house and never (to come back).
2. The answer made (he/to feel) as if he had been slapped in the face.
3. I wonder if anyone saw (you/to come out) of that house. If anyone saw (you /to leave), you'll be in trouble.

4. I'd like (this book/to publish).
5. She watched (they/to disappear) and slowly went back into the house.
6. For a long time I've been watching (he/to take over) all the important jobs in the company.
7. We told jokes and it made (the time/to pass).
8. She liked (everything/to keep) in perfect order.

Exercise 6. Put the verbs in brackets into the correct form of the infinitive or the –ing form.

1. I suggest …………….. (call) the cinema to find out what time the film begins.
2. It's no use……………. (try) to make excuses. She won't believe you.
3. I look forward………………. (see) the artwork in the museum's latest exhibition.
4. She spent a long time……………… (talk) on the telephone so she didn't finish her essay.
5. We were happy………….. (hear) that Mary is coming to visit us.
6. Will you let me……………. (read) you some parts to tell me if you like them?
7. It was so nice of him………………(send) me flowers.
8. It's raining. There's no point in………… (go) out now.
9. Would you be so helpful as…………… (carry) this heavy bag for me?
10. You should…………… (speak) to her when you saw her.

Exercise 7. Fill in the correct form of the infinitive.

1. I've looked everywhere, but the file appears …(misplace).
2. He is not old enough…(allow) to stay out late.
3. I don't think I'll be able to make it tomorrow. I'm supposed …(meet) Jane for lunch.
4. She was only pretending…(read); she was really daydreaming.
5. I need you …(help) me prepare the food for the party.
6. The team is said …(win) the match through sheer luck.
7. The accident is believed…(cause) by reckless driving.
8. The newspaper received many calls from people claiming…(see) UFO.
9. He was the first British writer…(award) the Nobel prize for literature.
10. He is not likely …(return) before five o'clock.

Exercise 8. Translate the following sentences paying attention to the Nominative with the Infinitive construction.

1. These deposits are said to be of magmatic origin.
2. The moon is believed to be composed of materials similar in composition to the earth's mantle.
3. A zone of glassy rock is believed to be just beneath the sima at the upper edge of the mantle.
4. The salt water is believed to be sea water that filled the openings in the rocks when sediments were laid down.
5. Certain valuable lead and zink deposits generally are believed to have been concentrated by ground water and to have no connections with igneous processes.

Exercise 9. Translate into English.
1. Індонезія має плани побудувати першу атомну електростанцію у сейсмічно небезпечній зоні.
2. Сподіваються, що слухи про швидке потепління клімату трохи перебільшені.
3. Неможливо зупинити рух людства до прогресу.
4. Щоб наші діти могли дихати чистим повітрям, необхідно скоротити викиди парникових газів.
5. Для визначення форми і розміру родовища важливо визначити його структуру і ті характерні риси, від яких часто залежить успіх розробки родовища.
6. Геохімічні методи використовуються на різних етапах геологічної розвідки для визначення загальної мінералізації породи.
7. Для закінчення будь-якого екперименту ми повинні написати звіт.
8. Щоби дати відповідь на це питання, ми повинні розглянути властивості і поведінку магми.
9. При нагріванні деякі з цих мінералів розкладаються, а їх атоми перекомбіновуються для створення нових мінералів.
10. Малоймовірно, що цей мінерал цінний.

IV PRE-TEXT DISCUSSION

1. Do you know that:

- The shortage of clean water is dangerous.
- Per capita water consumption differs in the developed and in the developing countries.
- Access to clean drinking water is one of the basic human rights.
- Lake Baikal is one of the largest fresh water lakes in the world.
- Environmental standards in the former Soviet States were much lower than in the West.
- The Mediterranean Sea is responsible for 50 percent of all marine pollution.
- Industrial wastes and sewage dumping are the main sources of water pollution.

2. Make up dialogues of your own, discussing the information given in the part "Do you know that".

Activity 3. Give your opinion on the following

1. The problem of clean water is the most urgent environmental problem of our days.
2. Man and his history is a question of water and little else.
3. Many dams and irrigation schemes have been and are environmental disasters.

V. READ AND TRANSLATE TEXT 9A.

Text 9A
WATER

One of the most urgent environmental problems in the world today is the shortage of clean water. There are large differences in per capita water consumption between different countries. A comfortable lifestyle (with flush toilets, washing machines and public swimming pools) uses a lot of water. A lavish lifestyle (with automatic car-wash machines, Jacuzzis and backyard swimming pools) uses many times more. The average Kenyan uses five liters of water a day, the average American uses 1,000. More and more people in the world are adopting a western lifestyle. So even if population growth stops, the water shortage will get worse.

Access to clean drinking water is a basic human right. But acid rain, industrial pollution and sewage dumping have made many sources of water undrinkable. Lakes, reservoirs and even entire seas have become vast pools of poison. Lake Baikal in Russia is one of the largest lakes in the world. It is also one of the most beautiful. The local people call it the Holy Sea. It contains a rich variety of animals and plants, including 1,300 rare species that do not exist anywhere else in the world. But they are being destroyed by the massive volumes of industrial effluents which pour into the lake every day. Until very recently, environmental standards in the former Soviet states were much lower than in the West. Even where laws existed, the government did not have the power to enforce them. Most industries simply ignored the regulations.

The Mediterranean Sea occupies 1 percent of the world's water surface. But it is the dumping-ground for 50 percent of all marine pollution. Sixteen countries border on the Mediterranean. Almost all of them regularly dump shiploads of industrial waste a few miles offshore. Sewage effluents pour into the sea only meters from popular bathing beaches. In 1975, the United Nations Environment Program brought together these 16 countries and drew up the Mediterranean Action Plan. The countries agreed to stop dumping from ships and to reduce sewage pollution. Few, if any, of them have kept their word. In the 1950s, Japanese factories dumped waste containing mercury into the sea at Minamata Bay. Shellfish became contaminated with this very toxic heavy metal. Over 2,000 people developed brain damage and 40 of them died. These tragic examples should teach us that the ocean is neither a garbage can nor a toilet.

Sewage is a rich source of micronutrients, which are essential for the growth of plants and animals. Sewage sludge, and fertilizers washed off the land, increases the concentration of micronutrients (particularly nitrates) in the sea to dangerous levels. Plankton (tiny plants that float near the surface of the water) becomes so numerous that they cut out the light to deeper parts of the sea. This endangers plants that grow on the sea bed, which need the sun's light for photosynthesis. Seaweed is also very sensitive to changes in the level of micronutrients in coastal waters. One or two species of algae (seaweed) can outgrow all the other species. Overgrowth of algae can cause slimy, smelly, ugly deposits on beaches. Occasionally algae produce poisonous toxins that can kill fish or cause skin rashes in swimmers.

We condemn deliberate pollution of the water supply by industrial waste and sewage dumping. But we are usually impressed by "developments" such as huge dams, dikes and irrigation schemes. These are often magnificent feats of civil engineering. They cost a lot of money and use modem materials and equipment. We often assume that the people who plan and build these systems know what effect they will have on the environment. In fact, many dams and irrigation schemes have been environmental disasters. Three quarters of the world's water is used to irrigate crops, so inefficient or extravagant irrigation schemes can cripple a region's water supply. The Aral Sea in Russia was once the fourth-biggest lake in the world. It is now less than half the size it was in 1965. Badly-planned irrigation schemes have taken water from the rivers that fed the Aral Sea. In addition, overuse of pesticides on the cotton crops nearby has polluted the water with toxic chemicals. Great damage was caused to the Nile Valley by Egypt's Assuan Dam.

In some cases, major water diversion projects began because a new technology became available and governments wanted to demonstrate their new-found power over nature. Dams can also be a direct political tool.

Rivers often flow through one country to get to another, so the first country can potentially control the flow of water into the second. Turkey has recently built several dams across the river Euphrates, and has already used these darns to restrict the water flowing through to Iraq and Syria. It has also signed an agreement to sell water to Israel.

"Development" projects can also make soil erosion worse. Forests and grasslands in a river valley soak up water after heavy rains and slowly release it back into streams and rivers. This prevents the valley from becoming dry and dusty in the months without rain. In addition, vegetation also prevents erosion by holding the particles of soil together. If there is no vegetation, the soil crumbles away and is washed into the rivers as silt. Rivers become clogged with sediment. Lakes change from clear, blue pools into thick, muddy puddles. The destruction of rainforests, and intensive farming practices (such as heavy grazing of cattle and excessive plowing with powerful machines) both increase soil erosion. Because of deforestation and modern farming methods, the sediment load of the Yellow River in China is 1.6 billion metric tons per year, and that of the Ganges is 1.455 billion metric tons. The traditional farming methods used by primitive communities may seem inefficient, but the sediment loss from these methods is tiny.

The best things in life are free. But because water is free, we often take it for granted. A few years ago, people thought that the supply of clean water in the world was limitless. Today, many water supplies have been ruined by pollution and sewage. Others have dried up because we have diverted the water for hydroelectricity or badly-planned irrigation projects. The destruction of forests and grasslands has increased soil erosion. Clean water is now scarce, and we are at last beginning to respect this precious resource. Like other environmental resources, the clean water that remains is the property of our children and grandchildren. For their sake, we must fight to protect what is left of the water supply.

VI. COMPREHENSION CHECK

Exercise 1. Do the false/true activity

1. If the population falls there will be enough water.
2. The use of sewage sludge and fertilizers is bad for plants on the sea bed.
3. It is good that sewage sludge and fertilizers help plankton to grow strong.
4. Polluting water with industrial waste and sewage is worse than the damage caused by poor civil engineering developments.
5. A lot of people are protesting about industrial effluent but very little is being done.
6. Forests and grasslands are necessary to keep valleys supplied with water.
7. The Aral Sea is the fourth biggest lake in the world.
8. People are less likely to condemn poor civil engineering developments than polluting water with industrial waste and sewage.
9. There have been some improvements in treating industrial effluent in Russia.
10. Clean water is now scarce and we are at last beginning to respect this precious resource.

Exercise 2. Look through text 9A carefully. Then complete the following to make suitable sentences according to the meaning of the text.

1. The reasons for the shortage of water _________________________.
2. Factors affecting the demand of water and factors affecting the supply mean that nowadays there is _______________________________.
3. The demand for water has increased because ______________________.
4. There is also less water available in reserves on account of _____________.
5. We condemn pollution of water supply by ________________________.
6. The Mediterranean Sea occupies 7 percent of ________________________.
7. Access to clean drinking water is _________________________________.
8. Lake Baikal contains a rich variety of _________________________.
9. One of two species of algae can outgrow all ______________________.
10. Many dams and irrigation schemes have been _______________________.

Exercise 3. Translate in writing and render.

- Can the sea-water be the cause of health hazards?

- Certainly. Today grave concern is expressed about the pollution of the sea with untreated domestic and industrial sewage. This concern is expressed with justification. Sea is the final cesspool into which most of the discharge of man's polluting activities flows.
- What is the most important aspect of the pollution?
- The sea pollution problem has many aspects but in its essence it is a question of toxicology. The toxic effects of a chemical substance on a specific cellular system of an organism, be it a plant, an animal, or a man are manifold and harmful. Industrial pollution has proved disastrous to the fishery, especially in certain regions.
- What is the present state of affairs with fish safety in general?
- Well, today it is very hard for big and small fish alike to survive in polluted water as they choke with refuse, ashes, chemical salts, tars, phenol and bacteria. In some places a layer of grease has formed on the surface of the water which prevents oxygen from penetrating through it.
- Can the fish from waste water be the direct threat to human health?
- Yes, indeed. It's the matter of great concern. Public Health Service record (official report) has established that human poisoning and illnesses associated with eating contaminated fish and shell-fish multiply.
- What parts of the sea are most susceptible to pollution?
- The continental coastal regions and the insular shallow water areas in tropical seas are. It's just the part of the sea from which the world's marine fishery products are derived.

VII. LOOK THROUGH TEXT 9B AND GET READY TO SPEAK ABOUT WATER CONSUMPTION.

Text 9B
LIQUID ASSETS

There is no life without water. Man can live without clothes, without shelter, and even for some time without food. Without water he soon dies. But not all water helps him to survive: if it is not clean, then also he may die before his time.

Some people say that man and his story is "a question of water and little else." All his food has water, from about 60 to as much as 95 per cent. His body is about 70 per cent water. The surface of the earth is 70 per cent water to an average depth of over 4 kilometers. But often man does not have enough water.

Water played an important part in man’s progress. He needed something to carry and keep water in, and so the idea of 'pottery was born. Ancient civilizations rose on the banks of the Nile, the Tigris, and other rivers. But then the world's population was not so large as it is now. And industry is thirsty, too. We need 3,5 liters of water to produce a kilogram of dry cement, 10 liters to produce one liter of petrol, 100 liters to produce one kilogram of paper, and so on.

The greatest number of townspeople needing new water services live in South-Central and South-East Asia. The needs are greatest in India, Indonesia, the Philippines, Nigeria, Brazil and Pakistan.

Under the tropical sun women have to carry water again, again and again. In the dry parts of Africa, where there is little surface water and no ground water, housewives spend most of their time carrying a few liters of water from springs and rivers which are sometimes as far as 15 kilometers or three good hours' walk away. People there are so short of water that they use it mostly or only for drinking, and very little or nothing is left for hygiene.

The earth has as much water as it ever had: no more, no less. But with every year the population of the world gets larger and larger.

In the climb up the ladder of civilization, first things come first; one of those things is certainly clean, plentiful and convenient water supply in all parts of the world.

For the Middle East, water has always been a politically sensitive issue.

The river Jordan, in the words of the old gospel song, is deep and wide with milk and honey on the other side... hallelujah! But no matter how deep and wide it may have been in biblical times, today the river is not much more than a trickle.

On average, one mi1lion people require a billion cubic meters of water a year, which means that the Middle East can meet only two-thirds of its needs. These alarming figures make the situation look better than it actually is because comparisons with wetter regions ignore moisture – or lack of it – in the soil.

"In the UK they only count the rivers and ground water, which doesn't have to supply the agriculture. About 80%-90% of UK water is in the soil". The Middle East, on the other hand, has little soil water.

Egypt, with a similar population to the UK, has 55 bn cubic meters from the Nile – and that's all. It's all engineered water and it gets counted.

This raises some intriguing questions. If the Middle East has been so massively short of water for years, how has it survived?

Water, for everyone in the Middle East, is a highly sensitive issue – not least because it is so closely related to the food supply. As a result, politics gets in the way of devising economically and environmentally logical policies.

Logically the first priority is to bring the issue into the open and secure supplies of virtual water through international food agreements. The second priority is to manage the demand for water and relocate it to the most profitable uses. The third priority is to use it more efficiently by improving irrigation, reducing waste, and so on. But in terms of political feasibility, these priorities are reversed in the Middle East.

The idea that the region will have to meet its water shortage by importing vast and growing quantities of food –for ever – creates feelings of deep insecurity, linked as it is too many people's livelihoods. In Saudi Arabia, for example, at enormous expense they started to grow wheat and even exported some.

But reallocating water resources can bring huge benefits. As a field of wheat, the land would use 10,000 cubic meters of water per year, generate revenue of $3,000 – $4,000 and provide half a job. As a college, it uses the same amount of water, turns over $50 m a year, provides 1,000 jobs and educates 3,500 students. This helps to explain why many Middle Eastern governments are so enthusiastic about information technology: you can write software in the desert, and it takes less water than growing a row of beans.

Reallocating water to more profitable uses also involves social change as people move to different types of jobs – arousing controversies that the politicians would rather avoid. In Egypt farmers are an important political force. Allocating water efficiently has a high political cost. Peop1e don't want to move water out of agriculture.

Ukraine’s major water resource is the Dnipro, along with the Danube, Dniester, Southern Buh, Tysa, Prut, and other rivers. Experts stress that every year nearly one-third of the Ukrainian population suffers from illnesses caused by industrial waste being discharged in these bodies of water.

The state of our water and the full flow of these major rivers largely depend on the condition of their estuaries – small rivers of which there are some 63,000 in Ukraine. Their role is extremely important; surfice it to say that 90 percent of the populated areas in our country are located precisely in the valleys of small rivers and are using their water. However, the state of these small rivers in Ukraine is alarming. According to Derzhvodhosp statistics, Ukraine lost some 5,000 small bodies of water in the second half of the 20^{th} century; this will inevitably cause our large rivers to degrade.

Exercise 1. Rearrange and write the following sentences in a paragraph that summarizes the text.

1. The greatest number of townspeople needing new water lives in South-Central and South-East Asia.
2. Climbing up the ladder of civilization we understand that clean, plentiful and convenient water is life.
3. Man can live without clothes, without shelter and for some time without food but without water he soon dies.
4. People in dry parts of Africa are so short of water that they use it mostly or only for drinking.
5. In Egypt farmers are an important political force.
6. Water for everyone in the Middle East is a highly sensitive issue.
7. People don’t want to move water out of agriculture.
8. The people of Ukraine are alarmed by the state of their rivers.
9. On the average one million people require a billion cubic meters of water a year.
10. The earth has as much water as it ever had.

Exercise 2. Translate into English using the dictionary.

Гідросфера – це водна сфера нашої планети, сукупність океанів, морів, вод континентів, льодовикових покривів. Наша планета містить близько 16 млрд куб. м води, що становить 0.25 % її маси. Основна частина цієї води (понад 80%) перебуває у глибинних зонах Землі – в її мантії. Підземна частина гідросфери охоплює грунтові, підґрунтові, міжпластові води.

Для величезної кількості живих організмів, особливо на ранніх етапах розвитку біосфери, вода була середовищем зародження та розвитку. Вода у біосфері перебуває у безперервному русі, бере початок у геологічному та біологічному кругообігах речовин. Вона є основою існування життя на Землі. Без води не може існувати людська цивілізація, бо вода використовується людьми не тільки для пиття, а й для забезпечення санітарно-гігієнічних та господарсько-побутових потреб.

Загальний об’єм води на нашій планеті оцінюється вражаючою цифрою – 1385 мільйонів кубічних кілометрів. Якби Земля була правильною сферою, цієї кількості було б достатньо, щоб покрити її на глибину 2650 метрів.

Лише незначна частина цієї води придатна для використання людиною. Абсолютна більшість цієї колосальної маси – це гіркувато-солона морська вода, непридатна для життя та технічного використання.

VIII. PROJECT WORK.

Prepare projects on the following topics.

1. Causes of the world water shortage.
2. The situation with Lake Baikal and the Aral Sea.
3. Irrigation schemes: advantages and disadvantages.

TEST 9

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

mouth	sediment	lake	accumulate	deposits
currents	delta	reason	rivers	to form

Much sediment carried by a stream finally reaches its ….. If the stream flows into a …. or the ocean, the velocity of the current is largely or wholly checked and thus much or all of the …. must be deposited. The destination (ending point) of the most streams is the sea and where tides or shore …. in the sea are relatively weak, the discharged sediments …. mainly at or near the mouths of the streams to form flat, partly submerged fan-shaped …. called delta. If there are strong tides or shore currents in the body of water which the stream enters or if the amount of sediments discharged is relatively small, the sediment has the tendency to be swept so far away from the mouth of the stream that either no ….. will form or only a small or imperfect one will develop. Another …. for absence of deltas from the mouths of many existing ….. (even large ones) is the sinking of the land, causing notable submergence of the mouth of the rivers so recently that there has not been time enough …. delta.

Task 2. Give English or Ukrainian equivalents of the following.

1. Сильна ерозія.
2. Питна вода.
3. Споживання на душу населення.
4. Dumping ground.
5. Brain damage.
6. Громадянське будівництво.
7. Extensive plowing.
8. Вантаж осадової породи.
9. Розкішне життя.
10. Grazing of cattle.
11. Мені треба йти, термінова справа.
12. Жахливий вітер.
13. Чекаю з нетерпінням.
14. Температура вище нуля.
15. Дощ ллє за вікном.
16. Яка сьогодні погода.
17. Йде град.
18. Годинник показує точний час.
19. Ваш годинник відстає на 6 хвилин.
20. Зараз північ.

Task 3. Fill in the gaps using the words:

Direct, direction, directed

1….stress acts most strongly in one…

2. Tectonic processes create three types of ….stress.

3. Compression squeezes rocks together in one …..

4. The possibility of making….observations in workings depends on the mining system to be applied.

5. The term "prospecting" includes the whole range of geological work…..to discovering deposits of valuable minerals.

Deform, deformation, deformed

1. Strain is the ….produced by stress.

2. A rock responds to tectonic stress by elastic …., plastic…. or brittle fracture.

3. An elastically ….rock springs back to its original size and shape when the stress is removed.

4.In some cases a rock will….plastically and then fracture.

5. During plastic …., a rock ….like putty and retains its new shape.

Task 4. Make the following sentences disjunctive questions.

1. The weather is fine.
2. He always forgets his watch at home.
3. There is no life without water.
4. One million people require a billion cubic meters of water a year.
5. Water has always been a political sensitive issue.

Task 5. Translate the following into English.

1. Гідросфера – це водна сфера нашої планети.
2. Наша планета вміщує близько 16 млрд куб. м води.
3. Вода є основою існування життя на Землі.
4. Людська цивілізація не може існувати без води.
5. Якби Земля була правильною сферою, води на нашій планеті було б достатньо.

Task 6. Open the brackets to use the correct verb form.

1. The cause of health hazards (may) (can) (could) be sea water.
2. Water in the Middle East (to be) a highly sensitive issue.
3. Without water a man soon (to die).
4. Our Earth (to have) as much water as it ever (to have).
5. An ancient man (to need) something (to carry) and (to keep) water in

Task 7. Translate in writing without a dictionary.

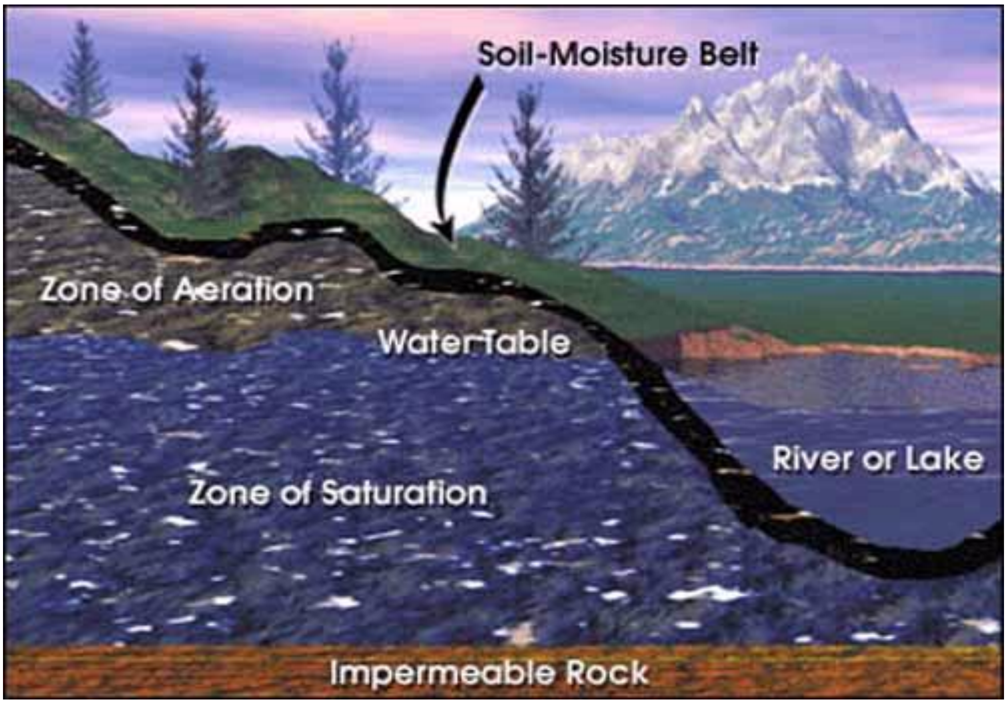
IS IT SAFE TO DRINK THE WATER?

Roughly 1,000 contaminants have been detected in the public water supply in the United States, and virtually every major water source is vulnerable to pollution. About half the U.S. population relies on surface water from rivers, lakes, and reservoirs that may contain industrial wastes and pesticides washed off fields by rain. The other half uses groundwater that may be tainted by chemicals slowly seeping in from toxic-waste dumps. In some areas where groundwater supplies are being gradually depleted, the chemical pollutants are becoming more concentrated.

Most pollutants are probably not concentrated enough to pose significant health hazards; however, there are exceptions. The most widespread danger in water is lead, which can cause high blood pressure and an array of other health problems. Lead is especially hazardous to children, since it impairs the development of brain cells. The U.S. EPA estimates that at least 42 million Americans are exposed to unacceptably high levels of lead, and the U.S. Public Health Service estimates that perhaps 9 million children are at least slightly affected by it.

The contamination comes from old lead poisoning and solder that have been used in plumbing for years. These materials are gradually being replaced in homes and water systems. Individuals may want to have their water tested for lead by an official lab. If the level is too high, they can investigate ways to deal with the problem or switch to bottled water for drinking and cooking. Even then, caution is called for: some bottled waters contain many of the same contaminants that tap water does.

UNIT 10
Ground Water



Grammar
Gerund

I. ACTIVE VOCABULARY

to occur (v) – залягати
saturated zone – зона насичення
cracks (v) – тріщини
unconsolidated material – матеріал, що не затвердів
precipitation (n) – опади
solvent (n) – розчинник
outer (adj) – зовнішній
storage place – місце зберігання
evaporation (n) – випарування
seepage (n) – просочування
homogeneous (adj) – однорідний
damp (adj) – вологий
to encounter (v) – зустрічати(сь)
void (n) – порожнина
phreatic zone – зона породи з порами, які заповнені водою
swamp (n) – болото
discharge (n) – водоскид
drought (n) – посуха
aquifer (n) – водоносний горизон
contaminate (v) – забруднювати

derive (v) – отримувати
fluctuate (v) – коливатися
humidity (n) – вологість
intricate (adj) – складний, ускладнений
percolate (v) – фільтрувати, просочуватися
permeability (n) – проникність, фільтрація
sinkhole (n) – карстова воронка

II. LEXICAL EXERCISES

Exercise 1. Read and translate the following word combinations:

To fill with water, subterranean ground water, to saturate the earth's crust, to dig wells, to pump the water to the surface, to provide drinking water, porosity of rock or soil, permeability, to soak into the ground, to descend into the crust, the zone of saturation, the water table, capillary action, to recharge the ground water, to be poor acquifers, to create landforms, an intracate stalactite, high humidity.

Exercise 2. Give the Ukrainian for:

a) porosity, occurrence, solvent, carrier, shape, discharge, seepage, drought, to saturate, to erode, to supply, to penetrate

b) surface depression, water supply, mineral grain, ground water reservoir, surface water course, drainage cycle, soil moisture, moisture content, water table, spring bottom, rock strata, zone of saturation, zone of aeration

c) as, in order to, only, wherever

Exercise 3. Find in the text English equivalents for:

Пористість, вміст вологи, зона насичення, розчинник, однорідний, піддаватися ерозії, для того щоб, посуха, капілярний пояс, оболонка, дебіт, молекулярне тяжіння, зона аерації, дзеркало грунтових вод, грунтова волога.

Exercise 4. Find antonyms among the following words:

homogeneous, dry, lower, fine-grained, bottom, wet, upper, heterogeneous, course-grained, downward, consolidated, upward, loose, dependent, independent, top

Exercise 5. Word-building:

a) Form nouns from the following words:

to move, to consider, to solve, to seep, homogeneous, to drain, to exist, to occur, porous, to attract, to contain, to fluctuate, to carry, to deposit

b) Form verbs using the suffix -en from the adjectives: flat, broad, black.

Exercise 6. Translate the following word groups and make up sentences with them:

phreatic zone, vadose zone, saturated zone, underground water, total volume, damp soil, intermediate belt, molecular attraction, capillary fringe, swampy condition, wet season, seazonal fluctuation, subdued replica.

III. GRAMMAR REVIEW

Exercise 1. Match the sentence halves.

1. I'm looking forward to	a. signing anything like that
2. I don't remember	b. talking for half an hour
3. He's decided to give up	c. increasing our debt-equity radio
4. Borrowing any more money would involve	d. smoking cigars for health reasons
5. She loves the sound of her voice and carries on	e. seeing you in Milan soon

Exercise 2. Using the word in brackets, complete the second sentence so that it has a similar meaning to the first.

1. Travelling doesn't bother me as long as there are no delays (mind)
I don't mind……………………………………
2. In my job I have to meet many people (involve)
My job________________________________
3. I certainly did not pass on any trade secrets (deny)
I firmly ______________________________
4. There's a danger we will lose business to our competitors. (risk)
We__________________________________
5. He was late so I didn't see him. (miss)
He was late so____________________________

Exercise 3. Read the following sentences, and decide which of the given meanings is the correct one

1. During development, we stopped to think about the difficulties.
a) We stopped thinking about difficulties and we don't think about them now.
b) For a short time, during the development, we did not think about the difficulties.
c) We did think about the difficulties during the development phase.

2. I like to call customers, to check that they are happy a few weeks after buying a machine from us.
a) I think it is a good policy to check that the customer is happy.
b) I really enjoy calling customers to check that they are happy.
c) I would like to call customers, to check that they are happy.

3. I was trying to contact the firm last week.
a) I attempted to call the firm last week.
b) I succeeded in contacting the firm last week.
c) I did not attempt to call the firm last week.

Exercise 4. Put the appropriate word before the ing - form in these sentences.

1. Never turn on the current, …making sure that the fuse is in place.
2. He was taken to hospital…being knocked down.
3. The idea came to me suddenly…lying awake last evening.
4. You should consult his secretary… disturbing him.
5. Think what you want to say…putting pen to paper.
6. You have to get permission… taking the day off.
7. They had a nasty accident … returning home last night.
8. They all went home…hearing his speech.
9. He found his spectacles …looking for something different.
10. He suddenly felt faint …having breakfast and had to leave the table**.**

Exercise 5. Fill in the blanks with Participle I or Participle II of the following verbs: *to disappoint, to excite, to bore, to interest, to confuse, to surprise, to tire, to amuse.*

1. I never found this sort of shows in any way …, so I won't join you.
2. I thought you were not…and for that reason did not offer you a chance.
3. Whenever you feel…you may leave at once.
4. The tour was rather… – we couldn't see most of the places since the weather was pretty awful.
5. She is very…because she is going to New York this afternoon.
6. Are you…or were you expecting this news?
7. I've had a very…day at work today and I want to go to bed.
8. Most people were …that he won the championship.
9. I can't tell you how…I am. Let's better go and have a cup of coffee somewhere.
10. The situation was very….I did not know what to say or what to do.

Exercise 6. Translate into English.

1. Ваша ідея дуже цікава. Розкажіть мені про неї більше.
2. Неможливо, щоб він не знав наслідків Чорнобильської катастрофи.
3. Кажуть, що вирубка лісів призводить до повеней та зсувів грунту.
4. Подорож мене розчарувала. Я не чекав, що там буде настільки нудно.
5. Ви пам'ятаєте, як ви були на Північному Полюсі?
6. Я ніколи не забуду, як купався у тій брудній воді.
7. Я дуже шкодую, що тоді розказав вам усю правду.
8. Постарайтеся зменшити використання пластикових пакетів – сміття стане менше.
9. Спробуйте не забути принести свій конспект на урок.
10. Боюся, ви пошкодуєте, що позичили їм таку велику суму грошей.

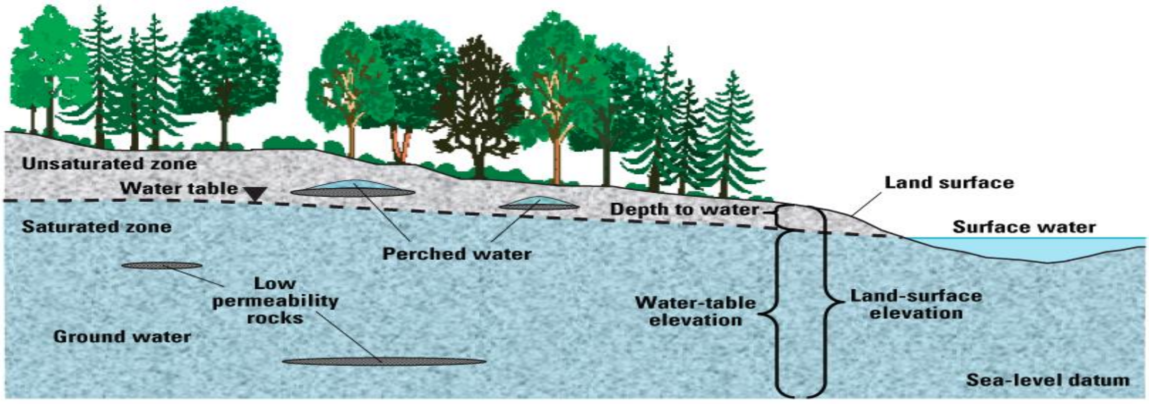
IV PRE-TEXT DISCUSSION

Do you know that:

- The average temperature of the Earth has increased by 0,3-0,6ºC.
- The year of 1995 was the warmest one in the 20^{th} century.
- Man greatly increases the amount of greenhouse gases.

V. READ AND TRANSLATE TEXT 10 A.

TEXT 10 A
OCCURRENCE OF GROUND WATER



Ground water is the water that occurs in a saturated zone of variable thickness and depth below the earth's surface. Cracks and pores in rocks and unconsolidated material make up a large underground reservoir where part of the precipitation is stored. Ground water not only functions as a geologic agent in the role of solvent, carrier, and depositer of minerals, but it also serves as a source of water supply.

The outer portion of the earth's crust is made up of material ranging from dense granite with almost no pores to loose, to unconsolidated gravel with many voids between mineral grains. The volume of the pores in a rock or sediment is expressed as a per cent of the total volume of the material, and is known technically as *porosity*. Porosity depends on the shape and size of the grains plus the degree of sorting.

All the materials of variable porosity near the upper portion of the earth's crust can be considered as a potential storage place for ground water, and hence might be called the ground water reservoir. The total volume of water contained in the ground water reservoir in any localized area is dependent on (1) the porosity of the rock, (2) the rate at which water is added to it by infiltration, and (3) the rate at which water is lost from it by evaporation, transpiration, seepage to surface water courses, and withdrawal by man.

In order to understand the conditions of occurrence of ground water, consider the zones penetrated while drilling a hole through a homogeneous and isotropic

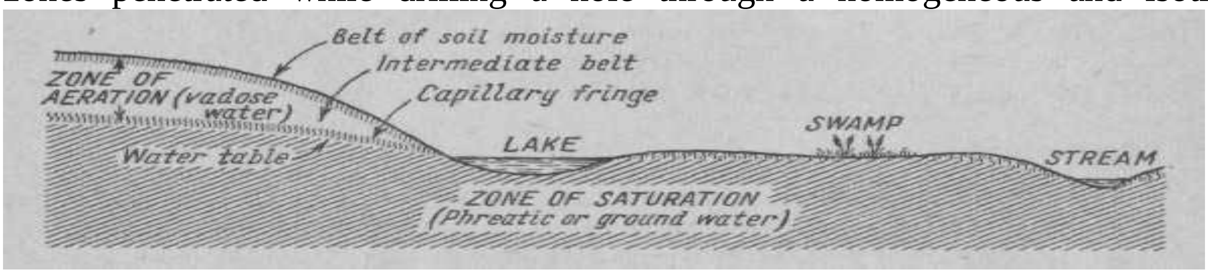


Fig. 1. Cross-sectional diagram showing the zones of subsurface moisture and the relationships of ground water to surface water.

material such as sand. Within a few feet of the surface the soil might be slightly damp, depending upon the recency of the last rainfall. Below this belt of soil moisture a zone of increasing moisture content, the intermediate belt,[2] would be encountered, and still deeper the sand might be very wet where it is held by molecular attraction in the capillary fringe. These three belts comprise what is known as *the zone aeration* or *vadose zone* as shown diagrammatically in Fig. 1.

Eventually, the hole would penetrate to sand in which all the voids were filled or saturated with water. This is *the zone of saturation* or *phreatic zone,* and the plane separating the vadose zone from the phreatic zone is the *water table.* Under normal conditions, the water table is a subdued replica of the land surface. Where the water table lies at or very near the ground surface, swampy conditions exist, and a lake is merely a surface depression that has a bottom below the water table.

Springs are points at which water escapes from the ground water reservoir and becomes incorporated in the surface drainage system. Springs usually occur along valley walls where downward eroding streams have incised the rock strata below the water table, but wherever the water table intersects the ground surface, a spring occurs. Seasonal fluctuations of the water table also affect the discharge from springs to the extent that many of them dry up completely during periods of drought.

The water table fluctuates as the amount of infiltration changes. It is high during the wet seasons and low during periods of drought. If no more moisture were added by infiltration, the water table would eventually flatten out, because the water in the zone of saturation is constantly moving toward lower points on the water table, although such movement may amount to only a small fraction of a foot per day in silts and other fine-grained materials.

VI. COMPREHENSION CHECK

Exercise 1. Answer the following questions:

1. What are the functions of ground water as a geologic agent? 2. What does porosity depend on? 3. What does the total volume of ground water depend on? 4. Name the belts of occurrence of ground water. 5. What do we call the water table?

Exercise 2. ***Put questions to the parts of the sentence in bold type****:*

The **water table** fluctuates as **the amount of infiltration changes.**

Exercise 3. Fill in the gaps with the appropriate words in brackets.

1. …saturates the Earth's crust in a zone between a few meters and a few kilometers below the surface.
2. In the upper layer of the earth, bedrock and soil…small cracks and voids that are filled with air or ground water.
3. …is the ability of rock or soil to transmit water.
4. When rain falls, it usually….into the ground.
5. The water table is the top of the…
6. Topsoil usually contains abundant ….and….which retain moisture.
7. During a wet season, rain….into the ground ….the ground water.
8. Most caverns form at or below…..
9. If the roof of a cavern collapses,….forms on the earth's surface.
10. Caverns and sinkholes are common features of …..

(the water table, to seep, to recharge, ground water, to contain, to soak, zone of saturation, litter, humus, a sinkhole, carst topography, permeability).

VII. LOOK THROUGH TEXT 10 B AND GET READY TO SPEAK ABOUT THE DISTRIBUTION OF GROUND WATER.

Text 10 B
VERTICAL DISTRIBUTION OF GROUND WATER

Water occurring in the zone of saturation is commonly referred to simply as *ground water*. In the zone of aeration suspended, or vadose, water occurs. This *general zone* may be further subdivided into the soil water zone, intermediate zone, and the capillary zone. The extent and water distribution of each zone are described in the following sections.

Soil Water Zone. Water in the soil water zone exists at less than saturation except temporarily when excessive water reaches the ground surfaces from rainfall or irrigation. The zone extends from the ground surface down through the major root zone. Its thickness varies with soil type and vegetation. Because of the agricultural importance of soil water in supplying moisture to roots, agriculturists and soil scientists have studied soil moisture distribution and movement extensively.

Intermediate Zone. The intermediate zone extends from the lower edge of the soil water zone to the upper Umit of the capillary zone. This zone may vary in thickness from zero, when the bounding zones merge with a high water table approaching the ground surface, to several hundred feet under deep water table conditions. The zone serves primarily as a region connecting the zone near the ground surface to that near the water table through which water moving vertically downward must pass. Non-moving, or pellicular, water in the intermediate zone is held in place by hydroscopic and capillary forces, and is equivalent to field capacity in the soil water zone. Excess water is gravitational water, which moves downward under the influence of gravity.

Capillary zone. The capillary zone extends from the water table up to the limit of capillary rise of water. Several investigators have studied the rise and distribution of water in the capillary zone in terms of the properties of porous media. If a pore space could be idealized to represent **a** capillary tube, the capillary rise can be derived from equilibrium between surface tension of water and the weight of water raised.

Saturated Zone. Ground water fills all the interstices in the saturated zone, hence the porosity is a direct measure of the water contained per unit volume. Not all of this water may be removed from the ground by drainage or pumping from a well, however, as molecular and surface tension forces will hold a portion of the water in place. Thus, retained water is the water held in place against gravity. The specific retention of a rock or soil is the ratio expressed as a percentage of the volume of water it will retain after saturation against the force of gravity to its own volume.

Exercise1. Answer the following questions:

1. What is ground water? 2. Where does vadose water occur? 3. How can the general zone be subdivided? 4. What is retained water? 5. What do we call the specific retention of a rock?

Exercise 2. Give the Ukrainian for:

a) extent, rainfall, irrigation, thickness, influence, pumping, to refer, to suspend, to subdivide, to merge, to retain
b) soil, water zone, water distribution, root zone, soil type vegetation, field capacity,

pellicular water, pore space, surface tension, force of gravity, water table condition, vadose water

c) because of, except, hence

***Exercise 3*. *Find in the text English equivalents for*:**
Потужність, грунтова вода, пористий простір, зрошення, підвішувати, поділяти, поверхневий натяг, через, за винятком, плівкова вода, питоме водозатримання, проміжок, верховодка, польова вологоємність.

***Exercise 4. Give antonyms to*:**
deep, upper, downward, direct, common

Exercise 5. Word-building:
Form nouns from the following words:
thick, to retain, to distribute, to exist, to irrigate
Give derivatives to the words: pore, distribution, to vary

Exercise 6. Translate the following words. State the meaning of the prefix 'sub':
subdivide, subsurface, submarine, subterranean, subcapillary

Exercise 7. Make up questions using the following verbs:
to occur, to suspend, to serve, to approach, to subdivide, to extend, to supply, to connect, to merge, to remove.

Exercise 8. Translate into English.

ВОДНІ ВЛАСТИВОСТІ ҐРУНТІВ

Водні властивості ґрунтів визначаються їх фізичними властивостями і вмістом у них води. До основних водних властивостей ґрунтів належать вологість, вологоємність, водовіддача, водопроникність, капілярність.

Природна вологість – це вміст води в породі за природних умов, який виражається відношенням маси води в породі до маси породи після її висушування при температурі 105 – 110^0 С:

$$W = (m_в / m_c)\ 100\ \% = [(m_n - m_c) / m_c]\ 100\ \%,$$

де W – вологість, $m_в$ – маса води в породі, m_c – маса сухої породи, m_n – маса проби породи до висушення.

Вологість породи, яка визначається відношенням маси води в породі, до маси сухої породи, називається ***ваговою вологістю***. Розрізняють ще такі типи вологості:

Об'ємна вологість – це відношення об'єму води, що міститься в породі, до об'єму всієї породи.

Відносна вологість – відношення об'ємної вологості до пористості породи показує ту частину пор, яка зайнята водою. В абсолютно сухій породі відносна вологість дорівнює нулю, а при цілковитому заповненні пор водою – одиниці.

Вологоємність – здатність порід вміщувати й утримувати в собі певну кількість води. Розрізняють породи досить вологоємні (торф, глини, суглинки), слабко вологоємні (крейда, пухкі пісковики), невологоємкі (скельні породи, галечник). Розрізняють вологоємність повну, капілярну, найменшу (або польову) та максимальну молекулярну.

Повна вологоємність – це сумарний вміст у ґрунті води при повному насиченні її пор. Повна вологоємність – це максимально можлива вологість для даного ґрунту.

Капілярна вологоємність – це найбільша кількість води, яка утримується в капілярах породи при повному її насиченні.

Максимальна молекулярна вологоємність – це найбільша кількість гігроскопічної та плівкової води, що утримується лише силами молекулярного притягання часток породи.

Найменша, або польова вологоємність – максимальна кількість води, яка утримується в породі при неповному насиченні незалежно від механізму її утримання.

Exercise 9. Speak on:

a) Soil Water Zone; b) Intermediate Zone; c) Capillary Zone; d) Saturated Zone.

TEST 10

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

shaft	surface	earth	sewage	subsurface	wells
supply	conditions	optimum	hydraulic		

A water well is a hole or …., usually vertical, excavated in the … for bringing ground water to the ….. Occasionally wells serve purposes, such as for…. exploration and observation, artificial recharge, and disposal of … or industrial wastes. Many methods exist for constructing ….; selection of a particular method depends upon the purpose of the water …., the quantity of water required, depth to ground water, geologic …., and economic factors. Shallow wells are dug, bored, driven, or jetted and deep wells are drilled by the cable tool, ….. rotary, or reverse rotary methods. After a deep well is drilled, it should be completed and developed for …. yield and tested before installing a pump. For long life, wells should be sealed against entrance of surface contamination and given periodic maintenance. Wells of horizontal extent, including collector wells and infiltration galleries, are constructed where special water situations exist.

Task 2. Choose the correct form to complete the sentences.

1. The documents …... ….to the Deputy Minister by e-mail half an hour ago:
   a) is sent b) were sent
   c) was sent d) did sent
2. His garage ………. when he bought a car:
   a) was building b) was built
   c) was being built d) were being built
3. She was walking along the road when the car …………. :
   a)was crashing b) crashes
   c) had crashed d) crashed.
4. Did you ……… the Tower when you were in London?
   a) seen b) saw
   c) sees d) see

5.What …… you doing at 8 p.m.?

a)do b) did

c) were d) was

Task 3. Translate the sentences. Differentiate among Participle I and Gerund.

1. Describing and classifying metamorphic rocks geologists can make conclusions about their origin.
2. By studying the light from the stars and the sun astronomers get a good idea of the chemical composition of the Universe.
3. The intense pressure prevents the mantle from melting.
4. To illustrate this, think of a tiny but very steep stream tumbling over boulders.
5. Frictional resistance with the valley walls slows movement along the edges and glacial ice flows plastically allowing the center to move faster than the sides.
6. Stating the distance between stars in miles or kilometers would be analogous to giving the distance from New York to London in milimeters or tenths of an inch.
7. You could identify a sample of halite by measuring its chemical composition and crystal structure using laboratory procedures.
8. The high humidity of the case prevents the water from evaporating rapidly.
9. Because stalagmites are formed by splashing water they tend to be broader than stalactites.
10. The planetesimal then coalesced to form a few large planets, including the Earth.

Task 4. Insert the correct preposition before the gerund where required.

1. "I hated the idea ….. your going," he said simply.
2. She said: "Excuse me …. coming in … knocking."
3. The others insisted….. accompanying them.
4. I am tired ….. being old and wise.
5. We'll look forward ….seeing you.
6. Why were you so anxious to prevent anybody…. leaving the house?
7. I'm afraid I shan't succeed….being as sympathetic as you have the right to expect.
8. I was afraid …..saying the wrong thing.
9. Look here, it may sound funny, but I'm terrifically grateful to you…. saying it.
10. Both windows needed ….cleaning.
11. I've paid very heavily….. being a romantic girl.
12. She could not bear …. lying.
13. I suppose nothing is gained …...delaying.
14. They were in the habit….. coming up to London for the season.
15. We wouldn't mind.... being poor again.
16. I didn't at all like the idea…..going to the station in the luggage cart.
17. He looked at me for a long time….. answering.
18. He felt he was going to be denounced ….daring to suggest such a thing.
19. I thought you had just been blaming me….being neutral.
20. If you won't tell me what's wrong, what's the use …. my being here?

Task 5. Put the verbs in brackets into the –ing form or the infinitive without to.

1. I watched her (get up) and walk slowly out of the room.
2. I heard the phone….(ring) twice and then stop.

3. She stopped to watch the river….(flow) down the mountainside.
4. Listen to the wind….(blow) through the trees.
5. We heard the workmen …..(drill) in the road as we were eating breakfast.

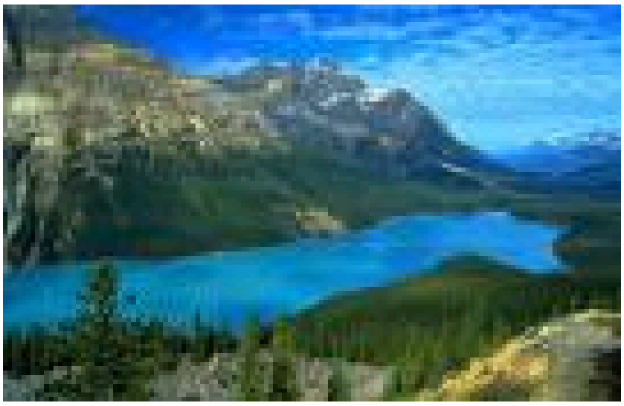
Task 6. Translate into English.

За характером залягання підземні води на Землі можна поділити на дві великі групи: підземні води суші і підземні води під океанами і морями. Останні вивченні недостатньо.

Підземні води суші можна поділити на підземні води зони аерації та зони насичення. Зона аерації охоплює верхні, не насичені водою шари ґрунтів, включаючи грунт від денної поверхні до рівня ґрунтових вод. Через цю зону здійснюється зв'язок підземних вод з атмосферою. Зона насичення характеризується тим, що пори і пустоти в її межах повністю заповнені рідкою водою. Зверху ця зона обмежена зоною аерації або зоною вічномерзлих ґрунтів, знизу – глибиною критичних температур, при яких існування рідкої води неможливе. У зоні насичення на континентах знаходяться підземні води трьох типів – безнапірні ґрунтові, напірні артезіанські та глибинні.

Unit 11

LAKES



Grammar

The Participle

I. ACTIVE VOCABULARY

1.shore (n) – берег озера
recreational environments (n) – оздоровче довкілля
sparkling (adj) – грайливий, блискучий
abundant (adj) – багатий, рясний
scenery (n) – пейзаж
fragile (adj) – тендітний
swamp (n) – болото
to scour (v) – розчищати
debris (n) – обломки
pothole or kettle lake (n) – котловинне озеро
oxbow (n) – старе озеро
indigenous (adj) – корінний
top water (n) – верховодка
bend (n) – вигин
to dump (v) – викидати
steep (adj) – крутий, стрімкий
hollow (adj) – порожній
pebble (n) – галька

II. LEXICAL EXERCISES

Exercise 1. State from what words the following verbs are formed and translate them:

1. crystallize, localize, specialize, characterize, realize, oxidize, stabilize, analyze, generalize, organize.
2. classify, simplify, solidify, stratify, modify, diversify, identify, qualify, purify

Exercise 2. Give Ukrainian equivalents of the following:
to be perfectly level, salty seawater, ice caps, tributaries, flood, current velocity, the gradient of the stream, the shape and the roughness of the channel, steepness of a stream, to increase turbulence and resistance, to scour the stream bed.

Exercise 3. Arrange synonyms in pairs.
1. margin, debris, amount, jump, to fluctuate, frigid, motion, to retreat, to advance.
2. quantity, pile, cold, to recede, edge, fragments, movement, move forward, to vary.

Exercise 4. Give the verbs corresponding to the following nouns and translate them into Ukrainian:
Erosion, abrasion, steepness, corrosion, explosion, resistance, roughness, action, production, appearance, suspension, explanation, elongation, resemblance, development, maintenance, abandonment, recreation, vegetation, movement, accumulation.

III. GRAMMAR REVIEW

Exercise 1. Complete the table with the verbs below. Then complete the sentences with the verbs in brackets in the correct form (-ing or to infinitive).

Avoid enjoy want consider hope plan

Verbs+ing	Verb+to infinitive
Suggest, can't stand, miss, dislike, not mind, recommend	Decide, afford, promise, expect, refuse, need, continue

1. I promised (get)……..home by ten but the bus was late.
2. We only had twenty pounds, so we couldn't afford (go)……anywhere expensive.
3. The tourists expected (leave)……………at three o'clock.
4. I suggest (wait)…………for a bus but they wanted (walk)…………
5. Mr. Johnson enjoyed (learn)…………German at school and continued (study)……..the language when he was older.
6. I hope (do)……..well in the exam, so I suggested (ask)………Karl to help us.
7. Laura dislikes (be)……….. with children, so she doesn't plan (be)…….a primary school teacher.
8. We can't stand (wait)………in queues.

Exercise 2. Rewrite the sentences starting with the words given, and the – ing or to infinitive form of the verb.

1. It was John's idea to go to the cinema.
John suggested going to the cinema.
2. James said that he would take the library books back.
James agreed…………………………………………..
3. We told Martha we'd give her a lift.
We've arranged………………………………………..

4. "I'm giving you a test tomorrow" Mr. Kelly mentioned.
Mr. Kelly mentioned……………………………………
5. If the weather is good, we'll play tennis tomorrow.
We hope…………………………………………………......
6. I'm not doing any more work today.
I've finished…………………………………………......

Exercise 3. Rewrite the sentences using the verbs in the box +-ing or to infinitive.

Refuse, risk, consider, start, decide, continue

1. I said I wouldn't pay Fred again.
I refused <u>to pay</u> Fred again.
2. We did some more work after lunch.
……………………………………………………………………......
3. We climbed down the mountain, although it was dangerous.
………………………………………………………………………
4. I'm on page one of *War and Peace.*
………………………………………………………………………
5. Scotland is one possibility for our holiday this year.
………………………………………………………………………
6. Last year we went to Hungary on holiday.
………………………………………………………………………

Exercise 4. Make up the sentence using the Participle.
Model:
The train goes to Manchester. It leaves from platform 7.
The train leaving from platform 7 goes to Manchester.
1. The goods found general approval. They were exhibited by Great Britain.
2. The plane will take off again at 5 p.m. It lands at 4.30 p.m.
3. The match must be put off. It was planned for tomorrow.
4. The tickets cost 10 dollars each. They were reserved for us.
5. We enjoy listening to the birds. They sing in our garden
6. The value of the stamps amounts to $1,000. They were collected by my friend.
7. The novel was a great success. It was published last year.
8. The meeting has been cancelled. It was announced yesterday.
9. They accepted the change. It was suggested by the secretary.
10. The car broke down again. It was repaired only last week.

Exercise 5. Translate the following sentences into Ukrainian paying attention to the Participles.
1**.** A rock is a substance composed of one or more minerals.
2. Rocks are composed of primary minerals and other minerals derived from them.
3. Dissolved minerals taken from the rocks by running water make the sea salty and make the ocean life possible to exist.
4. The geologic work done by running water accounts for most erosive features on the earth's surface.

5. The instruments used now are capable of measuring extremely small differences in gravitational force.

Exercise 6. Translate into English.

Верховодка – це тимчасове сезонне накопичення підземних вод, які залягають поблизу земної поверхні (у зоні аерації). Основні риси верховодки – невтримність у вертикальному розрізі і по площі, непостійність у часі та незначна потужність обводнених порід. Верховодка накопичується переважно на поверхні глин, суглинків та інших слабопроникних порід і зазнає різного роду змін, спричинених гідрометеорологічними умовами. До верховодки О. М. Овчинніков відносить капілярні води зони аерації, води піщаних масивів і дюн, такирів, бугристих пісків та, із певною умовністю, болотні води.

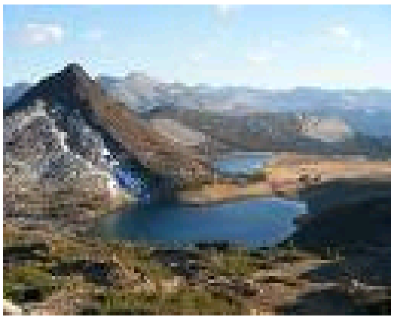
IV. PRE-TEXT DISCUSSION

Do you know that:

1. About 60 times more fresh water is stored as ground water than as surface water.
2. Only about 0,65% of the Earth's water is fresh.
3. Evaporation, transpiration, precipitation and run-off continuously recycle water among land, sea, and atmosphere.

V. READ AND TRANSLATE TEXT 11 A.

Text 11 A
LAKES



Lakes and lake shores are some of the most attractive recreational and living environments on Earth. Clean, sparkling water, abundant wildlife, beautiful scenery, aquatic recreation, and fresh breezes all come to mind when we think of going to the lake. Despite the great value that we place on them, lakes are among the most fragile and ephemeral landforms. Modern, post-ice age humans live in a special time in Earth history when the Earth's surface is dotted with numerous beautiful lakes.

A lake is a large, inland body of standing water that occupies a depression in the land surface. Streams flowing into the lake carry sediment, which fills the depression in a relatively short time, geologically speaking. Soon the lake becomes a swamp, and with time the swamp fills with more sediment and vegetation to become a meadow or forest with a stream flowing through it.

If most lakes fill quickly with sediment, why are they so abundant today? Most lakes exist in places that were covered by glaciers during the latest ice age. About 18,000 years ago, great continental ice sheets extended well south of the Canadian border, and mountain glaciers scoured their alpine valleys as far south as New Mexico and Arizona. Similar ice sheets and alpine glaciers existed in higher latitudes of the Southern Hemisphere. We are just now emerging from that glacial episode.

The glaciers created lakes in several different ways. Flowing ice eroded numerous depressions in the land surface, which then filled with water. The Finger Lake of upper New York State and the Great Lakes are examples of large lakes occupying glacially scoured depressions.

The glaciers also deposited huge amounts of sediment as they melted and retreated. Because mountain glaciers flow down stream valleys, some of these great piles of glacial debris formed dams across the valleys. When the glaciers melted, streams flowed down the valleys but were blocked by the dams. Many modern lakes occupy glacially dammed valleys.

In addition, the melting glaciers left huge blocks of ice buried in the glacial sediment. As the ice blocks melted, they left depressions that filled with water. Many thousands of small lakes and ponds, called kettles or pothole lakes, formed in this way. Kettles are common in the northern United States and the southern Canadian prairie.

Most of these glacial lakes formed within the past 10,000 to 20,000 years, and sediment is rapidly filling them. Many smaller lakes have already become swamps. In the next few hundred to few thousand years, many of the remaining lakes will fill with mud. The largest, such as the Great Lakes, may continue to exist for tens of thousands of years. But the life spans of lakes such as these are limited, and it will take another glacial episode to replace them.

Lakes also form by nonglacial means. A volcanic eruption can create a crater that fills with water to form a lake, such as Crater Lake, Oregon. Other lakes form in abandoned river channels, such as the oxbow lakes on the Mississippi River flood plain, or in flat lands with shallow ground water, such as Lake Okeechobee of the Florida Everglades. These types of lakes, too, fill with sediment and, as a result, have limited lives.

A few lakes, however, form in ways that extend their lives far beyond that of a normal lake. For example, Russia's Lake Baikal is a large, deep lake lying in a depression created by an active fault. Although rivers pour sediment into the lake, movement of the fault repeatedly deepens the basin. As a result, the lake has existed for more than a million years, so long that indigenous species of seals and other animals and fish have evolved in its ecosystem.

Most lakes contain fresh water because the constant flow of streams both into and out of them keeps salt from accumulating. A few lakes are salty; some, such as Utah's Great Salt Lake, are saltier than the oceans. A salty lake forms when streams flow into the lake but no streams flow out. Streams carry salts into the lake, but water leaves the lake only by evaporation and a small amount of seepage into the ground. Evaporation removes pure water, but no salts. Thus, over time the small amounts of dissolved salts carried in by the streams concentrate in the lake water. Salty lakes usually occur in desert and semiarid basins, where dry air and sunshine evaporate water rapidly.

VI. COMPREHENSION CHECK

Exercise 1. Do the false/true activity

1. A lake is a large, inland body of standing water.
2. Most lakes contain fresh water.
3. Most of glacial lakes formed within the past 10,000 to 20,000 years.
4. We are still in that glacial episode.
5. All lakes are salty.
6. A salty lake forms when streams flow into the lake but no streams flow out.
7. Streams carry salts from the lake.
8. Many smaller lakes have already become swamps.
9. Sediment fills the depression in a relatively short time.
10. Salty lakes usually occur in desert and semiarid basins.

Exercise 2. Answer the following questions.

1. Explain the difference between an antecedent and a superposed stream.
2. Why are most lakes short-lived landforms?
3. What geologic conditions create a long-lived lake?
4. Why do salty lakes occur in deserts?
5. How does the water leave the lake?
6. How is water recycled?
7. Why are most lakes fresh water?
8. Can a lake be saltier than the ocean?

Exercise 3. Translate in writing and render.

1. Do you know that only about 0.65 percent of the Earth's water is fresh? The rest is salty seawater and glacial ice. Evaporation, transpiration, precipitation, and runoff continuously recycle water among land, sea, and the atmosphere in the hydrologic cycle.
2. And moreover, about 60 times more fresh water is stored as ground water than as surface water. A stream is any body of water flowing in a channel. A flood occurs when a stream overflows its banks and flows over its flood plain.
3. What about the velocity of a stream?
4. The velocity of a stream is determined by its gradient, discharge, and channel shape and roughness.
5. What does competence and capacity of a stream mean?
6. The ability of a stream to erode and carry sediment depends on its velocity and its discharge. Stream competence is a measure of the largest particle it can carry. Capacity is the total amount of sediment a stream can carry past a point in a given amount of time. Most erosion and sediment transport occur when a stream is flooding.
7. What happens then?
8. A stream weathers and erodes its channel and flood plain by hydraulic action, abrasion, solution. A stream transports sediment as dissolved load, suspended load, and bed load. Most sediment is carried as suspended load. Streams deposit sediment in channel deposits, alluvial fans, deltas, flood plain deposits. A braided stream flows in many shallow, interconnecting channels.

9. What can you say about a base level?
10. Ultimate base level is the lowest elevation to which a stream can erode its bed. It is usually sea level. A lake or resistant rock can form a local or temporary base level. A graded stream has a smooth, concave profile. Steep mountain streams form straight channels and V-shaped valleys, whereas lower-gradient streams form meanders and wide valleys. Tectonic uplift, increased rainfall, and lowering of base level all can rejuvenate a stream, causing it to cut down into its bed to form incised meanders and abandon an old flood plain to form a stream terrace. Headward erosion can cause stream piracy.

VII. LOOK THROUGH TEXT 11B AND GET READY TO SPEAK ABOUT LAKES, OCEANS AND SEAS.

Text 11B
LAKES, OCEANS AND SEAS

Lakes are areas of water surrounded by land. They occur where water collects in hollows in the Earth' surface, or behind natural or man-made barriers.

Lakes don't last forever. The water may cut through the barrier, so the lake drains away. Sooner or later most lakes fill up with sand and mud. As a river enters a lake, the water flows slower and drops its load of sediment. Plants grow in the sediment, trapping more sand and mud.

Lakes also disappear if more water flows out of them or evaporates than the rivers bring in. When a desert lake evaporates, the dissolved salts and sediments are left behind and gradually fill up the lake, which becomes very salty. The Caspian Sea is like this. It has shrunk drastically as more and more irrigation water has been taken from the Volga and Ural rivers which feed it.

A crater lake is one which lies in the natural hollow of an old volcano. The Eifel district of north-west Germany has hundreds of lakes lying in extinct craters. One of the rarest crater lakes is Lake Bosumtwi in the Ashanti Crater in Ghana. The crater was probably made by a meteorite.

Glacial lakes form where ice-sheets and glaciers have left the ground very uneven. They scraped and hollowed out hard rock or dumped sand, gravel and clay in uneven layers. Finland is a country of such lakes. Northern Canada and north-west England have similar lake districts.

Rift valley lakes are long thin lakes such as Lake Malawi, Lake Turkana and Lake Tanganyika in East Africa, the Sea of Galilee in Israel and the Dead Sea between Israel and Jordan. When the Earth's crust slipped down between long lines of faults, the water filled part of the valley floor.

Artificial dams have created lakes. People have built earth, stone and huge concrete dams to hold back rivers for water supply, irrigation or hydroelectric power. Lakes may form in disused gravel pits and mines. Often they are used for leisure and water sports, or to attract wild birds.

Probably the most famous of all lakes in volcanoes is the Crater Lake in Oregon, USA, which is 9 km across.

The largest lake.

Caspian Sea, 371,000 sq km

The largest freshwater lake.

Lake Superior, 83, 270 sq km (border of Canada and USA)

The deepest lake.

Lake Baikal, 1,741 m deep

The highest navigable lake.

Lake Titicaca, 3,811 m above sea-level (in the Andes of Peru and Bolivia)

The largest temporary lake.

Australia's Lake Eyre, a desert lake 9,300 sq km in area. It disappears completely after a few dry years.

Oceans and seas. The five major oceans are the Arctic, Atlantic, Pacific, Indian and Southern Oceans. They are connected to each other by open water. Water slowly circulates between them in currents at the surface and deeper down. The oceans contain about 1,370 million cubic km of water altogether. The average depth of this water is 4,000 m, but in some ocean trenches it may be 11,000 m deep.

The ocean floor has a landscape of its own. Much of the deep sea-bed is a flat plain. But in places, mountains rise thousands of metres from the sea-bed, sometimes pushing through the sea's surface as islands. Many of these are active or extinct volcanoes. Running down the centre of the ocean floor in several of the oceans is a ridge of mountains which is continually being built up by outpourings of lava. As the rock is forced outwards from the ridge by the new lava, the ocean floor spreads until it reaches the boundaries of the continents. At the edge of each continent is a shallow shelf which slopes gently down to about 200m, then dips steeply down, in some cases to a deep trench which marks the point where the ocean floor is being forced under the continent.

Much of the ocean floor is covered in sand or mud brought in by rivers. In places, hot springs bubble up, depositing sulphur and other minerals. Millions of microscopic plants and animals live in the surface waters. When they die, their glassy or chalky shells sink down to the bottom to form a sediment.Here, the pressure of other sediment layers slowly turns the sediments into rocks. Future upheavals of the Earth's crust may one day fold these rocks into new mountain ranges and new land.

The water in the oceans is constantly moving, driven by winds, waves, tides and currents. It may be moving in different directions and at different speeds at different depths. Where the wind blows from the same direction for most of the year, it is able to move large volumes of water, forming surface currents. But the spinning of the earth on its axis makes these currents turn to the right in the northern hemisphere, and to the left in the southern hemisphere. So, the surface currents move in giant circles called gyres.

If you mix oil and water, the oil floats on the top because it is less dense than the water. Warm water is less dense than cold water, and salty water is denser than fresh water. In the oceans, cold or salty water sinks, and this sets up deep currents.

In the tropics, the warm surface waters are pushed into two great west-flowing currents by the north-east and south-east trade winds. Between them, the equatorial counter current flows in the opposite direction to compensate. Where these currents reach the continents, the rotation of the earth forces them into clockwise circles in the northern hemisphere, and anticlockwise circles in the southern hemisphere.

Nearer the poles, these circular currents meet cold water flowing from the melting ice, and return to the equator as cold currents. Where cold water wells up from the deep ocean, it brings nutrients which support large stocks of fish. Warm and cold currents also affect the climate of coastal countries.

Waves are caused by wind blowing over the surface of the water, pushing against ripples and making them bigger. The water in a wave does not move from place to place. Each water particle moves in a circle, up and forward on the wave crest, then down and back as the wave passes. The longer and stronger the wind blows, and the greater the distance over which it blows, the higher will be the waves. Big waves are further apart than small waves and move faster.

Exercise 1. Answer the following questions:

1. What is a lake?
2. Do lakes last forever?
3. What happens when a desert lake evaporates?
4. Which country has most glacial lakes?
5. What are the largest lakes?
6. Name the major oceans.
7. What is the average depth of the oceans?
8. What is the ocean floor covered in?
9. Is the water in the oceans moving?
10. What are waves caused by?

Exercise 2. Are the following statements true or false?

1. Lakes are areas of water surrounded by land.
2. Lakes last forever.
3. Lakes disappear if more water flows out of them than the rivers bring in.
4. The Caspian Sea has not changed.
5. Artificial dams have created lakes.

Exercise 3. Translate into English.

Треба мати на увазі, що в льодовикову епоху ріки, які виникали на краях льодовика, повинні були текти до моря цілковито в іншому напрямку, ніж у наші часи; це стосується в першу чергу рік, що течуть на північ, тобто тих, чий напрямок ішов уздовж льодовикового пасма, яке загороджувало їм дорогу на північ.

Щодо рік, які текли на південь, то, очевидно, вони були значно багатші водою, ніж сучасні.

Якщо льодовики закривали «тальвеґи», які при відступанні льоду знову відкривалися, то ріки могли направляти свої води новими шляхами.

За таких яскравих змін кори могли створюватися річні долини значної ширини так само, як і озера, судячи з того, що утворені в них піскові поклади лежать цілковито горизонтально.

Береги рік, що існували за льодовикової епохи, утворюють іноді так звані долинові тераси, походження яких можна пояснити раптовим зниженням рівня рік, що пливли цими долинами за льодовикової епохи; причина такого зниження — це зміна напрямку ріки.

Однак, не всі піскові осади, що нібито заповнюють долини рік льодовикової доби, вододайні, і ось чому.

Ширина таких давніх долин пояснюється тим, що талі води, які текли не по вузьких долинах, а по широкому рівному місці, мають властивість дуже часто змінювати своє річище, ділячись на відноги, що розходяться й знову сходяться. Внаслідок цієї обставини одна ріка, не дуже багата на воду, може своїми відкладаннями покрити обширні простори. Це явище може виникнути у звязку з тим, що льодовикові ріки при значній бистрині течії, переносячи та відкладаючи величезні маси піску, самі загороджують собі дорогу, спиняються на нанесених пасмах, наростають та проривають собі дорогу в нижчі місця.

TEST 11

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

soaks bedrock overlying channels unsaturated aeration gravity capillary topsoil saturation

When rain falls, it usually …. into the ground. Water does not descend into the crust indefinitely, however. Below a depth of a few kilometers, the pressure from …. rock closes the pores, making …. both nonporous and impermeable. Water accumulates on this impermeable barrier, filling pores in the rock and soil above it. This completely wet layer of soil and bedrock above the barrier is called the zone of….. The water table is the top of zone of saturation. Above the water table lies the…. zone, or zone of…... In this layer, the rock or soil may be moist but not saturated. ….pulls ground water downward. However, electrical forces can pull water upward through small …., just as water rises in a paper towel dipped in water. This upward movement of water is called … action. Thus, a capillary fringe 30 to 60 centimeters thick rises from the water table. ….usually contains abundant litter and humus, which retain moisture. Thus, in most humid environments, topsoil is wetter than the unsaturated zone beneath it. This moist surface layer is called the soil moisture belt, and it supplies much of the water needed by plants

Task 2. Translate into Ukrainian paying attention to the –ing forms.

1.The country rocks are amphibolite schists, a fine-grained greenish type being predominant.

2.The ground mass is microgranular, there being a marked contrast in size between the albite of the phenocrysts and that of the ground mass.

3. Mechanical weathering is not finished before chemical weathering begins, the two processes usually going on simultaneously.

4. In speaking of rocks, geologists use the word “solid” in its technical sense.

5. On cooling or through reactions with the wall rocks the metals are deposited.

Task 3. Put the correct form of the verb “clean” in each gap.

1. I enjoy ….the house every Monday morning.
2. It’s Monday lunchtime and I ….the house already.
3. I think most of the houses in my street….at least once a week.
4. In the future, houses ….by robots.
5. My friends arrived while I ….my room.

Task 4. Read the text about the Irish National Holiday. Fill in the gaps with a suitable word. Use only one word in each gap.

Some say that if you would like to buy a passport on the black market, an Irish……..would be the most expensive.……..Irish are warm-hearted, open and friendly people and are welcome everywhere. No surprise, then, that St. Patrick‘s Day is …… on 17 March every year in …. countries around the world than …..other National Holiday. On this day…..wants to be Irish. The first St.Patrick’s Day Parade was organized in Boston in 1737. Nowadays, parades…….held in most places where the Irish have been forced, or have chosen, to emigrate. Whether ….is Dublin, London, New York….Sydney, people flock to participate and to watch. ….it is a commemoration of a Christian saint, it is a day of celebration for all Irish people of all religions and creeds.

Task 5. Choose the correct variant.

1. He seemed ….all about his health and said….was nothing ….about.

a) to know, it, to worry
b) to be knowing, there, worrying
c) to know, there, to worry
d) to have known, it, to have been worried

2.I don’t object…..there, but I don’t want…..alone.

a) to your living, you living
b) you to live, your living
c) your living, you to live
d) to your living, you to live

3. He stood invisible at the top of the stairs…..her….the letters….by the ….post.
a) to watch, to sort, bringing, latest
b) watching, sorting, brought, last
c) having watched, sorting, having brought, latest
d) being watched, having sorted,to have been brought, last
4.I wouldn't like….because I'm afraid….
a) drive fast, crashing
b) to drive fast, of crashing
c) driving fastly, to crash
d) to be driven faster, to be crashed
5.You….your children….their own way in the end.
a) are to let, to go
b) have letting, going
c) have to let, go
d) are to let, gone.

Task 6. Make questions to which these sentences are answers.

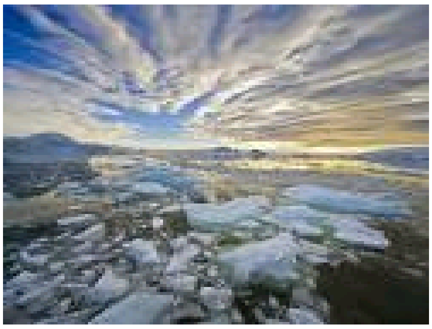
1.He was working in this company when the war started.
2. I was cooking supper when I heard this news.
3. They wished to stay because they liked the place.
4. He invited me to the party yesterday.
5. I have passed my exam in history today.

Task 7. Translate into English.

Джерелом називають більший або менший потік підземної води, що виходить на поверхню землі в природних умовах, тобто без участі людини, щоб відрізнити від штучно влаштованого витоку, який називаємо колодязем, криницею.

Джерела з давніх-давен цікавили людину через їхнє велике значення для її життя. Одні з них придатні для пиття, другі — для роботи, треті — для лікування хвороб і т. д. Тому питання про їхнє походження виникло ще в давнині, а знайшло своє розв'язання тільки два століття тому. Розв'язання цього питання полягає в тому, що основою живлення джерел є атмосферні опади. На підставі сказаного вище треба припустити, що в кожній даній місцевості джерела будуть тим багатші, чим більше випаде там атмосферної вологи й чим кращі умови її поглинання грунтом. Досвід цілком пітверджує це положення, бо в пустелях джерела з'являються тільки винятково, в країнах із періодичними дощами джерела підлягають значним коливанням і, нарешті, багаті на дощі країни визначаються багатством постійних та багатоводних джерел. На земну поверхню джерела виходять на різній висоті на узбіччях гір та ярів, але інколи вони виливаються в рівнинах, озерах та болотах.

Unit 12
GLACIERS



Grammar
Past Perfect
Past Perfect Continuous

I. ACTIVE VOCABULARY

epoch (n) – епоха
topography (n) – топографія
to accumulate(v) – накопичуватися
transformation (n) – перетворення
granular (adj) – гранульований
substance (n) – речовина
planetesimal (adj) – планетарний
blanket (n) – покрив
to elapse (v) – проходити (про час)
remnants (v) – залишки
tabular (adj) – табулярний, пластинчатий
hexagonal (adj) – шестигранний
to alter (v) – змінювати
brittle (adj) – крихкий

II. LEXICAL EXERCISES

Exercise 1.Give Ukrainian equivalents for the following:
At the same time, late in the Pleistocene Epoch, in a large measure, to be responsible for, in common, under favourable conditions, to be capable of, under delicately balanced conditions, formation of glaciers; rounded ice grains; closely packed ice crystals; long lasted moving mass of snow and ice; under their own weight; alpine glaciers; temperate regions; annual temperature; entire mountain ranges; equal amount of ice; viscous fluid; plastic flow; to deform in a plastic manner; huge plastic masses; uneven bedrock; higher elevation part of the glacier; throughout the year; permanent and seasonal snow; tidewater glaciers; continental glacier.

Exercise 2. Give English equivalents for the following:
Висота, з року в рік, у великій мірі, щодо цього, стиснене повітря, одночасно, обрис землі, круглі зерна льоду, на протязі року, величезні пластичні маси, помірні зони, альпійські льодовики.

Exercise 3.Write out the equivalents in pairs.

To waste away, present, to take place, blanket, finally, to resume, to cause, margin, mainly, fast, to help, little by little, because of, to resemble, to change, to calculate, to continue, to recede, recent, to occur, sheet, eventually, to begin again, to bring about, edge, chiefly, rapid, to aid, due to, gradually, to alter, to look like, to go on, to estimate.

Exercise 4. Give antonyms for:

To advance, top, thick, melting, fast, like, to appear, long, gentle, possible, to decrease, underlying, reliable, early.

III. GRAMMAR REVIEW

Exercise 1. Put the verbs in the Past Perfect or Past Perfect Continuous tense:

1. Mary was late for work. Her boss was very surprised. She never …… (be/late) before.
2. He was cold. He ……… (swim) in the lake.
3. He couldn’t pay the bill. He ……… (lose) his wallet.
4. He bought a car after he ……… (save) enough money.
5. She signed the letter after she ……… (write) it.

Exercise 2. Complete these sentences using the verbs in brackets in the Past Perfect tense:

1. My best friend, Kevin, was no longer there. He ……… (go) away.
2. The local cinema was no longer open. It ……… (close) down.
3. I didn’t recognise Mrs. Johnson. She ……… (change) a lot.
4. Mr. and Mrs. Davis were in an aeroplane. They were very nervous as the plane took off because they never ……… (fly) before.
5. Jane played tennis yesterday – at least she tried to play tennis. She wasn’t very good at it because she never ……… (play) before.

Exercise 3. Join the sentences using the words in brackets:

1. She cleaned the house. Then she watched TV. (after)
2. I found a solution to my problem. Then I felt happier. (when)
3. The boys finished their homework. Then they went out to play. (before)
4. He locked the door. Then the phone rang. (after)
5. She washed the dishes. Then her husband arrived. (by the time)

Exercise 4. Put the verbs in brackets in thePast Perfect Continuous:

1. Sophie ……… (paint) the walls all day before she finished them.
2. Tom ……… (look) for a job for six months when he found one.
3. Stan ……… (work) as a postman for forty years when he retired.
4. Tom was watching television. He was feeling very tired. He …….. (study) hard all day.
5. When I arrived, Ann was waiting for me. She was rather annoyed with me because I was late and she ……… (wait) for a very long time.

Exercise 5. Put the verbs in brackets into the Past Perfect or the Past Perfect Continuous:

Yesterday was a bad day for Andrew. He 1) ……… (not/sleep) well because there was a terrible storm at night. After he 2)……… (have) a shower, he made breakfast. After he 3)……… (eat), he got into his car and drove to work. He only 4)…….. (drive) for five minutes when he remembered that he 5)……… (leave) his briefcase at home. He turned the car around and went home again. Then he realised that he 6) ……… (lock) himself out. The keys were still inside the house! Andrew was already late for work, so he decided to leave the briefcase and go to work. When he arrived, his secretary told him that his boss 7) ……… (try) to call him at home.

Exercise 6. Translate the sentences paying attention to Participle I and Absolute Participle Construction

1. Glaciers also cause mud abrasion as they drag particles ranging in size from clay to boulders across bedrock.
2. Discharge is the amount of water flowing down a stream.
3. A swiftly flowing stream can carry cobbles, boulders and ever automobiles during a big flood.
4. When ice melts, silt is deposited in a relatively thin layer over a broad area forming a ground moraine.
5. As the ice rides over the bedrock, it plucks rocks from the downstream side producing a steep jagged face.
6. Land plants grow on the Earth's surface, with roots penetrating at most a few meters into soil.
7. Some minerals such as mica and graphite have one set of parallel cleavage planes, others having two, three, or even four different sets.
8. Crystal growth being obstructed by other crystals, a mineral cannot develop its characteristic habit.
9. The moon having no atmosphere, its surface experiences great extremes of temperatures.
10. All other conditions being equal, the velocity depends on temperature.

Exercise 7. Translate into English

1. Коли ми прийшли додому, пішов сильний дощ.
2. Цей міст був уже збудований, коли почали будувати метро?
3. Багато видів рослин і тварин було знищено перед тим, як люди почали замислюватись над майбутнім планети.
4. Поки ми стояли пів години у заторі на дорозі, ми спізнилися на спектакль.
5. До кінця другого дня у таборі він вже познайомився з багатьма дітьми.
6. Кімната була порожня – всі кудись пішли.
7. Вона економила гроші цілий рік, перш ніж змогла купити квиток до Австралії.
8. Експедиція була дуже вдалою, бо вони готувались до неї майже цілий рік.
9. Після того, як люди вирубали ліс у Картапах, почалися повені та зсуви ґрунту.
10. Після того, як закінчили досліди, вони змогли відпочити.

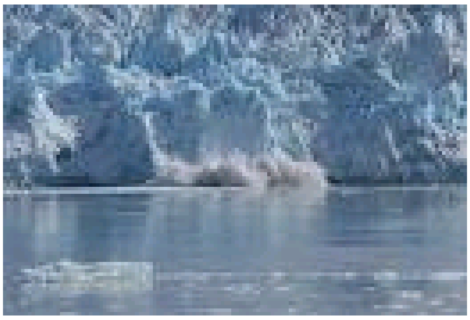
IV. PRE-TEXT DISCUSSION

Do you know that:

1. There are several types of glaciers.
2. There were many piedmont glaciers during the Pleistocen Epoch on the plains which border the Northern Rocky Mountains

V. READ AND TRANSLATE TEXT 12 A

Text 12 A
GLACIERS



Late in the Pleistocene Epoch, some 30,000 or 40,000 years ago, nearly half of North America, all of northern Europe, Greenland and Antarctica and much of northern Asia were covered by great blankets of snow and ice called continental glaciers. At the same time, valley glaciers in all the high mountain regions of the earth were much larger than the present ones, and thousands were in existence where none are now. It is estimated that more than one-fifth of the whole land surface, about 12,000,000 square miles, was covered with ice during this time.

Much has been written on the length of time represented by the Pleistocene Epoch but since many of the factors are indeterminate, no accurate statement can be made. Estimating the time that has elapsed since the continental glaciers entirely disappeared from Europe and North America is also impossible. Several methods have been used for determining the length of the postglacial time both in Europe and North America but most of them are unreliable.

Glaciers may be divided into four principal types: continental glaciers, ice caps, valley glaciers and piedmont glaciers. All have certain characteristics in common, but they differ in size, position and in their origin.

Three conditions are necessary for the formation of a glacier: first, abundant snowfall; second, cool or cold temperatures; and third, a sufficiently low rate of summer melting and evaporation, so that snow fields endure and increase in size through a long period of years. Snow field may accumulate on plains, plateaus or mountains. Wherever the conditions are favourable, the snow field grows in depth and in surface area from year to year. The transformation of snow to glacial ice occurs chiefly in the snow fields. As it falls through the air, snow consists of delicate, thin, tabular, hexagonal crystals. After having lain on the ground for some time and having been covered by later falls, the snow gradually changes to granular ice which is called něvě. This change is brought about by the partial melting of the snow crystals due to the weight of the overlying load. The water from the melting snow trickles down and almost immediately freezes, thus making grains of ice. A thick snow blank formed by the successive snowfalls of only one winter will have ice at the bottom, thoroughly granular snow in the center and slightly altered snow at the top. After many years of accumulation the ice at the bottom of the snow field becomes very thick and, at last, is ready to move.

The repeated process of melting and freezing both in the snow field and the glacial ice, aided by gravity cause the movement of glaciers and in the same glacier during different seasons. All glaciers move faster in the summer than in the winter. Long glaciers move more rapidly than short ones. The center and top of a glacier, where friction is less, move more rapidly than do the bottom and sides. Glaciers are capable of carrying great loads of rock debris. Bolders as large as a small house may be carried long distances.

The ice itself is a brittle solid, as is shown by faults, folds and shear zones and by crevasses which remain open long after having been formed. Yet a glacier which is highly fractured, due to the movement over steep slopes soon becomes welded together at the bottom, like a plastic substance after it resumes its normal course. Unlike streams which move around obstacles, glaciers tend to overwhelm them or erode them away.

All glaciers waste away at their lower ends and at their margins. This is accomplished through melting and evaporation, which are greater near the lower end, but which go on to some extent the whole length of the glacier. Also glaciers which move from the land out into the ocean finally break to pieces and float away as icebergs. Many icebergs form from the ice sheets of Alaska, Greenland and Antarctica. They are gradually carried away from their sources by winds and currents, and finally melt in the ocean water. The glacial cycle is something like the river cycle in this respect. Precipitation feeds both glaciers and rivers, and the moisture which falls as rain or snow eventually is returned to the atmosphere through evaporation. These processes of melting and evaporation terminate all glaciers that do not reach the ocean. If, due to climatic conditions, melting and evaporation are rapid, the end of the glacier recedes; if these processes are reduced during a period of years, the glacier advances. Under delicately balanced conditions, where the rate of movement exactly equals the melting and evaporation, the end of the glacier may remain in the same position for many years. As a rule, however, glaciers periodically advance and retreat.

VI. COMPREHENSION CHECK

Exercise 1. Answer the following questions:

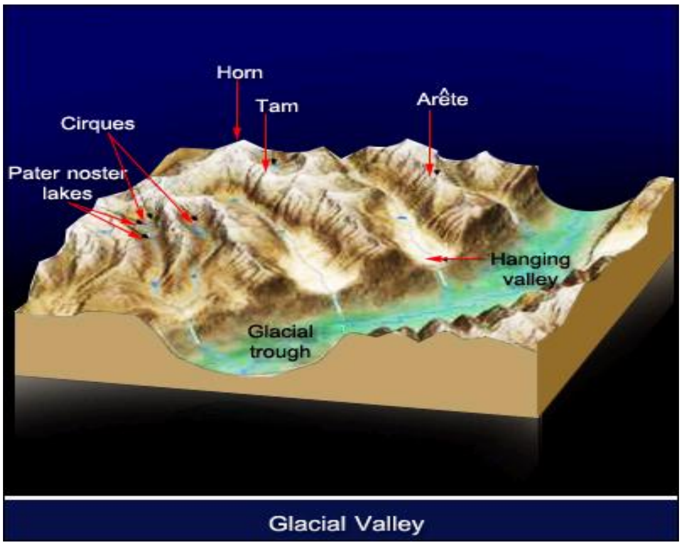
1. What did the continents look like in the Pleistocene Epoch?
2. Where are the remnants of ancient glaciers found now?
3. What types of glaciers do you know?
4. What conditions are necessary for the formation of a glacier?
5. How is snow transformed to glacial ice?
6. What causes the movement of glaciers?
7. What is the rate of glacier movement?

8. What is the difference between the movement of a glacier and a stream?
9. How are icebergs formed?
10. What is a glacial cycle?
11. What conditions are necessary for the glacier to remain in the same position?

Exercise 2. Translate into Ukrainian paying attention to the words in bold type:
Origin – Clouds are not classified according to **origin** but on the basis of height, general appearance, etc. The Gulf Stream **originates** in the Gulf of Mexico. As a result of heat, pressure and movement, igneous rocks change their **original** qualities. According to the planetesimal hypothesis the earth and other planets have come **originally** from the sun.
Observe – Once an air mass has left its source region, it undergoes changes which often make it difficult to identify by ground **observer.** The speed of transmission of weather **observations** is an important problem. Marked changes in the distribution of temperature over the Atlantic are **observable** at a depth of 500 fathoms. Weather cannot be easily **observed** in the laboratory. Dozens of permanent **observatories** have been built on the outermost reaches of our country.
Divide – From the point of view of relief the Crimea can be **divided** into three **divisions.** The years which are evenly **divisible** by 4 are called leap years. Most of the European rivers rise in the main European **divide** which reaches its maximum elevation in the Valday Upland.

VII. LOOK THROUGH TEXT 12 B AND GET READY TO SPEAK ABOUT THE TYPES OF GLACIERS.

Text 12 B
FORMATION OF GLACIERS



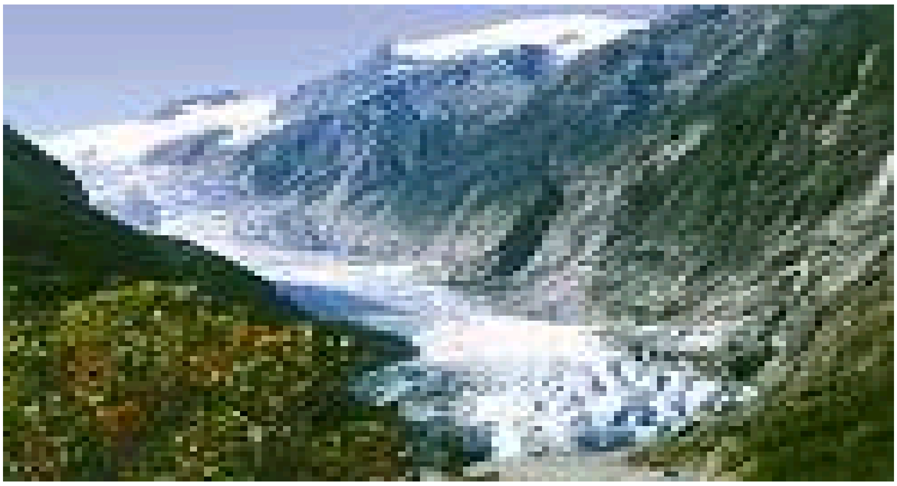
In most temperate regions, winter snow melts in spring and summer. However, in certain cold, wet environments, only a portion of the winter snow melts and the remainder accumulates year after year. During summer, snow crystals become rounded as the snow pack is compressed and alternately warmed during daytime and cooled at night. Temperature changes and compaction make the snow denser. If snow survives through one summer, it converts to rounded firn ice grains called nĕvĕ.

Mountaineers like firn ice because the sharp points of their ice axes and crampons sink into it easily and hold firmly. If firn ice is buried deeper in the snow pack, it converts to closely packed ice crystals.

A glacier is a massive, long-lasting, moving mass of compacted snow and ice. Glaciers form only on land, wherever the amount of snow that falls in winter exceeds the amount that melts in summer. Glaciers in mountain regions flow own hill. Glaciers on level land flow outward under their own weight, just as cold honey poured onto a tabletop spreads outward.

Glaciers form in two environments. Alpine glaciers form at all latitudes on high, snowy mountains. Continental ice sheets form at all elevations in the cold polar regions.

ALPINE GLACIERS



Mountains are generally colder and wetter than adjacent lowlands. Near the mountain summits, winter snowfall is deep and summers are short and cool. These conditions create alpine glaciers. Alpine glaciers exist on every continent– in the Arctic and Antarctica, in temperate regions, and in the tropics. Glaciers cover the summits of Mount Kenya in Africa and Mount Cayambe in South America, even though both peaks are near the equator.

Some alpine glaciers flow great distances from the peaks into lowland valleys. For example, the Kahiltna Glacier, which flows down the southwest side of Denali (Mount McKinley) in Alaska, is about 65 kilometers long, 12 kilometers across at its widest point, and about 700 meters thick. Although most alpine glaciers are smaller than the Kahiltna, some are larger.

The growth of an alpine glacier depends on both temperature and precipitation. The average annual temperature in the state of Washington is warmer than that in Montana, yet alpine glaciers in Washington are larger and flow to lower elevations than those in Montana. Winter storms buffet Washington from the moisture-laden Pacific. Consequently, Washington's mountains receive such heavy winter snowfall that even though summer melting is rapid, large quantities of snow accumulate every year. In much drier Montana, snowfall is light enough that most of it melts in the summer, and thus Montana's mountains have no or only very small glaciers.

CONTINENTAL GLACIERS

Winters are so long and cold and summers so short and cool in polar regions that glaciers cover most of the land regardless of its elevation. An ice sheet, or continental glacier, covers an area of 50,000 square kilometers or more. The ice spreads outward in all directions under its own weight.

Today, the Earth has only two ice sheets, one in Greenland and the other in Antarctica. These two ice sheets contain 99 percent of the world's ice and about three fourths of the Earth's fresh water. The Greenland sheet is more than 2.7 kilometers thick in places and covers 1.8 million square kilometers. Yet it is small compared with the Antarctic ice sheet, which blankets about 13 million square kilometers, almost 1.5 times the size of the United States. The Antarctic ice sheet covers entire mountain ranges, and the mountains that rise above its surface are islands of rock in a sea of ice. If the Antarctic ice sheet melted, the meltwater would create a river the size of the Mississippi that would flow for 50,000 years.

Whereas the South Pole lies in the interior of the Antarctic continent, the North Pole is situated in the Arctic Ocean. Only a few meters of ice freeze on the relatively warm sea surface, and the ice fractures and drifts with the currents. As a result, no ice sheet exists at the North Pole.

Exercise 1. Answer the following questions:

1. What happens if snow survives through one summer?
2. In what environment do glaciers form?
3. Differentiate among alpine and continental glacier. Where are alpine and continental glaciers found today?
4. What are the mechanisms by which glaciers move?
5. Describe the surface of a glaciers in the summer and in the winter in (a) the zone of accumulation and (b) the zone of ablation.
6. How do icebergs form?

Exercise 2.

a) Translate the following words:

regardless, steepness, curvature, elevation, outward, upward, downward, toward, downhill, downslope, thickness, mountaineer, favorable, southwest.

b) Form nouns from the verbs:
terminate, cause, advance, influence, effect, grow, record, form, cycle, cover, flow, visit, deposit, remain, land, plant, melt, fall.

Exercise 3.
a) Transform the sentences using Participle I according to the model
Model:
Rocks which form in the interior of the Earth … Rocks forming in the interior of the Earth.
1. A glacier is a mass of compacted snow that forms only on land.
2. An ice fall is a section of a glacier which consists of crevasses and towering ice pinnacles.
3. Consider an alpine glacier that flows from mountains into a valley.
4. The snowline shifts up and down the glacier from year to year. This shift depends on weather.
5. The glacier may advance again; it destroys the vegetation.
6. Giant chunks of ice break off and form icebergs.
7. The icebergs which calve from the Antarctic ice shelf are the largest in the world.
8. A small glacier valley that lies high above floor of the main valley is called a hanging valley.
b) Put the questions to which the following sentences are the answers:
1. Glaciers have advanced and retreated at least five times during the past 2 million years.
2. In south-western France and northern Spain, humans carved body ornaments between 40.000 and 30.000 years ago.
3. In most temperate regions, winter snow melts in spring and summer.

Exercise 4 .Complete the sentences:
1. If snow survives through one summer, it converts to round ice grains called …
2. A massive, long-lasting, moving mass of compacted snow and ice is called …
3. … exist on every continent in the Arctic and Antarctica, in temperate regions and in the tropics.
4. Glaciers move by two mechanisms: …… and ……..
5. A glacier also moves by … in which it deforms as a viscous fluid.
6. The zone of accumulation is …
7. The lower part of a glacier, where more snow melts in summer than accumulates in winter is called …

Exercise 5. Translate into English.

ТИПИ ЛЬОДОВИКІВ

Серед льодовиків, як тих, що існують нині , так і тих, що колись були, розрізняють три головних типи, а саме:
1. Альпійський тип. У цьому типі по високих розчленованих горах, підіймаючись в снігові краї, верхів'я долин створюють великі улоговини, де й скупчується фірн. З цього фірнового басейну льодовик живиться; льодовий потік, що виходить із цього басейну, називають місцем стоку. В місцях

живлення розрізняють фірнові схили та фірнову мульду: течучи з крутих схилів, фірн дає живлення мульді, а з неї тече льодовик. Такі льодовики переважно властиві пасмовим горам.

2. Скандинавський тип. Цей тип характеризує те, що великі пасма підіймаються вище снігової лінії, і широкі простори тут укриті суцільною льодовою поволокою. В такій масі льоду виявляється повільний рух до його окраїн, де лід тече поодинокими вузькими коритами, якщо порівняти його з величезною площиною поволоки. В кожному з таких корит часто маємо могутній льодовиковий потік, але те місце, де місце живлення переходить у льодовиковий язик, повністю вкрите грубим снігом і неприступне для безпосередніх спостережень. Скандинавський тип властивий платовим горам.

3. Гренландський тип відзначається тим, що цілий континент підіймається вище снігової лінії і є вкритий льодовиковою поволокою. Цей тип є властивий полярним країнам і дає не поодинокі льодовикові потоки, а суцільні поволоки й таким чином, що рельєф місцевості майже ніякої ролі не відіграє.

TEST 12

Task 1. Fill in the gaps with a word from the box and translate the text in writing.

glacial	interior	coastal	alpine	basal	accumulate
cold	accumulation		heat	pressure	

Rates of ….. movement vary with slope steepness, precipitation, and air temperature. In the …. ranges of Alaska, where annual precipitation is high and average temperature is relatively high (for glaciers), some glaciers typically move 15 centimeters to a meter a day. In contrast, in the …. of Alaska where conditions are generally …. and dry, glaciers move only a few centimeters a day. At these rates, ice flows the length of an ….. glacier in a few hundred to a few thousand years.

Glaciers move by two mechanisms: basal slip and plastic flow. In …. slip,the entire glacier slides over bedrock in the same way that a bar of soap slides down a tilted board. Just as wet soap slides more easily than dry soap, an ….. of water between bedrock and the base of a glacier accelerates basal slip.

Several factors cause water to….. near the base of a glacier. The Earth's … melts ice near bedrock. Friction from glacial movement also generates heat. Water occupies less volume than an equal amount of ice. As a result, …. from the weight of overlying ice favors melting. Finally, during the summer, water melted from the surface of a glacier may seep downward to its base.

Task 2. Underline the correct word.

1.I didn't tell them *anything/nothing* about your plans.
2. There was *no one/anyone* to meet me at the airport.
3. It will take you *some/any* time to understand the new computer program.
4. There is *anything/something* I'd like to tell you.
5. I am not going *nowhere /anywhere* tonight.
6. *Nobody/somebody* is allowed to enter this office.
7. If *no one/anyone* asks for me, tell them to ring later.

8. *Somebody/Anybody* took my bag by mistake.
9. We had *no/any* money left after shopping all morning.
10. Have I said *anything/nothing* to upset you?

Task 3. Fill in the comparative and superlative forms of adjectives.

1. good/well…………..
2. bad/badly……………
3. much…………..
4. many/a lot…………
5. little…………..
6. far……….
7. beautiful…………….
8. silly…………..
9. comfortable………
10. dirty……….

Task 4. Choose the correct item.

Up until 1900, fishermen caught around 150,000 salmon a year in the Rhine, but by 1920, that number had dropped to 30,000. Six years 1)…….., the last few fish in the river were wiped out completely. This ecological disaster occurred when toxic pesticides 2)…..into the river from a burning chemical factory in Switzerland.

Almost immediately, however, ecological 3)…..along with the International Commission for the Protection of the Rhine, started the Salmon 2,000 programme. Their 4)…….was to make the river clean enough for 5)……types of fish to live in once more.

Today, their task is almost complete and 6)…..laws prohibit the dumping of waste into the river. Moreover, thousands of young salmon will be released there to encourage the redevelopment of the Rhine's fishing industry. In fact, it is hoped that 7) …..of this century, there will be up to 2,000 salmon living and breeding there.

1 A before	B ago	C then
2 A poured	B jumped	C felt
3 A members	B groups	C people
4 A reason	B want	C aim
5 A none	B every	C all
6 A new	B recent	C first
7 A in the end	B before	C by the end

Task 5. Choose the correct variant.

1. She______her exam by two o'clock.

a) passed	c) has passed
b) have passed	d) had passed

2. A plate slipped out of my hands when I______the washing up.

a) was doing	c) had done
b) did	d) was done

3. It's nine o'clock. The pupils______a lesson.

a) will be having	c) have
b) are having	d) have had

4. He______ill twice so far this year.
a) is c) was
b) has been d) is being
5. By summer you______English for two years.
a) 'll study c) 'll have been studying
b) have studied d) are studying
6. What______you______at this time yesterday?
a) was doing c) did do
b) have done d) were doing
7. We're late. The film______finished by the time we______to the centre.
a) is finished, get
b) will be finished, 'll get
c) will have finished, get
d) finished, 'll get
8. The documents______by the time I come.
a) 'll have been typed c) 'll be typed
b) 'll have typed d) will be typing
9. Last year I______ill only twice.
a) was c) am
b) have been d) has been
10. By the 8th of April my mother_______at school for twenty years.
a) 'll work c) has worked
b) 'll be working d) 'll have been working
11. I______these sentences for one hour.
a) am writing c) have written
b) 've been writing d) was writing
12. We______it for half an hour when the teacher entered.
a) have discussed c) discussed
b) were discussing d) had been discussing
13. It______for three hours.
a) was snowing c) is snowing
b) snowed d) has been snowing
14. My sister learns French and she______very well.
a) does c) is doing
b) do d) did
15. My nephew is at college now, and my son______to college next year.
a) is going c) 'll go
b) is going to go d) goes
16. His friend______two English articles into Russian.
a) translated c) has translated
b) have translated d) translates
17. They______us several telegrams lately.
a) send c) sent
b) 've sent d) are sending

18. Don't worry! The child______better.
a) get c) have got
b) gets d) is getting
19. He______under treatment for two months but there are no signs of improvement.
a) 's been c) was
b) is d) is being
20. Doctor Ivanov______people for heart trouble.
a) is treating c) treats
b) has treated d) treat
21. This dictionary______much and is very valuable to me.
a) costed c) costs
b) is costing d) had cost
22. I wonder why John______a job yet.
a) finds c) didn't find
b) hasn't found d) found
23. The company______now for building workers.
a) advertised c) was advertised
b) has advertised d) is advertising
24. The hard work______on his health.
a) tells c) is telling
b) is told d) was telling
25. Peter______up photography as a hobby.
a) took c) has taken
b) was taken d) takes

Task6. Translate into English.

МЕХАНІЧНА ДІЯЛЬНІСТЬ ЛЬОДОВИКІВ

Льодовики схожі на ріки не лише своїм рухом, а й характером механічної діяльності. Як водяні, так і льодовикові потоки руйнують мінеральний матеріал, переносять, шліфують та відкладають на нових місцях, отже, в механічній діяльності льодовиків, так само, як і в діяльності води, можна розрізняти такі процеси: руйнування, перенесення, шліфування та відкладання. Перші три з них об'єднано загальною назвою жолоблення.

Вивчення механічної діяльності сучасних льодовиків та її різноманітних наслідків на земній поверхні має велику вагу, бо з'ясовує ті ознаки, за якими можна означити розвиток давніх льодовиків, давно вже зниклих, та допомагає розуміти й вивчати ті поверхневі витвори, які виникли як наслідок того, що певна місцевість колись була вкрита льодовиками нової епохи.

Терміном морени в науці домовилися називати увесь той матеріал, що льодовики пересувають по своїй поверхні. Всі морени можна поділити на дві групи: 1) морени пересувні й 2) морени відкладні.

PART II

SHORT GRAMMAR REFERENCE GUIDE

UNIT 1

Порядок слів у реченні

Будь-яка мова складається з окремих слів і граматичних механізмів, які показують, як складати ці слова у великі значущі словосполучення. Кожне слово має свій зміст, але слова не пов'язані одне з одним якимось особливим способом. *To make a mistake is only human* має зовсім інше значення; слова поєднані у змістовному словосполученні, у речення.

Англійська мова має декілька механізмів для складання слів у речення. Одним з найважливіших є порядок слів у реченні.

В англійській мові граматичне значення у великій мірі визначається порядком слів у реченні. *Blue sky* and *sky blue* означають різне: у першому випадку *blue* описує небо; у другому *sky* описує *blue*.

Можна побачити, як працює принцип на прикладах:

e. g. The hunter injured the wolf.	Мисливець поранив вовка.
The wolf injured the hunter.	Вовк поранив мисливця.
My old friend bought a new car.	Мій давній приятель купив нову машину.
My new friend bought an old car.	Мій новий приятель купив стару машину.

Порядок слів у розповідному реченні

0 Обставина часу	1 підмет	2 присудок (іменникова частина)	3 додаток	4 обставини способу дії	5 Обставини місця	6 Обставини часу
When?	Who? Which? What?	Action	Who? Which? What?	How?	Where?	When?
Last week	I	went			to the theatre	
	I	had	a very good seat.			
	The play	was	very interest-ing.			
	I	did not enjoy	It.			
	A young	were seating			behind me.	

	man and a young woman					
	They	were talking		loudly.		

(1) Дієслово + доповнення

Дієслово та доповнення до нього звичайно стоять поруч, інші слова не ставляться між ними:

	Дієслово	+	доповнення
I	like		children very much.
Did you	see		Norman yesterday?
Ann often	plays		tennis.

(2) Місце та час

Ми вказуємо місце (де?) перед часом (коли? як часто? як довго?)

	Місце	Час
Tom walks	to work	every morning.
She has been	in Canada	since April.
We arrived	at the airport	early.

Часто можливо ставити обставини часу на початку речення:

e.g. On Monday I'm going to Paris.

Every morning Tom walks to work.

***Примітка*:** На початку речення не можна ставити слова *early* або *late*.

(3) Прислівники з дієсловом

Деякі прислівники (наприклад, *always, also, almost, hardly, often, probably)* ставляться з дієсловом у середині речення:

e.g. Tom always goes to work by car.

We were feeling very tired. We were also hungry.

(a) Якщо дієслово – одне слово (goes, cooked), тоді прислівник ставимо перед дієсловом:

	Прислівник	Дієслово	
Tom	always	goes	to work by car.

Запитальні слова

Люди	Речі /тварини	Місце	Час	Кількість	Спосіб	Причина
Who	What	Where	How long	How many	How	Why

Whose (possession)	Which (of)		How often	How much		
Which (of)			What time			
What			when			

Типи питальних речень

1. Загальні питання	Do you work? Is she reading?	Yes, I do. No, I don't. Yes, she is.
2. Спеціальні питання	Where do you live? What are you doing? Who saw the Venus?	I live in Kharkiv. I am reading a special text. He did.
3. Розділові питання	Ecology is an important science, isn't it? We can't stop polluting our cities, can we?	Yes, it is. Yes, we can.
4. Альтернативні питання	Is this a liquid or a solid substance?	This is a solid substance.

Present Simple vs Present Continuous

Present Simple:

I/ you/ we they work Do I / you/ we/ they work?
He/ she/ it works Does he / she/ it work?
I/ you/ we/ they/ do not work.
He/ she/ it does not work.

Present Continuous (Progressive) Tense:

I am working Am I working?
You/ we/ they are working Are you/ we/ they working?
He/ she/ it is working Is he/ she/ it working?
I am not working
You/ we/ they are not working.
He/ she/ it is not working.

Вживання:

Present Simple	**Present Continuous**
1) постійна, звичайна дія або дія, яка властива особі чи предмету, який позначає підмет. e.g. She works in a bank. Загальні положення безвідносно до часу. e.g. The sun rises in the east.	1) тимчасові ситуації e.g. He is spending the week with his students.
2) дії, які постійно повторюються (особливо з прислівниками неозначеного часу): e.g. He always goes to bed at 11 o'clock.	2) ситуації, що змінюються чи розвиваються. e.g. She is getting more and more impatient.
3) для вираження майбутньої дії в підрядних реченнях умови й часу, які вводяться сполучниками when-коли, if –якщо, after- після, till,until – поки не, before – перш ніж. e.g. He will do the test if he has all the necessary equipment.	3) дії, які часто повторюються зі словами *always, constantly, continually*, які виражають роздратування або критику e.g. He's always getting into trouble.
4) розклад руху поїздів, програм e.g. The train leaves at 8.00.	4) дія збігається з моментом мовлення або близько до нього e.g. The sun is shining now. He is doing his course paper.
6) часто вживається зі словосполученнями: every day/week/month/year, usually, sometimes, always, rarely, never, often, in the morning/evening/afternoon, at night, on Mondays, etc.	5) заплановані дії у близькому майбутньому e.g. I'm going to the theatre this evening. 6) часто вживається з виразами: now, at the moment, at present, nowadays, today, tonight, always, still, etc.

У Present Continuous не вживаються дієслова feel, hear, see, smell, taste, adore, detest, dislike, enjoy, forgive, hate, like, agree, believe, suppose, understand, belong, concern, depend, know, mean, own, possess, need, prefer, want.

UNIT 2

Утворення множини іменників

Множина іменників утворюється додаванням до форми однини закінчень –s,-es.

-s	*Shop- shops; day- days*
-es	після *y* з попередньою приголосною, при цьому *y* змінюється на *i: city-cities, country-countries*
	після *o*: tomato – tomatoes, але piano-pianos; photo-photos

	Після -*s*,-*ss*,-*ch*,-*sh*,-*tch*,-*x*,-z: box-boxes; dress-dresses; bench-benches
	Після-*f*,-*fe*, при цьому -*f*,-*fe* змінюються на *v: wife-wives, life-lives;leaf-leaves;loaf-loaves.* Усі інші іменники на -*f*,-*fe* – за загальним правилом : *safe-safes; roof-roofs.*

Вимова закінчення –s

Після глухих приголосних вимовляється [s]	a desk-desks a Map-maps a month-months
Після дзвінких приголосних і голосних вимовляється [z]	a sea-seas a wall-walls
Після *ce, x, s,ss,sh,ch,ge* вимовляється [iz]	a box-boxes a bus-buses a family-families a place-places

Незлічувані іменники

Вживаються тільки у формі однини	Business, friendship, peace, money, ink, sugar, weather, advice, hair, information, knowledge, news, progress	His business is very successful. The weather is wonderful today.
Іменники, що мають форму однини, яка завжди узгоджу-ється з дієсловом у формі множини	Police, people, cattle, the poor, the rich, the youth, clothes, scissors	My people are all early risers.

Інші способи утворення множини іменників

Винятки	Man-men,woman-women,foot-feet,child-children,tooth-teeth,ox-oxen,goose-geese, mouse-mice
Однина=множина	A swine -many swine, a sheep-many sheep, a deer-many deer
Іменники грецького та латинського походження	Curriculum-curricula;datum-data;phenomenon-phenomena;basis-bases;thesis-theses;crisis-crises;radius-radii;nucleus-nuclei;stimulus-stimuli;index-indexes(indices)
Складені іменники	Mother-in-law- mothers-in-law;fellow-worker-fellow-workers; forget-me-not- forget-me-nots.

- **Note how certain nouns can be used in the singular and plural with a different meaning.**

Singular	Plural
Give me a **glass** of water, please.	I've been wearing **glasses** since I was 8 years old.
Has she always had short **hair**?	There are so many **hairs** in the sink!
Have you got any lined **paper** I could use?	He showed his **papers** to the customs officer.
I can't talk now; I have a lot of **work** to do.	A lot of Dali's **works** are on display in this museum.
We had at least 200 **people** at our wedding.	The **peoples** of Europe are hoping for change.
The **rain** is falling really heavily now.	The villagers are hoping for the **rains** to come soon.
You need **experience** for this job.	I had a lot of interesting **experiences** visiting Asia.

Present Perfect Simple and Present Perfect Continuous
Present Perfect Simple

Вживання

1. Закінчена дія у вашому житті до теперішнього часу.	Have you ever been to the USA?
У реченнях без обставин часу.	She's lived in China and Japan. We've reduced the prices.
2. У реченнях з прислівниками або обставинними фразами: *already, ever, never, yet, always, often, seldom,rarely, several times, today, already, just, this evening, for a long time, for, since, how long? up to now, up to the present, lately.*	Have you had a holiday this year? He has never seen the rainbow. We haven't met since 2000.
3. У ситуаціях, які почалися в минулому і все ще тривають.	He's been an architect since 1992. How long have you known her?
4. Дії у минулому, які тривають до тепер, коли ми вказуємо кількість.	She has designed a lot of fashion items for this firm . How many tests have you done?

Present Perfect Continuous

Вживання

1. Дії, які почалися у минулому і все ще тривають, включаючи теперішній час.	We've been producing pens since the 1980s. This plant has been polluting the

	air since it was built in 1995. He's been living here for five years.
2. Дії, які почалися у минулому і щойно закінчились.	You look very tired. Have you been working? I'm hot because I've been running.

*The Present Perfect Continuous і Present Perfect Simple мають подібне значення. Яку форму вибрати, залежить від того, що нас більше цікавить: сама дія, чи її результат.

e.g. I've been fixing the car (My hands are dirty).
e.g. I've fixed the car (Now I can drive to work).

For and since

We use **for** with the period of time we use **since** with a point in time

For	three days	since	Tuesday
	five hours		8 August
	a month		4 o'clock
	ten minutes		last summer
	a long time		1995
	ages		I last saw you

UNIT 3

1. Види прикметників та утворення ступенів їх порівняння

Види прикметників	**Позитивний ступінь**	**Вищий ступінь**	**Найвищий ступінь**
1. Односкладові	long big hot	longer bigger hotter	the longest the biggest the hottest
2. Двоскладові прикметники: а) що закінчуються на-y,-er,-le,-ow; б) з наголосом на другому складі.	easy clever simple narrow polite severe	easier clever simpler narrower politer severer	the easiest the cleverest the simplest the narrowest the politest the severest
3.Багатоскладові прикметники	beautiful important	more beautiful more important	the most beautiful the most important

4. Винятки	good (хороший) bad (поганий) little (маленький) much,many (багато) far (далекий)	better(кращий) worse (гірший) less (менший) more (більший) farther (більш далекий)	the best (найкращий), the worst (найгірший), the least (найменший), the most (найбільший), the furthest, farthest (найбільш далекий)

2. Форми вищого та найвищого ступенів прикметників, які відрізняються за своїм значенням

Позитивний ступінь	Вищий ступінь	Найвищий ступінь
old – старий	1) older – старіший за… 2) elder – старший (в родині)	1) the oldest – найстаріший 2) the eldest-найстарший
late – пізній	1) later – пізніший 2) latter – останній з двох (по порядку)	1) the latest-найпізніший (за часом) 2) the last – найостанніший (по порядку)
far – далекий	1) farther – дальший (про відстань) 2) further – найдальший (по порядку)	1) the farthest – найдальший (про відстань) 2) the furthest – найдальший (по порядку)
near – близький	nearer – ближчий	1) the nearest – найближчий 2) the next – найближчий (по порядку),наступний

3. Порівняльні конструкції

As+	**Прикметник**	+as	Такий самий+прикметник+як і…	This tree is as tall as that one.-Це дерево таке ж високе, як і те.
Twice as +		+as	Удвічі+прикметник у вищому ступені+ніж	This medicine is twice as effective as that one. – Ці ліки удвічі ефективніші, ніж ті.
As+		+as possible	Як можна+прикметник у вищому ступені	You must do your work as well as possible. – Ви повинні виконати свою роботу якнайкраще.
Not so+		+as	Не такий+прикметник+як	This way is not so long as the way to the West. – Цей шлях не такий довгий як на захід.

The +…		…+the +	Чим+прикметник у вищому ступені, тим+прикметник у вищому ступені	The higher they rise, the thinner the air becomes. – Чим вище вони підіймаються, тим більш розрідженим стає повітря.

Past Tenses.
Past Simple. Past Continuous.
Past Simple

I/ you/he/ she/ it/ we/ they **worked**
I/ you/he/ she/it/we/they**/did not work**
Did I/ you/he/she/it/ we/ they **work?**

I/he/she/it **was** late
You/ we/ they **were late**
Was I/ he/ she/ it **late?**
Were you/ we/ they late?

Вживання

1. Past Simple – це форма для опису минулих подій, для вираження ряду послідовних або повторюваних дій у минулому, часто вживається зі словами: *yesterday – учора, last week-минулого тижня,the other day – на днях, і т.д.*	The standard of living in Europe went up **during the 1960s.** Ted Turner launched CNN **in 1980**.
2. Past Simple вживається для вираження дії або властивості, що характеризувала підмет у минулому.	Alexander Graham Bell **invented** the telephone.
3. У додаткових підрядних реченнях у непрямій мові, коли дієслово у головному реченні стоїть у Past Simple.	He said he didn't understand the problem.

Past Continuous (Progressive)

I **was working.**
You/ we/ they **were working.**
He/she/it **was working.**

Was I working?
Were you/we/they **working?**
Was he/she/it **working?**

I **was not working.**
You/we/they **were not working.**
He/she/it **was not working.**

Вживання

1. Дія відбувалася у визначений момент у минулому.

e.g. He was working on the report all day long.

During the 1990s computer scientists were trying to deal with the millennium bug.

2. У підрядних додаткових реченнях, якщо дієслово-присудок головного речення вжито у минулому часі. Past Continuous **ч**асто вживається з дієсловами, що означають рух (to go, to come) для позначення дії, яка була майбутньою стосовно минулого.

e.g. She said she was coming to see you.

UNIT 4.

Future Tenses. Future Simple. Future Continuous

Є декілька способів передачі майбутнього часу. Сюди входять:

Present progressive:	I'm seeing him tomorrow.
Going to:	We're going to discuss the news.
Present simple:	His plane gets to Heathrow at 12.45.
Will:	It will probably arrive late owing to bad weather.
Future perfect simple:	I'll have arranged his hotel accommodation by then.
Future continuous (progressive):	He'll be staying at the Kharkiv Hotel.
Be + infinitive:	You are to tell nobody of our discussions.

Вживання

1. При розмові про плани або домовленості .

I'm meeting Mr. Brown next week. *He's arriving* on Tuesday.

2. При розмові про наміри.

У цьому випадку скоріше використовується *going to*, ніж *will.*

She *is going to* leave in a month's time.

When *are you going* to visit us next?

3. При обіцянках чи пропозиціях.

"Could you lend me $50? *I'll pay* you back tomorrow".

I don't know if I can finish the job by Friday but *I'll do* my best.

4. У розкладі руху поїздів , літаків, тощо.

Для вираження майбутньої дії тут використовуємо present simple, тому що навряд чи ці події скоро зміняться.

The train *leaves* from Waterloo at 17.00.

Our next planning meeting *is* on Wednesday.

5. Події, які будуть завершені до настання майбутнього часу.

У цьому випадку вживається the future perfect simple:

By the time they arrive we *will have gone* home.

6. Для ввічливого звертання.

Will you *be staying* for dinner? (питання про плани)

Will you *stay* for dinner? (просьба).

7 The present simple після *if, when, until, as soon as.*

If you *give* us a discount we'll place a big order.

Switch off the lights when you *leave*.

UNIT 5
Modals. Модальні дієслова.

До модальних належать такі дієслова: can (could), may (might), must, need, ought to, та інші. Вони вживаються у сполученні з інфінітивом іншого дієслова і означають не саму дію, а лише ставлення до неї того, хто говорить.

Особливості модальних дієслів:

Не змінюються за особами, числами.

Не мають безособових форм – інфінітива, герундія, дієприкметника.

Не мають часових форм.

Після модальних дієслів інфінітив вживається без частки to (за винятком дієслова ought).

Модальні дієслова не мають закінчення у третій особі однини.

Питальна та заперечна форми утворюються без допоміжного дієслова

Модальні дієслова та їх еквіваленти

Модальне дієслово	**Значення**	**Приклад**
Can could	1) можу, умію, 2) можливо (з Perf.Inf.у стверджувальних реченнях), 3) невже (у питальних реченнях), 4) не може бути (в заперечних реченнях)	1. She can do it. 2. She can have done it. 3. Can she do (have done) it? 4. She can't do (have done) it.
to be able (to)	бути в змозі	She will be able to do it**.**
May might	1) можна (прохання – у питальних реченнях), Дозвіл (у стверджувальних реченнях), 2) можливо	1. May I come in? 2. You may take the book. 3. She may do (have done) it.
Must	повинен напевно	She must do it. She must do (have done) it.
Need	потрібно	The plants need watering.
shall (should)	повинен	Shall I apply for the job? They should have warned us.

will (would)	просьба, пропозиція	Will you give me a hand? Would you mind helping me?
ought (to)	обов'язок	People ought to live in peace.

UNIT 6
Утворення умовного способу (The Conditional Mood)

Conditional Mood – складна форма, яка утворюється з допоміжних дієслів should і would і основи інфінітива відмінюваного дієслова. Conditional Mood має два часи: Present Conditional і Perfect Conditional.

Present Conditional збігається за формою з Future Simple in the Past, а Perfect Conditional – з Future Perfect in the Past, але вони розрізняються за своїм значенням.

Умовні речення вживаються з *if*. Основні види умовних речень це: тип 0, тип 1, тип 2, тип 3.

Вони складаються з двох частин: the *if – clause* (гіпотеза) і головне речення (результат). Коли if – clause стоїть перед головним реченням, між ними ставиться кома. Якщо головне речення стоїть перед if – clause, кома не потрібна.

If the weather is good tomorrow**,** we will go to the beach.

Якщо завтра буде гарна погода, поїдемо на пляж.

We will go the beach ***if*** the weather is good tomorrow.

	If – clause (гіпотеза)	**Головне речення (результат)**	**Вживання**
Тип 0 (загальна правда)	if + present simple	present simple	Те, що завжди існує
Тип 1 (реальний теперішній час)	if + present simple, present continuous, present perfect or present perfect continuous	future/imperative/can/ may/might/must/ should/ could + bare infinitive	Реальне, можливо трапиться у теперішньому або майбутньому
Тип 2 (нереальний, в тепер. часі)	if + past simple or past continuous	would/could/might + bare infinitive	Уявна ситуація, яка протирічить фактам в теп. часі, вживається для порад

Тип 3 (нереальний, в минулому часі)	if + past perfect or past perfect continuous	would/could/might + have + past participle	Уявна ситуація , яка протирічить фактам в минулому, також вживалася для вираження співчуття або критики

Вживання:

- **Тип 0:**
  If/When the sun ***shines***, snow ***melts***.
  If/When it ***rains***, the roads ***get*** slippery and dangerous.
  If/When the temperature ***falls to*** 0˚C, water ***turns into*** ice.
- **Тип 1:**
  If he ***doesn't study*** hard, he ***won't pass*** his exam.
  If we ***work*** hard, we***'ll finish*** the project on time.
  If you ***need*** help, ***come*** and ***see*** me.
  If you ***have finished*** your work, we ***can have*** a break.
  If you***'re*** ever in the area, you ***should come*** and ***visit*** us.
- **Тип 2:**
  If I ***won*** the lottery, I ***would buy*** an expensive car and I ***would go*** on holiday to a tropical island next summer.
  If I ***had*** time, I ***would take up*** a sport.
  If I ***were*** you, I ***would talk*** to my parents about it.
- **Тип 3**
  If John ***hadn't got up*** late, he ***wouldn't have missed*** the bus.
  If she ***had studied*** harder, she ***would have passed*** the test.
  If he ***hadn't been acting*** so foolishly, he ***wouldn't have been punished***.
  Had she been asked, she **would have given** her permission.
- **Усі типи умовних речень можуть бути змішаними і будь-який може вживатись, якщо дозволяє контекст.**
  If they were working all day (Type 2), they will be tired now (Type 1).
  If I were you (Type 2), I would have accepted the job (Type 3).
  If he were a better driver (Type 2), he wouldn't have crashed the car. (Type 3).
  If she had finished earlier (Type 3), she would be going to the party tonight (Type 2).

UNIT 7
Пряма і непряма мова (Direct and Indirect Speech)
Приклади висловлювань прямою і непрямою мовами

Пряма мова (Direct Speech)	**Непряма мова(Reported Speech)**
Прямою мовою називається передача	Непрямою мовою називається

чийогось висловлювання.	передача змісту прямої мови у вигляді переказу.
She said to him “Come at 3 o’clock”. He said to me “Don’t go there”.	She asked him to come at 3 o’clock. He told me not to go there.
He said:”I know the answer”. He said to me, “I will do it tomorrow”.	He said that he knew the answer. He told me that he would do it the next day.
She asked me,”Have you written the paper?” He asked me, “Where do you live?” this (these) now here today yesterday tomorrow ago next week	She asked me if (whether) I had written the paper. He asked me where I lived. that (those) then there that day the day before the next day before the following week

Способи передачі непрямої мови

Типи речень	**Пряма мова**	**Непряма мова**
Стверджувальне	He says,”I am happy”. He says to us “I like football”. She says,”I don’t know this rule”.	He says (that) he is happy. He says to us (that) he likes football. She says (that) she doesn’t know this rule.
Наказове	She says,”Close the window, please”. Mary says to Mike,”Don’t close the door”. The officer orders the soldiers,”Don’t talk!”	She asks me to close the window. Mary tells Mike not to close the door. The officer orders the soldiers not to talk.
Загальне питання	The tourist asks me,”Do you know the city well?” He asks,”Is it raining?” The manager asks,”Are there any people at the office?”	The tourist asks me if I know the city well. He asks if it is raining now. The manager asks if there are any people at the office.
Спеціальне питання	I ask them,”Where does John live?” They ask,”What’s the matter?”	I ask them where John lives. They ask what the matter is.

	We ask them,”When shall we meet?” My friend asks,”Who called you yesterday?”	We ask them when we shall meet. My friend asks who called me yesterday.

Дієслова, що вводять непряму мову

add	додавати	offer	пропонувати
advise	радити	promise	обіцяти
allow	дозволяти	protest	протестувати
describe	описувати	remark	зауважувати
explain	пояснювати	reply	відповідати
complain	скаржитися	remind	нагадувати
continue	продовжувати	recommend	рекомендувати
inform	повідомляти	refuse	відмовляти
insist	наполягати	suggest	пропонувати
note	помічати	think	думати
observe	спостерігати	warn	попереджувати
order	наказувати	wonder	цікавитися

UNIT 8

Стан (Voice)
Типи станів

Англійське дієслово має два стани: активний стан (The Active Voice) і пасивний стан (The Passive Voice).

Активний стан (The Active Voice)	Пасивний стан (The Passive Voice).
Дієслово означає дію, яку виконує підмет. Vehicles emit exhaust fumes.	Дієслово означає дію, яка спрямована на підмет. Exhaust fumes are emitted by vehicles.

Утворення часів пасивного стану (The Passive Voice)

Якщо підмет означає предмет або особу, на яку спрямована дія іншого предмета або особи, то дієслово-присудок ставиться у формі пасивного стану.

Речення з дієсловом-присудком у формі пасивного стану вживаються в англійській мові тоді, коли головний інтерес для співрозмовників становить особа або предмет, на які спрямована дія, а не той, хто виконує дію, як у реченнях з дієсловом у формі активного стану.Часи пасивного стану мають в основному ті самі значення, що й відповідні часи активного стану.

Зведена таблиця часів пасивного стану

	Simple (Indefinite)	**Continuous**	**Perfect**
Present	I am *He* / *She* / *It* } is } asked *We* / *You* / *They* } are питають взагалі, завжди	I am *He* / *She* / *It* } is } being asked *We* / *You* / *They* } are питають зараз	I have *He* / *She* / *It* } has } been asked *We* / *You* / *They* } have вже спитали
Past	I *He* / *She* / *It* } was } asked *We* / *You* / *They* } were спитали колись	I *He* / *She* / *It* } was } being asked *We* / *You* / *They* } were питали у той момент	I *He* / *She* / *It* } is } had been asked *We* / *You* / *They* } are до того моменту вже спитали

Future	*I* / *We* } shall } be asked *He* / *She* / *It* / *You* / *They* } will спитають коли-небудь	—	*I* / *We* } shall } have been asked *He* / *She* / *It* / *You* / *They* } will спитають до того часу в майбутньому

Future-in-the-Past	*I* *We* } should } be asked *He* *She* *It* } would *You* *They* спитають коли-небудь	—	*I* *We* } should } have been asked *He* *She* *It* } would *You* *They* спитають до того часу в майбутньому

UNIT 9
Інфінітив (The Infinitive)

Інфінітив – неособова форма дієслова, яка поєднує властивості дієслова і іменника. Інфінітив звичайно вживається з часткою ***to.***

Форми інфінітива та їх переклад

Форми	Active	Passive
1. Simple	to help I am glad to help her. Я радий допомогти їй.	to be helped I am glad to be helped. Я радий, що мені допомагають.
2. Continuous	to be helping I am glad to be helping him now. Я радий, що допомагаю йому.	
3. Perfect	to have helped I am glad to have helped him. Я радий, що допоміг їм.	to have been helped I am glad to have been helped. Я радий, що мені допомогли.
4. Perfect Continuous	to have been helping I am glad to have been helping you. Я радий, що допомагав (допомагаю) вам (протягом якось часу).	

Ознакою інфінітива в англійській мові є частка ***to,*** але в багатьох випадках інфінітив вживається без частки ***to.*** Частка ***not*** перед інфінітивом вказує на заперечну форму.

Особливу увагу потрібно звернути на інфінітив у пасивному стані (Simple Infinitive), який дуже часто вживається в технічних текстах.

The engineer wants to help the workers. (Active)

The engineer wants to be helped. (Passive).

Після деяких дієслів у дійсному стані вживають **інфінітивний зворот**, що становить поєднання займенника в об'єктному відмінку або іменника у загальному відмінку з інфінітивом. Українською мовою речення з такми зворотом перекладають **складнопідрядним реченням**.

I want him to study greenhouse gases.

Я хочу, щоб він вивчав парникові гази.

They expect the conference on greenhouse effect to be held in France this June.

Очікують, що конференція з питань парникових газів відбудеться у Франції в червні цього року.

Інфінітив в Об'єктному звороті може вживатись також у пасивному стані, відповідаючи присудкові підрядного речення, що виражений дієсловом у пасивному стані.

I expect the problem of oxidation to be discussed at the meeting.

Я очікую, що проблема окислення буде обговорюватись на зустрічі.

Об'єктний інфінітивний зворот вживають після таких дієслів, як:

to assume	вважати
to like	подобатись
to hate	ненавидіти
to expect	очікувати
to think	думати
to believe	вірити, сподіватися
to suppose	сподіватися
to find	знаходити
to consider	вважати, розглядати
to know	знати
to order	замовляти, наказувати
to ask	питати
to allow	дозволяти
to want	хотіти
to wish	бажати
to require	потребувати, вимагати
to maintain	підтримувати, стверджувати

Після дієслів, які виражають сприйняття за допомогою органів чуття, частка **to** перед інфінітивом не вживається.

to see	бачити
to watch	дивитись, спостерігати
to observe	спостерігати
to notice	відмічати

to hear	чути
to feel	відчувати

Функції інфінітива

Функції	Приклад	Переклад
1. Підмет (звичайно перед таким інфінітивом ставиться *if*)	**To learn** the foreign language is important.	Вивчати іноземну мову важливо.
2. Додаток	We decided **to wait** for her.	Ми вирішили зачекати на неї.
3. Означення	Her wish **to win** was quite natural. Is there much work **to do/to be done** today?	Її бажання виграти було зовсім природним. Сьогодні багато роботи, яку потрібно виконати?
4. Обставина мети або наслідків	I went to London **to learn** English. He left home, never **to be seen** again.	Я поїхав у Лондон, щоб вивчати англійську мову. Він залишив їм дім, і ніхто не бачив його знову.
5. Частина складного додатку	I heard someone **open** the door. I'd like you **to find** him a job.	Я чув, як хтось відкрив двері. Я хотів би, щоб ви знайшли йому роботу.
6. Частина складного підмета	She is known to have a fine collection of paintings.	Відомо, що у неї є гарна колекція живопису

UNIT 10
Герундій

Герундій – неособова форма дієслова, яка поєднує властивості дієслова та іменника. Усі форми герундія збігаються з формами дієприкметника. У реченні герундій вживається у функціях:

1) підмета і перекладається або іменником, або інфінітивом.

e.g. **Walking** is useful. – Ходьба пішки корисна. Ходити пішки корисно.

2) частини присудка і перекладається інфінітивом, або іменником.

e.g. Our aim is **studying** English. – Наша мета – вивчити (вивчення) англійську мову.

3) додаток, перекладається іменником або інфінітивом.

e.g. She likes **singing.** – Вона любить спів (співати).

4) означення – перекладається іменником, прикметником або інфінітивом.

e.g. I don't like her manner of **speaking.** - Мені не подобається її манера говорити.

5) обставини – перекладається іменником, дієприкметником або інфінітивом.

e.g. He left the room **without saying** good-bye. – Він вийшов з кімнати, не попрощавшись.

Частіше за все герундій вживають після дієслів, прикметників та дієприкметників, що потребують спеціальних прийменників. До тих, що використовують такі прийменники, належать :

to be disappointed at	бути розчарованим у чомусь
to be surpised at	бути здивованим чимось
to be responsible for	бути відповідальним за
to prevent from	перешкоджати, заважати
to result in	призводити у результаті до чогось
to succeed in	удаватися
to be engaged in	займатися чимось
to be interested in	бути зацікавленим у чомусь
to accuse of	звинувачувати у чомусь
to approve of	схвалювати щось
to hear of	чути про щось
to think of	думати про щось
to be afraid of	боятися чогось
to be capable of	бути спроможним на
to be fond of	любити щось
to depend on(upon)	залежати від
to insist on	наполягати на
to object to	заперечувати проти
to be/get used to	звикати до

Герундіальний зворот (Gerund Construction)

Перекладається підрядними реченнями, яке вводяться сполучниками *що, щоб*. Іменник чи займенник, що стоїть перед герундієм, виступає в українській мові підметом підрядного речення, а герундій – присудком.

His (my friend's) taking part in this work helped me greatly. – Те, що він (мій друг) брав участь у цій роботі, дуже допомогло мені.

I heard of our head engineer's having been sent abroad. – Я чув(про те), що нашого головного інженера відправили за кордон.

UNIT 11

Дієприкметник (The participle)

Дієприкметник – це не особова форма дієслова, яка поєднує в собі властивості дієслова, прикметника і прислівника.

Дієприкметник Participle 1(-ing)		asking	
	Active	Passive	
Simple	asking	being asked	дія одночасна
Perfect Participle II (-ed)	having asked	having been asked asked	дія попередня

Форми дієприкметника співпадають з формами герундія.

У реченні дієприкметники I та II вживаються у таких функціях:
1) частини присудка і перекладаються дієсловом в особовій формі.
He is writing a letter. – Він пише листа.
2) означення
The playing boy is my son. – Хлопчик, який грається, це мій син.
The results obtained were promising. – Отримані результати були обнадійливими.
3) обставини
While reading he made notes. – Читаючи, він робив помітки.
Having finished the experiments, he compared the results. – Коли він закінчив експерименти, він порівняв результати.

В англійській мові дієприкметник утворює синтаксичні комплекси з іменниками та займенниками. Дієприкметник входить до складу трьох комплексів: об'єктного дієприкметникового комплексу (the Objective Participle Complex), суб'єктного дієприкметникового комплексу (the Subjective Participle Complex) та незалежного дієприкметникового комплексу (the Absolute Participle Complex).

У реченні *об'єктний дієприкметниковий комплекс* виконує функцію складного додатка після дієслів: to see, to hear, to feel, to watch, to notice, to find, to observe:

I saw her coming out. – Я бачив, як вона виходила.
I watched the snow falling. – Я спостерігав, як падає сніг.

Суб'єктний дієприкметниковий комплекс вживається переважно з дієсловами, які виражають сприймання за допомогою органів чуттів (to see, to feel, to hear, to watch, to observe) у пасивному стані.

A plane was heard flying high in the sky. – Було чути, як високо в небі летів літак.

Незалежний дієприкметниковий комплекс перекладається українською мовою:

a) підрядним обставинним реченням:

The letter being written, I went to post it. – Коли лист був написаний, я пішла відправити його.

The rain having stopped, we went home. – Коли дощ ущух, ми пішли додому.

b) простим реченням, що входить до складносурядного:

They went quickly out of the house, John accompanying her to the station. – Вони швидко вийшли з дому, і Джон провів її до вокзалу.

c) дієприслівниковим зворотом:

Her face smiling, she came into the room. – Усміхаючись, вона увійшла в кімнату.

UNIT 12
Утворення та вживання Past Perfect
Past Perfect утворюється з допоміжного дієслова to have у past Simple – had і Past Participle основного дієслова.

Past Perfect вживається для вираження минулої дії, яка вже відбулася до певного моменту або іншої дії в минулому. Цей момент позначається такими обставинними словами: by Monday – до понеділка; by 3 o'clock – до 3 години; by that time- до того часу; by the first of May – до першого травня, for, since, already, after, before, just, never, yet	She had finished her work by 5 o'clock. Вона закінчила свою роботу до 5 години. I had not done the exercise when my father came in. Я ще не виконав вправу, коли увійшов мій тато.

Past Perfect

I had worked. Had I worked?
You/ we/ they had worked. Had you/we/they worked?
He/she/it had worked. Had he/she/it worked?
I had not worked.
You/we/they had not worked.
He/she/it had not worked.

Past Perfect Continuous

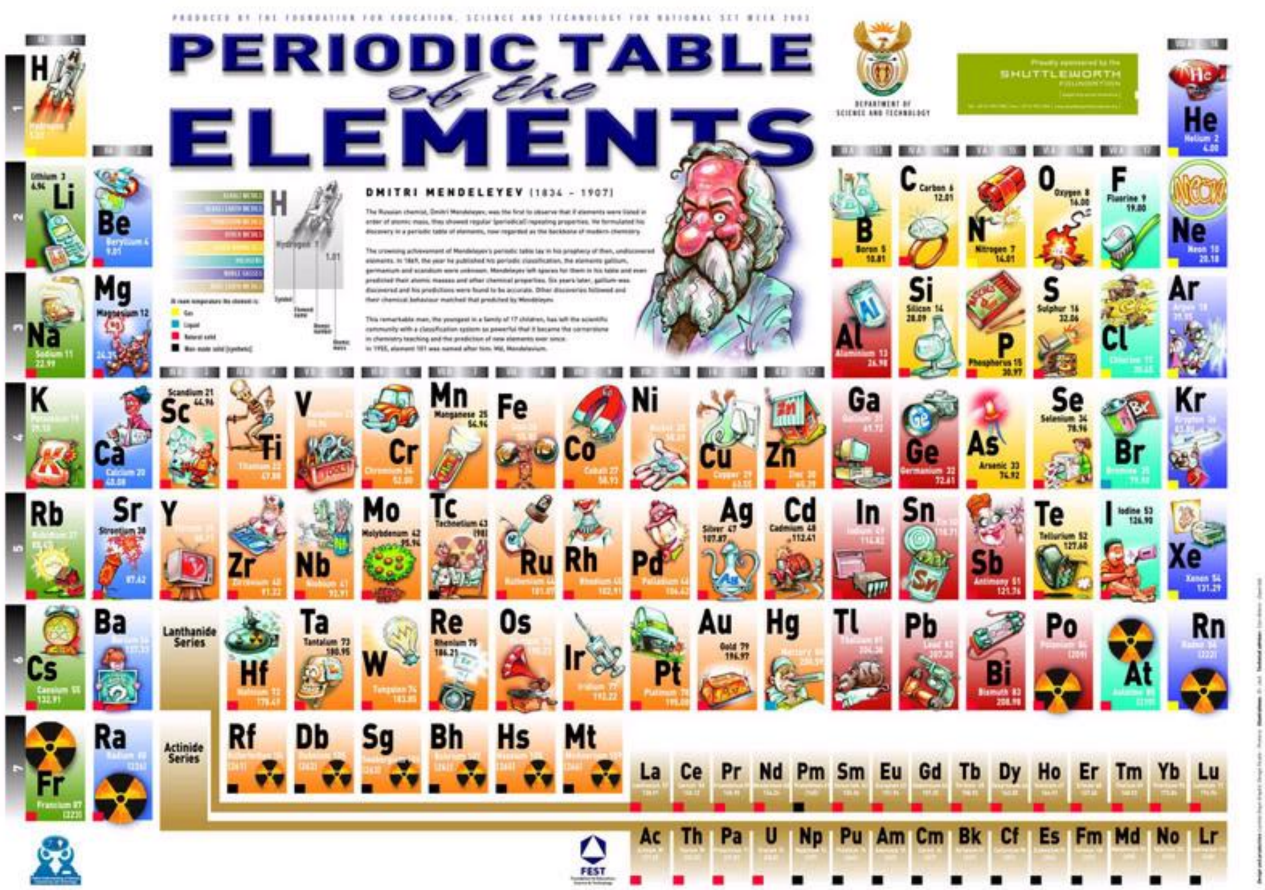
I had been working Had I been working?
You/ we/ they had been working Had you/we/they been working?
He/she/it had been working Had he/she/it been working?
I had not been working
You/we/they had not been working
He/she/it had not been working

Вживається
1. Для вираження дії, яка тривала протягом певного часу до якогось моменту у минулому.
She *had been saving* for a whole year before she bought her ticket to Australia.
He *had been waiting* for an hour before she arrived.

2. Для вираження дії, яка тривала у минулому і яка мала наслідки у минулому.
He was tired. He *had been cleaning* the house all morning.

The Periodic Table of the Elements

Traditionally, elements are represented in a shorthand form by letters. For example, the formula for water, H_2O, shows that a molecule of water consists of two atoms of hydrogen and one atom of oxygen. These chemical symbols for each of the atoms can be found on any periodic table of the elements. Using the periodic table, we can determine the number and position of the various parts of atoms. Notice that atoms number 3, 11, 19, and so on are in column one. The atoms in this column act in a similar way since they all have one electron in their outermost layer. In the next column, Be, Mg, Ca, and so on act alike because these metals all have two electrons in their outermost electron layer. Similarly, atoms number 9, 17, 35, and so on all have seven electrons in their outer layer. Knowing how fluorine, chlorine, and bromine act, you can probably predict how iodine will act under similar conditions. At the far right in the last column, argon, neon, and so on all act alike. They all have eight electrons in their outer electron layer. Atoms with eight electrons in their outer electron layer seldom form bonds with other atoms.



The List of Chemical Elements

Ac	Actinium	актиній
Ag	Argentum, Silver	срібло
Al	Aluminium	алюміній
Ar, A	Argon	аргон
As	Arsenic	миш'як
Au B	Aurum, Gold Boron	золото
Ba	Barium	барій

Be	Beryllium	берилій
Bi	Bismuth	вісмут
Br	Bromine	бром
C	Carbon	вуглець
Ca	Calcium	кальцій
Cd	Cadmium	кадмій
Ce	Cerium	церій
Cl	Chlorine	хлор
Co	Cobalt	кобальт
Cr	Chromium	хром
Cb	Columbium	ніобій
Cs	C(a)esium	цезій
Cu	Cuprum, Copper	мідь
Dy	Dysprosium	диспрозій
Er	Erbium	ербій
Eu	Europium	європій
F	Fluorine	фтор
Fe	Ferrum, Iron	залізо
Ga	Gallium	галій
Gd	Gadolinium	гадоліній
Ge	Germanium	германій
Gl	Glucinium	берилій
H	Hydrogen	водень
He	Helium	гелій
Hf	Hafnium	гафній
Hg	Hydrargyrum, Mercury	ртуть
Ho	Holmium	гольмій
Il	Illinium	ілiній
In	Indium	індій
Ir	Iridium	іридій
J, I	Oodine	йод
Kr	Krypton	криптон
La	Lanthanum	лантан
Li	Lithium	літій
Lu	Lutecium	лютецій
Ma	Masurium	мазурій
Mg	Magnesium	магній
Mn	Manganese	марганець
Mo	Molybdenym	молібден
N	Nitrogen	азот
Na	Natrium, Sodium	натрій
Nb	Niobium	ніобій
Nd	Neodymium	неодим
Ne	Neon	неон
Ni	Nickel	нікель

0	Oxygen	кисень
Os	Osmium	осмій
P	Phosphorus	фосфор
Pa	Protactinium	протактиній
Pd	Palladium	палладій
Po	Polonium	полоній
Pr	Praseodymium	празеодимій
Pt	Platinum	платина
Ra	Radium	радій
Rb	Rubidium	рубідій
Re	Rhenium	реній
Rh	Rhodium	родій
Rn	Radon	радон
Ru ч	Ruthenium	рутеній
S	Sulphur	сірка
Sa	Samarium	самарій
Sb	Stibium, Antimony	сурма
Sc	Scandium	скандій
Se	Selenium	селенів
Si	Silicon	кремній
Sr	Strontium	стронцій
Ta	Tantalum	тантал
Tb	Terbium	тербій
Te	Tellurium	телур
Th	Thorium	торий
Ti	Titanium	титан
Tl	Thallium	талій
Tu, Tm	Thulium	тулій
U	Uranium	уран
V	Vanadium	ванадій
Xe	Xenon	ксенон
Y, Yt	Yttrium	ітрій
Yb	Ytterbium	ітербій
Zn	Zinc	цинк
Zr	Zirconium	цирконій

Table of basic forms of irregular verbs

Indefinite Infinitive	Past Indefinite	Participle II
arise *виникати*	arose	arisen
be *бути*	was (were)	been
bear *носити, витримувати*	bore	borne,born
beat *бити*	beat	beaten
become *ставати*	became	become
begin *починати(ся)*	began	begun
bend *гнути(ся)*	bent	bent
blow *дути*	blew	blown
break *ламати*	broke	broken
bring *приносити*	brought	brought
build *будувати*	built	built
burn *горіти, палити*	burnt	burnt
burst *розриватися*	burst	burst
buy *купувати*	bought	bought
cast *кидати; відливати*	cast	cast
catch *ловити, схоплювати*	caught	caught
choose *вибирати*	chose	chosen
cling *прилипати, чіплятися*	clung	clung
come *приходити*	came	come
cost *коштувати*	cost	cost
cut *різати*	cut	cut
deal *мати справу*	dealt	dealt
dig *копати*	dug	dug
do *робити*	did	done
draw *тягти; креслити*	drew	drawn
drink *пити*	drank	drunk
drive *везти; приводити у рух*	drove	driven
eat *їсти, приймати їжу*	ate	eaten
fall *падати*	fell	fallen
feed *годувати(ся); харчувати*	fed	fed
feel *почувати*	felt	felt
fight *боротися*	fought	fought
find *знаходити*	found	found
fly *літати*	flew	flown
forget *забувати*	forgot	forgotten

freeze *замерзати, заморожувати*	froze	frozen
get *одержувати, ставати*	got	got
give *давати*	gave	given
go *йти, їхати*	went	gone
grind *точити, молоти*	ground	ground
grow *зростати, вирощувати*	grew	grown
hang *висіти, вішати*	hung	hung
have *мати*	had	had
hear *чути*	heard	heard
hit *вдаряти*	hit	hit
hold *тримати*	held	held
hurt *зашкодити*	hurt	hurt
keep *зберігати*	kept	kept
know *знати*	knew	known
lay *класти*	laid	laid
lead *вести*	led	led
learn *вчитися*	learnt, learned	learnt, learned
leave *залишати; їхати*	left	left
let *дозволяти*	let	let
lie *лежати*	lay	lain
light *запалювати, освітлювати*	lit, lighted	lit, lighted
lose *втрачати*	lost	lost
make *робити; змушувати*	made	made
mean *значити; мати на увазі*	meant	meant
meet *зустрічати*	met	met
pay *платити*	paid	paid
put *класти*	put	put
read *читати*	read	read
ring *дзвонити, дзенькати*	rang	rung
rise *підніматися*	rose	risen
run *бігти*	ran	run
say *говорити, сказати*	said	said
see *бачити*	saw	seen
sell *продавати*	sold	sold
send *посилати*	sent	sent
set *поміщати; ставити*	set	set
shake *трясти*	shook	shaken
shine *сіяти, світити*	shone	shone

show *показувати*	showed	shown
shut *закривати*	shut	shut
sink *занурюватися*; *тонути*	sank	sunk
sit *сидіти*	sat	sat
sleep *спати*	slept	slept
slide *сковзати*	slid	slid
smell *пахнути*; *нюхати*	smelt, smelled	smelt, smelled
speak *говорити*	spoke	spoken
speed *поспішати*; *прискорювати*	sped	sped
spend *витрачати*	spent	spent
split *розколювати(ся)*	split	split
spoil *псувати*	spoilt, spoiled	spoilt, spoiled
spread *поширюватися*	spread	spread
stand *стояти*	stood	stood
stick *приклеювати*	stuck	stuck
strike *ударяти*	struck	struck
strive *прагнути*	strove	striven
swell *роздуватися*	swelled	swollen
swing *качати(ся); розмахувати*	swung	swung
take *брати*	took	taken
teach *навчати*, *учити*	taught	taught
tear *рвати*	tore	torn
tell *розповідати*	told	told
think *думати*	thought	thought
throw *кидати*	threw	thrown
understand *розуміти*	understood	understood
wake *будити*, *просипатися*	woke, waked	woken, waked
wear *носити*	wore	worn
win *вигравати*	won	won
wind *заводити*; *витися*	wound	wound
write *писати*	wrote	written

SOCIAL ENGLISH GUIDE

UNIT I
GREETINGS

Існує багато варіантів привітань, але вибір кожного з них залежить від того, з ким ви вітаєтесь. В українській мові – так само: своєму викладачу чи керівнику ми не скажемо: "Привіт!", хоч таке привітання буде природнім в адресу друзів та близьких родичів.

Заповніть таблицю привітань залежно від ситуацій.

<u>Привітання:</u> Good day. Good evening. Evening. Good morning. Good afternoon. Afternoon. How are you doing? Hi. Hello. How do you do?

Малознайома людина, керівник, викладач, офіційна особа	Родичі, близькі друзі, товариші

Деякі привітання як в українській, так і в англійській мовах можна використовувати при розставанні. Так само, як на прощання ми можемо сказати "Привіт!", англійською можна сказати "Good evening", "Good morning", "Good afternoon".

Зазвичай у тому випадку, коли ви вітаєтесь з близькими людьми, однієї фрази привітання буває недостатньо. Як правило, за нею йде слідом етикетна репліка типу **How are you?**, **How are you getting on?,** і т.д. Усі вони приблизно означають: "Як справи". Але не потрібно на це питання давати докладну відповідь, особливо у тому випадку, коли справи йдуть не досить добре. Перш за все потрібно відповісти так само коротко:

"I'm fine, thanks" або "Not too good"
(Добре, дякую) (Не дуже добре)

Якщо не має гострої необхідності поділитися своїми проблемами, краще у будь-якому настрої дати оптимістичну відповідь. Але на цьому церемонія привітання не закінчується. Якщо вас запитали про справи, значить і ви маєте поцікавитися, чи все добре у вашого співрозмовника:

"How are you" або "And you"
(Як ти?) (А ти?)

Часто після привітання йдуть дві етикетні фрази, перша з котрих передає задоволення від зустрічі.

1. **Speech patterns**

Hello! Meeting. Getting acquainted.

Good morning!	Доброго ранку!
Good afternoon!	Доброго дня!

Good evening!	Доброго вечора!
Hello!	Привіт!
Hello, everybody!	Привіт, усім!
Hi!	Привіт!
How do you do!	Здорові були!
Good night!	На добраніч!

How are you?	Як ви?
How are you getting on?	Як справи?
How is your family getting on?	Як сім′я?
How are things with you? (your sister, parents)	Як у тебе справи? (у твоєї сестри, у батьків)
How’s life?	Як життя?
How are you doing?	Як ся маєте?
How have you been?	Як ся маєте?
How’s life treating you?	Як ся маєте?
How are you this morning?	Як справи йдуть з ранку?
How about you?	А як у Вас?
I’m fine, thank you.	Чудово, дякую.
Not too bad, thank you.	Непогано, дякую.
Not too good.	Не дуже добре.
It is great! Thank you.	Прекрасно! Дякую.
Nothing to complain about.	Нема на що скаржитися.
Nothing to boast of.	Нічим хвалитися.
Life is going its usual way.	Життя йде своїм шляхом.
Nothing new, same old things.	Нічого нового, усе як і раніше.

to introduce, to allow, to acquaint, to meet, to get acquainted, to be acquainted, an acquaintance.

Let me introduce myself.	Дозвольте відрекомендуватися.
Let me introduce my friend to you.	Дозвольте відрекомендувати Вам мого друга.
Let me introduce you to my aunt.	Дозвольте відрекомендувати Вас моїй тітці.
Allow me to acquaint you with my assistant.	Дозвольте познайомити Вас з моїм асистентом.
Do you know Mr. Brown?	Ви знайомі з містером Брауном?
Let me acquaint you with Mr. Brown.	Дозвольте познайомити Вас з містером Брауном.
Is this face (name) familiar to you?	Вам знайоме це обличчя (ім′я)?
Meet Helen, she is my groupmate.	Познайомтеся з Оленою, вона моя одногрупниця.

2. Dialogues to be remembered

***

- Good morning, Jane!
- Hello, Frank. It's good to see you. How are you?
- I'm fine, thank you. And you?
- I'm doing very well, thanks.
- How's your new job?
- Nothing to complain about.

***

- Good afternoon, Mr. Ivanenko.
- Good afternoon, Mrs. Smith.
- How are you this morning?
- Not too bad, thank you. How about you?
- The same. Did you have a nice week-end?
- It was great, thank you!

***

- Hi, Lydmila! How are things with you?
- Nothing new. Same old things.
- How are you?
- Same here. It's a beautiful, isn't it?
- Oh, yes, great.
- Would you like to go out of town?

***

- Good evening, Nastia. I was very sorry to hear about your mother's illness. How is she now?
- Nice meeting you, Victor. Thank you, I appreciate your concern. She's much better.
- Is she? Happy to hear it.

***

- How are you doing? I hope you are enjoying your new apartment.
- Oh, yes, I really do.

***

- Hello, Michael! Nice meeting you again. How have you been?
- I've been quite well and I'm happy to see you, too.
- Have you been at home all this time?
- I was on vacation in Spain.
- Did you like it there?
- "Like" is not the right word. It was terrific!

***

- Let me introduce myself. I'm Kate Jenkins.
- I'm Irina, a geologist -researcher from Kharkiv.

***

- How do you do, Mr. Brown? Glad to get acquainted with you.

***

- My name's Bush, Robert Bush. I'm a university teacher.

- Nice meeting you, Mr. Bush, I hope I'm not late.
- No, just in time.

***

- Good evening, sir. I'm Ivan Petrov from Kharkiv Aviation Company Ltd.
- Good evening. Pleased to meet you.
- May I ask you some questions?
- You're welcome.
- Your face is familiar to me, haven't we met before?
- I don't think so.

***

- Excuse me, are you Charlie?
- No, you've mistaken me for someone else.
- (in a minute) I'm sorry, are you sure you are not Charlie?
- O.K. Let me introduce myself. I'm Robert.
- (in a minute) And still, let me ask you again, are you Charlie?
- Gosh! Yes, I'm Charlie if you want it.
- Strange. You don't even resemble him.

3. Translate in writing

****

- Таню, познайомся з моїм братом Михайлом.
- Рада познайомитися, Михайло, якщо ви не проти, щоб я називала вас так.
- Аніскільки. Я теж радий зустрітися з вами, Таню. Я дуже багато чув про вас від Катерини.
- Сподіваюсь, тільки хороше.
- Звісно.
- Вам подобається Харків?
- Подобається – не те слово. Це своєрідне історичне місто.
- Ви вже були у Благовіщенському соборі?
- Ще ні.
- Бажаєте подивитись? Це близько.
- Дякую, дуже люб'язно з вашого боку.

***

- Доброго дня, пане Смирнов.
- Добрий день, пані Клименко.
- Як справи (йдуть зранку)?
- Непогано. Дякую. А як у вас?
- Так само. Добре провели вихідні?
- Чудово, дякую.

***

- Привіт, Сашо! Як справи?
- Нічого нового. Усе так само.
- І у мене теж. Чудовий день, чи не так?
- О так, чудовий.
- Не хочеш поїхати за місто?

***

- Добрий день, пане Сміт!
- Вітаю, пане Холдер, дуже радий вас бачити. Як справи?
- Нічого нового, а в цілому (in general) скаржитися нема на що.
- Де ви були весь цей час?
- Я був у відпустці у Празі у своїх друзів.
- Правда? Вам сподобалося?
- Не те слово! Було просто здорово. Мої друзі – дуже компанійські люди, а Прага – чудове своєрідне (unique) місто. А я чув, що ви змінили квартиру. Це правда?
- Абсолютно вірно (absolutely). Нам наша нова квартира дуже подобається. Не бажаєте подивитися (to have a look)? Це близько (near here).
- Гарна думка, чому б ні.

UNIT 2
PARTING

Від вміння прощатися багато залежить. Можна так розлучитися, що вашому співрозмовнику більше не захочеться з вами зустрічатися, або, навпаки, він буде всіляко прагнути нової зустрічі.

Що треба пам′ятати:

Ніколи не прощайтеся різко, раптово. Співрозмовника треба підготувати до закінчення розмови. Зазвичай на прощання кажуть один одному що-небудь приємне, на зразок:

It was nice meeting you. (Було приємно зустрітися)

або

I've really enjoyed talking to you. (Мені було так приємно поговорити з вами)

Зверніть увагу на те, що останню фразу можна використовувати тільки в тому випадку, коли співрозмовники зустрічаються вперше. А зараз наведемо приклад „найвищого пілотажу" в мовному етикеті. Уявіть собі, що ваш співрозмовник дуже балакучий і вам треба якось зупинити його та попрощатися. Яку фразу ви би використали?

I'm afraid I need to be leaving. (Боюся, що мені треба йти)

I'd better be going, it's 6 o'clock. (Я, мабуть, піду, вже 6 година)

Мабуть, обидва варіанти не будуть досить ввічливими. Проте такі фрази, як:

I've taken up too much of your time already.
(Я і так забрав у вас багато часу)

або:

Let me leave you so you can get back to your work.
(Мабуть, залишу вас, щоб ви могли повернутися до своєї роботи)

будуть досить коректними.

Ну, а способів сказати „до побачення" дуже багато:

Good bye. Good bye for now. Bye-bye. Bye. So long. See you later (next week). Later. Good night. Keep well. Take care. Take it easy.

Якщо ви прощаєтесь з офіційною особою або людиною старшою за вас віком чи положенням, не витончуйтесь у красномовстві, скажіть просто **Good bye** і тоді вже напевно не потрапите в незручне положення.

1. Speech patterns

Parting

Good bye. Bye-bye. See you. Keep well. Take care. Good luck. So long. Bye for you! I kiss you good-bye. Give my love to …

Thank you for coming.	Спасибі, що прийшли.
Thank you for a wonderful evening.	Спасибі за чудовий вечір.
Thank you for the invitation.	Спасибі за запрошення.
Let's meet next week, Sunday	Давайте зустрінемося наступного тижня в неділю.
Let's keep in touch.	Давайте підтримувати зв'язок.
Let's hope for the meeting.	Давайте сподіватися на зустріч.
Let's hope for the best.	Будемо сподіватися на краще.
Let's meet soon.	Давайте зустрінемося найближчим часом.
It was nice talking to you.	Було приємно поговорити з вами.
It was great meeting with you.	Я отримав незабутнє задоволення від зустрічі з тобою.
It was a pleasure to talk with you.	Було приємно поговорити з вами.
It was a pleasure to see you.	Було приємно побачити вас.
It was an enjoyable evening!	Ми чудово провели вечір!
It was a wonderful trip!	Була чудова поїздка.
It is really too late.	Дійсно, дуже пізно.
I am sorry to part with you.	Шкода розставатися з вами.
I am very sorry about it.	Мені дуже шкода.
I am afraid I need to be leaving.	Боюся, що мені потрібно йти.
I'm going to be late.	Я спізнююся.
I must hurry.	Я повинен поспішати.
I must be going.	Настав час іти.
I must be going, urgent business.	Настав час іти, термінова справа.
I should be going, it's getting late.	Настав час іти, уже пізно.
I'd better be going. It's 10 o'clock.	Мені час. Уже 10 година.
I've taken too much of your time.	Я відняв у вас багато часу.

I kiss you. Good bye.	Цілую. До побачення.
Remember me to your aunt.	Передайте привіт вашій тітці.
Give my love to your uncle.	Передайте привіт вашому дядькові.
My best regards to your kids.	Привіт дітям.
Have a comfortable journey.	Щасливої подорожі!
Have a good time.	Бажаю добре провести час!
Have a happy holiday.	Гарних канікул!
Have a happy landing.	М'якої посадки!
Have a happy week-end.	Бажаю добре провести вихідні!

2. Dialogues and jokes to be remembered

****

- Thanks for a wonderful evening, Lisa. I had a great time.
- Me too. Let’s meet next week and see a new movie.
- Sure thing. See you later.
- Take care.

***

- My God, I’m going to be late if I don’t hurry. Nice talking to you, Irvin.
- Same here. Take it easy.
- You, too. Till tomorrow.

***

- Have you seen Helen lately?
- Not since last party. I heard she went to Mexico for a vacation.
- Really? I didn’t know that.
- Well, let me run. Let’s keep in touch. So long.
- Bye for now.

***

- I really hate the idea of going, but…
- Oh, how time flies! Is it really that late!?
- Yes, it’s about 8.
- Give my love to your kids and bring them with you next time.
- Thank you, by all means. Good bye.
- Bye-bye. Drive safe.

***

- I must be going, urgent business. It was a pleasure.
- The pleasure was mine. Hope we’ll meet soon. Remember me to Jane.
- She will be happy to hear from you. Do come and visit us next weekend.
- Thank you, by all means. I’ll give you a ring on Friday and we’ll finally agree.
- See you on Saturday.
- Till Saturday.

***

- Dear colleagues! We are so sorry to part with you!
- Nothing can be done. The conference is over and we are leaving.

- Thank you so much, hope you'll come next year again.
- We'd love to. You've been most hospitable and supportive.
- Good bye!
- All the best.

***

(The door bell rings)
- Who's there?
- It's me, your doctor.
- Sorry, I can't see you, doctor, I'm not feeling well. Good-bye.

***

- I hate saying good-bye, John.
- Do you? I can stay for a while.
- I'd better say "See you later…"

3. Translate in writing

****

- Мені так не хочеться розлучатися з тобою, Володю, але якщо я не поквaплюсь, то запізнюсь.
- Нічого не поробиш (Nothing doing). Було приємно побалакати з тобою. Сподіваюся, ти знову зайдеш наступного тижня.
- Добре, я зателефоную, і ми домовимось.
- Переказуй вітання дружині і дітям й наступного разу візьми їх з собою.
- Дякую, обовʼязково. Дякую за чудовий вечір. До зустрічі.
- Бувай.

***

- Я повинна йти – термінові справи. Було дуже приємно поспілкуватися з вами.
- Мені теж було дуже приємно.
- Сподіваюся, ми незабаром побачимося.
- Будемо сподіватися на краще.
- Побачимось!
- Побачимось!

***

- Ой! Я спізнююся. У мене зустріч з менеджером через годину.
- Нічого не поробиш (nothing doing). Щасливо!
- Я зателефоную тобі ввечері.
- Буду чекати з нетерпінням твого дзвінка. (I'll be looking forward to …)

***

- Спасибі за прекрасний вечір!
- Спасибі, що прийшли!
- Передайте привіт від мене своїм дітям і візьміть їх із собою (bring them) наступного разу.
- Спасибі, візьму обов'язково.
- До побачення.
- До побачення. Керуйте машиною обережно. (Drive safe)

UNIT 3
SAYING "THANK YOU"

Ніщо не коштує нам так дешево і не цінується так дорого, як ввічливість. Як же дякувати по-англійськи? Найпростіше сказати ”Thank you” або ”Thanks”, але іноді хочеться та і треба вкласти більше у виявлення почуття вдячності і сказати „Ви навіть не уявляєте, як я Вам вдячний” **(You have no idea how grateful I am).**

Ну і, звичайно ж, дуже важливо слова подяки говорити щиро, дивлячись у вічі співрозмовнику.

Також зазначимо, що на відміну від, наприклад, привітань, слова подяки не треба вибирати залежно від того, з ким ми говоримо. **Thank you** можна сказати і приятелю, і президенту США.

Але якщо подякувати багато хто вміє, то відповісти на подяку на свою адресу вміє далеко не кожний. І часто тут ми припускаємося однієї дуже грубої помилки: у відповідь на **Thank you** відповідають **Please.**

Запам′ятайте: **Please** – це будь ласка в проханні, пропозиції, пораді, але не в реакції на подяку.

– Give me your pen, please.	– Дайте мені, будь ласка, свою ручку.
– Here you are.	– Ось, візьми будь ласка.
– Thank you.	– Дякую.
– Not at all.	– Нема за що.

Not at all – це лише один спосіб відповісти на подяку.

1. Speech patterns.

Thank you very much!

Thanks a lot, thank you very much, don't mention it, you are welcome, it's a mere nothing, I am so grateful

It was my pleasure.	Мені було приємно допомогти.
You are very welcome.	Мені було приємно допомогти.
You are more than welcome.	Мені було приємно допомогти.
It was the least I could do.	Нема за що, все що міг.
Think nothing of it.	Не треба дякувати.
It was nothing.	Не треба дякувати.
Don't mention it.	Нема за що.
Any time.	Завжди прошу.

2. Dialogues and jokes to be learnt

***

- Would you like some more turkey, Robert?
- Yes, thank you, it's really delicious.

- Well, thanks, I'm happy you like it. How about some more salad?
- Be so kind, please. You're a fantastic cook, Irene.
- I appreciate your compliment, but, to tell you the truth, I can cook a few things really well.
- Don't be so modest.

***

- Well, I guess I'd better be going. Thanks for the invitation. You have no idea how grateful I am for your advice.
- It was the least I could do. You're more than welcome, Alex.
- And thanks a million for your terrific apple-pie.
- Not at all. By the way here are two pieces for your kids.
- It's so kind of you. They will be happy. Thanks once more and see you again.

***

- Many thanks for inviting me to dinner, Mrs. Gray, but I'm afraid I won't be able to come.
- Oh, I'm sorry to hear that. May I ask you why?
- I have a previous commitment.
- We'll certainly miss you. Hope you'll be free next time.
- I hope so.

***

- Lots of thanks for the invitation, Bob.
- How did you like the restaurant? Is it a good place to go?
- It's a good place to go, but a terrible place to eat.

***

- Hello. Is that Mr. Green? Let me warn you that Billy Smith has a bad cold and he can't come to school.
- Thank you ever so much for warning. Who is this speaking?
- This is my father.

***

- Oh, my dear, you have no idea how grateful I am for your present!
- Did you really want to have it?
- That's just what I needed to exchange for what I wanted.

***

- Honey, thanks a lot for dinner.
- Don't mention it.
- Could you tell me what was on my plate, in case I have to describe it to the doctor?

***

(Mabel returns home from a birthday party)

- Well, Mabel, I hope you kept saying "No, thank you" more often than "Yes? thank you".
- Yes, I did, Mum. When the hosts began saying "Aren't you afraid to get sick of cakes and candies?", I said: "No, thank you" every time.

3. Translate in writing

***

- Дякую вам за чудовий обід. Все було дуже смачно. Ви чудово готуєте.
- Дякую за комплімент. Я рада, що вам сподобалось.
- Мені б дуже хотілось познайомити вас зі своєю подругою. У мене є ідея. Може, ви прийдете до мене на обід в суботу? Моя мати також непогано готує.
- Дякую за запрошення, Сашко, але у нас на цей час вже призначено зустріч.
- Дуже шкода! А як щодо (how about) наступної суботи?
- Гадаю, ми будемо вільні і прийдемо. Дуже дякую за запрошення. Дуже мило з вашого боку.

***

- Ну, мабуть я піду. Дякую за запрошення. Ви навіть не уявляєте, як я вдячний за вашу пораду.
- Не треба дякувати. Завжди вам раді.

***

- Я дуже радий, що був присутній на вашій лекції, професоре. Дякую за запрошення, лекція дуже актуальна.
- Дякую. Я радий, що проблема боротьби із забрудненням повітря вас цікавить.
- Лекція була чудовою.
- Дякую за комплімент.
- Це не комплімент, так вважають усі.

UNIT 4
SAYING "EXCUSE ME"

Ви наступили на ногу комусь в автобусі. Ви образили людину і розкаюєтесь в цьому. Ви перервали бесіду і почуваєтесь незручно. Природно, у всіх цих та багатьох інших випадках слід вибачитися. Як це зробити? Легше за все сказати **I'm sorry**, але не завжди цього буває досить. Випадково штовхнувши перехожого на вулиці, можна обмежитися наступними фразами:

I'm sorry. Sorry. Pardon me.

Правда, можна собі уявити ситуацію, коли від вашого поштовху перехожий впав у калюжу. У такому випадку доведеться бути більш красномовним, наприклад:

Oh, I'm sorry. I was so clumsy. Let me help you to clean your jacket.
О, пробачте мені. Я був такий незграбний.
Давайте я допоможу вам відчистити костюм.

Тож запасайтеся „штампами" вибачень на всі випадки життя.

I beg your pardon.	Прошу вибачення.
Pardon me, please.	Пробачте мені, будь ласка.
I hope you'll forgive me.	Сподіваюсь, ви мені пробачите.
Excuse me for…	Вибачте мені за...

I apologize for…	Я прошу вибачення за...
I'm awfully sorry.	Я дуже завинив.
I won't let it happen again.	Це не повториться.
I'll be more careful next time.	Наступного разу я буду обережнішим.

А тепер уявіть собі, що всі ці неприємності трапилися з вами з чиєїсь вини. Вибачення принесені, і треба щось відповісти. Я сподіваюсь, що всі ви добрі люди, тому зосереджусь на способах прийняття вибачень.

1. Speech patterns.

Excuse me

That's quite all right.	Усе гаразд.
Think nothing of it.	Не звертайте уваги.
Don't worry about it.	Не хвилюйтесь.
No harm done.	Нічого не трапилось.
Forget it.	Забудьте про це.
No problem.	Нема проблем.
No big thing.	Дурниці.
Pardon me, please.	Вибачте, будь ласка.
I am really very sorry to leave.	Мені так не хочеться йти.
I am very sorry to say it.	Мені так не хочеться говорити це.
Don't trouble to see me to the door.	Не турбуйтесь і не проводжайте мене до дверей.
I forgive you.	Я тебе пробачаю.
I hope you'll forgive me.	Я сподіваюсь, що ти мені пробачиш.
Oh, think nothing of it.	О, пусте.
It's a mere nothing.	Дурниці.

quite, nothing of it, problem, worry, harm, anyway, trouble, to be sorry, pardon, forgive, forget.

2. Dialogues and jokes to be remembered

***

- Oh, excuse me, sir! I'm so clumsy! I'll get you something to clean your coat right away.
- No great harm done. Don't worry. I hope it doesn't stain.
- If it does, please phone me. I'll have your coat dry-cleaned. This is my phone number.
- Well, thanks. Take it easy.

***

- Helen, let me tell you something. I borrowed your dictionary and lost it.
- Forget it. I have a newer and better one. But next time would you mind telling me when you borrow something.
- I won't let it happen again.

- Don’t worry about it. It’s all right.

***

- Could you get the tickets?
- I’m really sorry, Linda, but I couldn’t.
- You don’t have to apologize. Next time I won’t ask you so late. Thanks anyway.

***

- How many times I told you not to be late for classes?
- I hope you’ll forgive me, sir, but I don’t know. I thought you were keeping the score.

***

- Doctor, I’m terribly sorry to drag you so far on such a bad night.
- Oh, that’s quite all right. I have another patient near here, so I can kill two birds with one stone.

***

- I beg your pardon, but Mrs. Smith can’t accept you this morning.
- What did she say?
- Sorry, but she said to tell you she was not at home.
- Oh, think nothing of it, just tell her I’m glad I didn’t come.

***

- Sorry for being late.
- Anything happened?
- There are eight people in my family and the alarm-clock was set for seven.

***

Excuse me, Mum, for breaking Dad’s pipe. I’m so sorry about it.
Have you told Dad yet?
I have.
What did he say?
Shall I leave out the naughty words?
Certainly.
He said nothing.

3. Translate in writing

***

Пам′ятаєте, у А. П. Чехова є оповідання „Смерть чиновника” про те, як Іван Дмитрович Червяков ненароком чхнув на лисину генерала Бризжалова і вивів його з себе своїми багаточисельними вибаченнями? Спробуйте перекласти англійською мовою діалог, який може служити вільним переказом цієї кумедної і в той же час сумної історії.

***

- Вибачте, я не навмисно...
- Нічого, нічого.
- Заради бога, вибачте, я ж не хотів.
- Я вже забув, а ви все про те саме.
- Вибачте, я був такий незграбний!
- Дрібниці.

- Більше таке ніколи не повториться.
- Забудьте про це. Нічого страшного не трапилось.
- Я буду більш обережним наступного разу.
- Ви що, смієтесь наді мною?
- Я дійсно винуватий...
- Пішов геть! (Get out!)

***

- Хелен, я тобі щось повинна сказати.
- Я взяла твою ручку і загубила її.
- Забудь про це. У мене є краща і новіша. Але наступного разу, будь ласка, говори мені, якщо ти що-небудь береш.
- Я більше так не буду.
- Не переймайся, все гаразд.

***

- Ти можеш дістати білети на новий спектакль?
- Вибач, але я не зможу.
- Не вибачайся. У будь-якому разі, дякую.

UNIT 5
WEATHER

Ми кажемо: „ У природи немає поганої погоди”. Англійці кажуть: „Немає поганої погоди, є поганий одяг”. Коли нам нема про що поговорити, ми говоримо про погоду. Щоб заповнити паузи, говорять про погоду. Ми слухаємо прогноз погоди та плануємо, що одягти. Часто від погоди залежить наш настрій та й не тільки! Від відповіді на питання **“What is the weather like today?”**ми очікуємо все-таки чогось приємного, що підвищує настрій. Але відповідь не завжди звучить **“The weather is fine”** іноді і **“The weather is nasty”** і настрій псується, але не забувайте „У природи немає поганої погоди!”

1. Speech patterns

Weather

How’s the weather?	Яка погода?
What’s the weather like?	Яка погода?
It’s nice!	Гарна (погода)!
It’s pleasant	Гарна (погода)!
It’s dreary	Похмуро
It’s sunny	Сонячно
It’s cloudy	Хмарно
It’s rainy	Дощить
It’s foggy	Туманно
It’s hot	Жарко
It’s warm	Тепло
It’s cool	Прохолодно

It’s chilly	Прохолодно
It’s cold	Холодно
It’s freezing	Морозно
It’s windy	Вітряно
It’s humid	Сиро

When there is precipitation at the moment

It is raining.	Йде дощ.
It is snowing.	Йде сніг.
It is sleeting.	Йде дощ зі снігом.
It is hailing.	Йде град.

Extreme weather events include the following:

What is happening?	Що відбувається?
There is lightning.	Блискавка
There is thunder.	Грім.
It’s a storm.	Шторм!
It’s a gale.	Сильний вітер.
It’s a hurricane.	Ураган (сильний вітер зі швидкістю 75 миль на годину).
It’s a cyclone.	Циклон.
It’s a tornado.	Торнадо (сильний вітер, що руйнує).
It’s an earthquake.	Землетрус.
It’s pleasant to walk in such weather.	Приємно гуляти в таку погоду.
It’s pleasant to go skating in such weather.	Приємно кататися на ковзанах в таку погоду.
It’s pleasant to eat ice-cream when the temperature is 35° above zero.	Приємно з’їсти морозиво, коли температура +35°C.
The weather is fine.	Погода чудова.
The weather is wretched.	Погода погана.
The weather is disgusting.	Погода огидна.
The climate is mild.	Клімат м’який.
The climate is humid.	Клімат вологий.
The climate is severe.	Клімат суворий.
The climate is temperate.	Клімат помірний.

Warm. Hot. Sleeting. Drizzle. Fog. Snow. To be fast. To be slow. To keep right time. Alarm-clock. Watch. a.m. p.m.

a.m. – in the morning
p.m. – in the afternoon, evening, at night.

What time is it?	Котра година?
It is one o’clock or it is one a.m.	Перша.
It is two o’clock or it is two p.m.	Друга.
It is seven o’clock or it’s seven p.m.	Сьома.
It is eleven o’clock or it is eleven p.m.	Одинадцята.
It is noon or it’s twelve p.m.	Полудень.
It is midnight or it’s twelve a.m.	Північ.

What time is it?	To answer:
use figures for:	it is + hour + the number of minutes past the hour
the traditional form:	it is + the number of minutes after the hour or the number of minutes before the hour

Digital form	Traditional forms
It’s one-oh five	It’s five after one. It’s five past one
It’s two-ten	It’s ten after two. it’s ten past two
It’s three-fifteen	It’s fifteen after two. It’s fifteen past two
It’s nine forty-five	It’s fifteen to ten. It’s fifteen of ten. It’s a quarter to ten. It’s a quarter of ten

What time is the concert?	В якому часі починається концерт?
It’s at eight o’clock (It’s at 8 p.m.)	В вісім вечора.
What time is the party?	Коли починається вечірка?
It’s at seven-thirty.	В 7.30
What time are we leaving?	Коли ви їдете?
We’re leaving at 6 a.m. sharp.	Ми їдемо рівно о шостій ранку.
My watch keeps right time.	Мій годинник йде правильно.
My watch doesn’t keep right time.	Мій годинник йде неправильно.
My watch is slow.	Мій годинник відстає.
My watch is five minutes slow	Мій годинник відстає на 5 хвилин.

2. Dialogues to be remember

***

- Lord! A beastly day. It’s pouring outside. I’m wet through: my sweater, my shirt, jeans, socks, shoes are all wet.
- Gee! I’d say, Peter, you are wet!
- You don’t look yourself. You should change your clothes as soon as possible, or you’ll fall ill.

***

- I wouldn’t put it like that. This winter is extremely warm. The temperature is usually high. There is no snow. It often rains.

- You have said it.

***

- What is the weather like today?
- It is rather warm , the sky is covered with grey clouds. Sometimes it rains.
- Do you like such weather?
- I don't. In such weather I feel sleepy.
- Same here.

***

- Is it frosty?
- Oh, yes. The temperature is about 15 degree below zero.
- Don't forget to put on your fur hat.
- I won't.

***

- How long does winter last in your city?
- It depends… Though December, January and February are the winter months, sometimes winter begins in February and lasts only 2 months.

***

- What time is it now?
- I don't know exactly.
- Don't you have a watch?
- Yes, I do.
- Then, what time is it by your watch?
- I've forgotten it at home.
- It's a pity.

***

- I must be off. Urgent business.
- What business I wonder?
- It's an appointment with my doctor.
- I have to be in his office at half past one. And now it is 20 past one.
- Take care!

3. Translate in writing.

***

- Погода кепська сьогодні, чи не так?
- Так, мабуть (Yes, rather).
- Що трапилось?
- Я не міг заснути всю ніч через цей жахливий вітер.

***

- Чи помітили Ви, яка стоїть гарна погода?
- Вона чудова! (Gorgeous!)
- Дуже гарний день для заміської прогулянки в лісі.
- Вірно!
- Шкода, що я не насолоджуюсь природою у відпустці!
- Тоді чекаю на вас внизу через 45 хвилин.

- Давайте звіримо годинники. Зараз 9.10. О 9.55 ми зустрічаємося в холі. Добре?
- Так, з нетерпінням чекаю на цю прогулянку.

***

- Сподіваюсь, погода скоро зміниться.
- Я також сподіваюсь. Дуже втомилася від цього безкінечного дощу.
- Ллє як із відра вже 2 тижні.
- Не турбуйся! Англійці кажуть: „Немає поганої погоди, є поганий одяг”.

***

- Що ви знаєте про клімат Великобританії?
- Там м’який клімат. Середня температура взимку вище ніж в Україні. сніг ніколи довго не лежить.
- А річки замерзають?
- Ніколи! Темза суднохідна весь рік, не те що Дніпро, який замерзає взимку!

UNIT 6
ASKING THE WAY

Дуже важливо уміти показати дорогу тій чи іншій людині, якщо вона не знає вашого міста. Якщо Ви приїхали у незнайому країну або місто, у Вас неодмінно виникнуть такі питання: „**Як добратися до...?”**, „**Як пройти до...?”** тощо. Тому тема “**Asking the way**”, можна сказати, – одна з найважливіших.

Перш за все Вам слід запамʼятати три моделі:

How can I get to…?	Як пройти до...?
How long will it take me to get to…?	Скільки треба часу, щоб дістатися до...?
It will take you…	Вам знадобиться...

А все інше залежить від того „**Куди?”** та знання граматичних часів.

It takes me	Мені треба.
It took me	Мені знадобилось.
It will take me	Мені знадобиться.

1. Speech patterns

How can I get to…?. Asking the way

It takes me an hour to get there	Мені потрібна година, щоб дістатися туди.
It took them two years to learn to play tennis	Їм знадобився рік, щоб навчитися грати в теніс.
It will take you a quarter of an hour to report	Вам знадобиться 15 хвилин, щоб зробити доповідь.
How long does it take us to get there by car?	Скільки нам потрібно часу, щоб дістатися туди на машині?
How long will it take our tourists to do	Скільки часу знадобиться нашим

shopping?	туристам, щоб зробити покупки?
How long did it take Alex to write the module test?	Скільки часу знадобилося Алексу, щоб написати модульний тест?
How can I get to the nearest bank?	Як дістатися до найближчого банку?
How do I get to the underground station “Moskovsky Prospect”?	Як потрапити на станцію „Московський проспект”?
How can we get to the Arts Museum?	Як пройти до Художнього Музею?
You have been most helpful.	Ви мені дуже допомогли.
You have been most polite.	Ви дуже люб′язні.
You have been most kind.	Ви дуже добрі.
The bus stop is over there.	Зупинка автобуса там.
The supermarket is not far from there.	Супермаркет недалеко звідси.
The State library is nearby.	Державна бібліотека поблизу.
The University you are looking for is near here.	Університет, який ви шукаєте, знаходиться тут.
The parking lot is opposite the hotel I am staying at.	Паркування напроти готелю, у якому я зупинився.
The Underground station is within 5 minutes’ walk.	Метро в п'ятьох хвилинах ходьби.
The bank is next to the drugstore.	Банк за аптекою.
The nearest post-office is round the corner.	Найближча пошта за рогом.
I go there **by** bus.	Я їду туди автобусом.
You can go there **by** local train.	Ви можете доїхати туди електричкою.
He gets there **by** Metro.	Він добирається туди на метро.
You can reach this place **by** air.	Ви можете добратися до цього місця літаком.
You can go there **on** foot.	Ви дійдете туди пішки.

Excuse me. How can (do) I get to…? To go by bus (trolley-bus, air, water…) To go on foot. To walk. To get in (off) a bus (trolley-bus). Over there, over here. Near there, near here. The traffic light. To cross. To pass. Nearby.

Is there a bus to the center?	До центру іде автобус?
Is there a tram stop nearby?	Тут поблизу є зупинка трамваю?
Is there a gas station near here?	Чи є тут заправка?

2. Dialogues to be remembered

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- Excuse me. I want to see Mr. Pavlov.
- Mr. Pavlov’s office is on the 11th floor. Take the lift, please
- Thank you, very much. You have been most helpful!
- It’s my duty to help you.

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- Is Broad Street far from here?
- Turn left, there you'll see a parking lot. Take the second turning on your right and you are in Broad Street.
- Thanks a lot.

***

- Is this the right way to Barford?
- I'm afraid not. You should drive in the opposite direction.
- How long will it take us to come to Barford?
- At the speed of 90 km/hour it will take you around 7 hours.
- Oh, no!
- I am sorry.

***

- Excuse me. Where is the nearest drugstore?
- Look here, go down this street two blocks straight ahead and you'll see the drugstore which is the nearest from here as far as I know.
- Thanks a lot.
- Don't mention it.

***

- Hi! Glad to see you!
- Hi! I heard you had moved to a new apartment.
- Yes. And I am very happy and I'd like to invite you to my housewarming party. Will you come?
- I will. But…
- What but?
- But I don't know how to get to your place.
- Look. Walk straight ahead until the traffic lights, then pass the road and turn left, one block down that street and you'll find yourself at my place. By the way, here is my visiting card with my phone numbers. Just in case!
- Thank you ever so much. I'll call you up and you'll tell me the day and time of your housewarming party.
- Hi!
- Hi!

3. Translate in writing

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- Вибачте мені, як пройти до гуртожитку № 13 ХНУ?
- Вниз по цій вулиці, потім поверніть ліворуч біля світлофору і ви побачите невеличкий парк. Ідіть через парк, нікуди не звертаючи, упродовж 3 хвилин. І ви біля гуртожитку № 13.
- Дякую.
- Бажаю успіху.

***

- Вибачте мені. Я вперше у Вашому місті. Як я можу дістатися до ХНУ?
- Ви майбутній студент?

- Так. Я збираюся подати документи у цей університет.
- Який збіг! Я там навчаюся на географічному факультеті.

  Дивіться. Йдіть вниз по цій вулиці до майдану. Ви побачите його праворуч. До речі, це другий за розміром майдан в Європі. Йдіть цим майданом угору до памʼятника Леніну. Йти треба прямо, нікуди не звертаючи. Праворуч від Вас буде готель „Харків ”, ліворуч ви побачите сквер, а потім побачите дуже гарну споруду – це і є ХНУ імені В. Н. Каразіна.

  До речі, біля університету ліворуч ви побачите памʼятник засновнику – В. Н. Каразіну.
- Дуже дякую. Ви мені дуже допомогли.
- Прошу. Бажаю Вам вступити до університету!

UNIT 7
INVITATIONS

Як запросити до себе в гості, в кіно, в театр? Як прийняти запрошення та як його відхилити? Чи можна іноді обманювати?

Теж мені проблеми, скажете ви. Сказав **Yes** – прийняв запрошення, сказав **No** – відмовився від нього. Чи так це?

Давайте уявимо собі чотири ситуації: вас запрошують і ви

1) з радістю приймаєте запрошення,
2) сумніваєтесь, прийняти його чи відмовитися,
3) ввічливо відмовляєтесь,
4) різко відмовляєтесь.

1. Speech patterns

Invitation (Will you come?)

To invite. Care to have. Another time, maybe. That’s perfect. I’d love to. With pleasure. I don’t think so. What’s the occasion? Occasion calls for celebration.

Let’s go for a walk.	Давай підемо на прогулянку.
Let’s play football on Sunday.	Давай пограємо у футбол у суботу.
Let’s go to the country for the weekend.	Давай поїдемо за місто на вихідні.
Let’s invite her to the housewarming party.	Давай запросимо її на святкування новосілля.
I would like to invite you to dinner.	Я хотів би запросити вас на обід.
I would like to go to the disco dancing with you.	Я б хотів піти на дискотеку з тобою.
Would you like to go to the theatre tonight?	Не хотів(ла) би ти піти до театру сьогодні ввечері?

Would you care to have a party one of these days?	Як ти дивишся на те, щоб влаштувати вечірку найближчим часом?
What about a game of tennis next week?	Пограємо у теніс наступного тижня?
How about going to the restaurant today?	Чи не піти нам у ресторан сьогодні?
Shall we go out in the evening?	Давай погуляємо ввечері.
What about having a cup of coffee?	Як щодо філіжанки кави?
What about coming in for a cold drink?	Давай зайдемо вип'ємо чого-небудь холодного.
Would you mind having dinner with me?	Ти не проти пообідати зі мною?
How do you feel about going to the Art Gallery?	Може, підемо в художню галерею?
I am sorry, but I can’t.	Вибачте, але я не можу.
I wish I could, but …	Я б хотів, але, на жаль, …
I don’t think so...	Я так не вважаю.
I have to say “no”.	Повинен відмовитися.
I hate saying ”no”, but …	Я ненавиджу відмовляти, але …
I really don’t care...	У мене дійсно немає бажання.
I’m busy.	Я зайнятий.
Maybe another time.	Може, іншим часом.
I’m not sure.	Я не впевнений.
I can’t. I am awfully sorry. I am busy.	Я не можу. Мені дуже шкода. Я зайнятий.
I’ve got another invitation already.	У мене вже призначена інша зустріч.
Maybe a little later.	Може, наступного разу.
With great pleasure!	З задоволенням!
I’d love to!	З задоволенням.
That’s fine!	Прекрасно!
It’s a good idea.	Гарна думка.
Why not!	Чому б і ні.
It sounds attractive (great).	Звучить привабливо (чудово).
That would be wonderful!	Це було б чудово!
That’s perfect!	Пречудово!
I’ll be looking forward to it.	Я буду з нетерпінням чекати.

2. Dialogues and jokes to be remembered

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- I would like to invite you to dinner at the new French restaurant.
- Thank you very much. That would be wonderful!

***

- Sally, would you care to go to the movies tonight?
- Thanks, Nick, but I'm not sure. Could I let you know in half an hour?

***

- How about a game of tennis tomorrow, Paul?
- Thank you, Victor, I wish I could, but I'm busy tomorrow. Maybe another time…

***

- Hi, Pat. Are you busy?
- Not much really. Why?
- That's good. Would you like to go to the Art Gallery? There's a new exhibition there.
- Nice idea! I'd like that very much. How about Saturday afternoon?
- That's perfect! I'll be looking forward to it.

***

- Morning, Alex! You look tired.
- I am, actually. I was helping my friend to move to a new apartment.
- What about coming in for a cold drink?
- I can't, Robert. I've got to get home before late. Another time maybe.
- Sure, see you later!

***

- Hello, Kate. I'm glad I ran into you. My parents are visiting me for a few days and I'm giving a small party this Friday. I want them to meet some of my friends. Can you and Alex come?
- That sounds great, but I need to check with Alex first and see what his plans are. What time does it start?
- About 7.30.
- If we come, we may be a little late, okey?
- Sure. No problem.

***

- I would like to invite you to the theatre.
- Thanks, but I would prefer movies. Last performance was so bad, that people were lining up to get out of the theatre.

***

- Would you mind having dinner with me?
- Sure. That would be fun. Where?
- Turkish restaurant.
- Oh, no, never. The food there is absolute poison and such small portions!

***

- How about going to the opera?
- Well, it's a good idea.
- What did you hear in the opera last night?
- All sort of news: Masha got married, the Ivanovs got divorced…

3. Translate in writing

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- Іро, як що до того, щоб піти в кіно сьогодні ввечері?
- Мені так не хочеться говорити „ні”, але я дуже втомилась. Я допомагала своїй подрузі в переїзді на нову квартиру.
- Може, тоді зайдемо у кафе або прогуляємось?
- Вибач мені ще раз, але я не впевнена. Може, іншим разом?
- Добре. Нічого не поробиш. Завтра день народження Кирила. Підеш зі мною?
- Дякую за запрошення, Віктор, але завтра у мене справи.
- А як щодо післязавтра?
- Добре, зателефонуй мені, і ми домовимось. А зараз вибач, я спізнюся на обід. Батьки чекають на мене.
- Передавай мої вітання батькам.
- Дякую, передам.

***

- Давай поїдемо за місто на вихідні.
- Спасибі за запрошення, але я зайнята в суботу і неділю. Приїхали мої батьки.
- А через тиждень? Погода обіцяє бути прекрасною. Покатаємося на лижах, підемо в ресторан.
- Добре, зателефонуй мені, і ми домовимося. А зараз вибач. Якщо я не поспішатиму, то спізнюся на вечерю. На мене чекають батьки.
- Передай їм привіт.
- Спасибі, передам.

***

- Добрий вечір, пане Мітчел. Як поживаєте?
- Спасибі, добре. А Ви?
- Теж добре. Ви зайняті в суботу?
- Ні. А що?
- Приходьте до нас обідати. Ми будемо дуже раді.
- Спасибі за запрошення. Але з якої нагоди? (What's the occasion?)
- День народження моєї дружини.
- Це треба відзначити. (The occasion calls for celebration). Прийду із задоволенням.
- Спасибі. До побачення. Чекаємо на Вас у неділю о 5 вечора.

***

- Привіт, Люсі. Я рада, що зустріла тебе. Я влаштовую (I am giving) невелику вечірку в цю п'ятницю. Я хотіла б познайомити тебе зі своїми друзями. Ти зможеш прийти з Пітером?
- Звучить привабливо, але мені потрібно спочатку запитати Пітера про його плани (to check with Peter at first). О котрій початок?
- Десь о 8.30.
- Якщо ми прийдемо, то, можливо, трішки спізнимося, добре?
- Звичайно. Ніяких проблем.

UNIT 8
APPEARANCE

Кажуть, „зустрічають за вбранням, а проводжають за розумом”. І дійсно тут є доля правди. Але перше враження не завжди правильне. Які ж фрази треба використовувати для опису зовнішності людини, рис його характеру, як позитивних так і негативних, тощо?

Запамʼятайте наступні фрази та не плутайте їх!

To look like	виглядати
What does he look like?	На кого він схожий?
To be like	риси характеру, освіта
What is he like?	Що він за людина?
To take after	Бути схожим на когось характером
Who does she take after?	В кого вона характером?

1. Speech patterns

Appearance

What do you think of Jane?	Що ти думаєш про Джейн?
What is Helen like?	Що за людина Олена?
Jane is honest and kind.	Джейн чесна та добра.
Helen is sincere.	Олена щира.
What does Nikita look like?	Як виглядає Микита?
He is tall, slim and black-eyed.	Він високий, стрункий з чорними очима.
Who does your sister take after?	В кого пішла характером ваша сестра?
She takes after our father.	В нашого батька.
To be honest.	Бути чесним.
To be sincere.	Бути щирим.
To be punctual.	Бути пунктуальним.
To be careless.	Бути недбалим.
To be stubborn.	Бути впертим.
To be easy to deal with.	Бути людиною, з якою легко мати справу.
To be talented.	Бути талановитим.
To be educated.	Бути освіченим.
To be a reliable partner.	Бути надійним партнером.
To be on friendly terms.	Бути у дружніх стосунках.
To be reserved.	Бути стриманим.
To be polite.	Бути ввічливим.
To be professional.	Бути професіоналом.
To be of great intellect.	Бути освіченою людиною.
To be angry.	Бути сердитим.

To be greedy.	Бути жадібним.
To be cruel.	Бути жорстоким, безжалісним.
To be double-faced (two-faced).	Бути нещирим, двоєдушним.
To be harmful (noxious).	Бути зловредним.
To be hot-tempered.	Бути запальним.
To be a lickspittle (toady, wheedler).	Бути підлизою.
To be illiterate.	Бути неосвіченим.
To be ignorant.	Бути невігласом.
To be beautiful.	Бути красивою.
To be a picture of a girl.	Бути красунею.
To be handsome.	Бути красивим.
To be blonde (brunette, brown, fair).	Бути блондинкою (брюнеткою, шатенкою, білявкою).
To be slim.	Бути струнким.
To be stout.	Бути повним.
To be tall.	Бути високим.
To be of middle height.	Бути середнім на зріст.
She is blue-eyed (black-eyed).	Вона блакитноока (чорноока).
My sister is long-legged.	У моєї сестри довгі ноги.
She is small-nosed (long-nosed).	У неї маленький ніс (довгий ніс)
To have an irresistible smile.	Мати неперевершену усмішку.
To be married.	Бути заміжнім.
To be engaged.	Бути зарученим.
To be divorced.	Бути розлученим.
To be single.	Бути одинаком.
To be a widow (widower).	Бути вдовою (вдівцем).

To look like. To be like. To take after. To think of. To keep fit. Well-read, well-educated. To be handsome. Irresistible smile. To rely on. By first marriage

2. Dialogues to be remember

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- Have you seen our new English teacher?
- Not yet, why?
- She is young and pretty.
- Really?
- She is blonde, tall, slim with an irresistible smile.
- Is she married?
- That’s what I’d like to find out.

***

- Do you know Mr. Robinson?
- We’ve met at the conference in New York. He was reporting there.
- What is he?
- He is talented, well-educated, highly professional. He is easy to deal with.

- Really? And what does he look like?
- He is of middle height, neither slim nor stout. He is black-eyed, broad-shouldered.
- Does he wear a beard or a moustache? When we met he was wearing neither a beard nor a moustache.

***

- Excuse me. Are you married?
- No, I am divorced.
- Do you have children?
- Yes, I have a daughter by first marriage.
- Who does she take after?
- Both my former husband and me. She is stubborn as my husband, but kind and honest as I am.
- Does she work or study?
- She graduated from the university and teaches English at the Kharkiv National Automobile and Highway University.
- Does she like her profession?
- “Likes” is the wrong word, she adores it!

***

- Hi, glad to see you! How are you! I heard you were going to get married.
- You are quite right!
- What is your future wife?
- She is a student. She is a future hydrogeologist. And her job is very promising.
- What does she look like?
- She is of middle height, slim, grey-eyed. Her hair is brown. She has a snub nose and a very good figure.
- When are you going to get married?
- In a week. Will you come to our wedding party?
- I will.
- By the way, what is her name?
- She is Victoria Dubrovina.
- Oh! Her name is familiar to me. If I am not mistaken we studied together in school.
- Really?
- I think so.

3. Translate in writing

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- Бажаєте ви познайомитися з Кирилом Кравчуком?
- Ну, я нічого про нього не знаю. Як він виглядає?
- Він ані високий, ані низький, широкоплечий. У нього чорні очі, густі брови та довгі вії.
- Що він за людина?
- Він дуже стриманий, ввічливий, добрий та чесний.
- Скільки йому років?

- Я точно не знаю. (I don’t know exactly) Гадаю, не більше тридцяти.
- Він одружений?
- Ні, і ніколи не був.
- Познайом мене з ним. Мені здається, що він цікава особистість (personality). До речі, а чим він займається?
- Він відомий геолог та вчений, незважаючи на те, що молодий.

***

- У вас новий начальник? Що ви можете сказати про нього?
- Я майже його не знаю, але можу сказати, що у нього гарні манери і він дуже кваліфікований керівник.
- Опишіть його зовнішність.
- Він маленький, повний, у нього кругле обличчя, світлі очі, прямий ніс, він лисий (bold).
- У вас була можливість з ним поговорити?
- Так, і я маю сказати, що з ним легко мати справу.
- Мені приємно це чути. Він мій старший брат. Вам буде легко з ним працювати, він – надійна людина.
- Будемо сподіватися.

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- Цей молодий чоловік ваш син?
- Звідки ви знаєте?
- Він схожий на вас.
- Так, але він пішов у матір характером. Він дуже запальний.
- Скільки йому років?
- Йому 18, він на 2 роки молодше моєї доньки.
- Ваша донька – красуня, вона схожа на кінозірку.
- Вона поліглот – знає англійську, французьку, німецьку, китайську та португальську мови. Я дуже пишаюся своїми дітьми.

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- Що трапилось з Віктором, він захворів?
- Так, але ліки тут не допоможуть (useless in this case).
- Що ви маєте на увазі?
- Віктор безнадійно закоханий.
  І якщо я не помиляюся, у вірусу світле волосся, блакитні очі, він стрункий, з довгими ногами та неперевершеною посмішкою.
- Нам слід відволікти його від думок про неї. Вона заміжня, закохана та щаслива.

UNIT 9
TELEPHONING

Загальні характеристики телефонних розмов майже такі ж, що і при особистій бесіді. Однак, є низка відмінностей, які залежать від середи комунікації та обмежень, які вона накладає.

Якщо під час бесіди ви бачите один одного, ви можете використовувати жести, міміку, які допомагають спілкуванню та взаєморозумінню, чого немає при розмові по телефону. Розмови по телефону менш емоційні та прості.

1. Speech patterns.

Speaking

call	телефонний виклик, дзвінок
to call up	зателефонувати
to make a call	зателефонувати
to phone	зателефонувати
to ring smb.	зателефонувати
to buss smb. (Am.)	зателефонувати
receiver	слухавка
to lift the receiver	підняти слухавку
to pick up the receiver	підняти слухавку
to replace the receiver	покласти слухавку
to hang up	покласти слухавку
to ring off	покласти слухавку
to dial	набрати номер
to listen for dialing tone	чекати відповіді
The line is free	Номер не зайнятий.
The line is engaged = The line is busy	Номер зайнятий.
coin-box telephone = telephone booth = box phone	телефон-автомат
extension	додатковий номер
switchboard	комутатор
switchboard operator	телефоністка
trunk-call = long distance call	міжміський телефонний виклик
subscriber	абонент
Subscriber Trunk Dialing (S.T.D.)	МАТС
telephone directory = telephone book	телефонний довідник
to clear = to disconnect	роз’єднувати
caller	той, хто дзвонить
to connect = to put a call through	з’єднувати
to hold on	не класти слухавку, чекати
to make a call through the operator	зателефонувати через телефоністку
ADC = “advice duration and charge”	повідомте тривалість та вартість розмови
personal call = person-to-person call	розмова по телефону, замовлена на певну людину
station-to station call	розмова по телефону, замовлена на номер абонента
transferred-charge call = collect call	розмова по телефону, замовлена за рахунок того, кого викликають

charge	плата (за телефонну розмову)
alphabetic directory	алфавітний довідник
fire department = fire brigade	пожежна станція
ambulance	швидка допомога
telephone repair service	бюро ремонту телефонів

Speaking. To put through. To dial. To be available. Wrong number. To be engaged. To make a call. To call back.

Can (could, may) I speak to Mr. Ivanov?	Я можу поговорити з паном Івановим?
Can (could) you put me through to Mr. Sedov?	З'єднайте мене, будь ласка, з паном Сєдовим.
Can (could) you take a message?	Прийміть, будь ласка, повідомлення.
Can (could, may) I use your phone, please?	Можна скористатися вашим телефоном?
Can (could) you speak up, please?	Говоріть, будь ласка, голосніше.
Can (could) you hold on?	Почекайте, будь ласка.
Can (could) you hear me well?	Ви мене добре чуєте?
Can (could, may) I make a long-distance call?	Я хотів би зробити міжміський дзвінок.
Is Mr. Surikov available?	Можна пана Сурикова?
Is that Mr. Brown?	Це пан Браун?
Are you on the telephone?	У вас є телефон?
Am I speaking to Frank Morris?	Я розмовляю з паном Френком Моррісом?
Are you there?	Ви мене чуєте?
Who is calling, please?	Хто телефонує?
What city, please?	Яке місто?
What number, please?	Який номер?
What is the charge for the call?	Яка плата за дзвінок?
How long will you be speaking?	Як довго ви будете розмовляти?
What is the extension number?	Який додатковий номер?
Speaking, please.	Слухаю.
Go ahead, please.	Продовжуйте.
Hold the line, please.	Не кладіть трубку, будь ласка.
You are wanted on the phone.	Вас до телефону.
I am trying to connect you.	Я намагаюся з'єднати вас.
You are through, please.	Ви на зв'язку. Говоріть.
I am putting you through with Mr. Ivanov.	З'єдную з паном Івановим.
Mr. Petrov is not available.	З паном Петровим не вдається з'єднатися.
There is no one by such name here.	Тут немає нікого з таким ім'ям.
There is no reply (answer) at the	Абонент не відповідає.

number.	
There is a call for you	Вам телефонують.
You’ve got the wrong number.	Ви неправильно набрали номер.
You were cut off completely.	Вас відключили.
We have been disconnected.	Нас роз’єднали.
I can’t get you on the phone.	Я не можу зв'язатися з вами за телефоном.
I can’t hear you well.	Я погано вас чую.
I can’t be reached by phone.	Зі мною не можна зв'язатися за телефоном.
He is speaking on the phone now.	Він зараз розмовляє по телефону.
The telephone is quite dead.	Телефон зіпсований.
I’ll answer the call.	Я відповім на дзвінок.
I have dialled the number twice.	Я двічі набрав номер.
There is no reply.	Відповіді немає.
The line is surcharged.	Лінія перевантажена.
The line is engaged (The line is busy).	Лінія зайнята.
The line is free.	Лінія вільна.
The call is urgent.	Дзвінок терміновий.
Where is a telephone booth?	Де телефонна будка?
Where is a coin-box phone?	Де телефон-автомат?
Where is a telephone directory?	Де телефонна книга?
Where can I make a call?	Де я можу подзвонити?
Tell him to call me up.	Скажи йому зателефонувати мені.
Tell the secretary to answer the telephone call.	Скажіть секретарю відповісти на телефонний дзвінок.
Tell her to call me back.	Скажи їй, щоб вона мені зателефонувала.
Tell your secretary to put down (take, write down) my phone number.	Скажіть своєму секретарю, щоб вона записала номер мого телефону.
As soon as he calls me up I’ll tell him everything.	Як тільки він мені зателефонує, я все йому розповім.
If he calls me up we’ll fix our meeting.	Якщо він зателефонує, то ми домовимося про зустріч.
After finishing the telephone interview our boss will call you back.	Після закінчення телефонного інтерв'ю наш начальник зателефонує вам.
What is the number of fire department (fire brigade)?	Який номер пожежної частини?
What is the number of police?	Який номер поліції?
What is the number of telephone repair service?	Який номер служби ремонту телефонів?

2. Dialogues to be remembered

***

- Hello!
- Hello. I'd like to speak to Mr. Smirnoff.
- Speaking.
- Barlow here. Good morning, Mr. Smirnoff.
- Could you speak up, please? Your voice is ever so faint.
- Hold on a minute, please. I'll try to fix the microphone. Are you here, Mr. Smirnoff?
- Oh, yes. I think that's much better now.
- Mr. Smirnoff, I am calling to invite you to dinner tomorrow.
- Thanks a lot. It's very kind of you and I'd be happy to join you but I'm afraid I've got another engagement for tomorrow. I'm very sorry.
- I'm sorry too, but I do understand. I should have invited you a few days ago. Good-bye.
- Good bye, Mr. Barlow.

***

- Hello. This is Petrov from the Ukrainian Trade Delegation. Could you put me through to Mr. Russell, please?
- Hold on a minute, please. Sorry, Mr. Russell is not available at the moment and he won't be back until late this afternoon.
- Would you ask him to call me when he gets back?
- Certainly.

***

- Hello. May I speak to Mr. Roberts?
- Sorry, sir. Mr. Roberts is not available. Are there any messages?
- No, thank you. I'll call back later.
- Right. Good-bye.

***

- Three-four-five-eight-double seven- nine.
- Can I speak to Mr. Scott?
- I'm afraid you've got the wrong number.
- Oh, sorry to have troubled you.
- That's all right.

***

- Hello, I'd like to talk to Mr. Smith, please.
- I'm afraid you have the wrong number. What number were you calling?
- I was calling 340-01-98.
- This is 34-01-98. But there is no one by the name of Smith here. This is a private residence.
- I'm sorry to have bothered you.
- That's quite all right.

***

- I'm sorry. I can't hear what you are saying. Could you speak up, please?
- Hello, hello. Are you there?

- Your voice is fading and there's some noise interfering. Hello, hello…
- (no reply) Operator. We had a very bad connection and could scarcely hear each other. Could you help us?
- Yes, sir. I'll try to do something about it.

***

- Five-seven-three-one-nine-oh-four. How can I help you?
- Good evening. Can I speak to Mr. Jones, please?
- Sorry. Mr. Jones is on the other line. Will you wait, please?
- All right.
- Sorry to have kept you waiting. I'm putting Mr. Jones on the line.
- Thank you.

3. Translate in writing.

***

- З'єдную.
- Алло, будьте ласкаві, пана Андерсена, будь ласка.
- Хвилинку Хто питає?
- Алла Іванівна. Я телефоную з Києва. Термінова розмова.
- Не вішайте слухавку, будь ласка.
- Алло, говорить Андерсон.
- Алло! Алло! Пан Андерсон, ви добре мене чуєте?
- Так, звичайно. Радий, що впізнали мій голос.
- Я прочитала вашу статтю. Вона дуже цікава. Вітаю вас.
- Дуже радий це чути. Дякую.

***

- Алло! Попросіть до телефону Олесю Іванівну.
- Боюся, її немає. Що-небудь переказати?
- Так, будь ласка. Перекажіть їй, що я буду телефонувати рівно о 15.00. Моє прізвище Кравченко. Валентин Кравченко.
- Добре. Що-небудь ще?
- У мене для неї приємна новина. Вона перемогла в олімпіаді з англійської мови.
- Це дуже приємна новина. Я перекажу. Дякую.
- Дякую. До побачення.

***

- Це готель „Чічіков"?
- Так. Доброго ранку. Говоріть. Я Вас слухаю.
- Я б хотіла забронювати номер по телефону.
- Назвіть себе, будь ласка.
- Пані Козлова.
- Дякую. Який номер Ви бажаєте?
- Одномісний, з усіма зручностями.
- Так, я можу забронювати Вам одномісний номер з усіма зручностями.

- Скільки він буде коштувати?
- 100$ на добу.
- Ви можете підтвердити замовлення письмово?
- Так, я підтверджу це замовлення письмово. Я напишу сьогодні та відправлю по e-mail.
- Дякую. До побачення.
- До побачення.

UNIT 10
HOTEL

Ви приїжджаєте до незнайомого міста, треба поселитися у готелі, як це зробити? А як забронювати номер в готелі, щоб не зіткнутися з тим, що всі місця зайняті і вам ніде переночувати? А як найняти квартиру?
Ось бачите, скільки запитань. І як їх вирішити?
I'd like to … – Я б хотів(ла). – Ось основна фраза, яка всім потрібна.

1. Speech patterns.

Apartment (Hotel)

I'd like to reserve a room in your hotel.	Я би хотіла забронювати номер в цьому готелі.
I'd like to book a room in your hotel.	Я би хотіла забронювати номер в цьому готелі.
I'd like to have a single room.	Мені потрібен одномісний номер.
I'd like to stay in a suite.	Мені потрібен номер-люкс.
I'd like to rent an apartment.	Я би хотіла найняти квартиру.
I'd like to check in.	Я би хотіла зареєструватися.
I'd like to check out.	Я би хотіла виписатися.
To move to a new apartment.	Переїхати на нову квартиру
To rent a flat.	Найняти квартиру.
To rent an apartment.	
One bedroom apartment.	Двокімнатна квартира.
Two bedroom apartment.	Трикімнатна квартира.
To live in a studio.	Жити в однокімнатній квартирі.
To share a studio with smb.	Жити в однокімнатній квартирі з кимось.
The apartment is comfortable.	Квартира зручна.
The room is cozy.	Номер затишний.
The room faces the street.	Номер з вікном на вулицю.
The room is noisy.	Гучний номер.

To reserve. To book. To rent. Double (single) room. Suite. To fill in (out)/ Arrival card/ Studio/ Two-bedroom flat. Facilities. Accommodation. Real-estate.

What's the charge for the room?	Скільки коштує номер?

What's the rent?	Скільки коштує оренда?
What's the fare?	Скільки коштує проїзд?
How much is the service?	Скільки коштує обслуговування?
How much do I owe you?	Скільки я вам винен?
How long are you planning to stay in our hotel?	Скільки ви збираєтесь жити в нашому готелі?
How long are you going to live in this rented apartment?	Скільки ви збираєтесь жити в цій орендованій квартирі?
How long do you want to live here?	Скільки ви хочете жити тут?
We can offer you an outside (inside) room.	Ми можемо запропонувати вам кімнату з вікном на вулицю (з вікном на двір).
We can offer you a room facing the yard.	Ми можемо запропонувати вам номер з вікном на двір.
We can offer you a flat on the third floor.	Ми можемо запропонувати вам квартиру на третьому поверсі.
Does the flat (apartment) (room) suit you?	Квартира (номер) вас влаштовує?
Does the charge suit you?	Платня вас влаштовує?
Will the rent suit you?	Вас влаштує оренда?
I can afford a large room (apartment, flat)	Я можу дозволити собі великий номер у готелі (квартиру).
I can afford a suite.	Я не можу дозволити собі номер-люкс.
You should turn to the rental agency to rent a flat.	Вам слід звернутися в агенцію з найму житла, щоб орендувати квартиру.
You should turn to the rental agent to see the flat.	Вам слід звернутися до агента з найму житла, щоб оглянути квартиру.
You should consult the real estate agency to buy a house.	Вам слід звернутися в агенцію з нерухомості, щоб купити будинок.
You should consult the real estate agent to find a house for renting.	Вам слід звернутися до агента з нерухомості, щоб орендувати будинок.

2. Dialogues to be remembered

***

- I hear you have moved to a new apartment, is it true?
- Yes it is. One of these days we'll arrange a housewarming party. I want you and your mother to be present.
- Thank you for the invitation. How do you like your new apartment?
- It's very comfortable. It is a three bedroom apartment with all modern conveniences: electric stove and a lot of built-in cupboards.
- Oh, what floor is it on?

- Our apartment is on the tenth floor of a high-rise dwelling house.

***

- Is your apartment far from the center of the city?
- Rather. It takes me about an hour to get to the center by bus and by metro.
- Have you bought new furniture?
- We've bought wall units, two armchairs and a new icebox. We are planning to buy two carpets and a dining set.
- Good luck!

***

- Are you going to move to a new apartment?
- No, I'm not. We have been living in our two-room apartment for about eight years and we don't want to move anywhere.
- Your apartment is comfortable, isn't it?
- Yes, very. We arranged everything very nicely and I like it very much. We don't have much furniture, but we have got everything we need.
- I'm glad to hear it.

***

- I'd like to have a double room with a bath.
- How long are you planning to stay?
- I guess, I'll stay here for three or four days.
- I can give you an outside room on the seventh floor.
- Is it very noisy?
- By no means. The street is very quiet. The room faces a big park.
- How much is the room?
- The charge is 100$ a day. Breakfast included.
- All right. I'll take it.

***

- Good evening. My name is Tamara Holder. I hope you've got my reservation.
- Could you spell your name, please?
- T-a-m-a-r-a H-o-l-d-e-r.
- Just a minute.There is a reservation in your name for a double room for three days from today.
- What floor is it on?
- The 4^{th}. Please, fill in the arrival card.
- Here you are!
- Here is your key.
- Thanks a lot.

***

- Hello, is it "Mir" Hotel?
- Right.
- Could I speak to the chief receptionist, please?
- What can I do for you?
- I'd like to reserve a room at your hotel.
- No problem. What room do you like to reserve?
- A suite on the third floor.

- I can reserve for you a suite on the third floor, room 333 with all conveniences facing a quiet street. Does it suit you?
- Sure. Thank you.
- What is your name and when are you arriving?
- Ivan Petrenko. I am planning to stay for a week.
- I've done the reservation, Mr. Petrenko.
- Thank you.
- Welcome to our hotel. We are looking forward to receiving you.

***

- Good afternoon. I'd like to check out. I am leaving tonight. Please, prepare my bill.
- Sure. The bill will be ready in 10 minutes. Shall I send it to your room?
- No, I'll pay here at the desk.

***

- I know you just returned from the USA, am I right?
- You are quite right!
- I am going to the USA one of these days.Is it possible to reserve a room there by telegram or by phone?
- Sure. And don't forget that the room charge includes breakfast and 13% service charge. You won't have to tip your maid and the waiter.
- I'll keep it in mind.

3. Translate in writing

***

- Доброго ранку! Мене звуть Дана Браун. Сподіваюся, Ви маєте номер для мене?
- Не могли б Ви назвати своє ім'я по літерах?
- Д-а-н-а Б-р-а-у-н.
- Хвилинку Міс Браун.

  Так все вірно. Ми можемо запропонувати Вам одномісний номер від сьогодні на 6 днів.
- Чи є там душ?
- В номері окрема ванна кімната, телевізор, холодильник.
- Скільки коштує цей номер?
- 150 $ за добу.
- Платня прийнятна.

***

- У Вас є вільні номери?
- А який Ви бажаєте?
- Я би хотіла одномісний з усіма зручностями.
- Заповніть цей бланк, будь ласка. Підпишіть тут. Ось Ваш ключ.
- До речі, о котрій годині сніданок?
- Будь-коли між 7 і 10 ранку в ресторані. Це внизу.
- Можу я поснідати у себе в номері?
- Це не складно. Ви можете замовити його за телефоном 0-1-1-1.

***

- В якому номері Ви живете?
- 1212.
- Як чудово! Ми сусіди! Мій номер на цьому ж поверсі. Я проводжу вас туди.
- Дякую. Ви дуже люб'язні.

***

- Погода погана сьогодні, чи не так?
- Так, мабуть.
- Що трапилось? Ви виглядаєте таким засмученим (upset).
- Біда в тому, що я не можу жити в своєму номері.
- Що в ньому не так?
- Нічого поганого в самому номері немає. Кімната досить велика. Вона виходить вікнами на двір і тому не гучна.
- Вона затишна?
- Вона світла, чиста, затишна та сонячна. Мені вона дуже подобається. Але мені не подобається людина, яка живе у сусідньому номері. Він дуже голосно хропить усю ніч.

***

- Проходьте у вітальню, я повернусь через хвилину.
- Яке затишне місце!
- Меблів не багато.
- Нема нічого зайвого.
- Яке приємне поєднання кольорів: золотистий, коричневий, білий, трошки червоного та чорного і раптом ця зелена кімнатна рослина.
- Кімната виглядає мило(cheerful)!

***

- Я чув, що Ви збираєтесь переїхати на нову квартиру?
- Ти не зовсім правий. Ми переїжджаємо в новий будинок, який нещодавно купили.
- А де він знаходиться?
- За містом. У 20 км від міста. Дивовижне місце! Поряд із будинком є озеро та ліс!
- Скільки часу Вам тепер потрібно, щоб дістатися до роботи?
- Близько 30 хвилин.
- А будинок великий?
- Три рівні. Внизу гараж, сауна, басейн. На 2-му поверсі – хол, кухня і на
- 3-му – 4 кімнати, ванна.
- У будинку всі зручності?
- Так, усі.

***

- У вашій квартирі багато меблів?
- Ні. Все, що необхідно.
- Нова квартира дуже зручна, чи не так?

- Так. І мені вона дуже подобається. Я запрошую тебе до себе. Ось моя візитка, тут усі мої телефони та адреса.
- Дякую за запрошення.

UNIT 11
STUDENT'S LIFE

Немає нічого кращого в житті за студентські роки. Згодом ми завжди згадуємо ці роки як найтепліші, найважливіші, доленосні сторінки нашого життя. Ми згадуємо улюблені предмети, шановних професорів, чудові миті студентства, коли ми юні, сповнені сил, попереду чудове життя, повне надій...

"What are you?" – звучить питання та дивовижна відповідь **"I am a student. I am a future ecologist, engineer…"**

1. Speech patterns

Student's life

What are you?	Хто ви?
Where do you study?	Де ви навчаєтесь?
What year student are you?	На якому курсі ви навчаєтесь?
What higher school do you study at?	В якому ВНЗ ви навчаєтесь?
When did you enter the college (University, Academy)?	Коли ви вступили до колледжу (університету, академії)?
When will you graduate from the University (college, Academy)?	Коли ви закінчите університет (колледж, академію)?
I've entered the road-building faculty (the geographical faculty, the faculty of hydrogeology).	Я вступив на дорожньо-будівельний факультет (географічний факультет, факультет гідрогеології).

To enter. To graduate from. To fail in (at). To lag (to fall) behind. To take an exam in. To pass an exam. Entrance exams. To be dull. To be interesting. To leave. To last. Postgraduate. Undergraduate. To deliver. Double period. Fresher.

Дуже цікаве в студентстві те, як студенти проводять свій вільний час, яке в них хобі.

Sports and sporting activity. To win. To lose. To be interested in. To go in for… Pastime. To prefer. To care for. To be crazy about. To enjoy doing. To be keen on. To be popular.

What's your hobby?	Яке твоє хобі?
My hobby is collecting coins.	Моє хобі – колекціонувати монети.
What is your favourite pastime?	Як ти любиш проводити час?
I have been crazy about dancing since	Я божеволію від танців ще зі

student's time.	студентських років.
What sports do you enjoy doing?	Якими видами спорту тобі подобається займатися?
I enjoy track and field athletics.	Мені подобається легка атлетика.
What are you keen on?	Чим Ви захоплюєтесь?
He is keen on football.	Він захоплюється футболом.
What is he interested in?	Чим він цікавиться?
We are interested in reading detective stories.	Ми цікавимось детективними історіями.
What did you care for when a student?	Чим Ви захоплювались, коли були студентом?
What was your hobby when you were a student?	Яке було у Вас хобі, коли Ви були студентом?
When a student I was good at playing tennis.	Я добре грав у теніс, коли був студентом.
My sister likes skin-diving.	Моя сестра займається підводним плаванням.
To go in for canoeing	Займатися веслуванням на каное
To go in for sailing	Займатися парусним спортом
To go in for fishing	Займатися риболовлею
To go in for sporting activity	Займатися фізкультурою
To go in for surfing (skate boarding, soccer, rugby)	Займатися віндсерфінгом (катанням на скейті, футболом, регбі)
Your hobby seems to be very useful	Твоє хобі здається дуже корисним.
Your pastime seemed to be both practical and interesting.	Твоє проведення часу здається корисним і цікавим.
He seems to be carried away by his hobby – collecting pictures.	Здається він по вуха захоплений своїм хобі – колекціонуванням картин.

2. Dialogues to be remembered

***

- Good morning, Karl!
- Good morning, Dale!
- I am sorry to have kept you waiting.
- Don't mention it. Where are we going?
- It's up to you.
- In that case I suggest we should go to the tennis court and play a game of tennis.
- Good idea! I know you are the best at the University at playing tennis. How old were you when you began playing tennis?
- Just a minute… Let me think… I was about eight years old when I started playing tennis. Since that time tennis has been my hobby.

***

- Hello, Valentina! Haven't seen you for ages! What are you doing now?

- I study at the Kharkiv National University.
- Do you? What faculty?
- At the faculty of geology.
- What a coincidence! I study at the Ivano-Frankivsk Oil and Gas institute. I study geology, too!

***

- How long does the course at the University last?
- It lasts 4 or 5 years. If you want to get only the bachelor's degree, then you study for 4 years. If you want to get the master's degree you have to study for 5 years.
- How many double periods a day do you usually have?
- As a rule, we have 3 double periods, namely: 2 lectures and a seminar or practical hours.
- Do you have any free time?
- Certainly. In my pastime I go in for gymnastics and modern dancing.
- And do you have a hobby?
- A hobby? My hobby is growing house plants.
- How very interesting!

***

- I hear golf is very popular in Great Britain.
- Oh! Yes. Golf is played all the year round – on special golf field both in summer and winter.
- Have you passed your seasonal exams?
- Yes. I could hardly manage them. I was sure I would fail at least in two of them.
- The trouble is that you burn the candle at both ends. You can't play football all days running and study well.
- But you know I am crazy about football and try to score as many goals as possible.
- But you shouldn't forget about your studies.
- You are quite right! I'll follow your advice.

3. Translate in writing

***

- Я чув, що ти навчаєшся в США, в коледжі?
- Так, я вивчаю екологію в коледжі та через рік буду магістром екології.
- А ти займаєшся спортом в коледжі?
- Звісно. Спорт дуже популярний в Університетах та коледжах США.
- А яким спортом ти займаєшся?
- Я займаюся баскетболом і бейсболом. У баскетбол грають в школах, коледжах та клубах. Як дівчата, так і хлопці захоплюються грою в баскетбол і бейсбол.
- Які ще ігри популярні в Америці?
- Ну, бейсбол, теніс, футбол та, звісно, гольф.
- Мені хотілося б подивитися гру в бейсбол. Де це можна зробити?

- Приходь до мене та ми подивимось на відеогру в бейсбол між нашим факультетом і факультетом електроніки.
- А хто виграв?
- Звісно, ми!

***

- Що Ви закінчили?
- Середню школу 10 років тому та університет 2 роки тому.
- Навчання в університеті було безкоштовне?
- Ні, я платив за своє навчання.
- Ви отримали диплом бакалавра?
- Не тільки. Я – бакалавр та магістр. Зараз навчаюся в аспірантурі.
- У Вас є аспірантура у ВНЗ?
- Так, через рік буду захищати кандидатську дисертацію.
- Ви дуже зайняті! А як Ви проводите вільний час?
- Я захоплююсь підводним плаванням. Можна сказати, що це моє хобі!

UNIT 12
GIVING TALKS AND PRESENTATIONS

1. Introducing the topic

This morning I'm going to … (talk about …)
Today I'd like to … (describe) …
The aim of my presentation this morning is to … (explain …)
I've divided my presentation into (three parts)
My talk will be on …
First, I'd like to ... (give you n overview of …)
Second, I'll move on to … (focus on …)
After that, we'll deal with …
Finally, we'll consider …

2. Referring to questions

Feel free to interrupt me if there's anything you don't understand.
If you don't mind, we'll leave questions till the end.

3. Introducing each section

So, let's start with … (objectives …)
Now let's move on to … (the next part …)
Let's turn our attention to … (the question of …)
This leads me to … (my third point …)
Finally … (let's consider …)

4. Summarizing a section

That completes my … (description of …)
So, to summarize … (There are five key points …)

5. Referring backwards and forwards

I mentioned earlier … (the importance of …)
I'll say more about this later.
We'll come back to this point later.

6. Checking understanding

Is that clear?

Are there any questions?

7. Referring to visual information

This transparency/diagram shows …

If you look at this graph you can see …

What is interesting in this slide is …

I'd like to draw your attention to …(this chart …)

8. Referring to common knowledge

As you know …

As I'm sure you're aware …

9. Concluding

That concludes my talk.

That brings me to the end of my presentation.

If you have any questions, I'd be pleased to answer them

I'll do my best

Thank you for your attention.

10. Dealing with the questions

That's a good point.

I'm glad you asked that question.

Can I get back to you on that later? I'm afraid I don't have … *(the information at present)*

I'm afraid I'm not the right person to answer that.

Practice

1. Presenting a company:

The text below is part of a presentation of a glass-making company. Fill in the blanks with the appropriate language:

Firstly, then, thirdly, secondly, if you look at, so to recapitulate, and to complete the picture, now I would like to describe, as you can see from the transparency, I'd like first of all to give you an overview

Good morning, ladies and gentlemen ……… of our company. It is organised in three world-wide business lines ……… , the Building products business, ……… the Automotive products business and ……… the Technical Glass products business.

……… the Building products business accounts for about half the Group's sales and has manufacturing operations in 19 countries. Its largest operation is in Europe and we also have major operations in North and South America and Australia.

The Automotive products business represents around 45 % of sales. Its organisation is subdivided into two major units supplying original equipment and replacement glass. There are operations in 18 countries with the major presence in

Europe and North America, and important operations in South America and Australia.

……… the technical Glass products business accounts for the remaining sales and is centred in Germany, the United Kingdom, the United States and Italy. It manufactures glass for the electronic and optical industry, precision mirrors and solar energy panels.

……… the country's structure ……… the organisation chart, the various businesses report through their management boards to the chief executive ……… , working from the corporate centre are Group functions – responsible for directing the businesses in their respective disciplines such as corporate affairs, environment and safety, finance, purchasing, legal and secretarial, human resources and internal audit. Technology is the only function that is organised centrally.

That's all I want to say at this point on company structure.

……… , we have three major business lines, Building products, Automotive products and Technical Glass products. And there are various Group functions that report to the chief executive through the management boards. Are there any questions at this stage?

2. Describing a graph:

It is not necessary to describe every single movement on a graph; an outline of the main trends is enough:

This graph shows world gross domestic product growth from 1973 until the end of the 20th century. With the oil crisis in 1973, GDP growth fell sharply by 5 %, from 7 % in 1973 to 2 % at the end of 1975. It recovered in the following year before declining ever further in the next six years to reach a low point of 1 % in 1982. Over the next two years GDP growth rose steadily to reach 5 % but fluctuated in the following years before plummeting again in 1997. It reached a low point of 1.5 % before edging up slightly in 1998-99.

Business correspondence

Opening

Dear Sir
Madam
Mr Murphy
Mrs Brown
Miss Young
Ms White
George
Dr Green

When you don't know the receiver's name, use *Sir or Madam*.
For a man, use the receiver's family name with *Mr*.
For a married woman, use the receiver's family name with *Mrs or Ms.*
For an unmarried woman, use the receiver's family name with *Miss or Ms.*

For a close business contact or friend, use the receiver's first name.
For a doctor, use *Dr* and the family name.
Ms can replace *Mrs and Miss.* It doesn't indicate whether a woman is married.

Making reference

Thank you for your telephone call today.
With reference to your letter of 8 August …
Further to your letter of 30 September …

Apologising

I apologise for the delay/not replying sooner.
I am sorry that I am not able to help you.

Explaining the reason for writing

I am writing to ask you…
to enquire about…
to inform you that…
to confirm…

Agreeing to requests

I would be delighted to… / pleased to…

Giving bad news

I am afraid that …

Unfortunately …

Requesting

I would be grateful if you could …
We would appreciate it if you could …
Could you possibly …

Enclosing documents

I have pleasure in enclosing …

I am enclosing …

I enclose

Referring to future contact

I look forward to meeting you next month
I look forward to receiving your reply
I look forward to hearing from you soon.

Finishing

Please let me know if you have any questions.

Please contact us again if we can help in any way
Please, contact us again if you would like any further information.

Closing

Yours faithfully
Yours sincerely
Best wishes.

NOTE!

When you open the letter with Dear Sir or Dear Madam, use Yours faithfully.
When you open the letter with the receiver's family name, use Yours sincerely.
For a close business contact or friend, use Best wishes.

Practice

1. Work in pairs. Read these statements about letters. Tick if they are T (true) or F (false):

Letter-writing quiz

1. If a letter begins with the receiver's name, e.g. *Dear Mr. Brown*, it closes with *Yours sincerely* and the signature.
2. If you wrote to Peter Brown and wanted to use his first name, you would write *Dear Mr. Peter*.
3. If you did not know if a female correspondent was married or not, you could write Ms, instead of *Miss or Mrs*.
4. If you wrote a letter to Mrs Susan Lambert, you would open it with *Dear Mrs Susan Lambert*.
5. The abbreviation for a doctor is *Dr.*, e.g. *Dear Dr. Bell*.
6. If you did not know the receiver's name, you would close the letter with *Yours faithfully* and the signature.
7. In the USA, the date 5/8/96 on a letter means 8 May 1996.
8. It is correct to begin a letter with *Gentlemen* in the USA.

2. Work in pairs. Match the phrases to the function they express:

Functions	**Standard phrases**
1. Making reference	a) Could you possibly …?
2. Explaining the reason for writing	b) I am afraid that …
3. Requesting	c) With reference to your letter of 20 February…
4. Enclosing documents	d) Please find enclosed …
5. Confirming	e) I am writing to enquire about …
6. Apologising	g) We apologise for the mistake…
7. Thanking	i) I am pleased to inform that…
8. Referring to future contact	j) I look forward to seeing you next month…
9. Finishing the letter	h) Thank you very much for sending…

3. Complete the letter with suitable phrases.

Institute of Energy Conservation
51 St. John’s street, Manchester M1 4DF
Prof. J. Penn
19A Gloucester St
Faringdon
OXON OSN 7JA

21 March

Dear John

……… to ask you if you could make a presentation of your latest research at our annual conference next month.

……… a provisional programme, to give you an idea of the main topics, and details of the conference hotel.

……… not writing to ask you earlier, and I very much hope that you will be able to talk to us.

……… .

With best wishes

Yours sincerely

Dr Marcus Lerner
Director

TEXTS FOR ADDITIONAL READING AND SPEAKING PRACTICE

Text 1

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

THE HISTORY OF SCIENCE

From the earliest times, people have been curious about the world around them. Thousands of years before civilization began, people learned to count and tried to explain the rising and setting of the sun and the phases of the moon. They studied the habits of the animals they hunted, learned that some plants could be used as drugs, and acquired other knowledge about nature. These achievements marked the beginnings of science. They were among the first attempts to understand and control nature. In general, mathematics and medicine were the first sciences to develop, followed by the physical sciences and social sciences.

The most ancient science was developed in Egyptian and Babylonian cultures as early as 3000 B.C. The Chinese and Indian civilizations developed a little later, in 300 B.C. But the Greeks left the greatest scientific heritage of all the ancient peoples. Aristotle (300 B.C.), the greatest Greek philosopher, studied many areas of science. He also developed deductive logic as a means of reaching conclusions. Greek mathematicians Pythagoras and Euclid (300 B.C.) had perfected geometry as a single logical system. Archimedes (200 B.C.) was not only a mathematician but also a great inventor.

By the 100's A.D., the city of Rome had conquered much of the known world, including the Greek civilization. They were excellent architects, engineers and builders but they contributed little to theoretical science. They accepted the scientific knowledge of Greeks.

The Middle Ages was a 1,000-year period in European history that began in the 400's A.D. For hundreds of years after this period began, little scientific investigation took place in Europe. Most scholars were more interested in theology, the study of God, than in the study of nature.

The rebirth of science in Europe began in 1543 with the publication of two books that broke scientific tradition. One book was by the Polish astronomer Nicolaus Copernicus “On the Revolutions of the Heavenly Spheres”, and the second by Andreas Vesalius, an anatomist, named “On the Structure of the Human Body”.

The scientific revolution took place during the late 1500's and early 1600's because scientists realized the importance of experimentation and mathematics to scientific advances. The great scientists Galileo (an astronomer), Isaac Newton (a physicist and astronomer), Wilhelm Lebniz (a philosopher), Robert Boyle (a chemist) and others worked at that period.

The Age of Reason, also called the Enlightenment (Просвіта), was a philosophical movement that greatly affected the development of science during the late 1600's and the 1700's. The leaders of the movement insisted that the use of reason was the best way to determine truth. The philosophers of the Age of Reason developed many rules of scientific study that are still used.

In 1800's scientific advances were great. Darwin's theory of evolution became one of the most intensely debated scientific issues of the late 1800's. The theory aroused especially fiery opposition among religious leaders who thought that it conflicted with the Biblical account of the Creation. Another important idea in biological sciences was the theory that all living things are made up of cells (proposed by two German scientists, Mattias Schleiden and Theodor Schwann). D. Mendeleev systematizes the study of chemistry, James Joule advanced the law of the conservation of energy, James Maxwell worked out the mathematical equations for the laws of electricity and magnetism, Heinrich Hertz produces elecromagnetic waves and his work led to the development of radio, radar and TV. Gregor Mendel, an Austrian monk, discovered the basic statistical laws of heredity that laid the foundation for the science of genetics. Louis Pasteur started modern microbiology. Sigmund Freud established the field of psychoanalysis.

2. What do these dates in the text refer to?

3000 B.C., 300 B.C., 400 A.D., 1543, 1800's.

3. What discoveries and inventions, in your opinion, are likely to appear in the near future? Continue the list of inventions in the text with 3-5 ideas of your own.

Text 2

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

EXPLORATION GEOPHYSICS AND THE BASIC SCIENCES

One of the most recently established branches of applied science, exploration geophysics, is actually an offshoot of several basic disciplines, such as physics, chemistry, and mathematics. The various techniques of geophysical prospecting are based on a number of fundamental principles of physics, such as the laws of gravitational and magnetic attraction, the laws governing reflection and refraction in optics (as applied to seismic prospecting), and the elements of electricity and electromagnetic theory. Although these principles are quite simple, it is generally difficult to apply them to the study of rock materials, which are seldom homogeneous and which often have complex physical properties.

Nearly all the major methods of geophysical prospecting evolved from techniques originally employed for more or less **academic studies of the earth's large-scale features.**[1] Gravity prospecting was developed after pendulum measurements had been carried out for several decades to determine the earth's precise shape by changes in gravitational pull (attraction) between different observing stations. The seismic refraction method **makes use of principles worked out early in the present century**[2] by earthquake seismologists who developed them to unravel the structure of the earth's interior. Magnetic instruments which were basically the same **as those used in present-day prospecting**[3] made it possible to chart some of the earth's magnetic elements on a global scale as early as in the seventeenth century.

Today there is a much greater volume of activity in geophysical exploration than in basic research on the physics of the earth. The dependence of geophysical prospecting upon the scientific work which preceded it has now evolved into a fruitful interdependence between the two. Many of the tools and techniques developed to explore for minerals have been advantageously used in academic studies on the structure of the earth's crust and its interior.

2. Answer the following questions:

1. What are the techniques of geophysical prospecting based on? 2. What are the physical properties of rock material? 3. When was gravity prospecting developed? 4. What are the major methods of exploration geophysics?

3. Put questions to all parts of the sentence:

The various techniques of geophysical prospecting are based on a number of fundamental principles of physics.

4. Give the Ukrainian for:

a) technique, science, law, dependence, exploration, to carry out, to work out

b) rock material, gravity prospecting, pendulum measurement, refraction method, earthquake seismologist, on a global scale, applied science

c) recently, such as, as ... as

5. Find in the text English equivalents for:

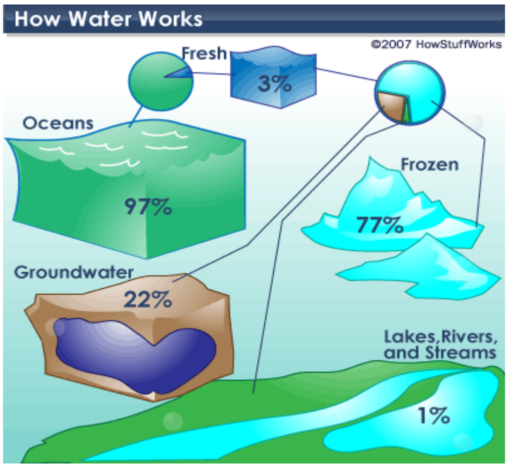
Закон, розвідка, розробляти, маятникові виміри, сейсмолог, прикладна наука, метод переломлених хвиль, землетрус, нещодавно.

6. Speak on the modern geophysical methods used in our country

Text 3

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

WORLD'S WATER SUPPLY



How much water is there in the world? The total amount of water in existence — in the world's oceans, ice fields, lakes, rivers, soils, rocks, and in the atmosphere — amounts to about 1,300 million cubic kilometres.

Man, however, gets along with less than one per cent of the world's water.

Where is the water?

About 97 per cent of water is in the oceans and most of the rest is frozen on Antarctica and Greenland. If the 16 million square kilometers of the Antarctic ice cap melted at a uniform rate, it would yield about 26,000,000 cubic kilometres of water. That much would feed the Volga River for more than 50,000 years.

The basic sources of water are the oceans, from which it is derived by evaporation, rivers and lakes and soil moisture.

The latter may be the most significant segment of the world's water supply because of the key role played by plants in the food chain. The greater mass of vegetation on earth lives on dry land. This is possible because the land is really dry at just a few places, and often only temporarily. Dust, for example, may contain up to 15 per cent of water by weight.

The average amount of water held as soil moisture at any given time is in the order of 24,000 cubic kilometres for the world as a whole — an insignificant percentage of the earth's total water, but vital to life.

The survey notes another little-considered water reservoir known to man for thousands of years: underground water.

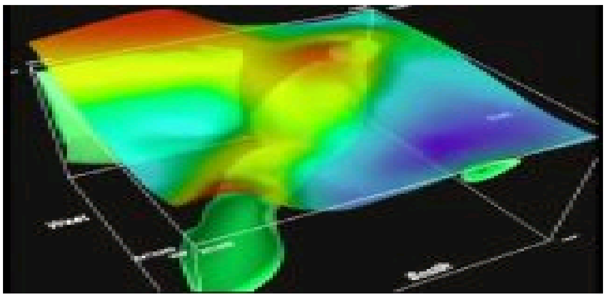
Below the water table — the upper limit of a zone underground where the pores of rocks and sediments are completely saturated with water — there are about 4 million cubic kilometers of ground water. The volume of ground water in the upper kilometer of the continental crust probably is about 3,000 times greater than the volume of water in all rivers at any time.

Man has become so numerous, and has activities so extensive, that he has begun to affect the water volume certainly on a regional scale and very likely on a global scale.

Text 4

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

GEOCHEMICAL SURVEY



Geochemical surveys may be divided into several groups on the basis of the material sampled and analyzed.

In general there are two more or less distinct methods of applying geochemical surveys to the problems of mineral exploration depending on whether the object of the survey is a broad reconnaissance of a large area or whether the object is a detailed study of a much smaller area.

Reconnaissance geochemical surveys are carried out by making use of the drainage system as the major control of the sampling pattern. In this type of survey, soils, sediments and waters are sampled and areas of general interest containing dispersion fans or dispersion trains are outlined. Such reconnaissance methods are most effectively applied in well-drained areas of moderate relief. In flat poorly-drained terrains such methods cannot be employed with any assurance of success.

Detailed geochemical surveys are carried out by sampling rocks, soils, or vegetation at regular intervals on a grid pattern. The proper interval between sampling points is determined by such factors as expected width of mineralized zone, depth of overburden, and slope of the ground. If the strike of the mineralized zone is known, then a greater sampling interval may be used in the strike direction. The base line of the grid pattern should be established parallel to the strike of the mineralized zone. Soil samples should be collected at uniform depths below surface.

Water samples may be collected from stream waters or from ground waters. Water samples are analyzed in the field. Ground waters normally contain higher base metal values than do running waters flowing in open channels. Therefore, values for ground waters cannot be compared with values for streams. In areas devoid of base metal sulphide mineralization the stream waters and the ground waters are negative in respect to the base metal and contain less than one part of metal in one thousand million of solution. Stream values in waters draining from areas containing base metal mineralization may have up to several parts per million of base metals.

Simple chemical analyses of stream or lake waters can be carried out by the prospector using prepared water-testing kits. More detailed analyses of waters, soils, twigs, etc., must be done by trained chemists in modern laboratories using precise quantitative chemical and spectrographic analyses.

In biochemical surveys, i.e. geochemical surveys of the metal content of vegetation, it is essential that the sampling of plant material be confined to similar parts of the same species of plant. Research work has shown that the optimum sampling conditions are achieved when the second –year growth of the plant twig is selected for sampling. The choice of species of plants is, of course, restricted to the plants growing in the area to be explored. At the present time it appears that the coniferous species are more reliable indicators than the most of the deciduous varieties. However, it should be noted that there is a marked variation in the ability of plant species to accumulate metal, and it is necessary to take into consideration both the distribution of the plant species and the type of metal that is being sought.

2. Answer the following questions:

1. What groups may geochemical surveys be divided into?
2. In what type of survey are soils, sediments and water sampled?
3. What is a biochemical survey?
4. What is essential in a biochemical survey?

3. Give the Ukrainian for:

a) survey, sampling, pattern, value, slope, overburden, strike, to sample, to carry out, to outline, to be devoid of, to confine, to take into consideration, to establish.

b) drainage system, sampling pattern, on a grid pattern, dispersion fan, reconnaissance methods, ground water, base metal value, stream value, metal content, research work, sampling interval, plant twig, mineral exploration
c) whether, in respect to.

4. Give the English for:
Грунтова вода, згідно з сіткою, басейн річки, опробування, протяжність, прийняти до уваги, малюнок розсіювання, вміст металу, по відношенню до.

5. Find synonyms among the following words:
To carry out, to confine, to choose, wide, precise, to restrict, to pick out, exact, broad, to select, to limit, to conduct.

6. Form nouns from the following words; translate them.
Broad, wide, deep, able, to choose.

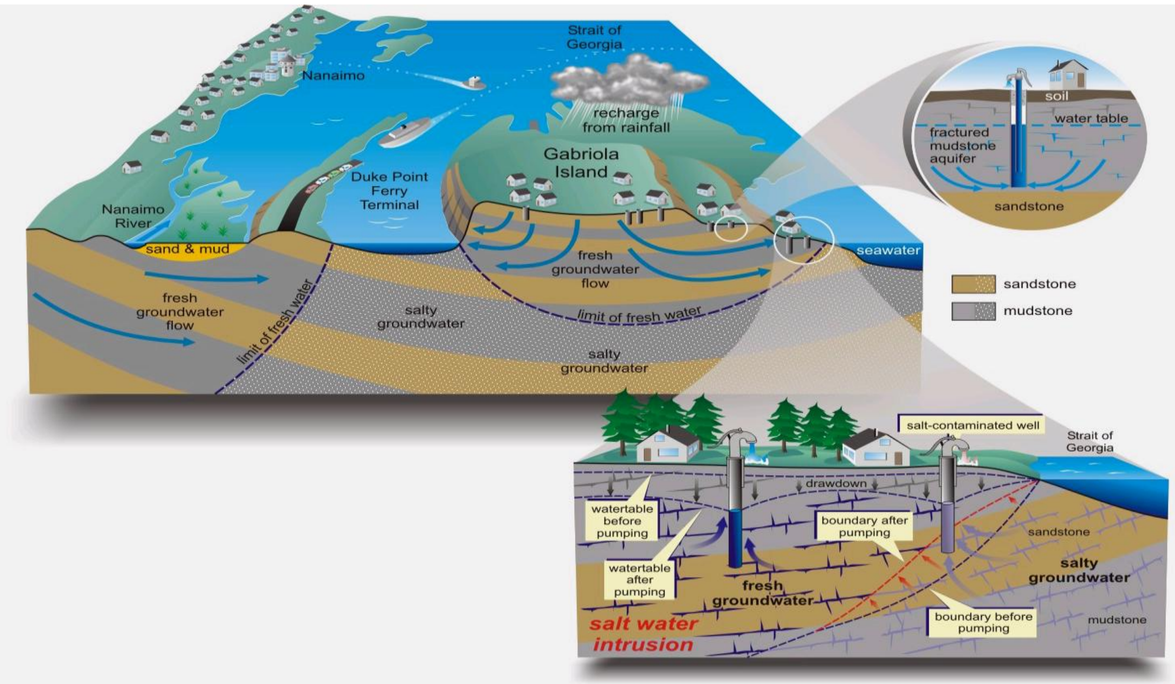
7. Make up questions using the following verbs:
To carry out, to restrict, to take into consideration, to make use of, to compare, to depend, to apply, to sample, to analyse, to achieve, to outline.

8. Translate the following combinations of words; use them in the sentences of your own.
Reconnaissance geochemical survey, major control, detailed geochemical survey, regular interval, coniferous species, water testing kit, trained chemists, precise quantitative , chemical and spectrographic analyses, uniform depth, reliable indicator, moderate relief, flat poorly drained area, base metal value, grid pattern.

9. Define the main idea of Text 5 in two or three sentence:

Text 5

WATER WELLS



A water well is a hole or shaft, usually vertical, excavated in the earth for bringing ground water to the surface. Occasionally wells serve purposes, such as for subsurface exploration and observation, artificial recharge, and disposal of sewage or industrial wastes. Many methods exist for constructing wells; selection of a particular method depends upon the purpose of the water supply, the quantity of water required, depth to ground water, geologic conditions, and economic factors. Shallow wells are dug, bored, driven, or jetted and deep wells are drilled by the cable tool, hydraulic rotary, or reverse rotary methods. After a deep well is drilled, it should be completed and developed for optimum yield and tested before installing a pump. For long life, wells should be sealed against entrance of surface contamination and given periodic maintenance. Wells of horizontal extent, including collector wells and infiltration galleries, are constructed where special water situations exist.

Text 6

1. Translate the text into Ukrainian.

THE EARTH'S CRUST

Most mineral resources are derived from the Earth's crust. The crust is composed of minerals that are crystalline solids with specific and rather simple composition. Minerals in the Earth's crust are concentrated into specific groups which are called *rocks.* Two distinctly different types of crust are recognized: oceanic and continental.

Since it is difficult to investigate the floor of the ocean, the composition of the oceanic crust is not known completely. Scientists say that it is relatively constant in composition. The oceanic floor consists largely of minerals rich in calcium, magnesium, iron and silicon, and it is formed by the cooling of lavas extruded on the sea floor to form a type of rock called basalt. It is subjected to the same forces of erosion and weathering.

The continental crust contains less iron and magnesium than the oceanic crust, but relatively more silicon, aluminium, sodium and potassium. The continental crust is more complicated and has a more variable thickness and a less well defined structure.

A systematic examination of all known rock types shows that two principal types predominate: 1) Igneous rocks which are formed by the cooling and crystallization of liquids from deep in the crust called magma; 2) Sedimentary rocks which are formed by sedimentation and gradual cementation of sediments by the action of water, ice, wind and organisms. They are layered or stratified. Most of the sediments are deposited in the sea along the continents.

As sediments grow larger and are buried deeper, increasing pressure and rising temperature produce physical and chemical changes in them. The resulting metamorphic rocks generally show whether they originated from sedimentary or igneous rocks. This process is slow — hundreds of millions of years are necessary.

As weathering and erosion occur, some substances are dissolved and removed in solution while others are transported as suspended particles.

Continental crust contains extremely varied types of rock. It is quite possible to say that the rock-forming processes which we can observe today, have been active for at least 3,500 million years.

The oceanic crust, by contrast with the continental crust, shows little variation in composition. It leads to the idea that the rocks of the sea floor might not contain as many valuable mineral resources as do the rocks of the continental crust. The solution of the problem will be one of the main problems of oceanographic research in future.

2. ***Define the main idea of the text :***

3. Find the sentences which tell us about examination of the Earth interior

4. Compose the annotation of the text:
The subject of the text is ...
The text deals with ...
It is pointed out that...
It is obvious that...
To sum it up …

5. Read and define the main idea of text 6A and text 6B, define the key words and write abstracts both in English and Ukrainian.

Text 6A

PROSPECTING AND EXPLORATION

1.World-wide economic development has been characterized by the growth rates in the demand for raw materials and especially for the primary sources of energy. Despite the development of nuclear energy, the expansion of off-shore oil and natural gas production, the extraction of oil from bituminous sands and oil shales, the liquefaction (разжижение) and gasification of coal, and the application of such sources as geothermal and solar energy, the burden of energy supply will continue to fall on the producers of fossil fuels for many years to come. This applies particularly to the production of solid fuels.

2. As is known, most minerals are mined from surface deposits now. Even though the mining industry continues the search for low-grade surface deposits, it is increasingly necessary that the economic subsurface deposits should be mined. This fact leads to the development of new methods of prospecting.

3. New techniques have been developed for rapid mapping and geochemical sampling from light aircraft while in flight. Statistical studies of regional geochemical sampling aided (допомагати) by computers are being widely adopted. In general, computers play an important role in the quick interpretation of geological problems. Colour photography is also being used as an aid in certain geological work and mining studies.

4. A method of prospecting for mineral, gas, oil, etc. which is based on a combination of X-rays and ultrasonic transmissions came into use recently. The method is fully portable and of great value in drilling. In addition, this method determines the areas of interest during drilling and gives close grade control during mining operations.

5. At present, the scientists are conducting intensive research aimed at using geocosmic rays as a means of determining the size of an ore deposit in the prospecting stage. As is known, until recently scientists dealt only with the interplanetary functions of cosmic rays. Cosmic rays coming in from the depths of the Universe are expected to explore near- earth and interplanetary space.

6.The geocosmic method is based on the fact that when the cosmic rays get into the atmosphere, the so-called secondary cosmic rays, muons, appear. These particles are capable of penetrating rather deep into the Earth's crust. The greatest muon penetration depth registered today is stated to be about three thousand metres. This fact has suggested the idea of using the rays in mineral prospecting.

7. Besides, successful development of space research has made it possible to survey the Earth's resources from space by satellites. The advantages of the surveys of the Earth's resources by satellites are such that vast areas such as entire mountain belts and continents can be mapped synoptically. The greatest potential of surveying the Earth's resources from space for mineral exploration is based on the ability to map synoptically the geomorphology and general geological environment (окружающая среда) of very large areas. The results obtained provide more accurate and complete information than is available from conventional (обычный) surveys.

Text 6B

NATURAL RESOURCES, PROGRESS AND TECHNOLOGY

During the 1970s people became very concerned about the prospect of depletion of energy resources, minerals, clean air, clean water, food, and almost everything else. This widespread concern set off a debate between two camps. On the one hand, pessimists foresaw a day, not far off, when we would start running out of one vital resource after another. The economy would then go into a tailspin. On the other hand, optimists thought we would surely be rescued by something called technology. Super plastics would be invented in time to replace metals; fusion energy would arrive just as we ran out of oil, and so on.

Now at the beginning of the 21st century the world is definitely in an energy crisis. Nobody knows exactly how much fossil fuel — oil, gas and coal — is left. Pessimistic forecasts say that coal will run out in 450 years, oil and gas will run out in about 30—50 years. Research is being done in different spheres: from nuclear power to the use of alternative sources of energy like solar energy, wind power, wave power, tidal power, etc.

The Chernobyl disaster, the first civil nuclear disaster, dealt a blow against nuclear ambitions of many countries. Nevertheless, the majority of experts believe that only nuclear power can be a reliable source of energy.

At the same time environmental issues have also come to the forefront of the fight for the survival of the human race.

Growth of population, spread of industry, and construction of the world transportation infrastructure have disrupted the ecological balance and have done an enormous amount of harm to our environment. Our environment has become overloaded with waste. Water and soil are contaminated. Air is polluted.

Most dangerous pollutants are plastics, chemicals, nuclear wastes, fumes from cars and industrial enterprises. When we do not treat wastes properly and when the untreated (or poorly-treated) wastes are dumped into water, buried under soil or released into the atmosphere they cause diseases, kill wildlife and bring about global warming.

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

Text 7
AN OVERVIEW OF THE MINING INDUSTRY
(General Characteristics)

According to the broadest definition, mining includes discovering, extracting and processing of all non-renewable resources up to the point at which they are used for fabricating or for producing energy. This broad definition includes the energy minerals such as coal, petroleum and natural gas; refined or processed metals such as copper, steel and the ferroalloys; and nonminerals such as diamonds, phosphate and potash. A much narrower definition of mining includes only crude or non-processed mine products, such as mineral ores and coal, and excludes petroleum and natural gas. We deal mainly with the major metals from the exploration and mining stages to the processing stage from which they are normally marketed for use in manufacturing.

The production of useful minerals involves several stages that are generally carried on by large mining firms, although small mining operations may engage in the initial stage. The first stage is exploration of areas identified by geological reports as possessing potential mineral resources. Modern exploration methods are quite sophisticated and include geological, geochemical and geophysical investigation; three-dimensional sampling by core drilling or other methods; laboratory analyses, including ore treatment, concentration, and recovery tests; and economic appraisal. The objective is to discover and evaluate an ore body that can be economically exploited.

Geochemical exploration is used to measure the chemical properties of the area surrounding the deposit in order to delineate abnormal chemical patterns that may be related to potentially economic mineral deposits. Geophysical investigations employ electronic equipment that can detect contrasts in such physical properties as specific gravity, electrical conductivity, heat conductivity, seismic velocity and magnetic susceptibility. Where much of the bedrock is concealed, telegeologic or remote sensing techniques measure various geologic properties from aircraft or satellites. Exploration is commonly carried on by teams of specialists that include geologists, geochemists and geophysicists. There are different levels of exploration beginning with regional geologic mapping of areas up to 50,000 square km (20,000 square miles) and ending with intensive investigations of ore bodies by means of numerous drillings to obtain bulk samples which are then metallurgically tested to determine the dimensions and character of the ore body.

If the results of exploration activities suggest that an economical deposit has been found, the second stage involves engineering and economic evaluations of the mining project. It is on the basis of this study that companies decide whether to go ahead with a mining project; the study may also be reviewed by prospective lenders. The feasibility study for a large mining project may be quite costly, running to $25 million or more in some cases. The total cost of exploration and the feasibility study for a large mine may run to $50 million or more. It is uncertain whether a profitable mine will be constructed until all the stages have been completed. In the initial exploration stage, several million dollars may be spent with less than a 10 per cent chance of a successful outcome.

The third stage is the construction of the mine, the metallurgical plant, and infrastructure. There are two basic types of operations to extract mineral ores: open-pit or surface mining, and underground mining. An open-pit mine is largely a quarrying operation that handles a large volume of material. Such mining involves drilling and blasting the ore and hauling it out of the pit in large trucks with capacities ranging up to 200 tons, or in ore trains. The ore is hauled to crashers and then to the metallurgical plant. In underground mining, shafts are dug into ore deposits below the surface, from which ore is drilled, blasted and removed through underground passages to the surface. Iron, bauxite and copper ores are extracted by means of open-pit mining, while lead, zinc, silver and gold are largely extracted by underground mining. There are also some underground copper mines. Economies of scale in open-pit mining permit the mining of relatively low-grade ores. As much as 100,000 tons of ore per day containing less than 1 per cent of metal are extracted in the larger open-pit operations. Higher ore grades are necessary for underground mining to be profitable.

One recent advance in mining and processing of lower-grade ores is in situ mining. In situ mining may be defined as the extraction of metals from ores located within a mine (broken or fractured ore, caved material, slag heaps, etc.). These materials represent an enormous potential source of all types of metals.

Large mines involve huge capital outlays running to a billion dollars or more. The mining complexes usually include concentration of ores for production of concentrates with 25 per cent or higher metal content. In the case of copper, large mine complexes include plants for smelting copper or for producing copper metal by hydrometallurgical methods, but in the case of other metals such as gold, lead, zinc, tin and iron, metal is produced in separate plants which may or may not be owned by the mining company. The degree of processing that usually takes place at the mine differs widely among metals, but refining the product for marketing to fabricators nearly always takes place in separate plants that refine the products of several mines.

As is known, modern methods of processing are dense medium separation, jigging and froth floatation. Operations prior to coal preparation include: blending, screening, crushing, dewatering and others. The aim is to get clean coal for metallurgical plants, etc.

Since mines tend to be located far away from developed areas, infrastructure is often a substantial proportion of capital cost. It is frequently necessary to provide sources of power and water, as well as highways, railroads and port facilities. In addition the mining company may be responsible for constructing living quarters for workers and their families and for providing education and other public services required by the mining community.

PHASE I before mining	**PHASE II** mining	**PHASE III** after mining

Prospecting:	→	**Extracting:**	ore processing →	**Processing**	to further processing or consumer products
finding		surface		size reduction	
proving		underground		screening	
planning		dredging		classification	
opening		breaking		dewatering	
developing		loading		thermal drying	
drilling		transporting		leaching	
sampling		unloading			
sinking					
tunnelling					
stripping					
underground					
surface construction					

SCOPE OF MINING ACTIVITIES

2. Discuss the following questions, using given phrases:

As a matter of fact
Broadly speaking
But this is what I mean
As I have said
I want to add
In conclusion let me say
Let me call your attention to
The discussion is due to begin (to finish)
To sum up all that has been said

As far as I know
But the fact is
Coming back to the main problem (subject)
I have nothing more to say
In this brief survey (обзор)
The next point is
Time limit will not permit us to continue the discussion
Well, the problem is

3. Answer the following questions.

1. Using the scheme above speak about the main divisions of mining activities. What are they?
2. What definition can you give to mining in general?
3. You are a geologist. What can you say about the main objectives of 1) exploration; 2) evaluation?
4. What is the difference between exploration and evaluation?
5. What else do you think "before mining" activities include?

6. Now we come to mining. What are the main mining methods? What factors should be taken into account in choosing this or that method of mining?
7. What is the role of economic factors in choosing a method of mining?
8. Do you know anything about in situ mining? When can it be used? What is the economic factor in using in situ mining?
9. Can you say a few words about processing?
10. What does infrastructure involve?
11. What conclusion can be drawn from what has been said? Sum up opinions of the participants in the conference.

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

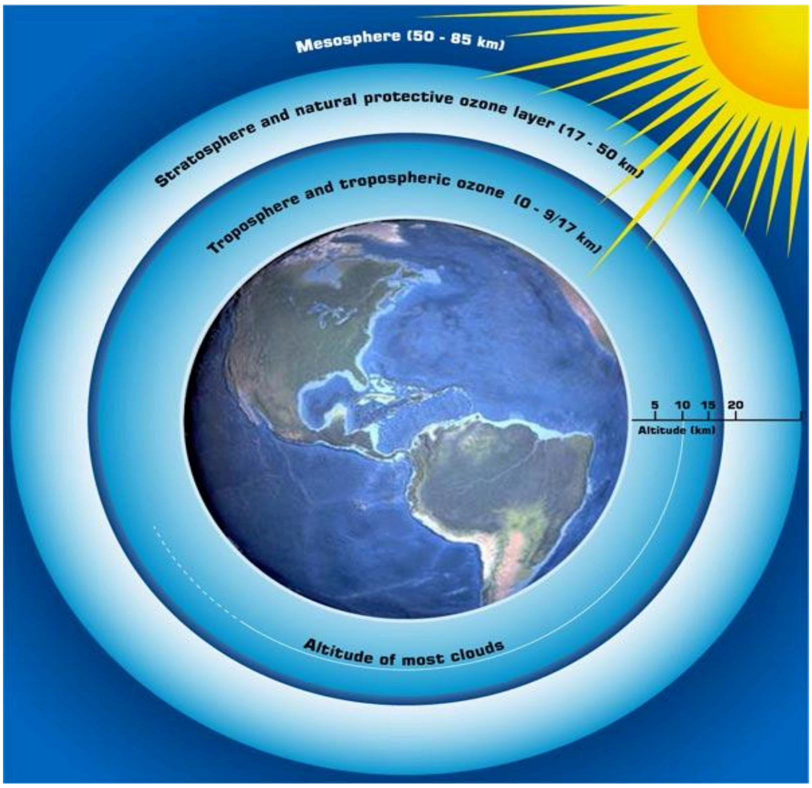
Text 8

GLOBAL WARMING

Like the glass panes in a greenhouse, gases in the earth's atmosphere permit the sun's radiation to heat the earth but do not permit the infrared energy radiated back out by the earth to escape into space. These gases, primarily carbon dioxide, methane, nitrous oxide, and water vapor, are responsible for maintaining a global temperature acceptable to life, and this process is referred to as the greenhouse effect. As the gases increase, more heat is trapped within the atmosphere, and the worldwide temperature edges upward.

Within the last century, the amount of carbon dioxide in the atmosphere has increased dramatically, largely because of the practice of burning fossil fuels—coal and petroleum and its derivatives. Global temperature has also increased 1° C (about 1.8° F) within the past century. Atmospheric scientists have now concluded that at least half of that increase can be attributed to human activity, and they have predicted that unless dramatic action is taken, temperature will continue to rise by between 1° and 3.5° C (between 1.8° and 6.3° F) over the next century. Although this may not seem like a great difference, global temperature was only 2.2° C (4° F) cooler during the last ice age than it is presently. The consequences of such a modest increase in temperature may well be devastating. Sea levels will rise, completely inundating a number of low-lying island nations and flooding many coastal cities such as New York and Miami. Many plant and animal species will probably be driven into extinction, agricultural regions will be disrupted, and the frequency of severe hurricanes and droughts is likely to increase.

Text 8 A
DEPLETION OF THE OZONE LAYER



The ozone layer, a thin band in the stratosphere, the upper part of the atmosphere, serves to shield the earth from the sun's harmful ultraviolet rays. In the 1970s, scientists discovered that the layer was being attacked by chlorofluorocarbons (CFCs), chemicals used in refrigeration, air-conditioning systems, cleaning solvents, and aerosol sprays. CFCs release chlorine into the atmosphere; chlorine, in turn, breaks ozone down into its constituent parts of oxygen. Because chlorine is not affected by its interaction with ozone, each chlorine molecule has the ability to destroy a large amount of ozone for an extended period of time.

The consequences of the depletion of the ozone layer are dramatic. Increased ultraviolet radiation will lead to a growing number of skin cancers and cataracts and also reduce the ability of people's immune systems to respond to infection. Additionally, the growth rates of the world's oceanic plankton, the base of all marine food chains, will be negatively affected, perhaps leading to increased atmospheric carbon dioxide and thus to global warming. Even if the use of CFCs was immediately banned, the chlorine already released into the atmosphere would continue to destroy the ozone layer for many decades. Additionally, the latest studies suggest that global warming may increase the amount of ozone destroyed. Predicting the rate of ozone depletion is difficult. Optimists claim that if international agreements for the phasing out of ozone-depleting chemicals agreed to in Montreal in 1987 (the Montreal Protocol on Substances that Deplete the Ozone Layer) are followed, ozone loss will peak in the year 2000. With many of the world's fastest growing countries in the process of industrializing and modernizing, there is reason to believe that destruction will continue to increase well beyond that year.

AIR POLLUTION

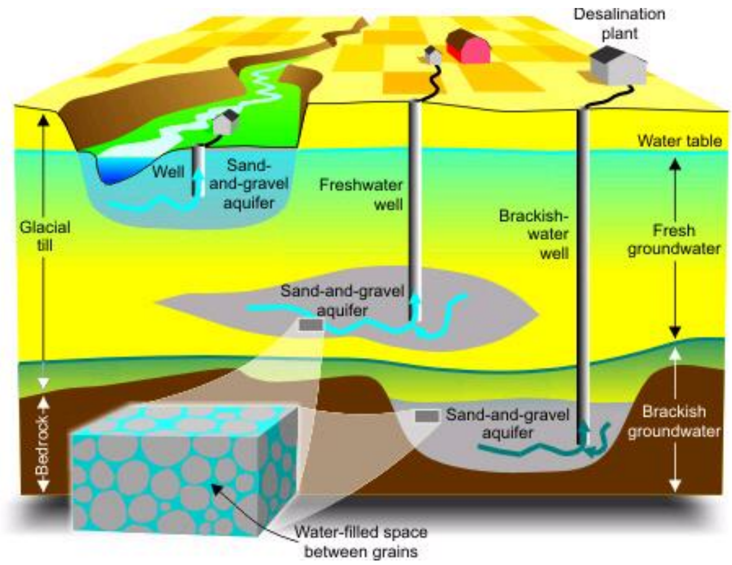
A significant portion of industry and transportation is based on the burning of fossil fuels, such as gasoline. As these fuels are burned, chemicals and particulate matter are released into the atmosphere. Although a vast number of substances contribute to air pollution, the most common contain carbon, sulfur, and nitrogen. These chemicals interact with one another and with ultraviolet radiation in sunlight in various dangerous ways. Smog, usually found in urban areas with large numbers of automobiles, is formed when nitrogen dioxide is broken down by sunlight, releasing ozone, aldehydes, and ketones. Smog can cause serious health problems. When sulfur dioxide and nitrous oxide are transformed into sulfuric acid and nitric acid in the atmosphere and come back to earth in precipitation, they form acid rain. Acid rain is a serious global problem because few species are capable of surviving in the face of such acidic conditions. Acid rain has made numerous lakes so acidic that they no longer support fish populations. Acid rain is also thought to be responsible for the decline of many forest ecosystems worldwide. Germany's Black Forest has suffered dramatic losses, and recent surveys suggest that similar declines are occurring throughout the eastern United States.

WATER POLLUTION

Estimates suggest that nearly 1.5 billion people lack safe drinking water and that at least 5 million deaths per year can be attributed to waterborne diseases. Water pollution may come from point or nonpoint sources. Point sources discharge pollutants at specific locations—from, for example, factories, sewage treatment plants, or oil tankers. The technology exists for point sources of pollution to be monitored and regulated, although political factors may complicate matters. Nonpoint sources—runoff water containing pesticides and fertilizers from acres of agricultural land, for example—are much more difficult to control. Pollution arising from nonpoint sources accounts for a majority of the contaminants in streams and lakes.

With almost 80 percent of the planet covered by oceans, people have long acted as if those bodies of water could serve as a limitless dumping ground for wastes. Raw sewage, garbage, and oil spills have begun to overwhelm the diluting capabilities of the oceans, and most coastal waters are now polluted. Beaches around the world are closed regularly, often because of high amounts of bacteria from sewage disposal, and marine wildlife is beginning to suffer.

GROUNDWATER DEPLETION



Water that seeps through porous rocks and is stored beneath the ground is called groundwater. Worldwide, groundwater is 40 times more abundant than fresh water in streams and lakes, and although groundwater is a renewable resource, reserves are replenished relatively slowly. In the United States, approximately half the drinking water comes from groundwater. Presently, groundwater in the United States is being withdrawn approximately four times faster than it is being naturally replaced. The Ogallala Aquifer, a huge underground reservoir stretching under eight states of the Great Plains, is being drawn down at rates exceeding 100 times the replacement rate, suggesting that agricultural practices depending on this source of water may have to change within a generation. When groundwater is depleted in coastal regions, oceanic salt water commonly intrudes into freshwater supplies. Salt water intrusion is threatening the drinking water of many areas along the Gulf and Atlantic coasts.

The EPA has estimated that, on average, 25 percent of usable groundwater is contaminated, although in some areas as much as 75 percent is contaminated. Contamination arises from leaking underground storage tanks, poorly designed industrial waste ponds, and seepage from the deep-well injection of hazardous wastes into underground geologic formations. Because groundwater is recharged and flows so slowly, once polluted it will remain contaminated for extended periods.

HABITAT DESTRUCTION AND SPECIES EXTINCTION

It is difficult to estimate the rate at which humans are driving species extinct because scientists believe that only a small percentage of the earth's species have been described. What is clear is that species are dying out at an unprecedented rate; minimum estimates are at least 4,000 species per year, although some scientists believe the number may be as high as 50,000 per year. The leading cause of extinction is habitat destruction, particularly of the world's richest ecosystems—tropical rain forests and coral reefs. At the current rate at which the world's rain forests are being cut down, they may completely disappear by the year 2030. If growing population size puts even more pressure on these habitats, they might well be destroyed sooner.

Since European colonization, North America has been transformed: Approximately 98 percent of tall-grass prairies, 50 percent of wetlands, and 98 percent of old-growth forests have been destroyed. This loss is critical from several perspectives. The economic value of species lost and of natural products and drugs that never will be discovered or produced is incalculable. Similarly, it is impossible to place either a moral or an aesthetic value on our growing list of extinct species. As habitats are destroyed and species lost, the world is increasingly losing threads from the interconnected fabric of life.

CHEMICAL RISKS

Pesticide residues on crops and mercury in fish are examples of toxic substances that may be encountered in daily life. Many industrially produced chemicals may cause cancer, birth defects, genetic mutations, or death. Although a growing list of chemicals has been found to pose serious health risks to humans, the vast majority of substances have never been fully tested. In recent studies, a wide range of chemicals has been found to mimic estrogen, the hormone that normally controls the development of the female reproductive system in a large number of animal species. Preliminary results indicate that these chemicals, in trace amounts, may disrupt development and lead to a host of serious problems in both males and females, including infertility, increased mortality of offspring, and behavioral changes such as increased aggression. Numerous studies have found that the amount of sperm produced by men has decreased precipitously over the past 50 years.

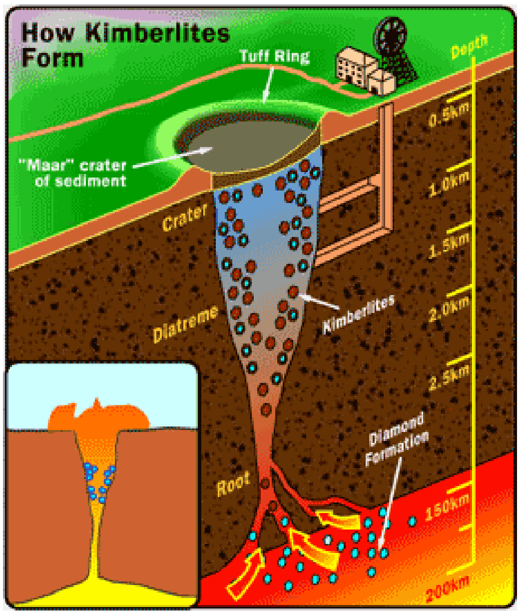
ENVIRONMENTAL RACISM

Studies have shown that not all individuals are equally exposed to pollution. For example, toxic waste sites are more prevalent in poorer communities, and the single most important factor in predicting the location of hazardous-waste sites in the

United States is the ethnic composition of a neighborhood. Three of the five largest commercial hazardous waste landfills in America are in predominantly black or Hispanic neighborhoods, and three out of every five black and Hispanic Americans live in the vicinity of an uncontrolled toxic waste site. The fact that the wealth of a community is not nearly as good a predictor of hazardous-waste locations as is the ethnic background of the residents reinforces the conclusion that racism is involved in the selection of sites for hazardous-waste disposal.

Environmental racism takes international forms as well. Dangerous chemicals banned in the United States often continue to be produced and shipped to developing countries. Additionally, the developed world has shipped large amounts of toxic waste to developing countries for less-than-safe disposal.

KIMBERLITE PIPES



These remarkable fossil volcanoes rise from a great depth. They are the ultimate source of diamonds and also of rocks that may be specimens of materials from the earth's mantle.

Living on the surface of the earth, geologists have little direct knowledge of the planet's interior. Of the three broad layers that make up the earth's structure - the crust, the mantle and the core - only the crust is accessible, and even in its thickest regions the crust represents only about I per cent of the earth's radius. Certain physical characteristics of the deeper layers, such as their average density and the speed with which they transmit earthquake waves, can be deduced from the surface. For studies of chemical composition, however, there is no adequate substitute for a specimen of mantle material.

An extraordinary source of such specimens is the rare rock type called kimberlite. Kimberlite formations generally take the form of small vertical shafts, called pipes, which are demonstrably of volcanic origin. The pipes have been studied extensively, in large part because they are of economic importance: they are the ultimate source of natural diamonds. For the geologist, however, kimberlite pipes supply gems of a different kind: rocks brought up from a great depth. Some of these rocks may be samples of material characteristic of that found in the upper portions of the earth's mantle.

Until about 100 years ago the only known deposits of diamonds were in river gravels. In 1870, however, allivial diamond deposits in southern Africa were traced to their source, the kimberlite pipes near a town that is now the South African city of Kimberley. Several other pipes have since been discovered at Kimberley, and isolated pipes and small groups of pipes are scattered in other parts of southern Africa. Elsewhere in the world the only comparable concentration of kimberlite deposits is in the Yakutsk Republic in Siberia.

Compared with the commoner remnants of volcanic activity on the earth's surface, kimberlite pipes are quite small features. The largest have diameters at the serf ace of less than two kilometers, and many pipes of economic importance are only a few hundred meters in diameter. The pipes generally have *the* form of a cylinder or a narrow cone that tapers slightly with increasing depth. In the vicinity of the pipes kimberlite can also be found in associated formations called dikes, which are vertical slabs formed by the intrusion of molten material into fissures in the surrounding rocks.

The pipes probably erupted at the surface when they were formed and were then marked by an open crater and a small cone of ejected material. In almost all cases, however, subsequent erosion has removed the surface features and the uppermost strata of both the kimberlite and the surrounding rocks. The pipes now available for study are exposed at deeper erosion levels.

Diamonds are released from kimberlite in stream beds. Subsequent geological changes may bury and consolidate these alluvial deposits, but the diamonds, being extremely durable, remain unaltered. Most of the known kimberlite pipes were emplaced in the Cretaceous period, some 70 million to 130 million years ago. Diamonds are found in alluvial deposits of several geological ages, however, indicating that there were also pipes in earlier periods.

Kimberlite is a highly variable rock type. Most kimberlite exposed at the surface, called "yellow ground" by miners and prospectors, is severely weathered. At deeper levels there is a material that is better preserved called "Hue ground", but only in recent years have samples of the native kimberlite become readily available. Fresh kimberlite «is a hard, dark grey or blue rock whose structure gives unmistakable evidence of an igneous origin. The kimberlite was extruded into its present position as a molten liquid; it was then cooled by contact with the volcanic conduit and finally solidified.

The major constituents of kimberlite are silicates, that is, compounds of silicon and oxygen with metal ions. In general, minerals cannot be defined as simple chemical compounds because their composition is not determined by fixed ratio of atoms. Often two or more compounds are present and are said to be in solid solution with one another. As in a liquid solution, the component substances can be mixed in any ratio over a wide range. One important constituent of kimberlite is the mineral called olivine, which is a solid solution of magnesium silicate and iron silicate. Another silicate is phlogopite, a kind of mica rich in potassium and magnesium, and there are also various silicate minerals that are classified as serpentines. The serpentines are formed by the hydration of olivine, or in other words, by chemically adding water to it. Kimberlite also contains the mineral calcite, which is not a silicate but consists of more or less pure calcium carbonate.

Of the materials found in kimberlite pipes kimberlite itself may be less interesting than some of the foreign bodies that appear as inclusions within the kimberlite matrix. Among these inclusions, of course, are diamonds, and it is to their presence that we owe much of our knowledge of these remarkable volcanoes. Another type of inclusions in kimberlite, and one that is far commoner than diamond, consists of rocks torn loose from the walls of the volcanic pipe during the eruption. These inclusions are called xenoliths (from the Greek for foreign rocks).

Perhaps the greatest scientific interest in kimberlites derives from a third kind of intrusion: the rocks called ultramafic nodules, like diamonds they are thought to come up from a great depth, perhaps as much as 250 kilometers below the surface. They have a characteristic rounded form, like beach stones, caused by abrasion in the pipe.

The interpretation of kimberlites is complicated by the eventful history of the upper mantle. Even several hundred kilometers under the surface the composition and crystal structure of rocks are altered repeatedly by a variety of chemical and physical processes. For example, fluids containing dissolved salts can penetrate the grain boundaries and microfractures of solid rock. Chemical reactions with the dissolved ions can completely change the character of the host rock.

Melting followed by slow cooling and recrystallization has also probably altered the structure of many rocks incorporated in kimberlite nodules. Much of the evidence required for recognition of their source is thereby destroyed.

The origin of the kimberlite matrix is perhaps even more obscure than that of the ultramafic nodules. The interpretation of kimberlite and the nodules it contains would surely be more secure if their history were less complicated. Even if the story they tell is for now confusing one, however, they remain among the best available sources of information about the material of the upper mantle.

2. Explain

1) why kimberlite pipes can be called "fossil" volcanoes;
2) what sort of information on the Earth's interior can be obtained from the surface;
3) what sort of information can be obtained from kimberlite pipes.

3. Define the main idea of these texts.

4. Make up the annotation of these texts.

5. Say whether the statements are true or false

1. Gases in the earth’s atmosphere permit the sun’s radiation to heat the earth and permit the infrared energy radiated back out by the earth to escape into space.
2. Increased ultraviolet radiation will lead to a growing number of skin cancers and cataracts and will also reduce the ability of people’s immune systems to respond to infection.
3. Smog cannot cause serious health problems.

4. With almost 80 percent of the planet covered by oceans, people have long acted as if those bodies of water could serve as a limitless dumping ground for wastes.

5. When groundwater is depleted in coastal regions, oceanic salt water commonly intrudes into freshwater supplies.

6. Many industrially produced chemicals may not cause cancer, birth defects, genetic mutations, or death.

7. The developed world has shipped large amounts of toxic waste to developing countries for less-than-safe disposal.

8. Some of these rocks may be samples of material characteristic of that found in the upper portions of the earth's mantle.

9. Minerals can be defined as simple chemical compounds because their composition is not determined by fixed ratio of atoms.

10. Chemical reactions with the dissolved ions can completely change the character of the host rock.

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

Text 9

THE DEEP-EARTH-GAS HYPOTHESIS

There is much evidence indicating that earthquakes release gases from deep in the earth's mantle. Such gases may indicate methane of nonbiological origin, which could be a vast resource of fuel.

It is widely believed that the earth's supply of hydrocarbon fuels will be largely used up in the foreseeable future, the most desirable ones (oil and natural gas) within a few decades and coal within a few centuries. Diverse evidence leads us to believe that enormous amounts of natural gas lie deep in the earth and that if they can be tapped, there would be source of hydrocarbon fuel that could last for thousands of years. The hypothesis that there is much gas deep in the earth also provides a unified basis for explaining a number of otherwise rather puzzling phenomena that either give warning of earthquakes or accompany them.

The exact composition of the gas is not known, since the observational evidence is scattered and not easily interpreted. Volcanic eruptions bring gas out from the interior of the earth. It is not possible, however, to deduce from such observations the initial composition of the gas while it is still deep in the earth.

Gases released during earthquakes are probably more reliable samples of what resides in the deep crust and the upper mantle. The sampling of such gases is just beginning, and the data will not yet support confident conclusions. One can assume that the composition of the deep-earth gases varies from place to place, since the location of mineral deposits in the crust suggests that the underlying mantle is quite heterogeneous. For a variety of reasons we think methane of nonbiological origin is one of the principle deep-earth gases, and it will be the focus of our discussion here, although we do not mean to minimize the possible importance of other deep-earth gases in the phenomena associated with earthquakes.

The notion of non-biological methane runs counter to the prevailing view in petroleum geology that virtually all the oil and natural gas in the earth is of biological origin. In that view the carbon in hydrocarbon fuels was originally derived from atmospheric carbon dioxide, and the energy to dissociate the carbon and the oxygen came from sunlight in the course of photosynthesis by green plants. The burial of some of these organic compounds before they could become oxidized would then have provided the source materials for oil and gas. It cannot be doubted that this process contributed to the genesis of much of the petroleum that has been recovered, but there may be more to the story.

The hypothesis that the earth contains much non-biological hydrocarbon begins with the observation that hydrocarbons are the dominant carbon containing molecules in the solar system. The universe is made mostly of hydrogen, and the evidence of cosmochemistry suggests that the earth and the rest of the solar system originally condensed out of a hydrogen-saturated nebula. Most of the carbon in meteorites, which provide the best clues to the original composition of the inner planets, is in the form of complex hydrocarbons with some chemical similarity to oil tars.

The picture we favour is of dual origin, with some hydrocarbons derived from buried organic sediments and probably much larger amount added to those hydrocarbons by augmentation from a stream of non-biological methane.

Let us now examine some of the evidence for the escape of methane from the interior of the earth. A likely place to look is along the crustal faults and fissures of the tectonic-plate boundaries, which ought to provide the best access to the deep interior. Indeed, hydrocarbons appear to be clearly associated with such plates.

Another line of evidence connecting nonbiological hydrocarbons with such features is the striking correlation between the major oil and gas regions and the principal zones of past and present seismic activity. Oil fields often lie along active or ancient lines. Most of the known natural seeps of oil and gas are found in seismically active regions. The association suggests to us that the deep faults may provide a conduit for the continuous input of nonbiological methane and other gases streaming up from below. Moreover, the upward migration of methane and other gases in fault zones may contribute to the triggering of earthquakes.

Seismologists have long recognized a difficulty in accounting for deep earthquakes. Yet earthquakes have been recorded from depth of as much as 700 kilometers and if the fracture is strong enough to fracture the ground up to the surface, the gas escaping may generate some of the peculiar phenomena that have been reported to accompany many major earthquakes. The phenomena include flames that shoot from the ground, "earthquake lights", fiece bubbling in bodies of water, sulphureous air and visible waves rolling slowly along alluvial ground. Tsunamis (large, earthquake-caused waves at the sea that are often highly destructive) may be an analogous phenomenon. It is usually assumed that they are generated by a sudden displacement of an enormous area of the sea floor over a vertical distance comparable to the height of the wave.

There is as yet no proof that any of the effects we have mentioned are caused by eruption of gas during earthquakes, but at least for the flame and bubbling water phenomena it is difficult to imagine a likely alternative.

Many of the precursory phenomena are detected only by instruments. Included in this category are changes in the velocity of seismic waves through the ground, in the electrical conductivity of the ground, in the tilt and elevation of the surface, in the chemical composition of gases in the soil and the ground water. The time between the onset of a precursor and the earthquake ranges from minutes to years.

Not all precursors of earthquakes can be detected only by instruments. Some are so obvious to the senses that they have been recognized since ancient times. We believe these effects too are caused by an increased flow of gas through the .ground. Among these "microscopic" precursors are dull explosive noises of unknown origin, the strange behaviour of animals, local increases of temperature, bubbling of water in wells and flames from the ground.

Many other lines of investigation can elucidate the degassing processes of the earth. Variations of the methane content of the atmosphere may be observable. Changes of fluid pressure in the ground can be monitored. No one has any firm evidence on the diverse gas regimes more than a few kilometers below the surface or on the quantity or frequency of the various gases emerge.

Our present attempt to formulate a relatively simple hypothesis to account for numerous previously unrelated facts will doubtless turn out to be in places oversimplified or overstated. We hope, however, that it will stimulate further research in this fundamental field of geophysics and geochemistry, leading perhaps to the discovery of large new sources of fuel and in any case to an improvement in the understanding of the earth and its resources.

2. Explain

a) why the problem of hydrocarbon fuel supply is considered to be urgent;
b) whether it is possible to deduce the exact composition of the gas released during volcanic eruptions; during earthquakes. Why? Give reasons.

3 .Complete the sentence below so that it agrees with the information in the paragraphs you have just read.

The exact composition of the deep-earth gases is not known because

- it varies from place to place;
- gases are not accessible for direct observation;
- there are difficulties in data interpretation;
- the gas is contaminated while rising to the surface;
- the underlying mantle is heterogeneous.

4. Comment on the following:

- The notion of non-biological methane is prevailing in petroleum geology.
- Organic processes can't contribute to the genesis of petroleum.
- There is no doubt that organic processes do contribute to genesis of petroleum but there may be more to the story.

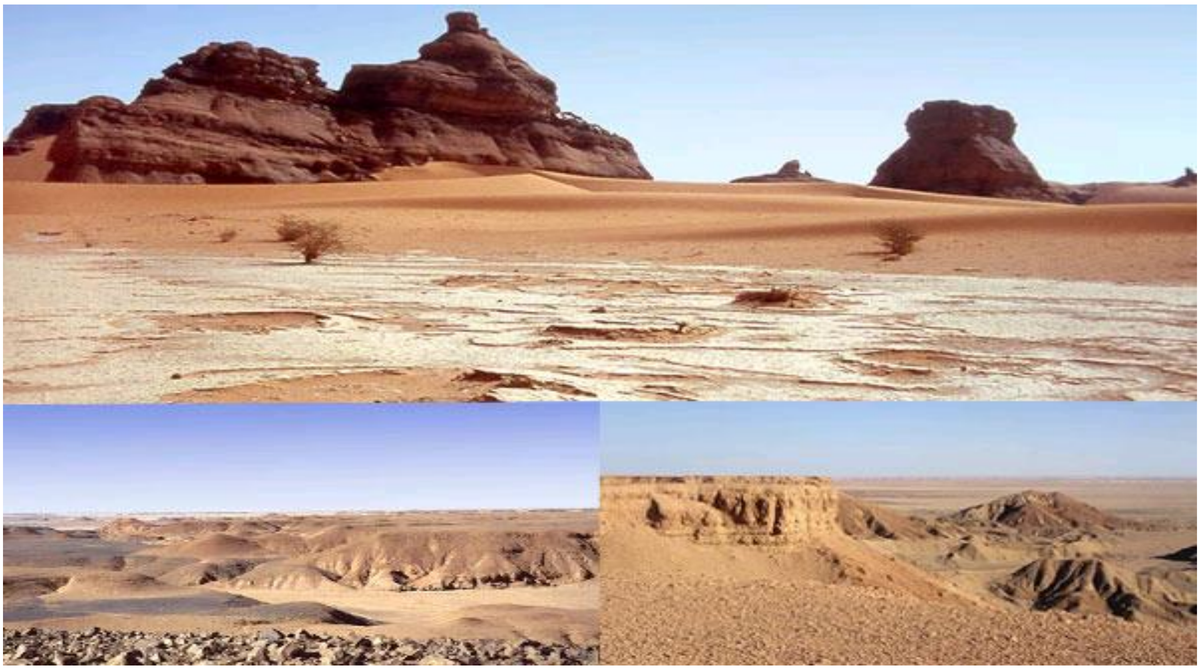
5. Say what the relationship between tectonic-plate boundaries and nonbiological methane is.

6. Identify all the major and minor factors that either give warning of earthquakes or accompany them. Could you trace the cause-effect relationship between the observed phenomena?

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

Text 10

WATER UNDER THE SAHARA



(Below the arid surface of the great desert are huge natural reservoirs of water. These resources are now beginning to be studied and exploited for the benefit of the Sahara nations.)

At the center of the "arid zone" in the lower latitudes is the great desert of the Sahara. Its area is some 3,089,000 square miles; the area of the entire U.S. is not much larger. It stretches across North Africa for 3,000 miles from the Atlantic Ocean to the Red Sea. (Indeed, the desert continues beyond the Red Sea into Arabia, but that part of it is not called the Sahara.) Geographically the Sahara constitutes a complete break between the lands of Africa that lie along the Mediterranean Sea and the rest of the continent.

Except where the Sahara meets the Red Sea and the Atlantic, its boundaries are somewhat imprecise. They coincide approximately with the contour line that traces out the areas with an average annual rainfall of 100 millimeters (about four inches). Within these limits the rainfall can be as little as 25 millimeters a year. The rainfall is notably irregular; sometimes a large region will have no precipitation for 10 years and then the region may have several rainstorms in a year. In summer the daytime temperature is often as high as 120 degrees Fahrenheit in the shade.

In the light of the fact that the only source of water for an aquifer is rainfall, which either percolates directly into the aquifer or reaches it indirectly through streams, the existence of substantial stores of water in Saharan aquifers at first seems a paradox. The explanation is geological. Most of the water now in the aquifers was laid down in past millenniums during pluvial periods when the Sahara had substantially more rainfall than it does now. Even today, however, the aquifers are recharged to a considerable extent by rain falling at the periphery of the desert.

The full extent of the Sahara's groundwater resources remains a matter of conjecture; specialists are only beginning to understand the disposition and volume of the tremendous reservoirs. Part of this information has been acquired in the process of the explorations that led to and have followed the discovery of oil in the Sahara. Part comes from a moderate amount of hydrogeologic prospecting that has been carried out in the desert during the past decade.

The groundwater of the Sahara is to be found mainly in seven major basins, each virtually a closed hydrologic system. Although each of these basins has individual characteristics, the basins also have much in common in their geology, in the crucial question of recharge and in the problems of development.

The major aquifers are found in three kinds of formation, two of which are geologic series: a related group of rocks formed in a particular period or epoch. One of the series is the main geologic feature underlying the Sahara: a sandstone series that recent oil explorations have shown to be of lower Cretaceous age. This sandstone, which in many places is interbedded with shale and marl, is more than 1,000 meters thick and rests on Paleozoic or Precambrian rocks that are impervious to water. The French name for it is the Continental Intercalate; the English, the Nubian sandstone. It constitutes an excellent aquifer.

Overlying this sandstone series is a limestone and marl series of marine origin, dating from periods when much of the Sahara was under water. About 1,000 meters thick, it is of upper Cretaceous lower Eocene age and almost impervious to water. Above it lies the second major aquifer formation: a sandstone series of Miocene-Pliocene age. This series, also about 1.000 meters thick, is called the Continental Terminal and represents the second important aquifer of the Sahara. The third class of aquifer is represented by sand dunes, riverbeds and other surface formations dating from the Pleistocene and Recent epochs.

Water occupies an aquifer under one or the other of two distinctly different conditions. If it is overlain by an impermeable stratum, it is likely to be under pressure that will cause the water to rise above the top of the aquifer when the aquifer is penetrated by a well. This is the condition described as artesian, the term is used whether or not the water rises high enough to flow at ground level. A large part of Saharan groundwater is under artesian conditions. If the water in an aquifer is not confined by an overlying impermeable stratum, it is said to be under water table conditions. Such water is not under pressure and can be extracted only by pumping or gravitational flow through underground canals.

Groundwater is seldom immobile in an aquifer. Artesian water in particular is likely to move over considerable distances from a recharge area. This movement is attributable to gravity. In the Sahara evaporation is also a powerful mechanism of vertical movement: it operates as a huge pump to lower the head of the groundwater.

Evaporation, which probably accounts for the largest discharge from the aquifers, takes place in vast depressions called chotts. Under the more normal climatic conditions of the past a chott would be a lake recharged by both rainfall and the artesian aquifers. Today the chotts are dry except during periods of rain.

In this connection there arises an interesting possibility of prospecting for water by zoological means. Experts in the behavior of the desert locust say that these insects need a humid environment for the laying and hatching of their eggs. In the Sahara one can observe locusts laying eggs in areas that are apparently dry. Evidently they are detecting the invisible outlets of the aquifers - the areas of evaporation. Close attention to the egg-laying habits of the locusts could conceivably lead to new sources of accessible groundwater.

The question of recharge has to be considered in two aspects. One concerns the recharge that is occurring at present; the other, the recharge that took place long ago. Today's recharge occurs mainly at the edge of the desert, where the rainfall increases over a relatively short distance from 100 millimeters a year to 1,000 millimeters and where the water of rivers percolates into the aquifers. As far as recovery of the water is concerned, the present recharge is immediately significant only for aquifers in which the discharge and recharge areas are close together or in which the aquifer formation outcrops (is exposed at the surface). This situation exists in the Great Eastern Erg and the Niger basin.

In all the other basins the present recharge moves through the aquifers quite slowly. The speed of this movement is unlikely to be more than half a mile a year; in some places it is only a yard or two a year. This means that in most of the basins the present recharge will not reach the discharge area for 15 centuries or more. In other words, the water coming out of those discharge areas today is rain that fell between the last Saharan pluvial period and the time of the Roman Empire.

Accordingly the question of greatest interest in the modern exploitation of Sahara groundwater is what kind of recharge was occurring some 2,000 years ago. For this purpose the technique of radioactive dating has recently been applied. The technique is based on the groundwater's content of tritium, carbon 14 or naturally occurring isotopes of uranium and thorium. Natural tritium is suitable for dating relatively young groundwater, with an age of less than 100 years, while carbon-14 dating is suitable for dating older groundwater. The results so far, however, are somewhat inconclusive, partly for the lack of sufficient data and partly because the uncertainty in the determination of an age can range from 1,300 to 5,700 years as a result of the fact that the water in the Nubian sandstone has a small content of carbon. The sources of the carbon are dissolved carbonate, carbon dioxide in the air and plant carbon from the decay of organic matter in the soil.

Thus, groundwater is the key to any development effort in the Sahara. If development is to be planned and executed soundly, it should be preceded by a survey of groundwater resources on a Sahara-wide scale. Such a survey would take into account the geographical distribution of the water and the need for equitable treatment of its users regardless of political boundaries. Several elements would be needed in such a survey. Data must be collected from the various nations that include parts of the Sahara within their boundaries. In addition to a survey of the groundwater resources, there would have to be findings about the water requirements, desirable development plans, the technology of extraction and the organizations that would be needed to carry out the plans. Presumably the results of the survey would be published. The report would constitute the first official assessment of the entire groundwater situation in the Sahara.

Some difficulties stand in the way of achieving these objectives. For one thing, investigations of groundwater resources are expensive, particularly in the Sahara. Moreover, most of the nations involved are facing economic difficulties, and their priorities of development are still focused on areas far from their Sahara regions. These difficulties point to the wisdom of a survey carried out by an international committee representing the local nations, under the sponsorship and technical and financial assistance of the UN and perhaps a group of other nations. That problem must be dealt with on the natural scale of the Sahara and on an international basis that would use modern concepts of development to make the desert's groundwater a resource benefiting all the nations involved.

2. Define the main idea of the text.

3. Make up the annotation of the text.

Text 11

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

THE SCOPE AND SIGNIFICANCE OF GEOLOGY

The study of geology has firmly established the great fact that the face of the earth, and the life upon it, represent merely a single phase of a tremendously long history which has involved many profound and far-reaching changes. For untold millions of years rocks at and near the surface of the earth have been crumbling under the weather; streams have been sawing incessantly into the lands; the sea has been eating into continental masses; the winds have been sculpturing desert lands; and more locally and intermittently, glaciers have plowed through mountain valleys and even vast sheets of ice have spread over considerable portions of continents. The outer shell of the earth has shown marked instability throughout geologic time. Slow upward and downward movements of the lands relative to sea level have been very common, in many cases amounting to thousands of feet. Various parts of the earth have been, and are being affected by sudden movements along fractures in the outer crust. During the eons of geological time, vast quantities of molten materials have, at intervals, been forced not only into the earth's crust, but also often out upon the surface. Mountain ranges have been brought forth and cut down, and sometimes rejuvenated. Sea waters have spread over many parts of what are now continental areas. There have been repeated advances and retreats of the sea over many districts. Lakes have come and gone. Plants and animals have inhabited the earth for many millions of years. The length of time of known human history is very short as compared to that of known geologic time. The former is to be measured by thousands of years, and the latter by tens or possibly hundreds of millions of years.

THE MARGINAL WORLD

The edge of the sea is a strange and beautiful place. All through the long history of the Earth, it has been an area of unrest where waves have broken heavily against the land, where the tides have pressed foreward over the continents, receded, and then returned. For no two successive days is the shore line precisely the same. Not only do the tides advance and retreat in their eternal rhythms, but the level of the sea itself is never at rest. It rises or falls as the glaciers melt or grow, as the floor of the deep ocean basins shifts under its increasing load of sediments, or as the earth's rust along the continental margins warps up or down in adjustment to strain and tension. Today a little more land may belong to the sea, tomorrow a little less. Always the edge of the sea remains an elusive and indefinable boundary.

The shore has a dual nature, changing with the swing of the tides, belonging now to the land, now to the sea. On the ebb tide it knows the harsh extremes of the land world, being exposed to heat and cold, to wind, to rain and drying sun. On the flood tide it is a water world, returning briefly to the relative stability of the open sea.

Only the most hard and adaptable can survive in a region so mutable, yet the area between the tide lines is crowded with plants and animals. In this difficult world of the shore, life displays its enormous toughness and vitality by occupying almost every conceivable niche. Visibly, it carpets the intertidal rocks; or half hidden, it descends into fissures and dravices, or hides under boulders, or lurk in wet gloom of sea caves. Invisibly, where the casual observer would say there is no life, it lies deep in the sand, in burrows and tubes and passageways. It tunnels into solid rock and bores into peat and clay. It encrusts weeds or drifting spars or the hard, chitinous shells of a lobster.

It exists minutely, as the film of bacteria that spreads over a rock surface or a wharf piling; as spheres of protozoa, small as pinpricks, sparkling at the surface of the sea; and as Lilliputian beings swimming through dark pools that lie between the grains of sand.

The shore is an ancient world, for as long as there has been an earth and sea there has been this place of the meeting of land and water. Yet it is a world that keeps alive the sense of continuing creation and of the relentless drive of life.

PLATE TECTONICS AND MAN

Science is cumulative, and advances are made in the light of knowledge gained painstakingly by many researchers. A survey of the development of plate tectonics illustrates the progressive and cooperative nature of science and the way in which research in diverse fields produces unifying concepts of practical value to society.

The basic understanding of plate motions was considered as a conceptual revolution as profound for the earth sciences as were earlier developments of the concept of evolution in biology and of the concept of atomic and molecular structure in physics and chemistry. We know the *new* fields as plate tectonics: the "plate" is the basic unit of the system, and "tectonics" (from the Greek word "tekton", meaning builder) refers to the processes and products of motions within the Earth.

According to the theory of plate tectonics the Earth's crust is broken into moving plates of "lithosphere". The plates tend to be internally rigid, and their interact mostly at their edges. All plates are moving relative to all others. Although velocities of relative motion between adjacent plates are low by human standards, they are extremely rapid by geologic ones. Plates are pulling apart primarily along the system of great submarine ridges in the world's oceans. Where plates converge, one tips down and slides beneath the other. Generally, an oceanic plate slides ("subducts") beneath a continental plate or another oceanic plate. A trench is formed where the undersliding plate tips down, and the ocean-floor sediments it carries are scraped off against the front of the overriding plate.

We now know much about the mechanics of these motions from geophysical studies and particularly from seismic-reflection profiles made with instruments developed for oil-field exploration.

New oceanic-plate material is generated by the upwelling processes at spreading ridges. Old lithosphere is consumed, and recycled deep into the mantle. The balance is global only: the formation of lithosphere at the Mid-Atlantic Ridge is compensated by subduction primarily in the western Pacific.

Although the integrated concepts of plate tectonics were proved primarily by geophysical studies of the ocean basins, they have revolutionized our understanding of continental geology. Earthquakes are the most dramatic way in which these plate motions affect man. Most volcanic eruptions are also produced by the plate motions. The distribution of the mineral deposits and fossil fuels upon which our civilization depends has to a large extent been controlled by plate motions and interactions.

The course of evolution of life on Earth has been much influenced by plate motions, too.The Earth has had contrasted areas of land and sea throughout its geologic history, although how much of the present water was early at the surface and how much has since been differentiated out by volcanic processes is debatable. The initial continents of an internally stable Earth, without the rejuvenating processes of uplift, mountain building, formation of new continental material, and magnetism, would long since have disappeared beneath the sea levelled by land and sea erosion, limiting potential life forms.

THE GREAT DYING

About 225 million years ago, at the end of the Permian period, fully half the families of marine organisms died out during the short span of a few million years - a prodigious amount of time by most standards, but merely minutes to a geologist.

This late Permian extinction was the greatest of several mass dyings that have punctuated the evolution of life during the past 600 million years. No problem in paleontology has attracted more attention or led to more frustration that the search for the causes of these extinctions. Since the Permian extinction dwarfs all the others, it has long been the major focus of inquiry. If we could explain this greatest of all mass dyings, we might hold the key to understanding mass extinctions in general.

During the past decade, important advances in both geology and evolutionary biology have combined to show which one of the many proposals is correct and even how it happened. This solution has developed so gradually that some paleontologists scarcely realize that their oldest and deepest dilemma has been resolved.

If we reconstruct the history of continental movements, we realize that a unique event occurred in the latest Permian: all the continents coalesced to form the single supercontinent of Pangaea. Quite simply, the consequences of this coalescence caused the great Permian extinction. But which consequences and why? Such a fusion of fragments would produce a wide array of results, ranging from changes in weather and oceanic circulation to the interaction of previously isolated ecosystems. Here we must look to advances in evolutionary biology - to theoretical ecology and our new understanding of the diversity of living forms.

Many studies now indicate that diversity - the numbers of different species present in a given area - is strongly influenced, if not largely controlled, by the amount of habitable area itself: the larger the area, the greater the number of species.

We must first understand two things about the Permian extinction and the fossil record in general. First, the Permian extinction primarily affected marine organisms. It did not strongly disturb the few terrestrial plants and vertebrates then living, and diversity of land organisms may have increased at the time. Second, the fossil record is very strongly biased toward the preservation of marine life in shallow water. We have almost no fossils of organisms inhabitating the ocean depths. Thus, if we want to test the theory that reduced area played a major role in the Permian extinction, we must look to the area occupied by shallow seas. We can identify, in a qualitative way, two reasons why a coalescence of continents would drastically reduce the area of shallow seas. The first is basic geometry: If each separate land mass of pre-Permian times were completely surrounded by shallow seas, then their union would eliminate all area at the sutures. The second reason concerns the mechanics of plate tectonics.

That paleontology's outstanding dilemma should be solved with the help of advances in two other disciplines is not surprising. When a problem has proved intricable for more than 100 years, it is not likely to yield to more data collected in the old way and under the old rubric Theoretical ecology and plate tectonics have provided paleontologists with the right questions to solve their hardest riddle.

2. Read and translate the following word combinations into Ukrainian:

aerial survey	geological exploration
ground methods of prospecting	accurate data
visible evidence of mineral deposits	exploration equipment
search for valuable minerals	certain ore deposits
exploratory workings	a particular type of ground
mode of occurrence	gold dredging
a preliminary estimation of the deposit	space research
lustrous coal	to crop out at the surface
to touch upon a problem	to cope with a problem
to solve a problem	to deal with a problem

3. Translate into Ukrainian:

the **problems** of searching for **economically** useful **mineral** deposits; visible evidence of **mineralization;** various distinctive **physical** properties of valuable **minerals; topographical relief; geochemical methods** of prospecting; areas of increased **concentration** of particular **elements;** the **biological (hydrochemical, geobotanical) methods** of prospecting; aerial **magnetic** and **gamma** surveys; **geological interpretation** of the data; the **type** of country rock; the **process** of mountain **formation;** aerial **photography**

4. Read text 11A

Text 11A
PROSPECTING

Mining activities include prospecting and exploration for a mineral deposit through finding, proving, developing, extracting and processing the ore. That is why it is possible to divide the mining activity into three major phases: 1) *before mining* which involves prospecting and exploration required to locate, characterize and prove a potential ore body; 2) *mining* which refers to actual coal or ore extraction. Extraction processes include underground or surface mining and dredging; 3) *after mining* which involves processing and preparing the raw ore for the end product.

As has already been said, before a mineral deposit can be worked, that is, before it can be extracted from the Earth for use by man, it must first be found. The search for economically useful mineral deposits is called *prospecting*. To establish the quality and quantity of a mineral deposit, the type of country rock, etc. means to prove it and this process is called *proving*. Prospecting and proving are only two different stages of mining geological exploration, the latter includes drilling and driving of openings.

Last century prospectors looked for visible evidence of mineralization on the surface of the Earth. To recognize valuable minerals it was necessary to know their various distinctive physical properties. For example, gold occurs in nature as a heavy malleable yellow metal. Galena, the most important mineral containing lead, is dark grey, heavy and lustrous. The first ores of iron to be mined were deposits of magnetite, a black heavy mineral capable of attracting a piece of iron.

As the deposits of mineral that cropped out at the surface were mined, the search for additional supplies of minerals took place. The science of geology was used to explain the occurrence of ore deposits.

The aim of geological prospecting is to provide information on a preliminary estimation of the deposit and the costs of the geological investigations to be made. It also indicates whether it is available to continue the exploration or not.

Prospecting work includes three stages: 1) finding signs of the mineral; 2) finding the deposit; 3) exploring the deposit.

General indications of the possibility of exposing this or that mineral in a locality can be obtained by studying its general topographical relief, the type of ground and its general natural conditions. Thus, in mountainous regions where fissures were formed during the process of mountain formation, ore minerals could be expected in the fissure fillings. In hilly regions, sedimentary deposits would be expected.

Certain deposits are found only in a particular type of ground. Coal seams, for example, are found in sedimentary formations mainly consisting of sandstones and shales. Veins, on the other hand, are found in crystalline (igneous) rocks, and the type of country rock usually determines the type of minerals.

At present, prospecting methods to be used are as follows:

1. Surface geological and mineralogical prospecting such as panning.
2. Geophysical, geochemical, geobotanical prospecting.
3. Aerial photography with geological interpretation of the data to be obtained is highly effective from aircraft or helicopter.

Besides, successful development of space research has made it possible to explore the

Earth's resources from space by satellites.

In modern prospecting the methods mentioned above are used together with the study of geological maps.

2. Are statements true or false? Find the sentences in the text.

1. The search for economically useful mineral deposits is called *proving*.
2. Last century prospectors looked for visible evidence of mineral deposits.
3. The first ores of iron to be mined were deposits of galena.
4. The science of geology can explain the mode of occurrence of ore deposits.
5. As a rule prospecting includes four stages.
6. The study of general topographical relief and the type of ground makes it possible to expose this or that deposit.
7. Geologists know that certain deposits are only found in a particular type of ground.
8. As is known, veins are found in metamorphic rocks.

3. Answer the following sentences:

1. What is prospecting?
2. What is proving?
3. How did prospectors find mineral deposits in the 19th century?
4. Does gold occur in nature as a heavy malleable yellow metal or as a heavy dark-grey one?
5. What metal is capable of attracting a piece of iron?
6. What does prospecting work provide?
7. What are the three main stages of prospecting?
8. Is it enough to know only the topographical relief of a locality for exposing this or that mineral?
9. What methods of prospecting do you know?
10. What are the most effective aerial methods of prospecting now?

4.a) Match the Ukrainian and English equivalents:

1) distinctive properties	a) залягання рудних родовищ
2) lustrous metal	b) блискучий метал
3) capable of attracting a piece of iron	c) корінна (основна) порода
4) the occurrence of ore deposits	d) додаткові запаси мінералів
5) country rock	e) промивання (золотоносного піску у лотку)
6) additional supplies of minerals	f) геологічна розвідка
7) panning	g) дослідження родовища
8) prospecting	i) пошуки економічно корисних родовищ
9) search for useful minerals	j) здатний притягати кусок металлу
10) exploration of a deposit	k) відмінні властивості

б) Match the word combinations in A with definition in B:

A		B
1)	вартість геологічних досліджень	a) the data obtained
2)	виходити на поверхню	b) galena, sandstones and shales
3)	зробити попередню оцінку (родовища)	c) the cost of geological investigations
		d) to crop out
4)	візуальні спостереження з повітря	e) certain ore deposits
5)	отримані дані	f) to make a preliminary estimation (of a deposit)
6)	галеніт, піщаники та сланці	
7)	загальні показання	g) visual aerial observations
8)	знаходити ознаки родовища	h) to find the signs of a deposit
9)	визначені рудні родовища	i) general indications

5. Fill the gaps in the following sentences using given words:

explore exploratory exploration exploring

a)l. ... deals with a complex range of geological, mining and economic problems. Its main task is to determine the quality, shape and mode of occurrence of mineral deposits and their main properties.

2. Exploration includes drilling and driving of ... openings. These ... openings can supply the most accurate information on the mineral exposed by them.
3. While ... a deposit the geologists establish its general size, determine shape, dimensions and quality.
4. The geological party was sent to ... a new deposit.

survey (surveying) surveyor(s) surveyed

b)1. In recent years combined geophysical ... by air has been used on a wide scale.

2. In modern ... automation is being used in recording the field measurements.

3. Now the ... need only to set up the instrument in the field and it will do all recordings automatically.

4. Laser is being used by mine ... now.

5. Underground working can be ... by modern methods.

store stored storing

c) Earth is not entirely without energy resources of its own. There is a large amount of heat energy ... in its molten interior. There is also both kinetic and potential energy ... in the Earth-Moon-Sun system. In addition, a relatively small amount of solar energy has been ... in the carbon atoms of the fossil fuels (coal, oil and natural gas). A potentially much larger energy reserve is ... in the nuclei of the very light and the very heavy elements. Wind, ocean currents and the evaporation of water only temporarily ... energy. It is known that there are different methods of... energy. ... tidal energy has not provided much to the total energy supply yet.

6. Read the text B. Speak of differences between preliminary and detailed geological exploration.

Text 11B

Exploration of Mineral Deposits

Exploration is known to include a whole complex of investigations carried out for determining the industrial importance of a deposit. The main task is to determine the quality and quantity of mineral and the natural and economic conditions in which it occurs. The exploration of the deposit is divided into three stages, namely preliminary exploration, detailed exploration and exploitation exploration.

The aim of preliminary exploration is to establish the general size of a deposit and to obtain an approximate idea of its shape, dimensions and quality. At this stage the geological map of the deposit is corrected and a detailed survey of its surface is completed.

The information on the preliminary exploration is expected to give an all-round description of the deposit which will enable the cost of its detailed exploration to be estimated.

The following points should be taken into consideration: 1) the shape and area of the deposit; 2) its depth and angles of dip and strike; 3) its thickness; 4) the properties of the surrounding rock and overburden; 5) the degree of uniformity of distribution of the mineral within the deposit and the country rock, etc.

Preliminary explorations can make use of exploratory openings such as trenches, prospecting pits, adits, crosscuts and boreholes. They are planned according to a definite system, and some are driven to a great depth.

All the exploratory workings are plotted on the plan. These data allow the geologist to establish the vertical section of the deposit.

The quality of the mineral deposit is determined on the basis of analyses and tests of samples taken from exploratory workings.

The method of exploration to be chosen in any particular case depends on the thickness of overburden, the angle of dip, the surface relief, the ground water conditions and the shape of the mineral deposit.

The task of the detailed exploration is to obtain reliable information on the mineral reserves, their grades and distribution in the different sectors of the deposit. Detailed exploration data provide a much more exact estimate of the mineral reserves.

Mine or exploitation exploration is known to begin as soon as mining operations start. It provides data for detailed estimates of the ore reserves of individual sections. It facilitates the planning of current production and calculating the balance of reserves and ore mined.

The searching and discovering of new mineralized areas are based on geological survey and regional geophysical prospecting. The results of these investigations provide data on iron-bearing formations and new deposits for commercial extraction.

In detailed exploration both underground workings and borehole survey are used. Core drilling with diamond and carbide bits is widely used. Non-core drilling is also used in loose rocks in combination with borehole geophysical survey.

One of the main methods to explore coal deposits is also core-drilling. Modern drilling equipment makes it possible to accurately measure bed thickness and determine structure of beds, faults and folds. Recording control instruments are attached to drilling rigs which allow the geologists to get reliable samples good for nearly all parameters of coal

7. Translate the text 11C into Ukrainian.

Text 11C
EXPLORATION GEOPHYSICS AND THE BASIC SCIENCES

One of the most recently established branches of applied science, exploration geophysics, is actually an offshoot of several basic disciplines, such as physics, chemistry, and mathematics. The various techniques of geophysical prospecting are based on a number of fundamental principles of physics, such as the laws of gravitational and magnetic attraction, the laws governing reflection and refraction in optics (as applied to seismic prospecting), and the elements of electricity and electromagnetic theory. Although these principles are quite simple, it is generally difficult to apply them to the study of rock materials, which are seldom homogeneous and which often have complex physical properties.

Nearly all the major methods of geophysical prospecting evolved from techniques originally employed for more or less **academic studies of the earth's large-scale features.**[1] Gravity prospecting was developed after pendulum measurements had been carried out for several decades to determine the earth's precise shape from changes in gravitational pull (attraction) between different observing stations. The seismic refraction method **makes use of principles worked out early in the present century**[2] by earthquake seismologists who developed them to unravel the structure of the earth's interior. Magnetic instruments which were basically the same **as those used in present-day prospecting**[3] made it possible to chart some of the earth's magnetic elements on a global scale as early as in the seventeenth century.

Today there is a much greater volume of activity in geophysical exploration than in basic research on the physics of the earth. The dependence of geophysical prospecting upon the scientific work which preceded it has now evolved into a fruitful interdependence between the two. Many of the tools and techniques developed to explore for minerals have been advantageously used in academic studies on the structure of the earth's crust and its interior.

1. Answer the following questions:

1. What are the techniques of geophysical prospecting based on?
2. What are the physical properties of rock material?
3. When was gravity prospecting developed?
4. What are the major methods of exploration geophysics?

2. Put questions to all parts of the sentence:

The various techniques of geophysical prospecting are based on a number of fundamental principles of physics.

3. Give the Ukrainian for:

d) technique, science, law, dependence, exploration, to carry out, to work out

e) rock material, gravity prospecting, pendulum measurement, refraction method, earthquake seismologist, on] a global scale, applied science

f) recently, such as, as ... as

g)

4. Find in the text English equivalents for:

закон, розвідка, виробляти, маятникові виміри, сейсмолог, прикладна наука, метод переломлених хвиль, землетрус, недавно

5. Find synonyms among the following words:

method, precise, to make use of, accurate, to employ, technique

6. Give antonyms to the following words:

simple, homogeneous, difficult, recent, dependence, precede, active

7. Word-building:

Form nouns from the following verbs:

to apply, to govern, to establish, to develop, to explore, to observe

Form adverbs from the following words:

actual, recent, general, original

Give all the derivatives of the words:

electrical, homogeneous, dependence, advantage, science, activity

8. Translate the following verbs. Make up questions with them:

to carry out, to work out, to find out

9. Pick out attributes to the following nouns; translate the word combinations into Ukrainian:

science, prospecting, attraction, principle, property, method, shape, scale, research, pull, work.

(attributes: gravitational, various, academic, global, basic, major, precise, magnetic, applied, seismic, fundamental, physical, scientific)

10. Speak on the modern geophysical methods used in our country.

1. Read the text, define the key words and write abstracts both in English and Ukrainian.

Text 12
VOLCANOES

The world's most obvious volcanoes are sited in the Andean mountain chains or island arcs above subduction zones. The global distribution of volcanoes above sea level correlates well with destructive plate boundaries. There is rather more volcanic activity, though of a different kind and harder to detect because it is usually below several kilometres of water, occurring continually along constructive plate boundaries. In contrast, conservative plate boundaries rarely show associated volcanism.

In this chapter, we will consider the types of volcanic activity that happen at plate boundary settings, and will also look at some volcanoes that occur well away from the edges of plates.

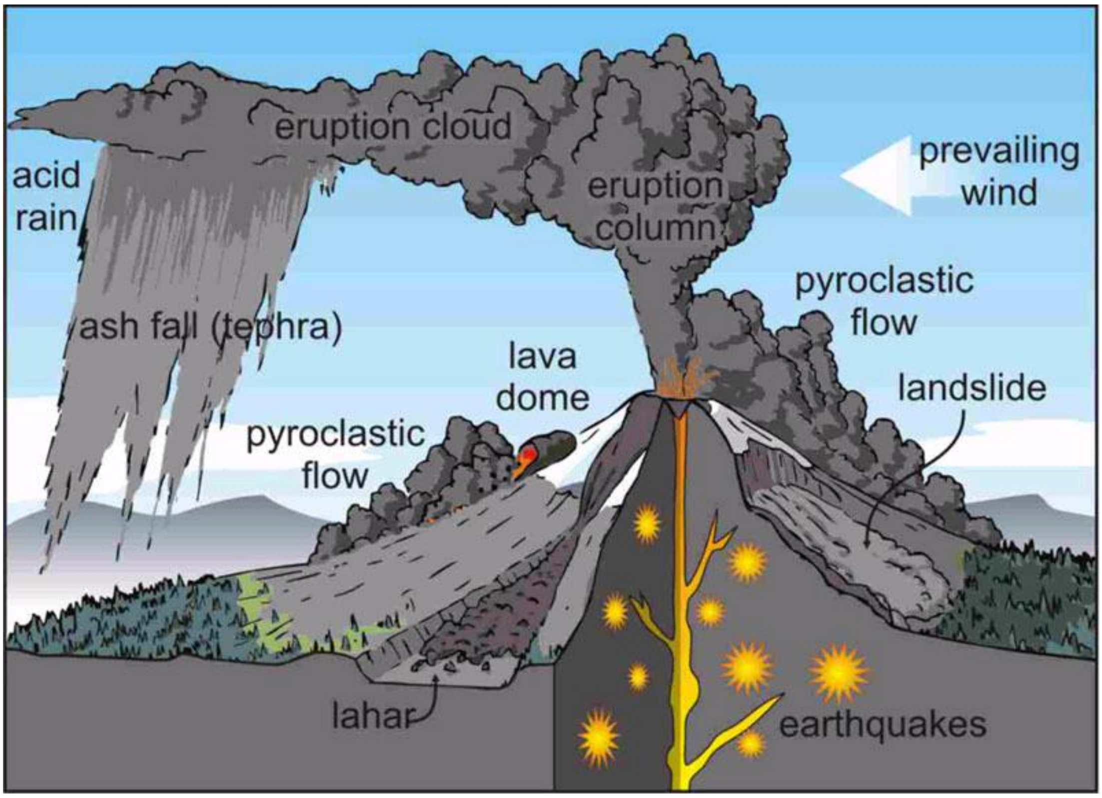
Mention the word "Volcano", and most people probably think of something looking like a fairly steep conical mountain like Mount Fuji in Japan This sort of volcano, known as a stratocone, is typical of settings above subduction zones, though they are not all so symmetric.

MAGMA ORIGIN AND ERUPTION

In this situation, the material that is being melted at depth belongs mostly to the crust of the descending slab With the exception of any sediments that have accumulated on top of it, this will be basaltic in composition, implying a silica content of about 49%. Most of the melt derived from this is richer in silica (about 55-60%) as a result of partial melting. Melts of the intermediate silica content produced by partial melting of basalt are called andesites (named after the Andes mountains, where they are common).

Magma is usually slightly less dense than solid rock, so once formed, it tends to rise to the surface. At first it percolates along the interfaces between crystals, but eventually collects into larger blobs that can force their way upwards. Some magma bodies cool down sufficiently to solidify before reaching the surface, forming intrusions. For now, we are concerned only with what happens if the magma reaches the surface. When it does so, one of two things happens. It may ooze out and begin to flow downhill. This is described as a "lava flow", lava being the term used to describe magma once it has reached the surface. Alternatively it may explode to produce a pyroclastic (fire-broken) rock

VOLCANIC HAZARDS



Lava flows of andesite composition are fairly viscous. They tend to have very blocky surfaces, and move more like a tram of rubble than a stream of liquid. As a result, they are usually shorter than about 10 km in length Although they may damage property, they rarely kill people because they mostly advance at only a few metres per hour.

When andesitic volcanoes erupt explosively, the effects are much more widespread. One of the biggest eruptions of the twentieth century occurred in June 1991 at Mt Pinatubo in the Philippines. This volcano had not erupted for at least 500 years. As is often found, when it awoke it erupted much more dramatically than a similar volcano in the habit of erupting every few years, and a column of ash reached a height of about 60 km over the volcano This type of eruption is described as plinian, after Pliny the Younger whose description of a similar eruption of Vesuvius in 79 AD, which led to the destruction of the towns of Pompeii and Herculaneum (and the death of Pliny the Elder, his uncle), is the first stage-by-stage account we have of a volcanic eruption.

In a plinian eruption, the ash is projected upwards by the force of the explosive escape of gas near the vent. However, columns of ash would not attain the great heights that they reach without the aid of buoyancy. What happens is that air is drawn into the column and heated by the hot ash particles and by mixing with the hot volcanic gases. The heated air expands, and, despite the weight of the ash particles, the column becomes buoyant and rises until it reaches a height where its density matches that of the surrounding air. The eruption cloud is then blown downwind, and the ash begins to settle out to form an 'airfall' ash desposit. The larger particles fall faster, and the airfall deposits tend to be thicker and made of larger particles closer to the volcano. The largest bits, ranging up to metres in size, are known as volcanic bombs. By mapping out the thickness of ancient airfall deposits it is possible to determine the direction of the wind at the time of the eruption. Where it accumulates thickly, airfall ash can cause roofs to collapse, and the fine particles can cause choking, but it is rarely a major cause of death.

Sometimes an eruption column becomes unstable and all or part of it collapses onto the side of the volcano, and then sweeps downslope across the ground surface as a cloud of searing hot ash and gas moving at over 100 km per hour. This sort of pyroclastic flow is known as a nuee ardente (French for 'glowing cloud') and can also be triggered by the collapse of a steep dome of extruded lava. A nuee ardente is justifiably the most feared consequence of aplinian eruption. One reason for this is the destruction of the town of St Pierre, the capital of the Caribbean island of Martinique, and the death of all but two of its 29 000 inhabitants. One survivor was a prisoner locked in the town jail, in a cell without a window and partly below ground level. He was dug out badly burned two days later, and pardoned for his crimes Fears of a similar eruption on the nearby island of Montserrat led to the evacuation of its most vulnerable areas in 1995 and 1996.

Unlike airfall deposits which blanket the topography irrespective of slope, pyroclastic flows tend to be confined to valleys, a characteristic that enables the two types of deposit to be distinguished. However, not all airfall material remains in place In particular it is easily washed away when it rains. In tropical areas the rain is liable to be torrential, so the water courses fill with a slurry of ash and water that, being denser than water, moves with a great force These volcanic mudflows (often called lahars, an Indonesian word) caused most of the damage resulting from the 1991 eruption of Mt Pinatubo Lahars can also be initiated if a volcanic eruption melts a glacier or snowcap This is what happened during an eruption of Ruiz, Colombia, in 1985 when approximately 23,000 people, including most of the population of the town of Armero, lost their lives. Readers may remember harrowing television pictures of a young girl, trapped by solid debris in the mud-flow, and with only her head showing, who succumbed after several days' attempts to dig her out.

We may add the risk of volcanic collapse, a process that first became widely-recognised after the May 1980 eruption of Mt St Helens, in Washington State, USA. Here there was two months' warning of a major eruption in the form of small but progressively shallower earthquakes, minor ash eruptions, and a slight bulging of the northern flank of the volcano. However, rather than culminating in a plinian eruption from the summit crater, the northern flank gave way, forming a giant debris avalanche. As this collapse began, the confining pressure on the magma within the volcano was released and it degased explosively, directing most of its force sideways. This directed blast was supersonic, and 60 square kilometers of what had been forest was devastated.

The sideways nature of this directed blast caught even the professionals by surprise. A volcanologist working for the US Geological Survey, Dave Johnson, was stationed in what should have been a safe location, on a high ridge several kilometres north of Mt St Helens, and was assigned the duty of recording the anticipated eruption. Tragically, his camp site caught the full force of the directed blast, and his body was never found His young field assistant, Harry Glicken, had been sent back to headquarters, and survived to become a well-known volcanologist in his own right. Sadly he too died, eleven years later, when he was caught by a nuee ardente generated by a collapsing lava dome on the Japanese volcano Unzen.

The Mt St Helens collapse was triggered by the injection of magma into the volcano, but it is possible that other volcanoes collapse simply under their own weight. When this happens debris avalanches can travel for tens of kilometres, to judge from mapping of ancient deposits. No major volcanic debris avalanche has happened in historic times.

Other causes of death associated with volcanoes include the release of suffocating gases, which may flow downhill, and tsunamis generated not by earthquakes but by underwater volcanic explosions, or by a volcanic landslide entering the sea or a lake, the Table lists the fatalities from some notable volcanic events.

Volcano	Year	Fatalities	Main cause(s) of death
Vesuvius. Italy	79AD	>3,500	Pyroclastic flows
Kelut, Indonesia	1586	10,000**?**	unknown
Asama, Japan	1598	800	Religious pilgrims killed at summit
Vesuvius. Italy	1631	>4,000	Pyroclastic flows
Merapi, Indonesia	1672	3,000?	Pyroclastic flows
Laki, Iceland	1783	9,350	Starvation
Asama, Japan	1783	1,500	Pyroclastic flow, lahars
Unzen, Japan	1792	14,300	Tsunami
Tambora, Indonesia	1815	92,000	Starvation
Krakatau, Indonesia	1883	36,400	Tsunami
Mt Pelee, Martinique	1902	29,000	Pyroclastic flows
Taal, Philippines	1911	>1,335	Pyroclastic flows
Merapi, Indonesia	1930	1,369	Pyroclastic flows
Ruapehu, New Zealand	1953	151	Lahar
Iliwerung, Indonesia	1979	539?	Tsunami
Mt St Helens, USA	1980	57	Directed blast, lahars
Mayon, Philippines	1981	>200	Lahar

El Chichon, Mexico	1982	1,900	Pyroclastic flows
Ruiz, Colombia	1985	23,000	Lahar
Lake Nyos, Cameroon	1986	>1,700	Asphyxation by gases
Pinatubo, Philippines	1991	800	Ainall, lahars, disease

Not all volcanoes above destructive plate boundaries are andesitic stratocones. In some places basaltic melts approach the surface, either because of more complete melting of the subducting slab of oceanic crust, or because of partial melting within the wedge-shaped volume of mantle between the two plates. This basalt may flow out as quiet lava flows, its lower viscosity allowing it to spread more thinly than andesite over many square kilometres, or if the eruption is driven by the force of escaping gases it may result in a 'cinder cone' formed of lumps of slightly frothy basalt.

On the other hand, very large volumes of more silica-rich magmas are sometimes generated above subduction zones. This is particularly likely where large proportions of sediment have been dragged down by the subducting slab, or when there is a lot of melting of the lower crust above the subduction zone. These magmas typically have around 70 % silica, And are described as acidic or granitic. These usually crystallize at depth, forming the well-known rock-type called granite, which we shall examine in the next chapter, but sometimes they do approach the surface.

It is rare for granite magmas to ooze out quietly. This is because granitic lava is even more viscous than andesitic lava, making it difficult for gases to escape quietly. Sometimes it does happen though, and a very thick flow or a steep-sided lava dome is formed.

2. Make up the annotation of the text.

3. Define the main idea of the text.

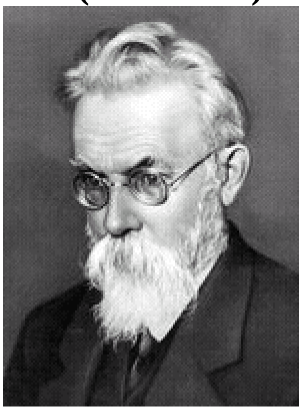
4. Say whether the statements are true or false

1. The global distribution of volcanoes above sea level correlates well with destructive plate boundaries.
2. Magma is not usually slightly less dense than solid rock, so once formed, it tends to rise to the surface.
3. The heated air expands, and, despite the weight of the ash particles, the column becomes buoyant and rises until it reaches a height where its density matches that of the surrounding air.
4. The largest bits, ranging up to metres in size, are known as volcanic bombs.
5. Fears of a similar eruption on the nearby island of Montserrat led to the evacuation of its most vulnerable areas in 1996 and 1998.
6. We may add the risk of volcanic collapse, a process that first became widely-recognised after the April 1980 eruption of Mt St Helens, in Washington State, USA.
7. Very large volumes of more silica-rich magmas are always generated above subduction zones.

SCIENTIST**S**
They contributed into the development of the Earth Sciences

Read the information about the scientists, prepare reports about them and discuss them in groups.
Outstanding scientists in the field of Hydrogeology and Geology

Volodymyr Ivanovych Vernadsky
(1863-1945)



Volodymyr Ivanovych Vernadsky – a great Russian scientist-mineralogist, crystallographer, geochemist, radiogeologist, creator of biochemistry and the study of biosphere.

Vernadsky's scientific interests were extremely wide. As a founder of geochemistry, he carried out his first research of laws of structure and composition of interacting elements and structures in the earth's crust, hydrosphere and atmosphere. He also investigated migration of chemical elements in lithosphere and the role of radioactive elements in its evolution. In 1923 he formulated a theory of a leading role of living organisms in geochemical processes, in 1926 - a concept and a definition of a biosphere and a living being; a study was created according to which a living thing involves inorganic matter into continuous circulation by transforming solar radiation, which is the central concept of biogeochemistry.

His main work is the book "Biosphere" published in 1926 and noticed by the scientific world because of descriptions of interrelations between living organisms and non-living nature. In his studies of the biosphere he investigated not only basic properties of "living matter" but also influence of properties "unsusceptible" to new ideas (such as soils or lakes". V.I.Vernadsky showed the leading role of living organisms in accumulation of solar energy and transformation of matter which composes the earth's crust. "Essentially the biosphere can be regarded as a region of the earth's crust, transforming the space radiation into effective earth energy", - he wrote. "The living matter" does enormous "geochemical "work, forming composition and structure of the earth. Clays, limestone, dolomites, iron ore, bauxite are all the rocks of organic origin.

V.I.Vernadsky's study about the biosphere played an important role in raising integral perception of natural processes as systems.

A.M. Terpigorev
(1873-1959)

Academician A.M. Terpigorev is a well-known mining engineer who successfully combined his practical experience with scientific research. He was born in 1873 in Tambov, Russia. In 1892 he finished school with honours[1] and decided to get a higher education. He chose the Mining Institute in St. Petersburg, passed all the entrance examinations successfully and became a student of the Mining Institute.

At the Institute he studied the full range of subjects relating to metallurgy, mining and mining mechanics.

At that time students' specialization was based on descriptive courses and elementary practical training. One of the best lecturers was A. P. Karpinsky. His lectures on historical geology were very popular.

During his practical training Terpigorev visited mines and saw that the miners' work was very difficult. While he was working in the Donbas he collected material for his graduation paper which he soon defended. The mining of flat seams in the Donbas was carefully studied and described in it.

In 1897 Terpigorev graduated from the Institute with a first-class diploma of a mining engineer.

His first job as a mining engineer was at the Sulin mines where he worked for more than three years, first as Assistant Manager and later as Manager.

From 1900 till 1922 Terpigorev worked at the Yekaterinoslav Mining Institute (now the Mining Institute in Dnipropetrovsk).

In 1922 he accepted an offer to take charge of the mining chair at the Moscow Mining Academy and moved to Moscow. From 1930 he headed the chairs of Mining Transport and Mining of Bedded Deposits at the Moscow Mining Institute.

Academician Terpigorev took a particular interest in mine safety. As a result of his investigations a series of safety measures in gassy collieries was worked out. For some time he was working on the problem of fire damp, the most harmful and dangerous of all the gases in mines.

His two-volume work *Coal Mining and Mine Transport Facilities* is a full description of the state of mechanization and the economy of the Donbas. His other works are about mining transport facilities, mechanization of coal mining and mining machinery. He is one of the pioneers in scientific methods of coal gasification.

A.P. Karpinsky
(1847-1936)

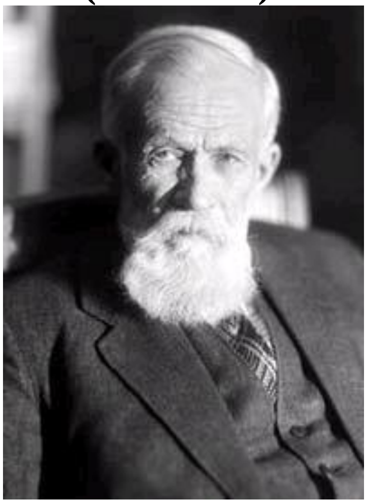
An entire epoch in the history of Russian geology is connected with A.P. Karpinsky's name. One of the greatest Russian geologists, he was a member and for some time President of the Academy of Sciences of the former USSR and a member of several Academies abroad. The Geological Society of London elected him a foreign member in 1901. His greatest contribution to geology was a new detailed geological map of the European part of Russia and the Urals.

For many years he headed the Russian Geological Committee, the staff of which was made up of his pupils. He was one of those geologists who embraced the whole of geological science. He created the new stratigraphy of Russia. He studied the geological systems in various regions of the country and was the first to establish[3] the regularity of the Earth's crust movement. His paleontological studies are of no less importance, especially those on palaeozoic ammonoids. He also took an interest in deposits of useful minerals and gave a classification of volcanic rocks. He advanced the view that petroleum deposits existed in Russia, which was confirmed later. He studied some ore and platinum deposits and may be justly considered the founder of practical geology of the Urals. He was the first Russian scientist who introduced microscope in the study of petrographic slides.

Karpinsky was a prominent scientist, an excellent man and citizen. He was one of the best lecturers at the Mining Institute in his time. He was also one of the greatest Russian scientists who later became the first elected President of the Academy of Sciences of the USSR. Students were attracted to him not only because he was a great scientist but also because of his charming personality and gentle manner.

Every geologist and every geology student knows very well Karpinsky's most significant work *An Outline of the Physical and Geographical Conditions in European Russia in Past Geological Periods.*

Volodymyr Opanasovych Obruchev
(1863-1956)



Volodymyr Opanasovych Obruchev was a Russian geologist, geographer, explorer, academician of the Soviet Academy of Sciences, Honorary president of the Soviet geographical Society from 1947. As one of the pioneers of Russian science fiction, Obruchev explored the possibilities of survival of prehistoric species in the remote areas of Siberia such as hypothetical Sannikov land.

Volodymyr Obruchev graduated from the Petersburg Mining Institute in1886. He held different posts throughout his life, such as professor of the Tomsk State Technical University in 1919, Taurida University in Simferopol and Moscow Mining Academy; Chairman of the Committee on Permafrost Studies of the Soviet Academy of Sciences,etc.

V.Obruchev was a well-known explorer of Siberia, Central and Middle Asia. In 1880-1890s he was engaged in designing the central Asian and trans-Siberian Railways. The results of his extensive work were summarized in a three-volume monograph “Geology of Siberia” and “History of Geological Exploration of Siberia”. These books mainly deal with the origins of loess in Central and Middle Asia , ice formation and permafrost in Siberia, problems of tectonics and tectonic structure of Siberia, and geology of goldfields in Siberia.

Volodymyr Obruchev was the author of many popular scientific works, such as “Formation of Mountains and Ore Deposits”, “Fundamentals of Geology”, “Field Geology”, ”Ore Deposits”. In Russia he is best known as the author of several science fiction novels, such as “Plutonia”, “Sannikov Land”, “Golddiggers in the Desert”, “In the Wilds of Central Asia”.

For his outstanding work in Central Asian Studies, V.Obruchev was awarded the Przhevalsky Prize, a big gold medal of the Russian Geographical Society and two Chikhachov Prizes from the French Academy of Sciences. In 1947, Obruchev was awarded the first Karpinsky Gold Medal.

A mineral obruchevite, a mountain range in Tuva, a mountain in the upper reaches of the Vitim River, an oasis in Antarctica, a crater on the Moon, and other landmarks are named after Volodymyr Obruchev. The Obruchev prize was established by the Soviet Academy of Sciences in 1938 for the best works on Siberian geology.

Mykola Ivanovych Andrusov
(1861—1924)

Geologist, stratigrapher, paleontologist born in Odessa in 1861. Graduated from Novorosiysk university in 1884, then continued his education at foreign universities and laboratories. Taught at Petersburg and Noborosiysk universities, in 1905-1912 was a professor at Kyiv university. In 1914-1918 –Director of the Geological Museum at Petrograd Academy of Sciences. From 1921 worked at the laboratories of Sorbonne (Paris) and Charles' university (Prague). Andrusov's works make up the new epoch in stratigraphy, paleontology, paleography, paleoecology, oceanology. They enabled scientists to develop the stratigraphy of neogenic sediments of Ponto-Caspian region in details which is still an unsurpassed example of accuracy and cleanliness of subdivisions. His further work only continued the rational basis. Andrusov's inheritance influenced the practice of oil deposits discovery on new territories.

All his life and research work were connected with the Black Sea area where he was born. In 1884 his first paper "Notes on geological research on the outskirts of Kerch" was published.

Andrusov was granted a two-year trip abroad to continue his education. He had a chance to work at leading European scientific centers in Vienna, Paris, Munich, Zagreb.

An important event in the life of the scientist was his participation in the Black Sea deep water expedition in 1890. New scientific results were obtained then, in particular, two discoveries were made: they found the remains of post-tertiary fauna of the Caspian type and found out that the deep sea bottom was contaminated with hydrogen sulphide .

Andrusov's works were recognized all over the world. In the XXth century his works in the field of neogenic sediments stratigraphy became extremely urgent and were used in prospecting for oil on the Caucasus and the Black Sea region. They made the basis for further study of sea litho- and sedimentogenesis. His reconstructions of paleographic situation through comparison of fossil sediments and fauna in them with sediments and fauna of modern seas were widely used.

Volodymyr Borysovych Porfiryev
(1899-1982)

Volodymyr Porfiryev was born to the family of the Zemstvo demographer. He graduated from 1st Vyatka Gymnasium in 1918 and then worked for the local demographic bureau. In 1919, Porfiriev as a volunteer joined the Red Army and took part in the Russian Civil War. After demobilisation he studied at Perm University and then transferred to the Exploration Faculty of the Petrograd Mining Institute, where he graduated in 1926.

In 1924, while still a student, he started his geological and research career in the State Geological Committee, where he first worked in their West Siberia Section and then for Petroleum one (now VNIGRI). From 1929 to 1938 he worked for as a geologits and head of the Central Asia Secion at All-Union Petroleum Research Geoexploration Institute (VNIGRI), and a foreman for Central oblasts of Russian SFSR. Without defending a thesis he received a PhD and professor degree in 1937. The next year he defended a Doctor of Science dissertation in Geology and Mineralogy titled "Formation conditions of the Central Asia oil fields". He then headed studies on hydrocarbon potential evaluation at the Institute of Geological Sciences at Kiev State University.

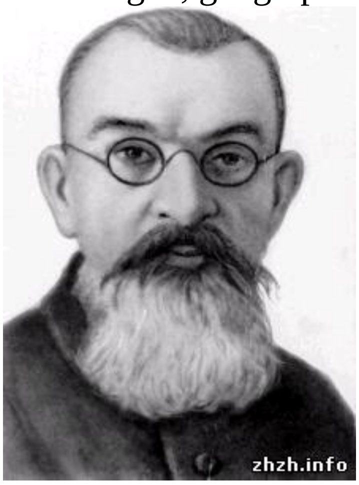
At the beginning of World War II he was called up for military service in the Red Army but soon was demobilized and sent to the Geological Institute at the Academic Sciences University in Tashkent, where he worked as senior researcher until 1944. Then he returned to Kiev and headed the Petroleum Department at the Institute of Geological Sciences.

In 1945, Porfiriev began a new phase of his career, beginning with his relocation to Lviv in the Western Ukraine. There he organized the Lviv Branch of the Institute of Geological Sciences, the Lviv Geological Society, the Physical Geology Department at Lviv State University and established the Oil and Gas Fields Geology and Exploration Department at Lviv Polytech Institute, the first Ukrainian college for petroleum engineers.

Under his guidance the Lviv Branch of the Institute of Geological Sciences became the Institute of Geology of Useful Minerals (1951), which was then transformed into the Institute of Geology and Geochemistry of Combustible Minerals (1962). Prof. Porfiriev headed that institute till 1963 when he was nominated to the post of Director of the Institute of Geological Sciences in Kyiv. From 1970 until his retirement, he headed the Department of Geology and Genesis of Oil and Gas fields at that institute.

Volodymyr Porfiriev contributed to numerous scientific journals, and edited the "Reports of Academic Sciences of the Ukrainian SSR" and the "Geological Journal". He was a member of the Earth Sciences Division at the Presidium of the Academy from 1963 to 1968. He published 262 research works, including many monographs.

Pavlo Apollonovych Tutkovsky
(1858-1930)
Geologist, geographer



Tutkovsky Pavlo Apollonovych was born in 1858 in the town of Lypovets in Kyiv province. In 1882 he graduated from physics and mathematics faculty of Kyiv university. In 1884—1895 Tutkovsky worked at the geological room of the university. In 1896—1904 he taught in Kyiv gymnasia. In 1904—1913 he was an inspector, director of people's schools in Volyn. From 1914 — professor of Kyiv university. He actively participated in the establishment of the Ukrainian Academy of Sciences, Ukrainian universities. In 1926 P.A. Tutkovsky headed the first research institute of Geology in Ukraine.

P.A. Tutkovsky's contribution into science is many-sided. He worked practically in all branches of the Earth sciences. Many of his works are devoted to problems of mineralogy, petrography, paleontology, stratigraphy, regional and dynamic geology, geomorphology, physical geography, hydrogeology, etc. Most of his great heritage (he published more than 1000 works) was dedicated to Ukraine. Thus, V.I.Vernadsky called P.A.Tutkovsky the best expert in inorganic nature of Ukraine.

In 1880—90s during his annual expeditions as a member of Kyiv society of nature investigators he studied the geologic structure of all Right-bank Ukraine, Volyn and Polissia.

An important step in his life was 1911 when he defended his Doctorate thesis in Moscow University. In 1913 he began teaching in Kyiv university and in 1914 P.A.Tutkovsky was appointed a professor of the geography chair. In 1917

P.A.Tutkovsky established the institute of Geography at the university. An important step in his scientific career was the creation of Ukrainian scientific society which raised the question of establishment of Ukrainian people's university in Kyiv. That was the beginning of the development of the national higher education, and P.A.Tutkovsky was one of the most active figures in this process.

Stratigraphy and paleontology of tertiary and quaternary periods was the main subject of his study for many years. P.A.Tutkovsky began studying fossil microfauna which had not been studied in Russia before. He was the first to notice the distribution of microfauna in different sediments of Kyiv, Chernihiv, Volyn, Poltava , Tavriya regions . His works in this field attracted great attention of national and foreign specialists.

Like many other geologists of that time, P.A.Tutkovsky also studied the problems of water supply and artesian wells.

In the north of Volyn region he collected many facts characterizing pre-glacial, glacial and post-glacial sediments. They made the foundation for a number of hypotheses and theoretical structures as to the peculiarities of quaternary period in Ukraine and Europe on the whole. On the base of this empirical material he made his generalizations about the causes of great Pleistocene glaciation, fossilized deserts of the Northern hemisphere, classification of landscapes of Ukraine.

In 1920 P.A.Tutkovsky did a lot to establish the school of Ukrainian geologists. His works dedicated to the study of chalk and paleogenic sediments in Ukraine and Belorussia are still actual now.

Kharkiv university is famous for its scientific schools. One of the oldest schools is the school of geology which was established more than fifty years ago as an independent part of the Faculty of Geology and Geography which was among the first faculties of the university in 1805. Many world famous scientists worked at the Faculty of Geology and Geography. Among them are the names of I.F.Levakovsky, O.V.Gurov, D.M.Sobolev, V.P.Makridin.

Ivan Fedorovych Levakovsky

Ivan Fedorovych Levakovsky graduated from the department of physics and mathematics at Kharkiv university in 1852 and went to work as a teacher to Simferopol gymnasium. During his teaching work he acquainted himself with geological structure of the Crimea mountains and published the first results of his investigations.

In 1858 he went abroad and listened to the lectures of the famous paleontologist and stratigrapher G.Bron. In 1859 Levakovsky returned to Kharkiv where he defended his Doctorate thesis and started his work as a graduate at the chair of mineralogy which at that time was headed by professor M.D.Borysiak.

Ivan Fedorovych Levakovsky was a follower of C.Darwin and C. Layel's ideas. In his lectures and scientific reports he used the principle of actualization .

From 1869 till 1889 he continued his regional geologic and hydrogeologic work and began his study of geomorphology. In one of his early works, “The description of relief of Kharkiv region", Levakovsky expressed quite up-to date view on relief as "common and final result of all previous changes". He noticed obviously expressed asymmetry, width and terracing of river valleys.

In Levakovsky's works different hydrological issues connected with neogenic aquifers, ground and surface waters were considered. He was the first to make up description of Kharkiv region's hydrogeology "On soil and water of Kharkiv, 1875" in which he investigated such important problems as ground water origin, formation of various aquifers and their interconnection, specific chemical composition of each of them.

Levakovsky was also interested in soil study. In his works "Materials for studying chernozem" and "On soil and water in Kharkiv" he established a number of main issues which were later adopted and developed by V.V.Dokuchayiv.

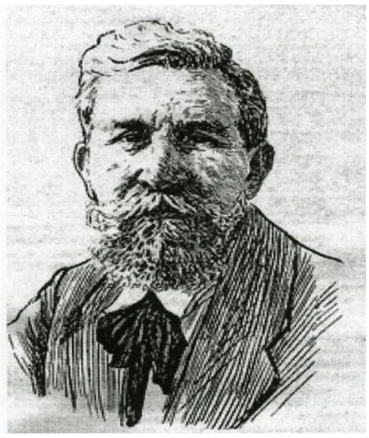
Oleksandr Vasyliovych Gurov
(1845-1919)

Oleksandr Vasyliovych Gurov was a successor of I.F.Levakovsky as a head of the chair from 1889 to 1906. He was one of the greatest scientist-geologists of pre-revolutionary period in Kharkiv university. In 1867 he graduated from the department of natural sciences at the faculty of physics and mathematics in Kharkiv university and began his research work there. From 1867 to 1873 O.V. Gurov headed geological prospecting work in Donbas,engaged in drilling in the town of Bakhmut, where in 1875 rock salt was found. In 1873-1875 he studied in Paris and London.

Even in his early work in 1869 O.V.Gurov significantly expanded paleontological characteristic of upper Jurassic sediments in northern Donbas, specified and made their detailed stratification. In 1882 Gurov defended his Master thesis in which he divided coal deposits of Donbas into lower and upper parts.
After his return from abroad, he was the first in the university to use the microscope method in study of rocks and fossils. In 1888 Gurov successfully defended his Doctorate thesis " Geological description of Poltava province" in which he paid much attention to geomorphological characteristics of green clays in Poltava region.

His name is connected with drilling of the first in Russia deep artesian well in Kharkiv (about 600 m) which was done at his own expense.This well functioned until World War II and provided the city with drinking water for many decades. Gurov’s success promoted spreading of drilling on artesian water in other towns of Russia.

Dmytro Mykolayovych Sobolev
(1872-1949)



Dmytro Mykolayovych Sobolev graduated from the department of natural sciences at the faculty of physics and mathematics in Warsaw university with honours and a scientific degree. In 1911 he published his first work concerning tectonic scheme of Sandomyr ridge which is now an emblem of Polish geological society.A tectonic map of Europe made up by him is included in the textbooks on geology.

In 1911 he defended his master thesis in Moscow university. His work made him famous among the Russian geologists.

D.M.Sobolev concentrated his first steps in Kharkiv university on his early research. He closely studied the works of his predecessors and O.V.Gurov.

In 1922 a decision about the establishment of a chair of geology at Kharkiv university was taken, and D.M.Sobolev headed the chair.

Sobolev’s work was characterized by a wide approach to the investigated problems, a desire to study them in their unity, which led him to search the laws of the Earth’s history and evolution of organic world. In his famous but controversial work “Earth and life”, developing the idea that the earth’s history is a sequence of geological cycles, he wrote that “ although it is not completely understood yet , we have the right to tend to build a periodic system of the earth’s crust history”.

Some of his ideas about classification of organisms were used in the methodology of their diagnostics and were later used by M.I. Vavilov .

As early as in 1924, Sobolev revived the notion of geological formation as a unity of rock formation which later was developed in the works of N.S.Shatsky, V.V.Belousov, L.B.Rukhin. He gave unsurpassed examples of analysis of glacial and near-glacial formation of Northern and Middle Europe.

Working at Kharkiv university, D.M.Sobolev forecast iol-bearing deposits in Dniprovsk-Donetsk hollow, which was completely confirmed after the war. Side by side with the oil-bearing, he considered the issues of coal distribution, iron quartzites and other mineral deposits on the territory of Ukraine.

Ignat Domeiko

Ignat Domeiko, a well-known geologist and mineralogist. He was born in 1802 in Belarus. Domeyko spent part of his life in Chili, of which he became a citizen and where he lived for 50 years. During his career, Domeyko made substantial contribution to mineralogy and technology of mining, studied several previously unknown minerals and was a meteorologist and ethnographer. Named after Domeyko are the mineral domeykite, the shellfish Nautilus domeykus, the Amonites domeykanus, asteroid 2784 Domeyko,the Cordillera Domeyko mountain range in the Andes, and the Chilean town of Domeyko.

Glossary of the Earth Science Terms

A

acequia (зрошувальний канал) – acequias are gravity-driven waterways, similar in concept to a flume. Most are simple ditches with dirt banks, but they can be lined with concrete. They were important forms of irrigation in the development of agriculture in the American Southwest. The proliferation of cotton, pecans and green chile as major agricultural staples owe their progress to the acequia system.

acid (кислотний**)** – a substance that has a pH of less than 7, which is neutral. Specifically, an acid has more free hydrogen ions (H+) than hydroxyl ions (OH-).

acre-foot (acre-ft) (акр фут) – the volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot. Equal to 325,851 gallons or 1,233 cubic meters.

alkaline (лужний) – sometimes water or soils contain an amount of alkali (strongly basic) substances sufficient to raise the pH value above 7.0 and to be harmful to the growth of crops.

alkalinity (лужність) – the capacity of water for neutralizing an acid solution.

alluvium (аллювій**)** – deposits of clay, silt, sand, gravel, or other particulate material that has been deposited by a stream or other body of running water in a streambed, on a flood plain, on a delta, or at the base of a mountain.

appropriation doctrine (принцип переваги) – the system for allocating water to private individuals used in most Western states. The doctrine of Prior Appropriation was in common use throughout the arid west as early settlers and miners began to cultivate the land. The prior appropriation doctrine is based on the concept of "First in Time, First in Right." The first person to take a quantity of water and put it to beneficial use has a higher priority of right than a subsequent user. Under drought conditions, higher priority users are satisfied before junior users receive water. Appropriative rights can be lost through non-use; they can also be sold or transferred apart from the land. Contrasts with Riparian Water Rights.

aquaculture (аквакультура) – farming of plants and animals that live in water, such as fish, shellfish, and algae.

aqueduct (акведук**)** – a pipe, conduit, or channel designed to transport water from a remote source, usually by gravity.

aquifer (водоносний горизонт) – a geologic formation(s) that is water bearing. A geological formation or structure that stores and/or transmits water to wells and springs. Use of the term is usually restricted to those water-bearing formations capable of yielding water in sufficient quantity to constitute usable supply for people's uses.

aquifer (confined or artesian) (водоносний горизонт закритий або артезіанський**)** – soil or rock below the land surface that is saturated with water. There are layers of impermeable material both above and below it and it is under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer.

aquifer (unconfined) (водоносний горизонт, відкритий) – an aquifer whose upper water surface (water table) is at atmospheric pressure, and thus is able to rise and fall.

aquifer, perched: (водоносний горизонт, підвішений**)** – an aquifer containing unconfined groundwater separated from an underlying body of groundwater by an unsaturated zone.
aquifer, principal (водоносний горизонт, основний) – the aquifer or combination of related aquifers in a given area that is an important economic source of water to wells.
aquifer, secondary (водоносний горизонт, вторинний) – any aquifer that is not the main source of water from wells in a given area.
artesian water (артезіанська вода) – ground water that is under pressure when tapped by a well and is able to rise above the level at which it is first encountered. It may or may not flow out at ground level. The pressure in such an aquifer commonly is called artesian pressure, and the formation containing artesian water is an artesian aquifer or confined aquifer. *See* flowing well.
artificial recharge (штучне поповнення) – a process where water is put back into ground-water storage from surface-water supplies such as irrigation, or induced infiltration from streams or wells.
Aa Hawaiian term used to describe a lava flow whose surface is broken into rough angular fragments. **Aa** flows commonly develop from pahoehoe flows as they cool and lose gas.
absolute date (абсолютна дата) – an estimate of the true age of a mineral or rock based on the rate of decay of radioactive minerals.
active volcano (активний вулкан) – a volcano that is erupting; or one that, while not erupting at the present, has erupted within (geologically) recent time and is considered likely to do so in the (geologically) near future.
adiabatic rate (адіабатичний діапазон) – the rate of temperature change in the atmosphere due to the raising or lowering of an air mass. The "dry adiabatic rate" is 5.5 deg. F. per 1000 feet, while the "wet" rate is 3.5 deg. F. per 1000 feet.
alluvium (алювій) – a general term for clay, silt, sand, gravel or similar unconsolidated material deposited by a stream or other body of running water.
andesite (андезіт) – intermediate volcanic rocks containing 54 to 62 percent silica and moderate amounts of iron and magnesium. Andesite minerals commonly include plagioclase and hornblende, with lesser amounts of mica, pyroxene, and various accessory minerals. Andesites are aphanitic in texture and are usually medium dark in color. They occur with composite volcanic cones associated with convergent plate margins.
aquiclude (водонапір**) –** an impermeable geologic formation or stratum which will not hold or transmit fluid.
aquitard (проникний водонапір) – a geologic formation or stratum that significantly retards fluid movement.
artesian well (артезіанський колодязь) – a well in an aquifer where the groundwater is confined under pressure and the water level will rise above the top of the confined aquifer.
artificial recharge (штучне поповнення**) –** the unnatural addition of surface waters to groundwater. Recharge could result from reservoirs, storage basins, leaky canals,

direct injection of water into an aquifer, or by spreading water over a large land surface.
ash (попіл) **–** fine particles of rock material ejected during an explosive volcanic eruption (commonly intermediate to felsic events). Ash may be either solid or molten when first erupted, and generally measures less than 0.10 inch in size (larger particles have other names).
ashfall (subaerial) (викид вулканічного попелу**) –** volcanic ash that has fallen through the air. The resulting deposit is usually well sorted and exhibits a finely layered structure.
ash flow (потоки попелу**) –** a turbulent mixture of gas and rock fragments, most of which are ash-sized particles, ejected violently from a crater or fissure. The mass of pyroclastics is normally of very high temperature and moves rapidly down the slopes, or even along a level surface.
avalanche (снігова лавина) **–** a large mass of material falling or sliding rapidly due to the force of gravity. In many cases, water acts as a catalyst and/or lubricant. Avalanches are often classified by what is moving, such as a snow, ice, soil, or rock avalanche. A mixture of these materials is commonly called a debris flow.

B

base flow (ґрунтовий стік) – sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced streamflows. Natural base flow is sustained largely by ground-water discharges.
base (основа**) –** a substance that has a pH of more than 7, which is neutral. A base has less free hydrogen ions (H+) than hydroxyl ions (OH-).
bedrock (материнська порода**) –** the solid rock beneath the soil and superficial rock. A general term for solid rock that lies beneath soil, loose sediments, or other unconsolidated material.
basalt (базальт**)** – volcanic rock (or magma) that is generally dark in color, contains 45 to 54 percent silica, and is rich in iron and magnesium. An eruption of basaltic magma is generally quiet, and results in flows (both vesicular and non-vesicular) and breccias. Undersea eruptions commonly result in the formation of "pillow lavas." Basalt represents the initial differentiated material erupted by the earth at spreading centers, and is considered by GeoMan to be the "blood of the earth."
bentonite (бентоніт**) –** a clay material composed principally of the mineral montmorillonite. It has a great affinity for fresh water and when hydrated will increase its volume more than seven times. Water/bentoninte suspensions are essentially impermeable. Commonly used as a sealant for ponds.
biostratigraphy (біостратіграфія**)** : the study and classification of rocks and their history based on their fossil content.
block (блок) – angular chunk of solid rock ejected during a volcanic eruption.
bomb (бомба) – fragments of molten or semi-molten rock, several inches to several feet in diameter, which are blown out during an explosive volcanic eruption. Because of their semi-plastic condition, bombs are often modified in shape during their flight or upon impact.

breccia (брекчія) – angular fragments of material, commonly formed by physical weathering processes or explosive volcanic activity.
brittle-ductile transition zone (крихка перехідна зона **) –** the location at depth within the earth's crust where the temperature and pressure have risen to such a high level that directed stress results in plastic deformation as opposed to fracturing and faulting.

C

caldera (кальдера) – the Spanish word for "cauldron", a basin-shaped volcanic depression; by definition, at least a mile in diameter. Such large depressions are typically formed by the subsidence of volcanoes. Crater Lake occupies the best-known caldera in the Cascades.
calorie (калорія) – a unit of heat energy. The amount of heat required to raise the temperature of 1 gram (cubic centimeter) of water by 1 degree Celsius. Also, the substance which gives food its flavor.
capillary action (дія капілярів) **–** the means by which liquid moves through the porous spaces in a solid, such as soil, plant roots, and the capillary blood vessels in our bodies due to the forces of adhesion, cohesion, and surface tension. Capillary action is essential in carrying substances and nutrients from one place to another in plants and animals.
chattermarks (сліди вібрацій) – erosional features associated with alpine glaciers.
cinder cone (конуси золи) – a volcanic cone built entirely of loose fragmented material (pyroclastics **commercial water use** (комерційне використання води) – water used for motels, hotels, restaurants, office buildings, other commercial facilities, and institutions. Water for commercial uses comes both from public-supplied sources, such as a county water department, and self-supplied sources, such as local wells.
condensation (конденсація) – the process of water vapor in the air turning into liquid water. Water drops on the outside of a cold glass of water are condensed water. Condensation is the opposite process of evaporation.
consumptive use (споживче використання**) –** that part of water withdrawn that is evaporated, transpired by plants, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment. Also referred to as water consumed.
conveyance loss (втрати при транспортуванні**) –** water that is lost in transit from a pipe, canal, or ditch by leakage or evaporation. Generally, the water is not available for further use; however, leakage from an irrigation ditch, for example, may percolate to a ground-water source and be available for further use.
cubic feet per second (cfs) кубічний фут за секунду) **–** a rate of the flow, in streams and rivers, for example. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second. One "cfs" is equal to 7.48 gallons of water flowing each second. As an example, if your car's gas tank is 2 feet by 1 foot by 1 foot (2 cubic feet), then gas flowing at a rate of 1 cubic foot/second would fill the tank in two seconds.

collection (накопичення) the accumulation of precipitation into surface and underground areas, including lakes, rivers, and aquifers.
comet (комета) – an object which circles the sun in a non-circular orbit. Commonly made up of a large mass of rock debris and ice. Basically, a giant snockball from space.
composite volcano (композитний вулкан**)** – a steep volcanic cone built by both lava flows and pyroclastic eruptions.
condensation (конденсація) **–** the change of state of water from the vapor to the liquid phase. Results in liberation of 80 calories per cubic centimeter.
connate water (реліктова вода) – water included in the groundwater which is derived from the rock itself, as opposed to water which has percolated down from the surface.
continental crust (континентальна кора**) –** solid, outer layers of the earth, including the rocks of the continents.
continental drift (континентальний дрейф) – the theory that horizontal movement of the earth's surface causes slow, relative movements of the continents toward or away from one another.
continental shelf (континентальний шельф) – portions of the continental land masses covered by sea water. Extend varying distances outward from the exposed continental margins. Usually, the continental shelf will be wider along a passive continental margin, and narrower along an active margin.
crater (кратер) – a steep-sided, usually circular depression formed by either explosion or collapse at a volcanic vent.

D

dacite (дацит) – Volcanic rock (or lava) that characteristically is light in color and contains 62 to 69 percent silica and moderate amounts of sodium and potassium.
debris avalanche (лавина обломків) – a flow of unsorted masses of rock and other material downslope under the influence of gravity. Water is commonly involved as a catalyst and/or lubricant. For example: a rapid mass movement that included fragmented cold and hot volcanic rock, water, snow, glacial ice, trees and other debris, and hot pyroclastic material was associated with the May 18, 1980 eruption of Mt. St. Helens. Most of the deposits in the upper valley of the North Fork Toutle River and in the vicinity of Spirit Lake are from the debris avalanche resulting from the eruption.
density (густина) – a measure of how tightly packed the atoms of a substance are. Measured in grams per cubic centimeter. Varies by the mineral or substance. For example, gold has a high density, while quartz has a low density. See also "specific gravity."
desalination обезсолювання) **–** he removal of salts from saline water to provide freshwater. This method is becoming a more popular way of providing freshwater to populations.
detachment plane (площина відриву потоку) – the surface along which a landslide disconnects from its original position.

dew point (точка роси) – the temperature (elevation) where adiabatic cooling results in the initiation of condensation of water vapor into cloud droplets.
di-polar (дво-полюсний) – the arrangement of the hydrogen atoms of a water molecule at 105 deg. across the oxygen results in a slight electrical charge to the molecule. It also results in water molecules looking like Mickey Mouse instead of Alfred E. Newman.
discharge (випуск) – the volume of water that passes a given location within a given period of time. Usually expressed in cubic feet per second.
domestic water use (використання води для домашніх потреб) – water used for household purposes, such as drinking, food preparation, bathing, washing clothes, dishes, and dogs, flushing toilets, and watering lawns and gardens. About 85% of domestic water is delivered to homes by a public-supply facility, such as a county water department. About 15% of the Nation's population supply their own water, mainly from wells.
drainage basin (дренажний басейн) – land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large drainage basins, like the area that drains into the Mississippi River contain thousands of smaller drainage basins. Also called a "watershed."
drip irrigation (крапельне зрошування) – a common irrigation method where pipes or tubes filled with water slowly drip onto crops. Drip irrigation is a low-pressure method of irrigation and less water is lost to evaporation than high-pressure spray irrigation.
drawdown (зниження рівня) **–** a lowering of the ground-water surface caused by pumping.
dome (баня) – a steep-sided mass of viscous (doughy) lava extruded from a volcanic vent, often circular in plane view and spiny, rounded, or flat on top. Its surface is often rough and blocky as a result of fragmentation of the cooler, outer crust during growth of the dome.
dormant volcano (сплячий вулкан) – this term is used to describe a volcano which is presently inactive but which may erupt again. The major volcanic cones of the Cascade Mountains (in Washington, Oregon, and California) are believed to be dormant rather than extinct.
drift (glacial) (дрейф) – general term for material deposited by a glacier.

E

effluent (стік) – water that flows from a sewage treatment plant after it has been treated.
erosion (ерозія) – the movement of weathered material downslope under the influence of gravity. Water acts as a catalyst and as a lubricant. Some common types of erosion include landslides, rockfalls, creep, etc. Erosion takes weathered material and puts it in a river so it can be transported to the beach.
eruption (виверження) – the process by which solid, liquid, and gaseous materials are ejected into the earth's atmosphere and onto the earth's surface by volcanic

activity. Eruptions range from the quiet overflow of liquid rock to the tremendously violent expulsion of pyroclastics.

eruption cloud (вулканічна хмара**)** – the column of gases, ash, and larger rock fragments rising from a crater or other vent. If it is of sufficient volume and velocity, this gaseous column may reach many miles into the stratosphere, where high winds will carry it long distances.

eruptive vent (жерло виверження) – the opening through which volcanic material is emitted.

evolution (еволюція) – the theory stating that living organisms mutate and change, generally from simple to increasingly complex forms.

estuary (гирло) – a place where fresh and salt water mix, such as a bay, salt marsh, or where a river enters an ocean.

evaporation (випарування) – the process of liquid water becoming water vapor, including vaporization from water surfaces, land surfaces, and snow fields, but not from leaf surfaces. *See transpiration.*

evapotranspiration (сумарне випарування) – the sum of evaporation and transpiration.

ejecta (матеріал, який викидається із вулкану) – material that is thrown out by a volcano, including pyroclastic material (tephra) and, from some volcanoes, lava bombs.

extinct volcano (вулкан, що погас) **–** a volcano that is not presently erupting and is not likely to do so for a very long time in the future.

F

flood (повінь) – an overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean.

flood, 100-year (100-річна повінь**)** – a 100-year flood does not refer to a flood that occurs once every 100 years, but to a flood level with a 1 percent chance of being equaled or exceeded in any given year.

flood plain (заливні рівнини) – a strip of relatively flat and normally dry land alongside a stream, river, or lake that is covered by water during a flood.

flood stage (повеневий рівень) – the elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured

flowing well/spring (фонтануюча свердловина) – a well or spring that taps ground water under pressure so that water rises without pumping. If the water rises above the surface, it is known as a flowing well.

freshwater (прісна вода) --water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids; generally, more than 500 mg/L of dissolved solids is undesirable for drinking and many industrial uses.

fault (складка) – a crack or fracture in the earth's surface in which there has been movement of one or both sides relative to the other. Movement along the fault can

cause earthquakes or, in the process of mountain-building, can release underlying magma and permit it to rise to the surface as a volcanic eruption.
firn (фірн) – the intermediate "granular" stage which occurs during the conversion of snow to glacial ice.
fissures: (тріщини) – elongated fractures or cracks on the slopes of a volcano. Fissure eruptions typically produce liquid flows, but pyroclastics may also be ejected.
flank eruption (бокове виверження) – an eruption from the side of a volcano (in contrast to a summit eruption.)
fossil (окамянілості) – evidence of past life on earth. Can include the preserved hard and soft parts of plants and animals, tracks and burrows, whole organisms preserved intact in amber or tar, and fossilized dung. ANY evidence of life constitutes a fossil.
fumarole (фумарол**) –** a vent or opening through which issue steam, hydrogen sulfide or other gases. The craters of many dormant volcanoes contain active fumaroles.

G

gage height (рівень води) – the height of the water surface above the gage datum (zero point). Gage height is often used interchangeably with the more general term, stage, although gage height is more appropriate when used with a gage reading.
gaging station (вимірювальна станція) – a site on a stream, lake, reservoir or other body of water where observations and hydrologic data are obtained. The U.S. Geological Survey measures stream discharge at gaging stations.
geyser (гейзер) – a geothermal feature of the Earth where there is an opening in the surface that contains superheated water that periodically erupts in a shower of water and steam.
giardiasis (гиардиоз**) –** a disease that results from an infection by the protozoan parasite Giardia Intestinalis, caused by drinking water that is either not filtered or not chlorinated. The disorder is more prevalent in children than in adults and is characterized by abdominal discomfort, nausea, and alternating constipation and diarrhea.
glacier (льодовик) – a huge mass of ice, formed on land by the compaction and recrystallization of snow, that moves very slowly downslope or outward due to its own weight.
glacial ice (льодовиковий лід) – naturally occurring ice which exhibits internal plastic flow and deformation.
glacial abrasion (льодовикова абразія) **–** a common mechanical weathering process where rock and debris frozen into the sides and bottom of a glacier act like sandpaper and wear down the bedrock the glacier is moving across.
glacial quarrying (plucking) (видобуток льоду) – a common mechanical weathering process in alpine glaciated terrain where glacial ice frozen into cracks in the bedrock literally "pluck" rock material from the valley floor.
glacial polish (льодовикове полірування) – polished bedrock surfaces left behind after melting of glacial ice. The polishing is probably due to very fine grained rock flour carried at the base of the ice.

greywater (стічна вода**) –** wastewater from clothes, washing machines, showers, bathtubs, hand washing, lavatories and sinks.

ground water (грунтова вода) – (1) water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table. (2) Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust.

ground water, confined (грунтова вода, зв'язана) – ground water under pressure significantly greater than atmospheric, with its upper limit the bottom of a bed with hydraulic conductivity distinctly lower than that of the material in which the confined water occurs.

ground-water recharge (поповнення грунтової води) – inflow of water to a ground-water reservoir from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Also, the volume of water added by this process.

ground water, unconfined (грунтова вода, незв'язана) – water in an aquifer that has a water table that is exposed to the atmosphere.

geothermal energy (геотермічна енергія) – energy derived from the internal heat of the earth.

geothermal power (геотермічна сила) – power generated by using the heat energy of the earth.

graben (грабен**)** – an elongate crustal block that is relatively depressed (downdropped) between two fault systems.

H

hardness (жорсткість) **–** water-quality indication of the concentration of alkaline salts in water, mainly calcium and magnesium. If the water you use is "hard" then more soap, detergent or shampoo is necessary to raise lather.

headwater(s) (витік ріки) – (1) the source and upper reaches of a stream; also the upper reaches of a reservoir – (2) the water upstream from a structure or point on a stream. (3) the small streams that come together to form a river. Also may be thought of as any of all parts of a river basin except the mainstream river and main tributaries.

hydroelectric power water use (використання води для виробництва енергії) – the use of water in the generation of electricity at plants where the turbine generators are driven by falling water.

hydrologic cycle (кругообіг води) – the cyclic transfer of water vapor from the Earth's surface via evapotranspiration into the atmosphere, from the atmosphere via precipitation back to earth, and through runoff into streams, rivers, and lakes, and ultimately into the oceans.

harmonic tremor(гармонійне дрижання**) –** a continuous release of seismic energy typically associated with the underground movement of magma. It contrasts distinctly with the sudden release and rapid decrease of seismic energy associated with the more common type of earthquake caused by slippage along a fault.

heat transfer (теплообмін) – movement of heat from one place to another.

horizontal blast (горизонтальний вибух) – an explosive eruption in which the resultant cloud of hot ash and other material moves laterally rather than upward.

hot-spot volcanoes (вулкани з постійним джерелом температури) – volcanoes related to a persistent heat source in the mantle.
hydrothermal reservoir:(резервуар з гарячою водою) – an underground zone of porous rock containing hot water.

I

impermeable layer (непроникний шар) – a layer of solid material, such as rock or clay, which does not allow water to pass through.
industrial water use (промислове використання води) – water used for industrial purposes in such industries as steel, chemical, paper, and petroleum refining. Nationally, water for industrial uses comes mainly (80%) from self-supplied sources, such as a local wells or withdrawal points in a river, but some water comes from public-supplied sources, such as the county/city water department.
infiltration (інфільтрація) – flow of water from the land surface into the subsurface.
injection well (свердловина нагнітання**) –** refers to a well constructed for the purpose of injecting treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal or storage into a designated aquifer. Injection wells are generally drilled into aquifers that don't deliver drinking water, unused aquifers, or below freshwater levels.
isostasy (ізостазія) – the vertical readjustment of the surface of the earth due to the addition or removal of weight. Commonly associated with the advance and retreat of glacial ice.
irrigation (зрошення, ірігація) – the controlled application of water for agricultural purposes through manmade systems to supply water requirements not satisfied by rainfall. Here's a quick look at some types of irrigation systems.
irrigation water use (використання води для зрошення) – water application on lands to assist in the growing of crops and pastures or to maintain vegetative growth in recreational lands, such as parks and golf courses.

K

kame (кам) **–** a mound of stratified glacial till deposited by meltwater streams. Kames vary considerably in nature and origin; some developed as deltas on the margins of a stagnating glacier whilst others resulted from the accumulation of glacial till in large crevasses. Sands and gravel in kames form as exploitable economic resource and are often extracted.
katabatic wind or mountain wind (направлений вниз вітер) – localized wind which flows down valley slopes, usually at night. Katabatic winds are caused by the rapid nocturnal cooling of valley slopes and their overlying layers of air and the subsequent drainage of this cold air under gravity onto the valley floor.
kilogram (кілограм) – one thousand grams.
kinetic energy (кінетична енергія) – the energy of motion.
kilowatt-hour (KWH) (кіловат-година) – a power demand of 1,000 watts for one hour. Power company utility rates are typically expressed in cents per kilowatt-hour.

karst (карст) **–** a complex of original relief features of the surface and underground hydrographic network, formed as a result of influence of moving water on soluble rocks: limestone, dolomite, gypsum, salts**.**
karst waters (карстові води) **–** underground waters in cracks, channels and cavities arising as a result of water influence on soluble rocks.
кinematic factor of viscosity (кінематичний фактор в'язкості) **–** quotient from division of (dynamic) factor of viscosity into liquid density.

L

laccolith (лаколіт**) –** a large dome–shaped mass of intrusive rock formed by the injection and solidification of magma along bedding planes and the resulting upward arching of overlying country rocks. The erosion of the overlying rock results in the formation of a domed landscape, such as the Henry Mountains in Utah, USA.
lahar(сель) – a torrential flow of water-saturated volcanic debris down the slope of a volcano in response to gravity. A type of mudflow.
langley (одиниця сонячної енергії) – the unit of solar energy relating to the amount which reaches a specific area of the earth's surface. In general, more "langleys" reach the surface of the earth at the equator than at the poles.
lapilli (лапіллі) **–** literally "little stones;" round to angular rock fragments measuring 1/10 inch to 2-1/2 inches in diameter, which may be ejected in either a solid or molten state.
lava (лава) – magma which has reached the surface through a volcanic eruption. The term is most commonly applied to streams of liquid rock that flow from a crater or fissure. It also refers to cooled and solidified igneous rock.
lava flow (потік лави) – an outpouring of lava onto the surface from a vent or fissure. Also, a solidified tongue-like or sheet-like body formed by outpouring lava.
lava tube (тунель лави) – a tunnel formed when the surface of a mafic lava flow cools and solidifies, while the still-molten interior flows through and drains away. These can insulate the flow and allow it to travel great distances.
laterite (червонозем, латеріт) – a porous, reddish duricrust found in humid tropical regions. Laterites are formed through the concentration of iron and aluminium oxides in the soil profile, resulting from the heavy leaching of other minerals, such as silica, and the deposition of iron and aluminium from groundwater which had been drawn upwards by capillarity. Laterites can occur both as subsurface and surface features.
leaching (вилужування) – the process by which soluble materials in the soil, such as salts, nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.
leeward (підвітряний) – the side facing away from the wind. When speaking of a mountain range, these areas are generally hotter and drier than on the windward side.
lentic waters (непроточна вода**) –** ponds or lakes (standing water).
levee (дамба) -a natural or manmade earthen barrier along the edge of a stream, lake, or river. Land alongside rivers can be protected from flooding by levees.
livestock water use (використання води у тваринництві) – water used for livestock watering, feed lots, dairy operations, fish farming, and other on-farm needs.
lotic waters (проточна вода) – flowing waters, as in streams and rivers.

loess (льос) – very fine-grained sediments deposited by wind action. Commonly associated with the margins of continental ice sheets. Large expanses of loess from the recent ice age are to a large degree responsible for the bountiful corn and wheat fields of the American Midwest.

M

magma (магма) – molten rock beneath the surface of the earth.

magma chamber (камера магми) – the subterranean cavity containing magma. When a conduit is opened to the surface, a volcanic eruption is possible.

mantle (мантія) – the zone of the earth below the crust and above the core.

magnitude (величина) – a numerical expression of the amount of energy released by an earthquake, determined by measuring earthquake waves on standardized recording instruments (seismographs.) The number scale for magnitude is a modified logarithmic value, rather than arithmetic, and the numbers get real big, real fast; a magnitude 9 earthquake, for example, is 33 times greater than a magnitude 8 earthquake, 1089 times greater than a magnitude 7 earthquake, 35937 times greater than a magnitude 6 earthquake, and so on. The short version? Small quakes don't really do much to relieve stress in the crust.

marker horizon (or bed) (маркировочний горизонт) – a distinctive horizon which is used for regional correlation of lithology. A good marker horizon is distinctive, widespread, and represents a relatively short period of geologic time. For example, ash from a volcanic eruption, debris from a meteorite impact, etc. It is GeoMan's opinion that humans will represent one of the earth's finest marker horizons in the geologic record of the future. Our effect on the surface is certainly distinctive and widespread, and, at the rate we are going, it is likely that our species will have a relatively short lifespan (speaking in terms of geologic time, of course).

metamorphic (метаморфічний**)** – from the Greek "meta" (change) and "morph" (form). Commonly occurs to rocks which are subjected to increased heat and/or pressure. Also applies to the conversion of snow into glacial ice.

mineral (мінерал) – a naturally occurring, inorganic, crystalline solid with a definite internal structure and chemical composition.

moraine (морена) – general term for material deposited beneath, along the sides, and/or at the terminus of a glacier. Also, what we get here in Oregon during the fall, winter, and spring. See also “till”.

mudflow (селевий потік) – a flowage of water-saturated earth material possessing a high degree of fluidity during movement. A less-saturated flowing mass is often called a debris flow. A mudflow originating on the flank of a volcano is properly called a lahar.

maximum contaminant level (MCL) (максимальний рівень забруднення) – the designation given by the U.S. Environmental Protection Agency (EPA) to water-quality standards promulgated under the Safe Drinking Water Act. The MCL is the greatest amount of a contaminant that can be present in drinking water without causing a risk to human health.

milligram (mg) **(**міліграм) – one-thousandth of a gram.

milligrams per liter (mg/l) (міліграм на літр) – a unit of the concentration of a constituent in water or wastewater. It represents 0.001 gram of a constituent in 1 liter of water. It is approximately equal to one part per million (PPM).
million gallons per day (Mgd) (мільйон галонів на день) – a rate of flow of water equal to 133,680.56 cubic feet per day, or 1.5472 cubic feet per second, or 3.0689 acre-feet per day. A flow of one million gallons per day for one year equals 1,120 acre-feet (365 million gallons).
mining water use (використання води у шахтах) – water use during quarrying rocks and extracting minerals from the land.
municipal water system (муніципальна система води) – a water system that has at least five service connections or which regularly serves 25 individuals for 60 days; also called a public water system.

N

natural gas (природний газ) – gaseous hydrocarbons (principally methane) trapped in underground rock reservoirs. It may occur alone but is more commonly associated with deposits of oil. Natural gas is the highest quality,cleanest burning fossil fuel and is heavily used as a domestic, commercial and industrial energy source; it is also as important raw material for the petrochemical industry. However, unless new, large-scale reservoirs of natural gas are discovered, all existing reserves may soon be exhausted.
nephelometric turbidity unit (NTU) - (нефелометрична одиниця) – unit of measure for the turbidity of water. Essentially, a measure of the cloudiness of water as measured by a nephelometer. Turbidity is based on the amount of light that is reflected off particles in the water.
NGVD (вертикальна геодезична величина) -National Geodetic Vertical Datum. (1) As corrected in 1929, a vertical control measure used as a reference for establishing varying elevations. (2) Elevation datum plane previously used by the Federal Emergency Management Agency (FEMA) for the determination of flood elevations. FEMA current uses the North American Vertical Datum Plane.
NGVD of 1929--National Geodetic Vertical Datum of 1929. A geodetic datum derived from a general adjustment of the first order level nets of the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in the USGS series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.
non-point source (NPS) -(джерело широкого забруднення**)** –pollution discharged over a wide land area, not from one specific location. These are forms of diffuse pollution caused by sediment, nutrients, organic and toxic substances originating from land-use activities, which are carried to lakes and streams by surface runoff. Non-point source pollution is contamination that occurs when rainwater, snowmelt, or irrigation washes off plowed fields, city streets, or suburban backyards. As this runoff moves across the land surface, it picks up soil particles and pollutants, such as nutrients and pesticides.

norite (норіт) – an igneous rock with mafic composition.
nuée ardente(гарячий газ) – a French term applied to a highly heated mass of gas-charge ash which is expelled with explosive force down the mountainside. Common to intermediate volcanoes. Can be quite deadly. Also known as a "glowing avalanche."

O

obsidian (обсідіан) – a black or dark-colored volcanic glass, usually of rhyolitic (felsic) composition.
ocean (океан) – a part of the World Ocean located between continents, has a big size, independent circulation of waters and the atmosphere, as well as specific hydrological conditions.
oceanology (океанологія) – a science about the world ocean as a part of hydrosphere.
oceanic crust (океанічна кора) **–** the earth's crust where it underlies oceans.
occluded front (поглинаючий фронт) – a type of front formed by an advancing cold front overtaking a more slowly moving warm front and gradually raising the warm sector of a depression off the earth's surface. Occluded fronts are commonly associated with mid-latitude depressions. When the air of the overtaking cold front is cooler than th cold air in front of the warm front then a cold occlusion results whilst if the cold front is warmer than the air ahead of the warm front then a warm occlusion occurs. The development of an occluded front indicates the decline of a depression.
offshore bar (піщана мілина при вході у затоку**) –** an offshore bank of sand and shingle that develops on gently sloping coasts. Lagoons form behind offshore bars, and these may eventually silt up completely.
olygotrophic vegetation (оліготрофна рослинність) – vegetation undemanding as to the contents or nutrients in soil.
ore (руда) – an economically workable metalliferous mineral deposit. Ore deposits may occur in igneous, metamorphic or sedimentary rocks and may be magmatic, metasomatic, pneumatolytic, hydrothermal or residual in origin. Some gold and tin ores are found in placer deposits. Ore deposits are a non-renewable resource.
organic matter (органічна речовина) – plant and animal residues, or substances made by living organisms. All are based upon carbon compounds.
osmosis (осмос) – the movement of water molecules through a thin membrane. The osmosis process occurs in our bodies and is also one method of desalinating saline water.
outfall (вивідний колектор) – the place where a sewer, drain, or stream discharges; the outlet or structure through which reclaimed water or treated effluent is finally discharged to a receiving water body.
outcrop (вихід на поверхню) – an area where bedrock occurs at the surface whether visibly exposed or underlying a veneer of soil and vegetation.
overburden (перекриваюча порода**)** – the soil and bedrock overlying mineral deposits that is removed prior to the commencement of opecast mining.

oxygen demand (киснева нестача) – the need for molecular oxygen to meet the needs of biological and chemical processes in water. Even though very little oxygen will dissolve in water, it is extremely important in biological and chemical processes.

P

pH – a measure of the relative acidity or alkalinity of water. Water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions.

particle size (розмір частки) – the diameter, in millimeters, of suspended sediment or bed material. Particle-size classifications are:

[1] Clay—0.00024-0.004 millimeters (mm);

[2] Silt—0.004-0.062 mm;

[3] Sand—0.062-2.0 mm; and

[4] Gravel—2.0-64.0 mm.

parts per billion (частка на мільярд**) –** the number of "parts" by weight of a substance per billion parts of water. Used to measure extremely small concentrations.

parts per million (частка на мільйон) – the number of "parts" by weight of a substance per million parts of water. This unit is commonly used to represent pollutant concentrations.

pathogen (патогенний) – a disease-producing agent; usually applied to a living organism. Generally, any viruses, bacteria, or fungi that cause disease.

peak flow (максимальний потік) – the maximum instantaneous discharge of a stream or river at a given location. It usually occurs at or near the time of maximum stage.

per capita use (використання на душу населення) – the average amount of water used per person during a standard time period, generally per day.

percolation (фільтрація) – (1) the movement of water through the openings in rock or soil. (2) the entrance of a portion of the streamflow into the channel materials to contribute to ground water replenishment.

permeability (проникність) – the ability of a material to allow the passage of a liquid, such as water through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas unpermeable material, such as clay, don't allow water to flow freely.

point-source pollution (забруднення з одного джерела**) –** water pollution coming from a single point, such as a sewage-outflow pipe.

polychlorinated biphenyls (PCBs) (бифеніл поліхлоринат) – a group of synthetic, toxic industrial chemical compounds once used in making paint and electrical transformers, which are chemically inert and not biodegradable. PCBs were frequently found in industrial wastes, and subsequently found their way into surface and ground waters. As a result of their persistence, they tend to accumulate in the environment. In terms of streams and rivers, PCBs are drawn to sediment, to which they attach and can remain virtually indefinitely. Although virtually banned in 1979 with the passage of the Toxic Substances Control Act, they continue to appear in the flesh of fish and other animals.

porosity (пористість) – a measure of the water-bearing capacity of subsurface rock. With respect to water movement, it is not just the total magnitude of porosity that is important, but the size of the voids and the extent to which they are interconnected, as the pores in a formation may be open, or interconnected, or closed and isolated. For example, clay may have a very high porosity with respect to potential water content, but it constitutes a poor medium as an aquifer because the pores are usually so small.
potable water (питна вода) – water of a quality suitable for drinking.
precipitation (опади) rain, snow, hail, sleet, dew, and frost.
primary wastewater treatment (первинна очистка води**) –** the first stage of the wastewater-treatment process where mechanical methods, such as filters and scrapers, are used to remove pollutants. Solid material in sewage also settles out in this process.
prior appropriation doctrine (доктрина першочергового водокористування**) –** the system for allocating water to private individuals used in most Western states. The doctrine of Prior Appropriation was in common use throughout the arid West as early settlers and miners began to develop the land. The prior appropriation doctrine is based on the concept of "First in Time, First in Right." The first person to take a quantity of water and put it to beneficial use has a higher priority of right than a subsequent user. The rights can be lost through non-use; they can also be sold or transferred apart from the land. Contrasts with riparian water rights.
public supply (комунально-побутове водопостачання) – water withdrawn by public governments and agencies, such as a county water department, and by private companies that is then delivered to users. Public suppliers provide water for domestic, commercial, thermoelectric power, industrial, and public water users. Most people's household water is delivered by a public water supplier. The systems have at least 15 service connections (such as households, businesses, or schools) or regularly serve at least 25 individuals daily for at least 60 days out of the year.
public water use (комунально-побутове використання води**) –** water supplied from a public-water supply and used for such purposes as firefighting, street washing, and municipal parks and swimming pools.
Pahoehoe: Hawaiian term for a fluid volcanic eruption resulting in broad basaltic shield volcanoes. The highly fluid magma flows readily, and hardens into ropey forms as it cools. It can be very impressive to view an active flow!
phreatic eruption (explosion) (поверхневе виверження) – an explosive volcanic eruption caused when water and heated volcanic rocks interact to produce a violent expulsion of steam and pulverized rocks. Magma is not involved.
pillow lava:(подушкоподібні куски лави) – interconnected, sack-like bodies of lava that form underwater.
plastic deformation (or flow) (пластична деформація) – permanent bending or folding of rock (or ice) as a result of directed pressure. In rock, usually occurs below the Brittle-Ductile Transition Zone, and is commonly associated with metamorphism.
plate tectonics (тектоніка плит) – the theory that the earth's crust is broken into fragments (plates) which move in relation to one another, shifting continents, forming new ocean crust, and causing volcanic eruptions.

plug (пробка) – solidified lava that fills the conduit of a volcano. Plugs (also called volcanic necks) are usually more resistant to erosion than the material making up the surrounding cone, and may remain standing as a solitary pinnacle when the rest of the original structure has eroded away.
plug dome (пробкова баня**) –** the steep-sided, rounded mound formed when viscous lava wells up into a crater and is too stiff to flow away. It piles up as a dome-shaped mass, often completely filling the vent from which it emerged.
pluton (інтрузія вивержених порід) – a large igneous intrusion formed at great depth in the crust.
potential energy (gravitational) (потенційна енергія) – the stored energy of a substance. Water has a lot of this if there is an elevation difference. Potential energy can be converted to kinetic energy if the water (or other substance) is allowed to move.
precipitation (опади) – any condensed water falling from the atmosphere to the surface of the earth. Common types include rain, snow, sleet, and hail.
problem (проблема) – a situation which is generally uncomfortable, or otherwise undesirable. I always seem to have several - how about you?
pumice (пемза**) –** light-colored, frothy volcanic rock, usually of dacite or rhyolite composition, formed by the expansion of gas in erupting lava. Commonly seen as lumps or fragments of pea-size and larger, but can also occur abundantly as ash-sized particles.
pyroclastic (пірокластичний) – pertaining to fragmented (clastic) rock material formed by a volcanic explosion or ejection from a volcanic vent.
pyroclastic flow (пірокластичний потік) – lateral flowage of a turbulent mixture of hot gases (≈400°C) and unsorted pyroclastic material (volcanic fragments, crystals, ash, pumice, and glass shards) that can move at a high speed (100 miles an hour or more). Also known as a "glowing avalanche" or "nueé ardente."

R

rating curve (рейтингова крива) – a drawn curve showing the relation between gage height and discharge of a stream at a given gaging station.
recharge (інфільтрація) – water added to an aquifer. For instance, rainfall that seeps into the ground.
reclaimed wastewater (очищена вода) – treated wastewater that can be used for beneficial purposes, such as irrigating certain plants.
recycled water (вода повторного використання) --water that is used more than one time before it passes back into the natural hydrologic system.
reservoir (колектор) – a pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.
return flow (потік у зворотньому напрямку) **– (**1) That part of a diverted flow that is not consumptively used and returned to its original source or another body of water. (2) (Irrigation) Drainage water from irrigated farmlands that re-enters the water system to be used further downstream.
return flow (irrigation) – (irrigation water that is applied to an area and which is not consumed in evaporation or transpiration and returns to a surface stream or aquifer.

reverse osmosis (зворотній осмос) – **(**1) (Desalination) The process of removing salts from water using a membrane. With reverse osmosis, the product water passes through a fine membrane that the salts are unable to pass through, while the salt waste (brine) is removed and disposed. This process differs from electrodialysis, where the salts are extracted from the feedwater by using a membrane with an electrical current to separate the ions. The positive ions go through one membrane, while the negative ions flow through a different membrane, leaving the end product of freshwater. (2) (Water Quality) An advanced method of water or wastewater treatment that relies on a semi-permeable membrane to separate waters from pollutants. An external force is used to reverse the normal osmotic process resulting in the solvent moving from a solution of higher concentration to one of lower concentration.
riparian water rights (права володіння) – the rights of an owner whose land abuts water. They differ from state to state and often depend on whether the water is a river, lake, or ocean. The doctrine of riparian rights is an old one, having its origins in English common law. Specifically, persons who own land adjacent to a stream have the right to make reasonable use of the stream. Riparian users of a stream share the streamflow among themselves, and the concept of priority of use (Prior Appropriation Doctrine) is not applicable. Riparian rights cannot be sold or transferred for use on nonriparian land.
river-(річка) **-**a natural stream of water of considerable volume, larger than a brook or creek.
runoff (витік**) – (**1) that part of the precipitation, snow melt, or irrigation water that appears in uncontrolled surface streams, rivers, drains or sewers. Runoff may be classified according to speed of appearance after rainfall or melting snow as direct runoff or base runoff, and according to source as surface runoff, storm interflow, or ground-water runoff. (2) The total discharge described in (1), above, during a specified period of time. (3) Also defined as the depth to which a drainage area would be covered if all of the runoff for a given period of time were uniformly distributed over it.
rhyolite (ріоліт) – volcanic rock (or lava) that characteristically is light in color, contains 69 percent silica or more, and is rich in potassium and sodium. It is fine grained, which although different in texture, has the same composition as granite
ridge, oceanic (океанічний хребет**)** – A major submarine mountain range. Commonly the sites of crustal rifting and plate separation, and the eruption of mafic basaltic lavas.
rift system (система рифів) – The oceanic ridges formed where tectonic plates are separating and a new crust is being created; also, their on-land counterparts like the East African Rift.
Ring of Fire (кільце вогню**) –** The regions of mountain-building earthquakes and volcanoes which surround the Pacific Ocean.
rock flour (кам’яна мука) – Finely ground rock material, usually associated with glaciers (or faults). Can be mixed with water and formed into loaves which, when baked for 45 minutes at 350°, are totally unedible.

S

saline water (солона вода) – water that contains significant amounts of dissolved solids.

Here are our parameters for saline water:

Fresh water - Less than 1,000 parts per million (ppm)

Slightly saline water - From 1,000 ppm to 3,000 ppm

Moderately saline water - From 3,000 ppm to 10,000 ppm

Highly saline water - From 10,000 ppm to 35,000 ppm

seafloor spreading (розширення морського дна) – the mechanism by which new seafloor crust is created at oceanic ridges and slowly spreads away as tectonic plates separate.

sea level (рівень моря) – The top of the ocean, where the water meets the atmosphere. It's not necessarily level!

sediment (осади) – rock debris commonly produced by mechanical or chemical weathering processes.

seismograph (сейсмограф) – an instrument that records seismic waves; that is, vibrations of the earth. Used to record and measure earthquakes.

shearing (робити вертикальний вруб) – the motion of surfaces sliding past one another.

shield volcano (щитовий вулкан) – a gently sloping volcano in the shape of a flattened dome, built almost exclusively of mafic lava flows. The Hawaiian Islands are a good example.

silica (кремній) – a chemical combination of silicon and oxygen.

snirtball (брудний сніг) a combination of snow and dirt. Snirtballs are produced by accident when the total snowfall on bare ground is less than 0.537 inches.

snockball (снігова грудка з камінням) – a combination of snow and rock: generally an innocent-looking snowball with a dense, rocky core. Snockballs are always premeditated, and are not known to occur naturally on earth. Giant snockballs from space (also called comets) may be responsible to the initial introduction of water onto our planet.

snowball (снігова грудка) – a spherical accumulation of water in the crystalline form.

snowline:(снігова лінія) – the lower limit of any year's permanent snowfall. Separates the Zone of Accumulation from the Zone of Ablation.

solid state (твердий стан) – in metamorphism, indicates the change of mineral identity without melting. All ion migration occurs while the rock (or pre-glacial ice) is still solid.

specific gravity (питома сила тяжіння) – a measure of how tightly packed the atoms of a substance are. Varies by the mineral or substance. Example, gold has a high specific gravity, while quartz has a low specific gravity. See also "density."

spines:(колючки на лаві**)** horn-like projections formed upon a lava dome.

spring: (джерело) a surface flow of groundwater which occurs any time the water table intersects the surface.

stratovolcano (стратовулкан) – a volcano composed of both lava flows and pyroclastic material. Also called "Composite" volcanoes. Common at convergent

boundaries. Excellent examples in the U.S. include Mt. St. Helens, Mt. Shasta, and the other peaks of the Cascade Range of California, Oregon, and Washington.
striations (glacial) (смугастість) – grooves eroded into bedrock by rock debris frozen into the base of a glacier.
strike-slip fault (горизонтально-зміщена складка**) –** a nearly vertical fault with side-slipping displacement.
subduction zone (зона руху вздовж розламів) **–** The zone of convergence of two tectonic plates, one of which usually overrides the other.
sublimation (сублімація) – The direct change from the solid to the vapor phase (without passing through the liquid phase). Commonly occurs in ice and snow fields on sunny days above the snowline.
secondary wastewater treatment (вторинна очистка стічної води) – treatment (following primary wastewater treatment) involving the biological process of reducing suspended, colloidal, and dissolved organic matter in effluent from primary treatment systems and which generally removes 80 to 95 percent of the Biochemical Oxygen Demand (BOD) and suspended matter. Secondary wastewater treatment may be accomplished by biological or chemical-physical methods. Activated sludge and trickling filters are two of the most common means of secondary treatment. It is accomplished by bringing together waste, bacteria, and oxygen in trickling filters or in the activated sludge process. This treatment removes floating and settleable solids and about 90 percent of the oxygen-demanding substances and suspended solids. Disinfection is the final stage of secondary treatment.
sediment (осад) – usually applied to material in suspension in water or recently deposited from suspension. In the plural the word is applied to all kinds of deposits from the waters of streams, lakes, or seas.
sedimentary rock (осадові породи) **–** rock formed of sediment, and specifically: (1) sandstone and shale, formed of fragments of other rock transported from their sources and deposited in water; and (2) rocks formed by or from secretions of organisms, such as most limestone. Many sedimentary rocks show distinct layering, which is the result of different types of sediment being deposited in succession.
sedimentation tanks (осадові ємкості) **–** wastewater tanks in which floating wastes are skimmed off and settled solids are removed for disposal.
self-supplied water (вода з власного джерела) – water withdrawn from a surface- or ground-water source by a user rather than being obtained from a public supply. An example would be homeowners getting their water from their own well.
seepage (просочування) **– (**1) The slow movement of water through small cracks, pores, Interstices, etc., of a material into or out of a body of surface or subsurface water. (2) The loss of water by infiltration into the soil from a canal, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field.
septic tank (каналізаційний септик**) –** a tank used to detain domestic wastes to allow the settling of solids prior to distribution to a leach field for soil absorption. Septic tanks are used when a sewer line is not available to carry them to a treatment plant. A settling tank in which settled sludge is in immediate contact with sewage flowing through the tank, and wherein solids are decomposed by anaerobic bacterial action.

settling pond (water quality) (осадовий ставок) – an open lagoon into which wastewater contaminated with solid pollutants is placed and allowed to stand. The solid pollutants suspended in the water sink to the bottom of the lagoon and the liquid is allowed to overflow out of the enclosure.
sewage treatment plant (водоочисні споруди) **–** a facility designed to receive the wastewater from domestic sources and to remove materials that damage water quality and threaten public health and safety when discharged into receiving streams or bodies of water. The substances removed are classified into four basic areas:
[1] greases and fats;
[2] solids from human waste and other sources;
[3] dissolved pollutants from human waste and decomposition products; and
[4] dangerous microorganisms.
Most facilities employ a combination of mechanical removal steps and bacterial decomposition to achieve the desired results. Chlorine is often added to discharges from the plants to reduce the danger of spreading disease by the release of pathogenic bacteria.
sewer (каналізація) – a system of underground pipes that collect and deliver wastewater to treatment facilities or streams.
sinkhole (водостічний колодязь) **–** a depression in the Earth's surface caused by dissolving of underlying limestone, salt, or gypsum. Drainage is provided through underground channels that may be enlarged by the collapse of a cavern roof.
solute (розчинена речовина) – a substance that is dissolved in another substance, thus forming a solution.
solution (розчин**) –** a mixture of a solvent and a solute. In some solutions, such as sugar water, the substances mix so thoroughly that the solute cannot be seen. But in other solutions, such as water mixed with dye, the solution is visibly changed.
solvent (розчинник) – a substance that dissolves other substances, thus forming a solution. Water dissolves more substances than any other, and is known as the "universal solvent".
specific conductance (питома провідність) – a measure of the ability of water to conduct an electrical current as measured using a 1-cm cell and expressed in units of electrical conductance, i.e., Siemens per centimeter at 25 degrees Celsius. Specific conductance can be used for approximating the total dissolved solids content of water by testing its capacity to carry an electrical current. In water quality, specific conductance is used in ground water monitoring as an indication of the presence of ions of chemical substances that may have been released by a leaking landfill or other waste storage or disposal facility. A higher specific conductance in water drawn from downgradient wells when compared to upgradient wells indicates possible contamination from the facility.
spray irrigation (дощування) – an common irrigation method where water is shot from high-pressure sprayers onto crops. Because water is shot high into the air onto crops, some water is lost to evaporation.
storm sewer (дощовий колектор**) –** a sewer that carries only surface runoff, street wash, and snow melt from the land. In a separate sewer system, storm sewers are

completely separate from those that carry domestic and commercial wastewater (sanitary sewers).

stream (потік, ріка) – a general term for a body of flowing water; natural water course containing water at least part of the year. In hydrology, it is generally applied to the water flowing in a natural channel as distinct from a canal.

streamflow (об'єм руслового потоку**) –** the water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

subsidence (просідання породи) – a dropping of the land surface as a result of ground water being pumped. Cracks and fissures can appear in the land. Subsidence is virtually an irreversible process.

surface tension (поверхневиф натяг**) –** the attraction of molecules to each other on a liquid's surface. Thus, a barrier is created between the air and the liquid.

surface water (поверхнева вода**) –** water that is on the Earth's surface, such as in a stream, river, lake, or reservoir.

suspended sediment (завислі осади**) –** very fine soil particles that remain in suspension in water for a considerable period of time without contact with the bottom. Such material remains in suspension due to the upward components of turbulence and currents and/or by suspension.

suspended-sediment concentration (концентрація завислих осадів) **–** the ratio of the mass of dry sediment in a water-sediment mixture to the mass of the water-sediment mixture. Typically expressed in milligrams of dry sediment per liter of water-sediment mixture.

suspended-sediment discharge (потік завислих осадів) **–** the quantity of suspended sediment passing a point in a stream over a specified period of time. When expressed in tons per day, it is computed by multiplying water discharge (in cubic feet per second) by the suspended-sediment concentration (in milligrams per liter) and by the factor 0.0027.

suspended solids (завислі тверді речовини) – solids that are not in true solution and that can be removed by filtration. Such suspended solids usually contribute directly to turbidity. Defined in waste management, these are small particles of solid pollutants that resist separation by conventional methods.

T

tertiary wastewater treatment (третинна очистка води) **–** selected biological, physical, and chemical separation processes to remove organic and inorganic substances that resist conventional treatment practices; the additional treatment of effluent beyond that of primary and secondary treatment methods to obtain a very high quality of effluent. The complete wastewater treatment process typically involves a three-phase process: (1) First, in the primary wastewater treatment process, which incorporates physical aspects, untreated water is passed through a series of screens to remove solid wastes; (2) Second, in the secondary wastewater treatment process, typically involving biological and chemical processes, screened wastewater is then passed a series of holding and aeration tanks and ponds; and (3) Third, the

tertiary wastewater treatment process consists of flocculation basins, clarifiers, filters, and chlorine basins or ozone or ultraviolet radiation processes.
thermal pollution (теплове забруднення) – a reduction in water quality caused by increasing its temperature, often due to disposal of waste heat from industrial or power generation processes. Thermally polluted water can harm the environment because plants and animals can have a hard time adapting to it.
thermoelectric power water use (використання води для отримання термоелектричної енергії) – water used in the process of the generation of thermoelectric power. Power plants that burn coal and oil are examples of thermoelectric-power facilities.
throughflow (кількість води, яка протікає) – the lateral and downslope subsurface movement of water through the soil. The erosive effect of throughflow is usually limited due to its low velocity. Throughflow often becomes concentrated in natural “pipes” in the soil to form percolines which may flow into rivers or cause springs.
transmissibility (ground water) (проходження води) – the capacity of a rock to transmit water under pressure. The coefficient of transmissibility is the rate of flow of water, at the prevailing water temperature, in gallons per day, through a vertical strip of the aquifer one foot wide, extending the full saturated height of the aquifer under a hydraulic gradient of 100-percent. A hydraulic gradient of 100-percent means a one foot drop in head in one foot of flow distance.
transpiration (транспірація, випарування) – process by which water that is absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface, such as leaf pores. See evapotranspiration.
tributary (притока) – a smaller river or stream that flows into a larger river or stream. Usually, a number of smaller tributaries merge to form a river.
turbidity (каламутність) – the amount of solid particles that are suspended in water and that cause light rays shining through the water to scatter. Thus, turbidity makes the water cloudy or even opaque in extreme cases. Turbidity is measured in nephelometric turbidity units (NTU).
tephra (тефра) – materials of all types and sizes that are erupted from a crater or volcanic vent and deposited from the air.
till (льдовиковий осад**) (**glacial):- general term for material deposited by a glacier. *See also moraine*.
tsunami (цунамі) – a great sea wave produced by a submarine earthquake, volcanic eruption, or large landslide. Commonly (but erroneously) called a "tidal wave," tsunamis can cause great damage due to flooding of low coastal areas.
tuff (туф**) -** rock formed of pyroclastic material.

U

ultrabasic rocks (ультраосновна порода) – any igneous rock, usually of plutonic or hypabyssal origin that contains very low levels of silica compared to iron and magnesium minerals.
underground drainage (підземне осушування) – an underground river system usually found beneath karst or chalk geology. Surface drainage is often confined to ephemeral streams which quickly disappear via swallow holes.

undiscovered resources (нерозвідані запаси**) –** presently unidentified mineral deposits of unknown quality and quantity but which are thought to exist, given current geological data.
unsaturated zone (ненасичена зона) – the zone immediately below the land surface where the pores contain both water and air, but are not totally saturated with water. These zones differ from an aquifer, where the pores are saturated with water.

V

vapor (water) (пара**)** – water in the gaseous state.
vein or lode (жила) – fissure within country rock into which minerals have been deposited by solution. Veins are usually associated with igneous activity but may occasionally have sedimentary origins. The ores of many metals commonly occur in veins, such as gold, silver and tin.
vent (отвір**,** жерло**) –** The opening at the earth's surface through which volcanic materials reach the surface.
vesicular basalt (пористий базальт) – holes and other openings in basaltic flow which are the result of trapped gas bubbles. Vesicles are often filled at a later date with a wide variety of materials, including, quartz, agate, zeolites, and many other minerals.
viscosity (в’язкість, тягучість) – a measure of resistance to flow in a liquid (molasses in January has high viscosity while molasses in August has lower viscosity).
volcanic neck (вулканічна шийка) – solidified lava that fills the conduit of a volcano. Volcanic necks (also called plugs) are usually more resistant to erosion than the material making up the surrounding cone, and may remain standing as a solitary pinnacle when the rest of the original structure has eroded away.
volatile (леткий**)** – a gaseous elementor compound dissolved in magma as a result of the high pressures within the earth’s crust; examples include water, carbon dioxide and chlorine.Volatiles return to the gaseous state during volcanic eruptions. Some of these volcanic gases are highly toxic and it is thought that many of the deaths from the Mount Pelee disaster in 1902 resulted from asphyxiation. In 1985, over 1700 lives were lost at lake Nyos in Cameroon due to the emission of poisonous volcanic gases.
Vulcan: (Вулкан) – Roman God of fire and the forge, after whom volcanoes are named.

W

wastewater (стічна вода**) –** water that has been used in homes, industries, and businesses that is not for reuse unless it is treated.
wastewater-treatment return flow (повернення води після очистки) – water returned to the environment by wastewater-treatment facilities.
water cycle (кругообіг води) – the circuit of water movement from the oceans to the atmosphere and to the Earth and return to the atmosphere through various stages or processes such as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transportation.

water quality (якість води) – a term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.
water table (рівень грунтових вод**) –** the top of the water surface in the saturated part of an aquifer.
water use (використання води) **–** water that is used for a specific purpose, such as for domestic use, irrigation, or industrial processing. Water use pertains to human's interaction with and influence on the hydrologic cycle, and includes elements, such as water withdrawal from surface- and ground-water sources, water delivery to homes and businesses, consumptive use of water, water released from wastewater-treatment plants, water returned to the environment, and instream uses, such as using water to produce hydroelectric power.
watershed (вододіл**) –** the land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds, like the Mississippi River basin contain thousands of smaller watersheds.
watthour (Wh) (ват за годину**)** – an electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electrical circuit steadily for one hour.
well (water) (колодязь**)** – an artificial excavation put down by any method for the purposes of withdrawing water from the underground aquifers. A bored, drilled, or driven shaft, or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies or oil, or to store or bury fluids below ground.
withdrawal (відбір**) –** water removed from a ground- or surface-water source for use.
weathering (surface) (звітрювання) – "Making little ones out of big ones." Weathering includes the processes which mechanically and chemically break down the mountains into little pieces, so they can be eroded and transported to the beach (see Strickler's 3rd Law of GeoFantasy).
windward (проти вітру**) –** the side facing into the wind. When speaking of a mountain range, these areas are generally cooler and wetter than on the leeward side.

X Y Z

xeriscaping (посухостійкий) – a method of landscaping that uses plants that are well adapted to the local area and are drought-resistant. Xeriscaping is becoming more popular as a way of saving water at home.
yield (вихід) – mass per unit time per unit area
zone of ablation (or wastage) (зона вимивання) – the area below the snowline where snow melt exceeds snowfall, and material is lost from a glacier.
zone of accumulation (зона накопичення) – the area above the snowline where snowfall exceeds snow melt, and material is added to a glacier.
zone of subduction (зона руху по розломах**) –** the zone where the theory of plate tectonics suggests that converging lithospheric plates collide, resulting in one or both plates being forced downwards into the mantle and melted to form magma. When

two oceanic plates collide a deep-sea trench indicates the presence of a zone of subduction. As one plate is overridden and descends into the mantle an island arc forms on the other plate. The zone of subduction is also marked by a deep-sea trench when oceanic and continental plates collide. The oceanic plate is forced under the more buoyant continental plate whose edge is subjected to intense deformation and metamorphism. A highly folded mountain range results on the edge of the continental plate; a good example is the Andes in South America. If two continental plates collide then a highly folded mountain range may develop with associated volcanic activity as the magma formed by the melting plates in the subduction zone below rises to the surface. The Himalayas were formed by the collision of the Eurasian and African-Arabian-Indian plates. Earthquakes and volcanic activity are commonly found in most subduction zones.

DISCUSSING CURRENT PROFESSIONAL LITERATURE

MODERN SCIENCE AND TECHNOLOGY

By Robert Colborn, Chief Editor and the Editors of International Science and Technology, pp. XIV+746. Van Nostrand Co., Inc., Princeton, N. Y., Toronto, New York and London. 1965.

This book, written mainly for professional scientists and engineers but comprehensible to the interested layman, aims to acquaint them with the latest discoveries and the state of the art in fields of science and technology other than their own. It consists of articles which originally appeared in the magazine ”International Science and Technology. “Although almost all the authors work in the United States, reference is made to workers in other countries.

The subject matter relates only to the understanding or controlling of the physical world and appears under six headings; space and astronomy; earth science and oceanography; mathematics and computers. Thus biology and medical or social sciences are excluded. Subjects have been chosen for the potential usefulness or development, rather than for the fact that they are well understood or widely used at present, and each article contains a summary and a section recommending further reading. In general, the style is refreshingly different from that in learned journals, yet it remains lucid. The book is illustrated with diagrams, photographs and marginal sketches, as well as some colour plates.

The editor is to be congratulated on producing this excellent collection of articles on such diverse subjects.
The book is stimulating to read, and deserves a place in any library used by those with an interest in science.
(Endeavour, vol. XXV, N94, January 1966, p. 51).

Exercise 1. Read the following sentences aloud and translate them into Ukranian paying special attention to the parts in italics.
1. This book *is written mainly for* professional scientists. 2. The book *aims to acquaint the reader* with the latest discoveries in fields of science and technology. 3. This *article originally appeared* in the magazine ”International Science and Technology.” 4. *Reference is made to* workers in other countries. 5. The *subject matter appears* under six headings. 6. *Subjects have been chosen* for their potential usefulness or development. 7. In general *the style is refreshingly different* from that in learned journals. 8. *The editor is to be congratulated on* producing this excellent collection of articles on such diverse subjects. 9. *The book deserves a place* in any library used by those with an interest in science.

Exercise. 2. Discuss with your fellow-student the books you are reading. Work in pairs.
A. Find out who the book is written for. (Use the definite article with the noun denoting profession in the Singular and no article with that in the Plural).
Model:
- The book I am reading is written for professional scientists.

- Professional scientists in what field?
- In the field of . . . (electronics, biology, etc.).
- I see. So it is written for the (engineers in electronics, biologists, etc.).
- Yes. For (engineers in electronics, biologists etc.).

B. Find out what countries the authors come from. (Use the definite article with the nouns denoting the names of the countries containing such words as republic, state, county, kingdom, etc.

E.g.: the USA, but America

Model:

- The book you have spoken about eonsists of articles. My question is: Who are the authors? I mean, what countries do they come from?

– Most of the authors work in the USA, but reference is made to workers in other countries.

- Such as?
- Such as (theUAE, the USA, Japan, Canada, the UK).
- Could you name those working in …{Great Britain)?
- Yes. Prof. H. Smith works in Great Britain.

C. Find out the name of the journal in which the article is published. (Use the definite article with the nouns "journal" and "magazine"; e. g. the journal (Physical Review, but "Physical Review").

***Model*:**

- I would like to know the following: in what journal did the article appear?
- It was published in a (monthly physical journal).
- In (Physical Review)?
- Yes, in the journal (Physical Review).

or: – No, not in the journal . . in . . . .

D. Find out the structure and composition of the book. (Use the indefinite article with nouns in the Singular and no article with those in the Plural after the verbs *consist of* and *contain*).

***Model*:**

- The volume consists of several parts. Is that so?
- Right. It contains . , . parts.
- Does it contain , . .? (a summary, an introduction, a preface, references, a section for further reading).
- Yes, it does (or: No, it does not).

E. Find out if the subjects you take interest in are included in the book. (Use the indefinite article with the noun in the Singular and no article with that in the Plural after *such).*

***Model*:**

- I wonder if . . . (biogenetics, electronics, computerization, etc.) is/are included in the volume?
- No, such a subject as . . . (or: such subjects as . . .) is/are not included, or: Yes, such subjects as . . . are included, such a subject as ... is included.

Exercise 3.Read the text and answer the questions.

This book presents a collection of articles which originally appeared in “Scientific American” and ”Physical Review”. Almost all the authors of the articles work in the United States of America. They are experts in different fields of science and technology. Tho book is addressed both to professional scientists and interested laymen. The book consists of two parts devoted to semiconductors and electronics. Such subjects as biophysics and space medicine have been excluded.

Comprehensive check:

1. To whom is the book addressed?
2. What country do the authors come from?
3. In what journals did the articles originally appear?
4. How many parts does the book contain?
5. What subjects were included and what subjects were excluded from the book?

Exercis 4. Discuss with your fellow-student the books you are reading. Use the text of exercise 3 as a model.

Exercise 5. Discuss with your fellow-student the books (articles) you are reading (have read). Work in pairs.

A. Find out what field of science the book (article, journal) acquaints the reader with.

Model:

1. If I am not mistaken, the book acquaints the reader with the latest discoveries in the field of . . . (physiology),
2. Right.
1. What I would like to know is this: What areas of . . . (physiology) is the reader introduced to?
2. To ... (electrophysiology, neurophysiology, etc.).

Use also: the latest developments in the field of . . .; the recent achievements in the field of .. .; the aims and achievements in . . .; exactly, precisely,

B. Find out what the structure of the book is.

Model:

1. The book consists of ... (6) chapters (parts, sections), doesn’t it?
2. Exactly. The subject matter of the book appears under . . . headings.
1. What are they?

(looking at the table of contents) They are . , .

C. Find out to whom reference is made.

***Model*:**

1. As far as I understand, reference is made to researchers working in many countries. Are (Japanese, British, American) workers also mentioned?
2. For all I know, they are.
1. And what about Austrian researchers?
2. As far as I know they contributed little to this field of knowledge, therefore no reference is made to them.

D. Find out in what country, in what field of knowledge, at what subject and at which educational establishment or research centre the author works.

Model:

1. You said that the author of the article works in . . . (Great Britain).
2. Yes (looking at the notes about the author's identity). He is a . . . (Ph. DM Doctor of . . ., at Cambridge University).
1. I wonder in what field of . . . (medicine, physics, chemistry) he is involved (engaged)?
2. In . . . (oncology, semiconductors).
1. And what is the subject of his research?
2. He works at . . . (breast cancer).

E. Find out on what subject and by whom the article (book, reference, lecture, volume, collection of articles) is written.

Model:

1. The article is written by . . . (one, two,three) author(s). Right?
2. Right.
1. Who is (are) he (they)?
2. This is a review article written by . . ., . . . and ... .
1. And what is its subject?
2. The article is on . . . (see its title).

Use also: contributors, experts, workers.

F. Find out what scientific interests of the author are.

Mode1:

1. As far as I understand the author is interested in a wide (narrow) field of . . . (physiology, physics, chemistry).
2. Right. And he takes particular (special) interest in . . . (the structure of . . .).

Find out whether or not the book is of value; where, when and by whom it was written, published, edited.

***Model*:**

1. What is your opinion of the book? How do you estimate its value?
2. I think this is an excellent book. The author(s) (editor(s), contributors) can be congratulated on producing it (on completing it). or: I don't think it is a good book. I can't say that the author is to be congratulated on producing it.
3. Which book are you two talking about? By whom is it written and published?
2. «. . .» by . .. (H. Smith). It was published by . . • (Academic Press) in .. . (London) in 19. . .
1. And (Pete) thinks that this is a . . . book. He says that the author can (can't) be congratulated on producing it.

Find out whether or not the book is illustrated, what kind of illustrations are there.

Model:

1. If I am not mistaken, the book acquaints the reader with the latest developments in the field of . , . (physiology),
2. Right.
1. I would like to know the following: Are there any illustrations?

2. Yes, the book is profusely illustrated with photos (colour plates, diagrams, tables, figures). or: No, there are no illustrations. It is very unfortunate because with illustrations the book would be much better.

Exercise. 6. Put questions to the words in italics minding the place of the prepositions.

Model:

The book consists of ***10*** chapters.

How many chapters does the book consist of?

1. The book acquaints us with the **latest developments**. 2. The volume consists of **8** essays. 3. Dr. Priestley is working at a **new invention**. 4. Reference is made to **researchers in other countries**. 5. Dr. Brown takes a great interest in **chemistry**. 6**. Students** are interested in results. 7. My friends **congratulated** me on obtaining these data. 8. The book is written by **Dr. Smith.** 9. The article is written by **professional scientists**. 10. The work is carried on by **neurophysiologists**. 11. The work is carried on with **microelectrodes**.

Exercise 7. Read the text and answer the questions.

The article I am going to speak about originally appeared in the "Proceedings of St. Petersburg University" in 1981. It was written by a leading authority in my field of science, Prof. N. Ivanov. The article consists of 4 sections. The purpose of the article is to acquaint the reader with the work carried on and the data obtained in one of the physical laboratories of the University. Reference is made to workers both at home and abroad. As the article is on the subject I am greatly interested in. I read it with pleasure. I think it will be extremely interesting to my colleagues who take interest in experiments of this kind. It is profusely illustrated with diagrams and colour plates. The author is to be congratulated on producing this excellent piece of work.

Comprehensive check:

1. Where and when was the article published?
2. By whom was it written?
3. What does it acquaint the reader with?
4. To whom is reference made?
5. How is the article illustrated?

Exercise 8. Speak about an article or any other publication. Use the text above (ex. 7) as a model.

Exercise 9. Answer the following questions using the prompts given in brackets.

Model:

- What does the book begin with? (a short introductory chapter).
- It begins with a short introductory chapter.

1. What does your article begin with? (an introductory part; a few general remarks; a short introduction).
2. What is each subsection preceded by? (a brief theoretical introduction) some introductory notes; an introductory discussion).
3. What does the book introduce us to? (the work done in . . the new data in the field of . . .; the up-to-date techniques in . . .).

4. What does the book acquaint us with? (recent discoveries in . . applications of new methods; experimental technique; the work done in the field of . . .).

Exercise. 10. Ask your fellow-student the following questions. Get him to give you detailed answers. Work in pairs.

1.Is there an introductory part in your thesis (article, the book you are reading)?
2.What subjects are dealt with in the introduction of your thesis (article, book, the book we are speaking about)?
3. What problems does the book acquaint us with?
4. When and how were you first introduced to this subject?

Exercise 11. Translate into English.

– Ви знайомі з цією статтею?
– Так. Я прочитав її вчора.
– Цікава стаття?
– Дуже.
– Мене теж цікавить ця проблема. Потрібно прочитати цю статтю.
– Прочитайте. У вступній частині автор знайомить читача з історією питання, а в подальших розділах ми знайомимося з методом дослідження, отриманими даними і висновками автора.

Exercise 12. Discuss the book your fellow-student is reading. Use"last" and "latest" . Work in pairs.

Model:

1. What are the final pages of the book devoted to?
2. The last pages present references (or: the table of contents; the list of contributors; conclusions; summary).
1. I wonder if the recent achievements in your field of knowledge, I mean in the field of . . ., are also taken into account?
2. By all means. The latest achievements are also taken into account (or: I am afraid not. The latest achievements are not taken into account).
1. As far as I understand, the author provides the reader with the up-to-date information on the problem of .... .Is that so?
2. Yes. The author provides the reader with the latest information on . . . (or: Unfortunately, the latest information on . . . is not given).
1. And what about the final section (part, chapter)? What problems are dealt with there?
2. The last section (part, chapter) is devoted to ... .

Exercise 13. Use the word-combination given below in sentences of your own.

Model:

- Have you read the last article by Academician Keldysh?
- Have you read the latest article by your professor?

1. The latest book, the last book. 2. The latest journal,the last journal. 3. The latest publication, the last publication.4. The latest edition, the last edition, latest issue of the newspaper, the last issue of the newspaper.

Exercise 14. Insert tbe right word; last or latest.

1. My aim is to acquaint the reader with the . . .discoveries in our field of research. 2. The . . . chapter of my thesis is devoted to the experimental technique. 3. The introductory discussion is concerned with the . . . types of polymer forming reactions. 4. The summary is given at the . . . two pages. 5. The second chapter deals with the . . . models of the apparatus. 6. This is the …. model received by our laboratory.

Exercise 15. Translate into English.

1. – Про що йде мова в останній статті, яку ти прочитав?
   – Про останні дослідження у моїй галузі дослідження.
2. Чому присвячений останній номер журналу цього року?
   – Новітнім роботам наших вчених.
3. – Ви читали останню статтю доктора Н. в останньому номері журналу? – Так. – Чому вона присвячена?— Найостаннішим методам дослідження.
4. – Про що останні сторінки роботи?
   – Про останні (найновіші) результати дослідження.

Exercise 16. Translate into Ukrainian

1. A list of references 2. Key references. 3. A complete set ot inferences, 4. To make reference to somebody (or something). 5. A reference book (work). 6. A work of reference.

Exercise 17. Discuss the book your friends are reading. Work in pairs.

Find out whether or nor the reviewed book provides the reader with all kinds of references.

A.

Model:

1. I wonder if the book provides the reader with key references?

2. Sure. Key references are supplied, or: I am sorry to say, key references are not given. or: There are no key references.

Use: **a list of references; a complete set of references; most extensive set of references; (inadequate references; generous references; numerous references.**

B. Find out to whom reference is made.

Model:

1. I see that reference is made to authors from many countries. Right?

2. Right.

1.- Which of the prominent researchers in this field of knowledge are referred to?

2. and . . . are among those to whom reference is made.

1. Are there any new names?

2. Reference is also made to . .., . . ., and . . whose research is not so well-known (or: For all I know, there are no new names).

C. Try to estimate the value of the book.

Model:

1. Do you think the book will prove useful (valuable) as a reference book?

2. I hope so. I think it'll be a most reliable work of reference (or: No, I don't think it will be useful as a reference book, because . . .).

Exercise 18. Ask your fellow-student the following questions. Get him to give you detailed answers. Work in pairs.
1. Did you (the author) provide your (his, her) paper with a list of references?
2. Whom did you (the author) make reference to?
3. Is your (the author's) list of references complete (extensive, generous, adequate, inadequate, numerous)?
4. What kind of book do you consult if you need some new information?
5. What reference work do you usually consult?
6. Who is the author or the editor of this work of reference?

Exercise 19. Complete the following sentences.
1. The title of the book I am reading is .... 2. The heading of the chapter I am interested in is .... 3. The headline of the newspaper article we discussed last time is .... 4. The title of my friend's thesis is .... 5. The title of my professor's work for Doctor's Degree is ... .

Exercise 20. Discuss the structure of the book your fellow-student has brought to class. Work in pairs.
Model:
1. What is the title of the book?
2. . . . (reading the title). And what is the title of the book you are reading now?
. . . (answers). I would like to know something else: how many parts (sections, chapters) does the book consist of?
. . .
– How is each part entitled?
– The heading of the first part is ... . The title of the second part is ... , The third part is entitled ...
– And now I would like to ask you this: how many chapters are there in the first (second, third) part? – Under what headings do they appear in … There are ... chapters. Their headings are as follows . . .

Exercise 21. Answer the following questions.
1. What is the title of your paper (the book you have recently read)?
2. Under what headings does the subject matter appear?
3. What is the heading of the last section?
4. Does the title describe the subject?
5. What is the headline of the newspaper article you are going to tell us about?

Exercise. 22. Your fellow-student has brought a book to class. Discuss it. Work in pairs.
Model:
– I have two questions to ask. First, what is the subject of the book; and, second, what is its aim?
– As to the first question, the subject of the book is . . . (e. g. cancer research). As for the second question, according to the preface, the aim (object, purpose) of the book is to . . . (e. g.: to provide the reader with information about recent advances in . . to give the reader some idea of . . .; to provide the reader with the latest data on . . .).

– I'd like to ask you something else. What is the book devoted to? What I mean to ask is this: What is the subject matter of the book?
– As far as the subject matter of the book is concerned, it deals with . . . (Use: diverse aspects of . . .; the understanding of . . the application of . .

Exercise 23. Fill in the right word: subject, object or subject matter.
1. The ... of the book is of major importance. 2. The ... of my thesis is arranged in the following way .3. The ... of the paper is to give some idea about analogue computers. 4. The ... of the textbook falls into two sections. 5. The ... of my work is to investigate this particular problem. 6. I am engaged in one of the aspects of the broad . . - of biochemistry.

Exercise 24. Translate into English.
Я хотів би поставити вам декілька питань: по-перше, яка тема вашої статті, по-друге, яка її мета, а також які висновки робить автор?

Exercise 25. Answer the following questions.
1. What subjects are dealt with in your thesis (paper, article, the book you are reading)?
2. What is the subject of your research?
3. What is the object of your investigation?
4. The subject of your investigation is of great importance, isn't it?
5. How is the subject matter of your thesis (paper, the book you are reading) arranged?

***Exercise 26. Discuss the hook (article, journal) your fellow-student has brought* to *class. Find out the subject matter of the publication and how it is arranged. Work in pairs*.**
Model:
1. I see that the book consists of several parts (or: articles, papers, contributions, essays). How many parts, exactly, does it consist of?
2. ... (four). (Or: It contains (four) parts). And each part contains . . . (e. g. an account of . . a careful account of . . .).
1. Are all the parts written by one and the same author or different authors?
2. . . . (answer and, if possible, supply some information about the authors, e. g. the first article «. . .» is written by N., who is an authority on . . He works at... , In recent years he mainly specializes in. . . .

Exercise 27. Put questions to the numerals in the following sentences.
Model:
The book consists of 2 parts.
How many parts does the book consist of?
1. The book contains 32 electron micrographs. 2. The volume consists of 18 separate articles. 3. The journal contains 11 review articles. 4. Volumes I and II together contain 20 articles.

Exercise 28. Use "consist (of)" instead of "contain" where posssible.
1. The volume contains 18 articles. 2. The text contains a number of minor errors. 3.

My article contains four parts. 4. The book contains a careful account of work done in the United States in this field of science. 5. The paper my professor is going to read contains a description of work carried on in our laboratory. 6. The last part of my thesis contains references to other workers in this special branch of physics.

Exercise 29. Ask your fellow-student the following questions. Get him/her to give you detailed answers. Work in pairs.

1. How many chapters does the book you are reading consist of?
2. Do the chapters contain any summary?
3. Does the book contain any original data?
4. Does it contain any errors?

Exercise 30. Translate into English.

– Скільки частин у вашій дисертації?
– Дві. У першій частині описується історія питання і методика дослідження, у другій – саме дослідження і його результати.
– Із скількох частин складається збірник, поданий на рецензування?
– З десяти.
– І в кожній статті є (подаються) оригінальні дані?
– Так. В кожній статті є багато оригінальних даних.

Exercise 31. Answer the following questions about the book and the review given above.

1.What is the title of the book under review?
2. Who edited the book?
3. Is the editor's name familiar to you? Is he a well-known editor?
4. Where and when was the book published?
5. Who is the book written for?
6. What is the purpose of the book?
7. Judging from the review, the book acquaints us with the latest discoveries in science and technology. But according to the date of its publication some information is no longer up-to-date, is it?
8. Does the book contain any introductory part?
9. What subjects have been excluded?
10. The reviewer enumerated the subjects dealt with in the book. What are the last two included?
11. Which of these subjects are you well acquainted with?
12. Where did the articles originally appear?
13. Are you acquainted with the magazine?
14. In what country do almost all the contributors live and work?
15. Can you tell us how many articles the book consists of?
16. What can you say about the references made in the book? Are they complete, numerous or adequate?
17. Who is reference made to?
18. Under how many headings does the subject matter appear?
19. How is the book illustrated?

Exercise 32. Translate Into English.

Поданий на рецензію збірник «На вулканах» вийшов декілька років тому у видавництві «Мир» за редакцією доктора мінералогічних наук М. Г. Леонова. Мета книги — познайомити читача з історією виникнення вулканів. Книга написана для спеціалістів-геологів із для неспеціалістів, що цікавляться питаннями розвитку Землі та процесами, які відбуваються у її надрах. Автором статей збірника є видатний спеціаліст з вивчення вулканів французький вчений Гарун Тазієв, який з захопленням розповідає про свою роботу і відкриття, які він зробив на вулканах Суфрієр, Еребус і Етна.

Збірник об'єднує три самостійні твори Г. Тазієва – книги «Суфрієр і інші вулкани», «Еребус – антарктичний вулкан» і «Етна». Це не тільки захоплююча розповідь про названі вулкани, про життя вулканологів і їхню роботу, яка підтверджується унікальними фотографіями, але також джерело цікавої і багато в чому абсолютно нової інформації, яка має велике значення для вулканологічної науки.

Книга написана з глибоким знанням матеріалу, включає багато унікальних фотографій.

Exercise 33. Speak about your own article. Mention its title, the time and the place o! its publication, its subject and aim, the arrangement of the subject matter; speak about the list of references, and if possible, about the authors you refer to.

Exercise 34. Write about a book (an article or any other publication). The points to be covered:

1. The title of the book. 2. The time and the place of its publication. 3. The aim of the book. 4. The subject of the book. 5. For whom the hook is written. 6. The author (s) of the book. 7. The list of references. 8, The arrangement of the subject matter. 9. The contents of each part. 10. The style and the way the book is illustrated. 11. Your own opinion about the value of the book.

Vocabulary

{to be used in discussing a scientific publication)

The book (volume, handbook, text-book, article, essay) to be discussed is . . .

The book (volume, etc.) which is discussed . . .

The articles represent papers (reports) given at the conference.

The author (editor, publisher) of the book is . . .

The contributor of the journal (magazine) is . . .

The book was published (edited) in 19. ...

The article originally appeared in (the USA, the former Soviet Union; in Russian, in English, in a journal).

The author is a well-known (distinguished, outstanding) scientist in the field of . . .

The author is a Nobel prize winner (State prize winner)

The title (name) of the book is . . .

The heading of the chapter (section, part) is . . .

The headline (title, name, heading) of the newspaper article is . . .

The book consists of . . . (10) chapters (sections, parts, articles, contributions).

The book contains (includes, falls into) . . . (3) parts.
The book contains a summary (a treatment of . . ., a list of references, a large amount of useful information).
The book is addressed to scientific workers (professional scientists, interested laymen, undergraduates, post-graduates, those working in the field of. . those studying the problems of . . those familiar with the field of . . those approaching the problems of . . .).
The book is written for researchers.
Reference is made to workers (works) in….
The subject of the book is . . . (includes . . is reviewed, is covered).
The topic (theme) of the book is . . .
The topic of the research (investigation, thesis) is . . .
The subject matter of the book relates to (includes, is devoted to) . . .
The subject matter of the book falls into two parts.
The book (the author) discusses (deals with, is concerned with, covers, considers, gives consideration to, describes, gives an accurate description of, outlines, emphasizes, places emphasis on) the problem of . . .
The book provides the reader with some data on ... (some material on . . ., some information on . . an introduction to . . a discussion of . . a treatment of . . ., a study of . . a summary of . . some details on . . ., a useful bibliography, a list (set) of references, key references).
A careful account is given of . . .
A detailed description is given of the theory (problem,)
A thorough description is given of the method) of...
Much attention is given to . . .
Little attention is given to . . .
Of particular (special, some, little) interest is the method of
Of great (little) importance is the method of ..
It is notable (noteworthy, praiseworthy, fortunate, unfortunate, a mistake, a slight disappointment, to the author's credit) that ...
The author has succeeded ia showing (providing, presenting) the results of . . ,
The author failel to show (to exhibit, to present, to give an account of, to direct out attention to
The book suffers from some mistakes (errors, limitations, shortcoming, careless proof-reading).
In spite of some drawbacks the book was useful to (helpful to)…
The book begins with a discussion of a chapter on; introduction to, introductory discussion of…
The book begins with introductory notes (remarks)..
The book ends with a discussion of . .
The .purpose (aim, object) of the book is to provide . .
The book aims to provide (acquaint, present, show) . ,.
The book is profusely (poorly) illustrated with diagrams (tables, colour plates, photographs, sketches).
The author (editor) is to be congratulated on the success of the book.

The labour protection

Ukraine practises the values of civilized world in which the worthy labour is, first of all, the safe labour. The labour protection and the industrial safety become exclusively topical.

The State Committee of Ukraine on Industrial Safety, Labour Protection and Mining Supervision develops and implements the state policy in the field of industrial safety and labour protection. One of its main tasks is supervision of the employer's observance of all laws and regulatory acts on labour protection.

The functions of the committee include the prevention of on-the-job accidents and casualties, complex management of industrial safety and labour protection at the government, branch and regional levels, as well as investigation of on-the- job accidents and casualties.

In the field of labour protection the task is to develop a legislative field which would increase the business interest in the creation of the safe labour conditions at the enterprises. The Committee has prepared and submitted to the Cabinet of Ministers some amendments to the laws which will interest the owner in the observance of safety regulations and determine financial liability for the labour protection laws violation. These proposals will help to regulate the partnership relations between the state and the employers.

The needs of the society in worthy labour are reflected in the joint work of the Committee with its social partners — trade unions and employers which are implemented in the form of legislative initiatives.

Within the scope of its activity the State Committee on Industrial Safety, Labour Protection and Mining Supervision solves two main tasks — labour protection management on the national, branch-wise and regional level, as well as public supervision on the observation of regulatory acts on industrial safety and labour protection.

In Ukraine more than 570 thousand enterprises are engaged into the industrial activities, i.e. approximately 13 million employees. The work of this Committee is aimed at ensuring of constitutional right of these people to have worthy, and first of all, safe labour.

The main function of the public supervision system is prevention from accidents, on-the-job injury rate, i.e. all those negative events which accompany the industrial activities.

Under the supervision there are also objects with higher risks of industrial accidents. It is coal mining industry, oil-and-gas and chemical complexes, metallurgy, ore mining industry, handling of explosives. For these purposes the Committee has powers to inspect enterprises, to stop production, to impose fines, to send inspection materials to the offices of prosecutor, to make proposals on the removal of the manager of any enterprise.

During the recent years a stable trend in reduction of injury rate has been noticed. Of course, this process was also influenced by economic recession, reduction of the production volumes. The number of injured people for the last ten years has decreased by 3.5 times. At the same time the injury rate is still high in many industrial branches. For instance, in the construction, power engineering, gas industries and, of course, in the coal industry. It is the most unsafe from the point of view of accidents and injuries. With the stable average of 80 mln. tonnes of coal a year, the total injury rate has reduced nearly by half.

In Ukraine coal is extracted in the most complicated conditions in the world. The depth of the mine tunnels already reached 1000 metres long ago. That is why the coal industry always was and still is the subject of high priority.

In Ukraine there is the Law "On Industrial Safety". This Law will clearly determine the terminology, the scope, the distribution of authorities who will estimate the state of industrial safety, to inspect objects and technological process, and who is in charge of the public supervision.

The level of industrial safety depends to a great extent on the technical state of capital assets operating in the production. Today there are 8 million machines, mechanisms and transport facilities operating in Ukraine. Thereof, nearly 322 thousands do not meet the regulatory labour protection acts, million and a half have exhausted specified operating resource.

That is why the issues of inspection and diagnostics of the potentially dangerous equipment are of particular importance. The quality of this work directly influences the general injury and accident rate level in the country. The Committee is permanently looking for the ways to improve the expert estimation of the industrial safety, studies the experience of the leading world countries.

In accordance with the Conventions of International Labour Organization principles in Ukraine the system of scientific-technical support of the governmental supervision has been created headed by the National Scientific Research Institute on Industrial Safety and Labour Protection, the network of certificating bodies has been developed.

The Agreement on partnership and co-operation between Ukraine and European Communities recognizes the labour protection as one of the most important areas of legislation adaptation.

The Committee works comprehensively with all-Ukrainian mass media. Our aim is to change people’s approach to the issues of their own safety and to ensure high industrial culture using the open information policy.

Today, when the strategic direction of the state development is turning to the world standards, industrial safety, in the first turn, should meet them. The safe, accident - free work of the industry is a mirror of a civilized society, an authoritative argument of its self-sufficiency and progress.

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dyke	debris
diamond pipes	diffraction
evolution theory	exploration geophysics
evaporation	energy
excess of water	exposed igneous rocks
extrusion	earth
-sciences	- crust
-composition	- evolution
-mantle	- nucleus
food chain	forecast
fossil fuel	foliated rocks
fire damp	flammability
fine-grained	fluorescence
fracture	geosciences
genetics	greenhouse effect
groundwater	geology
geography	geophysics
glaciology	gravity
grassland	humus
humidity	hurricanes
ice cap	interdisciplinary science
igneous rocks	isotope

impurities	indigenous population
livestock	luster
liquid	lithology
lithosphere	layer
landscape study	minerals
mine	-safety
- open pit	-profitable
-underground	-copper
metamorphic rocks	-foliated
-non-foliated	mineralogy
magma	magnetism
mica	moisture
marine life	nitrogen oxide
natural sciences	overburden
ore bodies	odour
ozone	-depletion
-layer	oil spill
prospecting	properties
- physical	-chemical
pollutants	precipitation
reflection	refraction
reconnaissance	relief
research	resources
- mineral	- alternative
- radiation	- renewable
recreational environment	sinkhole
survey	- geochemical
- biochemical	soil
species	- coniferous
- decidious	sewage treatment
seam	schistose structure
terrain	thaw
toxicity	texture
useful minerals	ultraviolet
- rays	- radiation
urban areas	vegetation
valency	volcano
water	- reservoir
- table	- stream
well	waste
wildlife	waterborne diseases
zone	- saturation
- phreatic	yield

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ENGLISH for GEOLOGISTS

Навчальний посібник з англійської мови
для студентів геологічних спеціальностей