FACULTY OF SCIENCE

DEPARTMENT OF BOTANY AND PLANT BIOTECHNOLOGY

BIO1A1E

BIOLOGY EXTENDED 1A

APK CAMPUS

NOVEMBER EXAM

NOVEMBER 2014

DATE:	**7 NOVEMBER 2014**
SESSION:	**8H30-11H30**
ASSESSOR:	**MS J. WILLIAMSON**
INTERNAL MODERATOR:	**DR. A. NEL**
DURATION:	**3 HOURS**
TOTAL MARKS:	**150**

NUMBER OF PAGES: 15 PAGES

Please read the following instructions carefully:

1. Answer all the questions in the question paper.
2. Answer ALL of the questions in the test book.
3. Work neatly
4. Read your questions carefully.
5. Good Luck.

QUESTION 1 **[20]**

Choose the alternative that best completes the statement or answers the question. Only write down the correct letter next to the question number in your answer book.

1.1 In terms of the hierarchical organization of life, a bacterium is at the _____ level of organization, whereas a human is at the _____ level of organization.

A) single-celled organism; multicellular organism

B) single organelle; organism

C) organelle; organ system

D) single tissue; multicellular organism

E) tissue; organism

1.2 Which branch of biology is concerned with the naming and classifying of organisms?

A) informatics

B) schematic biology

C) taxonomy

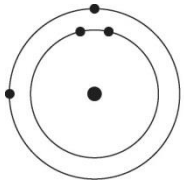
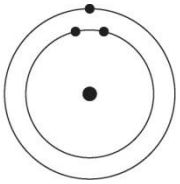
D) genomics

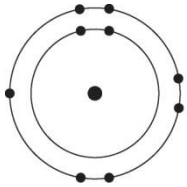
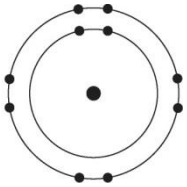
E) evolution

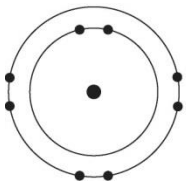
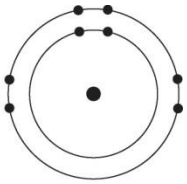
1.3 Which of the following pairs of atoms would be most likely to form a covalent bond?

A) 

B)  and

C)  and 

D)  and 

E)  and 

1.4 Which of the following explains most specifically the attraction of water molecules to one another?

A) nonpolar covalent bond

B) polar covalent bond

C) ionic bond

D) hydrogen bond

E) hydrophobic interaction

1.5 Organic chemistry is a science based on the study of

A) functional groups.

B) vital forces interacting with matter.

C) carbon compounds.

D) water and its interaction with other kinds of molecules.

E) inorganic compounds.

1.6 Which of the following statements is false for the class of biological molecules known as lipids?

A) They are soluble in water.

B) They are an important constituent of cell membranes.

C) They contain more energy than proteins and carbohydrates.

D) They are not true polymers.

E) They contain waxes and steroids.

1.7 All of the following are part of a prokaryotic cell except

A) DNA.

B) a cell wall.

C) a plasma membrane.

D) ribosomes.

E) an endoplasmic reticulum.

1.8 The volume enclosed by the plasma membrane of plant cells is often much larger than the corresponding volume in animal cells. The most reasonable explanation for this observation is that

A) plant cells are capable of having a much higher surface-to-volume ratio than animal cells.

B) plant cells have a much more highly convoluted (folded) plasma membrane than animal cells.

C) plant cells contain a large vacuole that reduces the volume of the cytoplasm.

D) animal cells are more spherical, while plant cells are elongated.

E) the basic functions of plant cells are very different from those of animal cells.

1.9 Water passes quickly through cell membranes because _____

A) the bilayer is hydrophilic.

B) it moves through hydrophobic channels.

C) water movement is tied to ATP hydrolysis.

D) it is a small, polar, charged molecule.

E) it moves through aquaporins in the membrane.

1.10 For living organisms, which of the following is an important consequence of the first law of thermodynamics?

A) The energy content of an organism is constant.

B) The organism ultimately must obtain all of the necessary energy for life from its environment.

C) The entropy of an organism decreases with time as the organism grows in complexity.

D) Organisms are unable to transform energy.

E) Life does not obey the first law of thermodynamics.

1.11 The primary role of oxygen in cellular respiration is to _____

A) yield energy in the form of ATP as it is passed down the respiratory chain.

B) act as an acceptor for electrons and hydrogen, forming water.

C) combine with carbon, forming CO_2.

D) combine with lactate, forming pyruvate.

E) catalyze the reactions of glycolysis.

1.12 Which of the following normally occurs whether or not oxygen (O_2) is present?

A) Glycolysis

B) Fermentation

C) Oxidation of pyruvate to acetyl CoA

D) Citric acid cycle

E) Oxidative phosphorylation (chemiosmosis)

1.13 Which of the following sequences correctly represents the flow of electrons during photosynthesis?

A) NADPH → O_2 → CO_2

B) H_2O → NADPH → Calvin cycle

C) NADPH → chlorophyll → Calvin cycle

D) H_2O → photosystem I → photosystem II

E) NADPH → electron transport chain → O_2

1.14 Which of the events listed below occur in the light reactions of photosynthesis?

A) NADP is produced.

B) NADPH is reduced to NADP+.

C) Carbon dioxide is incorporated into PGA.

D) ATP is phosphorylated to yield ADP.

E) Light is absorbed and funneled to reaction-center chlorophyll a.

1.15 What is a karyotype?

A) The set of unique physical characteristics that define an individual

B) The collection of all the mutations present within the genome of an individual

C) The combination of chromosomes found in a gamete

D) A system of classifying cell nuclei

E) A display of every pair of homologous chromosomes within a cell, organized according to size and shape

1.16 The human X and Y chromosomes _____

A) are both present in every somatic cell of males and females alike.

B) are of approximately equal size and number of genes.

C) are almost entirely homologous, despite their different names.

D) include genes that determine an individual's sex.

E) include only genes that govern sex determination.

1.17 The F1 offspring of Mendel's classic pea cross always looked like one of the two parental varieties because_____

A) one phenotype was completely dominant over another.

B) each allele affected phenotypic expression.

C) the traits blended together during fertilization.

D) no genes interacted to produce the parental phenotype.

E) different genes interacted to produce the parental phenotype.

1.18 A woman who has blood type A positive has a daughter who is type O positive and a son who is type B negative. Which of the following is a possible genotype for the mother?

A) I^AI^A

B) I^BI^B

C) ii

D) I^Ai

E) IAIB

1.19 RNA polymerase moves in which direction along the DNA?

A) 3' → 5' along the template strand

B) 3' → 5' along the coding (sense) strand

C) 5' → 3' along the template strand

D) 3' → 5' along the coding strand

E) 5' → 3' along the double-stranded DNA

1.20 In his transformation experiments, what did Griffith observe?

A) Mutant mice were resistant to bacterial infections.

B) Mixing a heat-killed pathogenic strain of bacteria with a living nonpathogenic strain can convert some of the living cells into the pathogenic form.

C) Mixing a heat-killed nonpathogenic strain of bacteria with a living pathogenic strain makes the pathogenic strain nonpathogenic.

D) Infecting mice with nonpathogenic strains of bacteria makes them resistant to pathogenic strains.

E) Mice infected with a pathogenic strain of bacteria can spread the infection to other mice.

QUESTION 2 **[20]**

Give the correct biological term for each of the following definitions. Only write down the correct term next to the appropriate question number in your answer book.

2.1 A structure that is composed of tissues & that provides a specific function for the organism.

2.2 Functional structures found within a cell.

2.3 Anything that occupies space and has mass.

2.4 The strongest kind of chemical bond.

2.5 The sugar used to sweeten Coke Cola.

2.6 The enzyme responsible for breaking up the sugar found in milk.

2.7 Part of the cytoskeleton which reinforce cell shape and anchor organelles.

2.8 Cell junctions found in a plant cell to allow two (2) adjacent cells to communicated.

2.9 The process which uses receptors in a receptor-coated pit to interact with a specific protein, initiating the formation of a vesicle.

2.10 The process whereby polar substances move across membranes with the help of specific transport proteins.

2.11 The organelle in which ATP is produced.

2.12 An important enzyme involved in oxidizing glucose.

2.13 The enzyme which catalyses the carbon fixation reaction during photosynthesis.

2.14 Accessory pigments found in the leaves of plants which absorb excessive light that would damage chlorophyll pigments.

2.15 The stage during interphase of mitosis where the duplication of genetic material takes place.

2.16 Proteins that stimulate division.

2.17 Alternative versions of genes.

2.18 A diagram for predicting the results of a genetic cross between individuals of known genetic makeup.

2.19 Viruses that infect bacterial cells.

2.20 Small, circular RNA molecules that infect plants.

QUESTION 3 **[11]**

3.1 Give an example of evolutionary adaptation as a property of life. Explain why this is a suitable example of evolutionary adaptation. (3)

3.2 Briefly discuss the two (2)major processes involved in the dynamics of ecosystems.(4)

3.3 In which domains will the following organisms in the diagrams below be categorized? In each case give a reason for your answer. (4)

3.3.1 

3.3.2 

QUESTION 4 **[11]**

4.1. What is an atom? (2 x ½ = 1)

4.2 Study the photo below. This photo portrays a very important property of water to sustain life. Identify this property and discuss it briefly. (6)

4.3 Distinguish between heat and temperature. (2)

4.4 Distinguish between ionic and covalent bonds. (2)

QUESTION 5 **[11]**

5.1 Name and distinguish between the lipids found in the plasma membrane and the lipids found in bacon. Tabulate your answer. (4)

5.2 Why is it beneficial to buy cotton towels rather that nylon towels? (4)

5.3 Distinguish between the following:

5.3.1 Aldoses and Ketoses (2 x ½ = 1)

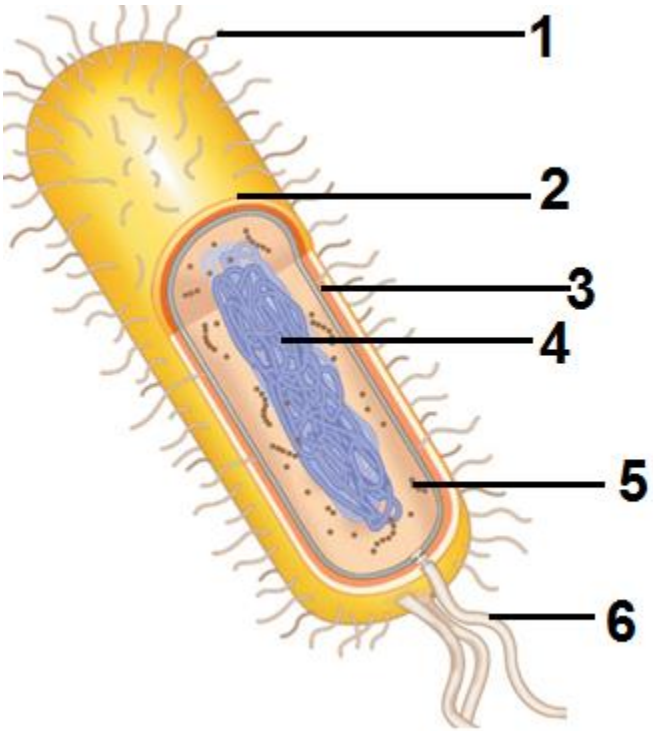
5.3.2 Pentose and Hexoses (2 x ½ = 1)

5.3.3 Maltose and Sucrose (2 x ½ = 1)

QUESTION 6 **[11]**

6.1 Study the diagram below. Which instrument was used to look at this organism? Identify the organism in the diagram. (2)

6.2 Study the diagram below. Identify the type of cell. Give a reason for your answer. Label structures 1-6 and give the function of each labelled structure. (14 x ½ = 7)



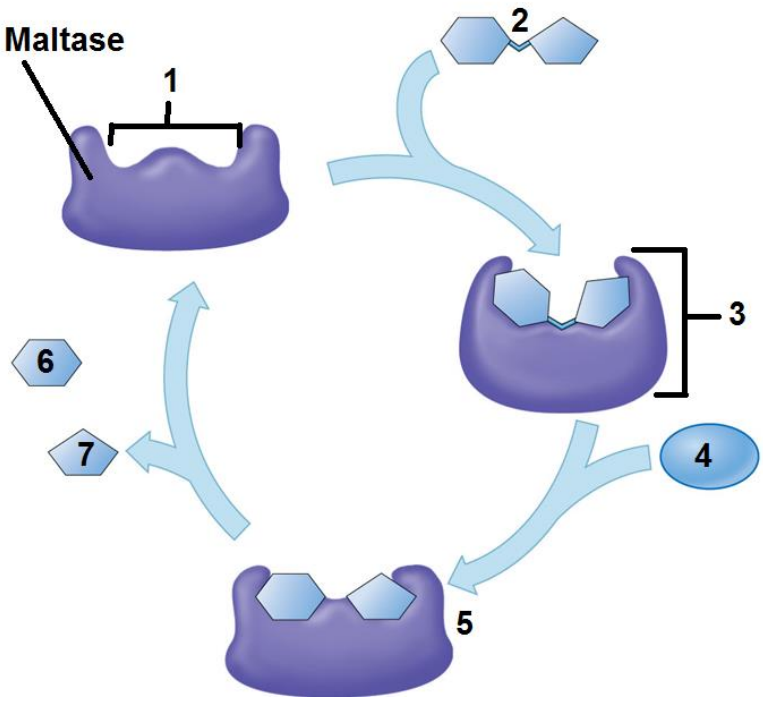
6.3 Briefly describe what the endo-symbiont theory proposes. (2)

QUESTION 7 **[11]**

7.1 What is an enzyme? Give a complete detailed definition. (3)

7.2 Draw a graph to show how by adding an enzyme to a chemical reaction compares to not adding an enzyme to a chemical reaction. (8 x ½ = 4)

7.3 Study the diagram below and answer the questions that follow.



7.3.1 Label structures 1, 2(specific name in this diagram), 3, 4, 6 and 7. (6 x ½ = 3)

7.3.2 The perfect fit of structure 3 is brought about by what model? (½)

7.3.3 What happens at 5? (½)

QUESTION 8 **[11]**

8.1 Distinguish between aerobic respiration and anaerobic respiration. (2)

8.2 Compare the reactants, products, and energy yield of the three (3) stages of cellular respiration by completing the following table (redraw table in your answer book).

(18 x ½ = 9)

	First stage:_____	Second stage:_____	Third stage:_____
Reactants			
Products			
Energy yield			

QUESTION 9 **[11]**

9.1 Solar radiation converts O_2 high in the atmosphere to O_3. Why is this so important to living organisms? (2)

9.2 Photosynthesis comprises of two (2) phases. Name and draw a flow diagram to represent the phase which is light dependent. (14 x ½ = 7)

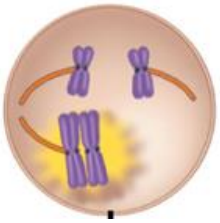
9.3 Plants are green because they contain chlorophyll. Where will one find the chlorophyll in the plant? (2)

QUESTION 10 **[11]**

10.1 Draw and label Anaphase I and Metaphase II which occurs during the process of gamete formation in a fly. (6)

10.2 Which division process is referred to in question 10.1? (1)

10.3 Study the diagram below and answer the questions that follow.



10.3.1 What is wrong with the diagram above? (1)

10.3.2 What is this (answer in 10.3.1) phenomena called? (1)

10.3.3 During which process and phase did this problem occur? (2)

QUESTION 11 **[11]**

11.1 In humans the gene from normal blood clotting, H, is dominant to the gene for haemophilia, h. This is a sex-linked trait found on the X chromosome. A woman with normal blood clotting has four children. They are a normal son, a haemophiliac son and two normal daughters. The father has normal blood clotting. What is the probable genotype for each member of the family? Show the genetic diagrams to proof your answers. (10)

11.2 State Mendel's Law of Segregation. (1)

QUESTION 12 **[11]**

12.1 Draw a labelled diagram to explain the process of protein synthesis. (11)

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