Lampiran 1

MAPPING CURRICULUM
CHEMISTRY HIGHER 1 (SYLLABUS OF SINGAPORE), NATIONAL SYLLABUS, AND CHEMISTRY SYLLABUS OF INTERNATIONAL SERVICES

Education unit : SMAN 7 Purworejo
Subject matter : CHEMISTRY
Service : International
Program : Science

No	Topic	Singapore Syllabus	National Syllabus			International Services Syllabus			Note
			Grade X	Grade XI	Grade XII	Grade X	Grade XI	Grade XII	
1	PARTICLE THEORY AND COLLOID	-	√	-	-		√		Remain the same
2	ATOMIC STRUCTURE a. The nucleus of the atom: neutrons and protons, isotopes, proton and nucleon numbers b. Electrons: electronic energy levels, ionization energies, atomic orbital's	√	√	√	-	√	√		Adapted
3	THE PERIODIC TABLE Periodicity of physical properties of the elements: variation with proton number across the third period (sodium to argon) of: (i) Atomic radius and ionic radius (ii) Melting point (iii) Electrical conductivity (iv) Ionization energy	√	√	√	-	√	√		Adapted
4	CHEMICAL PERIODICITY Periodicity of chemical properties of the elements in the third period (i) Reaction of the elements with oxygen and chlorine (ii) Variation in oxidation number of the oxides (sodium to sulfur only) and of the chlorides (sodium to phosphorus only) (iii) Reactions of these oxides and chlorides with water (iv) Acid/base behavior of these oxides and the corresponding hydroxides	√	-	-	√			√	Adapted

No	Topic	Singapore Syllabus	National Syllabus			International Services Syllabus			Note
			Grade X	Grade XI	Grade XII	Grade X	Grade XI	Grade XII	
5	CHEMICAL BONDING a. Ionic (electrovalent) bonding b. Covalent bonding and co-ordinate (dative covalent) bonding (i) The shapes of simple molecules (ii) Bond energies, bond lengths and bond polarities c. Intermolecular forces, including hydrogen bonding d. Metallic bonding e. Bonding and physical properties f. The solid state	√	√	√	-	√	√		Adapted
6	STOICHIOMETRY a. Relative masses of atoms and molecules b. The mole, the Avogadro constant c. The calculation of empirical and molecular formulae d. Reacting masses and volumes (of solutions and gases)	√	√	-	-	√			Adapted
7	SOLUTION PROPERTIES	-	-	-	√			√	Remain the same
8	ACID, BASE, AND SALT a. Ionic equilibriums (i) Bronsted-Lowry theory of acids and bases (ii) Acid dissociation constants, Ka (iii) Base dissociation constants, Kb (iv) The ionic product of water, Kw (v) pH: choice of indicators (vi) Buffer solutions (vii)Hydrolysis (viii)Solubility	√	-	√	-	-	√		Adapted
9	REDOX REACTIONS AND ELECTROCHEMISTRY Redox processes: electron transfer and changes in oxidation number (oxidation state)	√	√	-	√	√		√	Adapted
10	CHEMICAL ENERGETICS a. Enthalpy changes: ΔH of formation, combustion, and	√	-	√	-		√		Adapted

No	Topic	Singapore Syllabus	National Syllabus			International Services Syllabus			Note
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	neutralization; bond energy; lattice energy b. Hess ′ Law								
11	REACTION KINETICS a. Simple rate equations; orders of reaction; rate constants b. Concept of activation energy c. Effect of concentration, temperature, and catalysts on reaction rate d. Enzymes as biological catalysts	√	-	√	-		√		Adapted
12	EQUILIBRIA a. Chemical equilibrium: reversible reactions; dynamic equilibrium (i) Factors affecting chemical equilibrium (ii) Equilibrium constants (iii) The Haber process	√	-	√	-		√		Adapted
13	ANALYTICAL CHEMISTRY	-	-	-	√	-	-	√	Remain the same
14	HYDROCARBONS a. Alkanes (exemplified by ethane) (i) Combustion and substitution reactions b. Alkenes (exemplified by ethene) (i) Addition and oxidation reactions c. Arenes (exemplified by benzene and methylbenzene) (i) Influence of delocalized π electrons on structure and properties (ii) Substitution reactions (iii) Oxidation of side-chain d. Hydrocarbons as fuels	√	-	√	-	√			Adapted
15	ORGANIC CHEMISTRY a. Molecular, structural and empirical formulae b. Functional groups and the naming of organic compounds c. Characteristic organic reactions d. Shapes of organic molecules; σ and π bonds	√	-	-	√			√	Adapted

No	Topic	Singapore Syllabus	National Syllabus			International Services Syllabus			Note
			Grade X	Grade XI	Grade XII	Grade X	Grade XI	Grade XII	
	e. Isomerism: structural; geometrical HALOGEN DERIVATIVES a. Halogenoalkanes (i) Substitution (ii) Elimination b. Relative strength of the C-Hal bond ALCOHOLS a. Alcohols (exemplified by ethanol) (i) Formation of halogenoalkanes (ii) Reaction with sodium; oxidation; dehydration (iii) The tri-iodomethane test CARBONYL COMPOUNDS a. Aldehydes (exemplified by ethanal) (i) Oxidation to carboxylic acid (ii) Reaction with hydrogen cyanide (iii) Characteristic tests for aldehydes b. Ketones (exemplified by propanone) (i) Reaction with hydrogen cyanide (ii) Characteristic tests for ketones CARBOXYLIC ACIDS AND DERIVATIVES a. Carboxylic acids (exemplified by ethanoic acid) (i) Formation from primary alcohols and nitriles (ii) Salt and ester formation b. Esters (exemplified by ethyl ethanoate) (i) Formation from carboxylic acids (ii) Hydrolysis (under acidic and under basic conditions)									
16	MACROMOLECULES	-	-	-	√			√	Remain the same

Lampiran 2

ANALYSIS OF MATERIALS

1. PARTICLE THEORY AND COLLOID

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O		XI– 2	a. Menjelaskan proses pembuatan koloid melalui percobaan b. Mengklasifikasikan suspensi kasar, larutan sejati dan koloid berdasarkan data hasil pengamatan (effek Tyndall, homogen/heterogen, dan penyaringan) c. Mengelompokkan jenis koloid berdasarkan fase terdispersi dan fase pendispersi d. Mendeskripsikan sifat-sifat koloid (effek Tyndall, gerak Brown, dialisis, elektroforesis, emulsi, koagulasi) e. Menjelaskan koloid liofob dan liofil f. Mendeskripsikan peranan koloid di industri kosmetik, makanan, dan farmasi	XI– 2	a. Describe the process of a colloid preparation through an experiment b. Classify the suspension, solution and colloid based on the observations (Tyndall effect, homogeneous/heterogeneous, and filtration) c. Classify the colloid type based on the dispersed phase and the dispersant. d. Describe the properties of colloid (Tyndall effect, Brownian movement, dialysis, electrophoresis, emulsion, coagulation) e. Describe the lyofob and lyophil colloid. f. Describe the function of colloid in cosmetic industries, foods, and pharmacies.

2. ATOMIC STRUCTURE

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) identify and describe protons, neutrons and electrons in terms of their relative charges and relative masses; (b) deduce the behavior of beams of protons, neutrons and electrons in an electric field; (c) describe the distribution of mass and charges within an atom; (d) deduce the numbers of protons, neutrons and electrons present in both atoms and ions given proton and nucleon numbers (and charge); (e) (i) describe the contribution of protons and neutrons to atomic nuclei in terms of proton number and nucleon number; (ii) distinguish between isotopes on the basis of different numbers of neutrons present; (f) describe the number and relative energies of the s, p and d orbital's for the principal quantum numbers 1, 2 and 3 and also the 4s and 4p orbital's; (g) describe the shapes of s and p orbital's; (h) state the electronic configuration of atoms and ions given the proton number (and charge);	X – 1 XI – 1	a. Menjelaskan perkembangan teori atom untuk menunjukkan kelemahan dan kelebihan masing-masing teori atom berdasarkan data percobaan. b. Menentukan partikel dasar (proton, elektron dan netron) c. Menentukan konfigurasi elektron dan elektron valensi d. Menentukan hubungan konfigurasi elektron dengan letak unsur dalam tabel periodik e. Menentukan massa atom relatif berdasarkan tabel periodik f. Mengklasifikasikan unsur ke dalam isotop, isobar dan isoton a. Menjelaskan teori atom mekanika kuantum. b. Menentukan bilangan kuantum (kemungkinan elektron berada) c. Menjelaskan kulit dan sub kulit serta hubungannya dengan bilangan kuantum d. Menggambarkan bentuk-bentuk orbital. e. Menggunakan prinsip Aufbau, aturan Hund dan azas larangan Pauli untuk menuliskan konfigurasi elektron dan diagram orbital. f. Menghubungkan konfigurasi elektron suatu unsur dengan letaknya dalam sistem periodik	X – 1 XI – 1	a. Explain the development of atomic theory to show the advantages and the disadvantages of the atomic theory. b. (a) Identify and describe protons, neutrons and electrons in terms of their relative charges and relative masses; c. (b) Deduce the behavior of beams of protons, neutrons and electrons in an electric field; d. (d) Deduce the numbers of protons, neutrons and electrons present in both atoms and ions given proton and nucleon numbers (and charge); e. (h) Arrange the electronic configuration of atoms and ions given the proton number (and charge); f. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table. g. Explain the relative atomic mass pursuant to periodic tables h. Classify elements into isotope, isobar and isotones a. Explain the quantum atomic theory b. (f) Describe the number and relative energies of the s, p and d orbital's for the principal quantum numbers 1, 2 and 3 and also the 4s and 4p orbital's; c. Explain the shell and sub shell and its relation with the quantum number d. Describe the forms of orbital.

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
	(i) (i) explain the factors influencing the ionization energies of elements (see the Data Booklet); (ii) explain the trends in ionization energies across a period and down a Group of the Periodic Table (see also Section Inorganic Chemistry); (j) deduce the electronic configurations of elements from successive ionization energy data; (k) Interpret successive ionization energy data of an element in terms of the position of that element within the Periodic Table.				e. Use the Aufbau principle, the Hund rule and the principality of prohibition Pauli to arrange electron configuration and diagram of orbital f. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table.

3. THE PERIODIC TABLE

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) describe qualitatively (and indicate the periodicity in) the variations in atomic radius, ionic radius, melting point and electrical conductivity of the elements (see the Data Booklet); (b) explain qualitatively the variation in atomic radius and ionic radius; (c) interpret the variation in melting point and in electrical conductivity in terms of the presence of simple molecular, giant molecular or metallic bonding in the elements; (d) explain the variation in first ionisation energy; (e) (i) explain the factors influencing the ionization energies of elements (see the Data Booklet); (ii) explain the trends in ionization energies across a period and down a Group of the Periodic Table (see also Section Inorganic Chemistry); (f) deduce the electronic configurations of elements from successive ionization energy data; (g) Interpret successive ionization energy data of an element in terms of the position of that element within the Periodic Table.	X-1	a. Membandingkan perkembangan tabel periodik unsur untuk mengidentifikasi kelebihan dan kekurangannya. b. Menjelaskan dasar pengelompokan unsur-unsur. c. Mengklasifikasikan unsur ke dalam logam, non logam dan metaloid. d. Menganalisis tabel, grafik untuk menentukan keteraturan jari-jari atom, energi ionisasi, afinitas elektron dan keelektronegatifan	X-1	a. Compare the development of element periodic tables to identify the advantages and the disadvantages b. Explain the grouping of elements. c. Classify the elements into metal, non metal and metalloid d. Analyze the tables and graph to determine the regularity of atom radii, ionization energy, electron affinity and electro negativity. e. (a) Describe qualitatively (and indicate the periodicity in) the variations in atomic radius, ionic radius, melting point and electrical conductivity of the elements (see the Data Booklet)

4. CHEMICAL PERIODICITY

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators (Students should, for the third period <sodium to argon> be able to:)	Grade	Indikator	Grade	Indicators
O	(a) describe the reactions, if any, of the elements with oxygen (to give Na_2O; MgO; Al_2O_3; P_4O_6; P_4O_{10}; SO_2; SO_3), and chlorine (to give NaCl; $MgCl_2$; Al_2Cl_6; $SiCl_4$; PCl_3; PCl_5); (b) state and explain the variation in oxidation number of the oxides and chlorides; (c) describe the reactions of the oxides with water; [treatment of peroxides and superoxide is not required] (d) describe and explain the acid/base behavior of oxides and hydroxides, including, where relevant, amphoteric behavior in reaction with sodium hydroxide (only) and acids; (e) describe and explain the reactions of the chlorides with water; (f) interpret the variations and trends in (f), (g), (h), and (i) in terms of bonding and electronegativity; (g) suggest the types of chemical bonding present in chlorides and oxides from observations of their chemical and physical properties; In addition, students should be able to: (h) predict the characteristic properties of	XII - 1	a. Mengidentifikasi keberadaan unsur-unsur yang ada di alam terutama di Indonesia (gas mulia, halogen, alkali, alkali tanah, aluminium, karbon, silikon, belerang, krom, tembaga, seng, besi, oksigen dan nitrogen) b. Mengidentifikasi produk-produk yang mengandung zat tersebut c. Mengidentifikasi sifat-sifat fisik unsur utama dan unsur transisi (titik didih, titik leleh, kekerasan, warna, kelarutan, dan sifat khusus lainnya) d. Mengidentifikasi sifat-sifat kimia (kereaktifan, kelarutan) melalui percobaan e. Mengidentifikasi daya pengoksidasi halogen dan daya pereduksi halida melalui percobaan f. Mengidentifikasi reaksi nyala senyawa logam (terutama alkali dan alkali tanah) melalui percobaan g. Mengidentifikasi keteraturan sifat fisik dan sifat kimia unsur-unsur periode ke tiga melalui percobaan h. Mengidentifikasi sifat-sifat fisik dan sifat-sifat kimia unsur-unsur periode keempat i. Menjelaskan cara menghilangkan kesadahan air melalui percobaan j. Menjelaskan manfaat dan dampak unsur-unsur (seperti gas mulia, halogen, alkali, alkali tanah, aluminium, karbon, silikon, belerang, krom,	XII - 1	a. Identify the existence of elements in nature especially in Indonesia (inert gas, halogen, alkaline, earth alkaline, aluminium, carbon, silicon, brimstone, chrome, copper, zinc, iron, nitrogen and oxygen) b. (a) describe the reactions, if any, of the elements with oxygen (to give Na_2O; MgO; Al_2O_3; P_4O_6; P_4O_{10}; SO_2; SO_3), and chlorine (to give NaCl; $MgCl_2$; Al_2Cl_6; $SiCl_4$; PCl_3; PCl_5); c. Identify the products that consist of the substances d. Identify the physical properties of principal elements and transition elements (boiling point, melting point, hardness, colour, condensation, and the other properties) e. Identify the chemical properties (reactivity, solubility) through an experiment f. Identify the power of halogens as oxidator and halides as reductor through experiments. g. Identify the flame reaction of metal compounds (especially alkaline and earth alkaline) through experiments h. Identify the regularity of physical properties and chemical properties of third period elements through experiments. i. Identify the regularity of physical properties and chemical properties of fourth period elements through experiments.

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Grade	Indicators (Students should, for the third period <sodium to argon> be able to:)	Grade	Indikator	Grade	Indicators
	an element in a given Group by using knowledge of chemical periodicity; (i) deduce the nature, possible position in the Periodic Table, and identity of unknown elements from given information of physical and chemical properties.		tembaga, seng, besi, oksigen dan nitrogen) serta senyawanya dalam kehidupan sehari-hari dan industri. k. Menjelaskan pembuatan unsur dan senyawanya di laboratorium dan industri (misalnya H_2SO_4, N_2, Fe, Al, NH_3 dan O_2) l. Menentukan komposisi unsur dalam pupuk m. Radioaktivitas *1)* Mendeskripsikan penemuan sinar radioaktif *2)* Mengidentifikasi sifat-sifat sinar radioaktif *3)* Menentukan pita kestabilan inti *4)* Menuliskan persamaan reaksi inti *5)* Mendeskripsikan kegunaan unsur-unsur radioaktif *6)* Mendeskripsikan bahaya unsur-unsur radioaktif		j. Describe how to eliminate the hardness of water through experiment. k. Explain the impact and the benefit of elements and compounds in daily life and industrials (e.g. inert gases, halogens, alkalines, earth alkalines, aluminium, carbon, silicon, sulfur, chrome, copper, zinc, iron, nitrogen and oxygen) l. Explain the processes of compounds and elements preparation in industries and laboratories (e.g. H_2SO_4, N_2, Fe, Al, NH_3 and of O_2) m. Explain the composition of fertilizers. In addition, students should be able to: n. (h) predict the characteristic properties of an element in a given Group by using knowledge of chemical periodicity; o. (i) deduce the nature, possible position in the Periodic Table, and identity of unknown elements from given information of physical and chemical properties. p. Radioactive 1) Describe the invention of radioactive radiation. 2) Identifyi the properties of radioactive radiation. 3) Explain the stability of nucleus. 4) Construct the equation of nuclear reactions. 5) Describe the use of radioactive elements. 6) Describe the impact of radioactive elements

5. CHEMICAL BONDING

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) describe ionic (electrovalent) bonding, as in sodium chloride and magnesium oxide, including the use of 'dot-and-cross' diagrams; (b) describe, including the use of 'dot-and-cross' diagrams: (i) covalent bonding, as in hydrogen; oxygen; nitrogen; chlorine; hydrogen chloride; carbon dioxide; methane; ethane; (ii) co-ordinate (dative covalent) bonding, as in the formation of the ammonium ion and in the Al_2Cl_6 molecule; (c) explain the shapes of, and bond angles in, molecules such as BF_3 (trigonal planar); CO_2 (linear); CH_4 (tetrahedral); NH_3 (trigonal pyramidal); H_2O (non-linear); SF_6 (octahedral) by using the Valence Shell Electron Pair Repulsion theory; (d) describe covalent bonding in terms of orbital overlap, giving σ and π bonds (see also Section Introductory organic chemistry); (e) predict the shapes of, and bond angles in, molecules analogous to those specified in (c);	X – 1	a. Menjelaskan kecenderungan suatu unsur untuk mencapai kestabilannya. b. Menggambarkan susunan elektron valensi atom gas mulia (duplet dan oktet) dan elektron valensi bukan gas mulia (struktur Lewis). c. Menjelaskan proses terbentuknya ikatan ion. d. Menjelaskan proses terbentuknya ikatan kovalen tunggal, rangkap dua, dan rangkap tiga. e. Menjelaskan sifat-sifat senyawa ion dan sifat-sifat senyawa kovalen f. Menjelaskan proses terbentuknya ikatan kovalen koordinasi pada beberapa senyawa. g. Menyelidiki kepolaran beberapa senyawa dan hubungannya dengan keelektronegatifan melalui percobaan. h. Mendeskripsikan proses pembentukan ikatan logam dan hubungannya dengan sifat fisik logam. **i. Menghubungkan sifat fisik materi dengan jenis ikatannya** j. **Menjelaskan perbedaan sifat fisik (titik didih, titik beku) berdasarkan perbedaan gaya antar molekul (gaya Van Der Waals, gaya London, dan ikatan hidrogen)** **Langkah I dan j terintegrasi.** k. Menentukan bentuk molekul berdasarkan teori pasangan elektron. l. Menentukan bentuk molekul berdasarkan teori hibridisasi.	X – 1	a. Explain the trend of element stability b. Describe the duplet and octet rules and Lewis structures. c. (a) Describe ionic (electrovalent) bonding, as in sodium chloride and magnesium oxide, including the use of 'dot-and-cross' diagrams; d. (b) Describe, including the use of 'dot-and-cross' diagrams: covalent bonding, as in hydrogen; oxygen; nitrogen; chlorine; hydrogen chloride; carbon dioxide; methane; ethane; e. Explain the properties of ionic and covalent compounds f. (b) Describe, including the use of 'dot-and-cross' diagrams: co-ordinate (dative covalent) bonding, as in the formation of the ammonium ion and in the Al_2Cl_6 molecule; g. (g) explain the terms bond energy, bond length and bond polarity and use them to compare the reactivities of covalent bonds h. (i) Describe metallic bonding in terms of a lattice of positive ions surrounded by mobile electrons; i. (d) describe covalent bonding in terms of orbital overlap, giving σ and π bonds (see also Section Introductory organic chemistry); j. (e) predict the shapes of, and bond angles in, molecules analogous to those specified in (c); k. (f) describe hydrogen bonding, using ammonia

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	(f) describe hydrogen bonding, using ammonia and water as examples of molecules containing -NH and -OH groups; (g) explain the terms bond energy, bond length and bond polarity and use them to compare the reactivities of covalent bonds; (h) describe intermolecular forces (van der Waals' forces), based on permanent and induced dipoles, as in $CHCl_3$(l); Br_2(l) and the liquid noble gases; (i) describe metallic bonding in terms of a lattice of positive ions surrounded by mobile electrons; (j) describe, interpret and/or predict the effect of different types of bonding (ionic bonding; covalent bonding; hydrogen bonding; other intermolecular interactions; metallic bonding) on the physical properties of substances; (k) deduce the type of bonding present from given information; (l) show understanding of chemical reactions in terms of energy transfers associated with the breaking and making of chemical bonds; (m) describe, in simple terms, the lattice structure of a crystalline solid which is: i. ionic, as in sodium chloride				and water as examples of molecules containing -NH and -OH groups; l. (h) describe intermolecular forces (van der Waals' forces), based on permanent and induced dipoles, as in $CHCl_3$(l); Br_2(l) and the liquid noble gases; m. (j) Describe, interpret and/or predict the effect of different types of bonding (ionic bonding; covalent bonding; hydrogen bonding; other intermolecular interactions; metallic bonding) on the physical properties of substances; n. Step i and j are integrated. o. (c) Explain the shapes of, and bond angles in, molecules such as BF_3 (trigonal planar); CO_2 (linear); CH_4 (tetrahedral); NH_3 (trigonal pyramidal); H_2O (non-linear); SF_6 (octahedral) by using the Valence Shell Electron Pair Repulsion theory; p. Use the hybridization theory to predict the shape of molecules

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	magnesium oxide; ii. simple molecular, as in iodine; iii. giant molecular, as in graphite, diamond; iv. hydrogen-bonded, as in ice; v. metallic, as in copper; [the concept of the 'unit cell' is not required] (n) outline the importance of hydrogen bonding to the physical properties of substances, including ice and water; (o) suggest from quoted physical data the type of structure and bonding present in a substance; (p) recognise that materials are a finite resource and the importance of recycling processes.				

6. STOICHIOMETRY

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) define the terms relative atomic, isotopic, molecular and formula masses, based on the 12C scale; (b) define the term mole in terms of the Avogadro constant; (c) calculate the relative atomic mass of an element given the relative abundances of its isotopes; (d) define the terms empirical and molecular formulae; (e) calculate empirical and molecular formulae, using combustion data or composition by mass; (f) write and/or construct balanced equations; (g) perform calculations, including use of the mole concept, involving: (i) reacting masses (from formulae and equations); (ii) volumes of gases (e.g. in the burning of hydrocarbons); (iii) volumes and concentrations of solutions; [When performing calculations, candidates' answers should reflect the number of significant figures given or asked for in the question.] (h) Deduce stoichiometric relationships from calculations such as those in (g).	X – 1	a. Memberi nama senyawa menurut IUPAC b. Menuliskan nama senyawa biner c. Menuliskan nama senyawa poliatomik d. Menuliskan nama senyawa organik sederhana e. Menyetarakan reaksi sederhana dengan diberikan nama-nama zat yang terlibat dalam reaksi atau sebaliknya f. Membuktikan Hukum Lavoisier melalui percobaan g. Membuktikan hukum Proust melalui percobaan h. Menganalisis data percobaan pada senyawa untuk membuktikan berlakunya hukum kelipatan perbandingan (hukum Dalton) i. Menggunakan data percobaan untuk membuktikan hukum perbandingan volum (hukum Gay Lussac). j. Menggunakan data percobaan untuk membuktikan hukum hukum Avogadro. k. Mengkonversikan jumlah mol dengan jumlah partikel, massa, dan volum zat. l. Menentukan rumus empiris dan rumus molekul m. Menentukan rumus air kristal n. Menentukan kadar zat dalam suatu senyawa. o. Menentukan pereaksi pembatas dalam suatu reaksi p. Menentukan banyak zat pereaksi atau hasil reaksi q. Menghitung konsentrasi larutan (molaritas larutan).	X – 1	a. Explain the name of compounds based on the IUPAC rule b. Explain the name of binary compounds c. Explain the name of polyatomic compounds d. Explain the name of familiar organic compounds e. Construct the balanced of equations. f. Deduce Lavoisier's Law trough experiments g. Deduce Proust's Law trough experiments h. Analyze compound to prove Dalton's Law i. Use experiment data to prove Gay Lussac's Law j. Use experiment data to prove Avogadro's Law. k. (b) define the term mole in terms of the Avogadro constant; l. (g)perform calculations, including use of the mole concept, involving: 1) reacting masses (from formulae and equations); 2) volumes of gases (e.g. in the burning of hydrocarbons); 3) volumes and concentrations of solutions m. Calculate empirical and molecular formulae, using combustion data or composition by mass; n. Define the hydrate formulae o. Define the concentration of substance in a compound p. Define the limiting reactant in a reaction. q. Calculate the product of reaction r. Calculate the concentration of solution s. Deduce stoichiometric relationships from calculations such as those in (k).

7. SOLUTION PROPERTIES

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	-	XII– 1	a. Menghitung konsentrasi suatu larutan (kemolalan dan fraksi mol) b. Menjelaskan pengertian sifat koligatif larutan non elektrolit (hukum Raoulth) dan larutan elektrolit c. Menjelaskan pengaruh zat terlarut yang sukar menguap terhadap tekanan uap pelarut d. Menghitung tekanan uap larutan berdasarkan data percobaan e. Mengamati penurunan titik beku suatu zat cair akibat penambahan zat terlarut melalui percobaan f. Menghitung penurunan titik beku larutan elektrolit dan non elektrolit berdasarkan data percobaan g. Mengamati kenaikan titik didih suatu zat cair akibat penambahan zat terlarut melalui percobaan h. Menghitung kenaikan titik didih larutan elektrolit dan non elektrolit berdasarkan data percobaan i. Menganalisis diagram PT untuk menafsirkan penurunan tekanan uap, penurunan titik beku dan kenaikan titik didih larutan j. Menjelaskan pengertian osmosis dan tekanan osmosis serta terapannya k. Menghitung tekanan osmosis larutan elektrolit dan non elektrolit l. Menganalisis data percobaan untuk membandingkan sifat koligatif larutan elektrolit dan non elektrolit	XII– 1	a. Calculate the concentration of solution (mole fraction and molality) b. Explain the definition of properties of non- electrolyte colligative solution (Raoulth's law) and electrolyte solution. c. Explain the influence of nonvolatile solute the vapour pressure of the solution. d. Calculate the solution vapour pressure based on experiment data. e. Investigate the depression of the freezing point because of solute addition through an experiment. f. Calculate the depression of the freezing point of the electrolyte and non electrolyte solution based on experiment data. g. Investigate the increase of boiling point as result of dissolve substance addition through an experiment. h. Calculate the increase of electrolyte and non electrolyte boiling point solution based on experiment data. i. Analyze the PT diagram to interpret decreasing of the vapour pressure, depression of the freezing point and increasing of the boiling point solution. j. Explain the definition of osmosis and the osmosis pressure and also its applications. k. Calculate the osmosis pressure of electrolyte and non electrolyte solution. l. Analyze the experiment data to compare the colligative properties of electrolyte and nonelectrolyte solution.

8. ACID, BASE, AND SALT

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) show understanding of, and apply the Bronsted-Lowry theory of acids and bases, including the concept of conjugate acids and bases; (b) explain qualitatively the differences in behaviour between strong and weak acids and bases in terms of the extent of dissociation; (c) explain the terms pH; Ka; Kb; Kw; [the relationship Kw = KaKb is not required] (d) calculate [H+(aq)] and pH values for strong acids, and strong bases; (e) explain the choice of suitable indicators for acid-base titrations, given appropriate data, in terms of the strengths of the acids and bases; (f) (i) explain how acidic buffer solutions control pH; (ii) describe and explain the uses of buffers, including the role of $H_2CO_3/HCO3^-$ in controlling pH in blood.	XI– 2	a. Pengertian Asam Basa 1) Menjelaskan pengertian asam dan basa menurut Arrhenius 2) Menjelaskan pengertian asam dan basa menurut Bronsted dan Lowry 3) Menuliskan persamaan reaksi asam dan basa menurut Bronsted dan Lowry dan menunjukkan pasangan asam dan basa konjugasinya 4) Menjelaskan pengertian asam dan basa menurut Lewis 5) Mengidentifikasi sifat larutan asam dan basa dengan berbagai indikator. b. pH 1) Memperkirakan pH suatu larutan elektrolit yang tidak dikenal berdasarkan hasil pengamatan trayek perubahan warna berbagai indikator asam dan basa. 2) Menjelaskan pengertian kekuatan asam dan menyimpulkan hasil pengukuran pH dari beberapa larutan asam dan larutan basa yang konsentrasinya sama 3) Menghubungkan kekuatan asam atau basa dengan derajat pengionan (α) dan tetapan asam (Ka) atau tetapan basa (Kb) 4) Menghitung pH larutan asam atau basa yang diketahui konsentrasinya. 5) Menjelaskan penggunaan konsep pH dalam	XI– 2	a. CONCEPT OF ACIDS AND BASES 1) Outline the Arrhenius theory of acids and bases 2) Outline the Bronsted-Lowry theory of acids and bases 3) (a) show understanding of, and apply the Bronsted-Lowry theory of acids and bases, including the concept of conjugate acids and bases; 4) Outline the Lewis theory of acids and bases 5) Identify the acids and bases using an indicator b. pH 1) Predict pH an electrolyte solution based on the change of colour indicators 2) (b) explain qualitatively the differences in behaviour between strong and weak acids and bases in terms of the extent of dissociation; 3) (c) explain the terms pH; Ka; Kb; Kw; [the relationship Kw = KaKb is not required] 4) (d) calculate [H+(aq)] and pH values for strong acids, and strong bases 5) develop the concept of pH of the environment. c. Titration 1) Calculate the concentration of acid and base solution by titration 2) Explain the concentration of substance by titration. 3) (e) explain the choice of suitable indicators for

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Grade	Indicators	Grade	Indikator	Grade	Indicators
			lingkungan. c. Titrasi 1) Menentukan konsentrasi asam atau basa dengan titrasi 2) Menentukan kadar zat melalui titrasi. 3) Menentukan indikator yang tepat digunakan untuk titrasi asam dan basa 4) Menentukan kadar zat dari data hasil titrasi 5) Membuat grafik titrasi dari data hasil percobaan. d. Larutan Buffer 1) Menganalisis larutan penyangga dan bukan penyangga melalui percobaan. 2) Menghitung pH atau pOH larutan penyangga 3) Menghitung pH larutan penyangga dengan penambahan sedikit asam atau sedikit basa atau dengan pengenceran 4) Menjelaskan fungsi larutan penyangga dalam tubuh makhluk hidup e. Hidrolisis 1) Menentukan ciri-ciri beberapa jenis garam yang dapat terhidrolisis dalam air melalui percobaan 2) Menentukan sifat garam yang terhidrolisis dari persamaan reaksi ionisasi 3) Menghitung pH larutan garam yang terhidrolisis 4) Menganalisis grafik hasil titrasi asam kuat dan basa kuat, asam kuat dan basa lemah, asam lemah dan basa kuat untuk menjelaskan larutan penyangga dan hidrolisis.		acid-base titrations, given appropriate data, in terms of the strengths of the acids and bases; 4) Explain the concentration of substance of the titration data. 5) Draw the tittration graph of an experiment data. d. Larutan Buffer 1) Analyze a buffer and non buffer solutions through an experiment. 2) Calculate the pH or pOH of buffers 3) Calculate the pH of buffer solution after acid or base addition or dillution. 4) (f)(ii) describe and explain the uses of buffers, including the role of H_2CO_3/$HCO3^-$ in controlling pH in blood. e. Hydrolysis 1) Explain the character of salts which is hydrolyzed in water through an experiment. 2) Explain the character of salts which is hydrolyzed from the ionization reaction. 3) Calculate the pH of hydrolyzed salt solution. 4) Analyze the graph of titration of strong acid and base, strong acid and weak base, weak acid and strong base to explain the buffer solution and hydrolysis through discussion. f. Ksp 1) Explain the equilibrium of saturated solution or poorly soluble salt solution

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Grade	Indicators	Grade	Indikator	Grade	Indicators
			f. Ksp 1) Menjelaskan kesetimbangan dalam larutan jenuh atau larutan garam yang sukar larut 2) Menghubungkan tetapan hasil kali kelarutan dengan tingkat kelarutan atau pengendapannya 3) Menuliskan ungkapan berbagai Ksp elektrolit yang sukar larut dalam air 4) Menghitung kelarutan suatu elektrolit yang sukar larut berdasarkan data harga Ksp atau sebaliknya 5) Menjelaskan pengaruh penambahan ion senama dalam larutan 6) Menentukan pH larutan dari harga Ksp-nya 7) Memperkirakan terbentuknya endapan berdasarkan harga Ksp		2) Connect the constant solubility product with the solubility or its precipitation 3) Restate the expression of Ksp of poorly soluble substances. 4) Calculate the solubility of poorly soluble electrolyte using data of Ksp or vice versa 5) Explain the influence of addition of common ion to the solution 6) Explain the pH of the solution using the Ksp 7) Approximate the precipate formation based on the Ksp.

9. REDOX REACTIONS AND ELECTROCHEMISTRY

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) describe and explain redox processes in terms of electron transfer and/or of changes In oxidation number (oxidation state), as exemplified by Fe^{3+}/Fe^{2+}, MnO_4/Mn^{2+} and $Cr_2O_7^{2-}/Cr^{3+}$ (b) Construct redox equations using the relevant half-equations.	X – 2	a. Mengidentifikasi sifat-sifat larutan non elektrolit dan elektrolit melalui percobaan b. Mengelompokkan larutan ke dalam larutan non elektrolit dan elektrolit berdasarkan sifat hantaran listriknya c. Menjelaskan penyebab kemampuan larutan elektrolit menghantarkan arus listrik d. Mendeskripsikan bahwa larutan elektrolit dapat berupa senyawa ion dan senyawa kovalen polar. e. Membedakan konsep oksidasi reduksi ditinjau dari penggabungan dan pelepasan oksigen, pelepasan dan penerimaan elektron, serta peningkatan dan penurunan bilangan oksidasi. f. Menentukan bilangan oksidasi atom unsur dalam senyawa atau ion. g. Menentukan oksidator dan reduktor dalam reaksi redoks h. Mendeskripsikan konsep larutan elektrolit dan konsep redoks dalam memecahkan masalah lingkungan.	X – 2	a. Identify the properties of electrolyte and non electrolyte solutions through an experiment. b. Group the solution into electrolyte and non electrolyte solutions based on the properties of its electrics conductivity. c. Explain the ability of the electrolyte solution conducting the electricity. d. Describe the electrolyte solutions (ionic and polar covalent compound) in term of polarity. e. Describe and explain redox processes in terms of electron transfer and/or of changes In oxidation number (oxidation state), as exemplified by Fe^{3+}/Fe^{2+}, MnO_4/Mn^{2+} and $Cr_2O_7^{2-}/Cr^{3+}$; f. Explain the oxidation number of atom in a compound g. Explain the oxidatior and reductor in a redox reaction. h. Describe the concept of redox reaction and electrochemistry to solve the environmental problem

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
		XII – 1	a. Menyetarakan reaksi redoks dengan cara setengah reaksi (ion elektron) b. Menyetarakan reaksi redoks dengan cara perubahan bilangan oksidasi (PBO) c. Menyimpulkan ciri-ciri reaksi redoks yang berlangsung secara spontan melalui percobaan d. Menggambarkan susunan sel Volta atau sel Galvani dan menjelaskan fungsi tiap bagiannya e. Menjelaskan bagaimana energi listrik dihasilkan dari reaksi redoks dalam sel Volta f. Menuliskan lambang sel dan reaksi-reaksi yang terjadi pada sel Volta g. Menghitung potensial sel berdasarkan data potensial standar h. Menjelaskan prinsip kerja sel Volta yang banyak digunakan dalam kehidupan (baterai, aki dll) i. Mengamati reaksi yang terjadi di anoda dan katoda pada reaksi elektrolisis melalui percobaan j. Menuliskan reaksi yang terjadi di anoda dan katoda pada larutan atau cairan dengan elektroda aktif ataupun elektroda inert k. Menjelaskan faktor-faktor yang mempengaruhi terjadinya korosi melalui percobaan l. Menjelaskan beberapa cara untuk mencegah terjadinya korosi m. Menerapkan konsep hukum Faraday dalam perhitungan sel elektrolisis n. Menuliskan reaksi elektrolisis pada penyepuhan dan pemurnian suatu logam	XII – 1	a. (b) balance the redox equations using the half-equations method. b. Balance the redox equations using the oxidation number (oxidation state) method c. Conclude the character of the spontan redox reaction through an experiment. d. Describe Voltaic cell formation or Galvanis cell and explain every components e. Explain how electrics energy are generated from the redox reaction in the Voltaic cell f. Explain the cell notation and the reactions of Voltaic cell g. Calculate the potential cell based on the standard potential data h. Explain the princip of Voltaic cell used in daily life (battery, accumulator, etc) i. Observe the reaction on the cathode and the anode in electrolysis reaction through an experiment. j. Balance the reaction on the cathode and the anode in the dillution or the solution with the active or inert electrode. k. Explain the factors of corrosion through an experiment. l. Explain the ways to prevent of the corrosion. m. Apply the Faraday's Law concept in the calculation of the electrolysis cell. n. Construct the electrolysis reaction of the electropating and in a metal refining.

10. CHEMICAL ENERGETICS

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) explain that some chemical reactions are accompanied by energy changes, principally in the form of heat energy; the energy changes can be exothermic (ΔH negative) or endothermic (ΔH positive); (b) explain and use the terms: i. enthalpy change of reaction and standard conditions, with particular reference to: formation; combustion; neutralisation; ii. bond energy (ΔH positive, i.e. bond breaking); iii. lattice energy (ΔH negative, i.e. gaseous ions to solid lattice); (c) calculate enthalpy changes from appropriate experimental results, including the use of the relationship heat change = mc ΔT (d) explain, in qualitative terms, the effect of ionic charge and of ionic radius on the numerical magnitude of a lattice energy; (e) apply Hess' Law to carry out calculations involving given simple energy cycles and relevant energy terms (restricted to enthalpy changes of formation, combustion, and	XI – 1	a. Menjelaskan hukum/azas kekekalan energi b. Membedakan sistem dan lingkungan c. Membedakan reaksi yang melepaskan kalor (eksoterm) dengan reaksi yang menerima kalor (endoterm) melalui percobaan d. Menjelaskan macam-macam perubahan entalpi. e. Menghitung harga ΔH reaksi melalui percobaan. f. Menghitung harga ΔH reaksi dengan menggunakan: 1) data entalpi pembentukkan standar (ΔH°f) 2) diagram siklus dan diagram tingkat 3) energi ikatan	XI – 1	a. Explain the law of energy conservation b. Deduce the environment and system c. (a) explain that some chemical reactions are accompanied by energy changes, principally in the form of heat energy; the energy changes can be exothermic (ΔH negative) or endothermic (ΔH positive) d. Explain the enthalpy changes e. (c) calculate enthalpy changes from appropriate experimental results, including the use of the relationship heat change = mc ΔT f. (b) explain and use the terms: 1) enthalpy change of reaction and standard conditions, with particular reference to: formation; combustion; neutralisation; 2) bond energy (ΔH positive, i.e. bond breaking); 3) lattice energy (ΔH negative, i.e. gaseous ions to solid lattice); g. (f) Construct and interpret a reaction pathway diagram, in terms of the enthalpy change of the reaction and of the activation energy.

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	neutralization), with particular reference to: i. determining enthalpy changes that cannot be found by direct experiment, e.g. an enthalpy change of formation from enthalpy changes of combustion; ii. average bond energies; [construction of energy cycles is not required] (f) Construct and interpret a reaction pathway diagram, in terms of the enthalpy change of the reaction and of the activation energy.				

11. REACTION KINETICS

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) explain and use the terms: rate of reaction; rate equation; order of reaction; rate constant; half-life of a reaction; activation energy; catalysis; (b) construct and use rate equations of the form rate = k[A]m[B]n (limited to simple cases of single step reactions, for which m and n are 0, 1 or 2), including: (i) deducing the order of a reaction by the initial rates method; (ii) justifying, for zero- and first-order reactions, the order of reaction from concentration-time graphs; (iii) calculating an initial rate using concentration data; [integrated forms of rate equations are not required] (c) recognize that the half-life of a first-order reaction is independent of concentration; (d) explain qualitatively, in terms of collisions, the effect of concentration changes on the rate of a reaction; (e) show understanding, including reference to the Boltzmann distribution, of what is meant by the term activation energy;	XI – 1	a. Menghitung konsentrasi larutan (molaritas larutan). b. Menganalisis faktor-faktor yang mempengaruhi laju reaksi (konsentrasi, luas permukaan , suhu, dan katalis) melalui percobaan. c. Menafsirkan grafik dari data percobaan tentang faktor-faktor yang mempengaruhi laju reaksi. d. Menjelaskan pengaruh konsentrasi, luas permukaan bidang sentuh, dan suhu terhadap laju reaksi berdasarkan teori tumbukan. e. Membedakan diagram energi potensial dari reaksi kimia dengan menggunakan katalisator dan yang tidak menggunakan katalisator. f. Menjelaskan pengertian, peranan katalisator dan energi pengaktifan dengan menggunakan diagram. g. Menentukan orde reaksi, persamaan laju reaksi dan waktu reaksi. h. Menjelaskan peranan katalis dalam makhluk hidup dan industri.	XI – 1	a. Calculate the concentration of a solution (molarity a solution). b. Analyze the factors influencing the rate of reaction (concentrations, area of the surfaces , temperatures, and catalysts) using an experiment c. Interprete the data of the factors influencing the rate of reactions. d. Explain the influence of the concentration, surface area, and temperature to rate of reaction based on the collision theory. e. Difference the potential energy diagram of chemical reaction using a catalyst f. (g)(i) Explain that, in the presence of a catalyst, a reaction follows a different pathway, i.e. one of lower activation energy, giving a larger rate constant; g. Construct and use rate equations of the form rate = k[A]m[B]n (limited to simple cases of single step reactions, for which m and n are 0, 1 or 2), including: (i) deducing the order of a reaction by the initial rates method; (ii) justifying, for zero- and first-order reactions, the order of reaction from concentration-time graphs; (iii) calculating an initial rate using concentration data;

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	(f) explain qualitatively, in terms both of the Boltzmann distribution and of collision frequency, the effect of temperature change on a rate constant (and, hence, on the rate) of a reaction; (g) (i) explain that, in the presence of a catalyst, a reaction follows a different pathway, i.e. one of lower activation energy, giving a larger rate constant; (ii) interpret this catalytic effect in terms of the Boltzmann distribution; (h) describe enzymes as biological catalysts which may have specific activity.				[integrated forms of rate equations are not required] h. Describe enzymes as biological catalysts which may have specific activity.

12. EQUILIBRIUM

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	(a) explain, in terms of rates of the forward and reverse reactions, what is meant by a reversible reaction and dynamic equilibrium; (b) state Le Chatelier's Principle and apply it to deduce qualitatively (from appropriate information) the effects of changes in concentration, pressure or temperature, on a system at equilibrium; (c) deduce whether changes in concentration, pressure, or temperature, or the presence of a catalyst affect the value of the equilibrium constant for a reaction; (d) deduce expressions for equilibrium constants in terms of concentrations, Kc; (e) calculate the value of Kc, in terms of concentrations from appropriate data; (f) calculate the quantities present at equilibrium, given appropriate data (such calculations will not involve solving of quadratic equations); (g) describe and explain the conditions used in the Haber process, as an example of the importance of an understanding of chemical equilibrium in the chemical industry;	XI– 2	a. Menjelaskan kesetimbangan dinamis. b. Menjelaskan kesetimbangan homogen dan heterogen. c. Menjelaskan tetapan kesetimbangan. d. Meramalkan arah pergeseran kesetimbangan dengan menggunakan azas Le Chatelier e. Menganalisis pengaruh perubahan suhu, konsentrasi, tekanan, dan volum pada pergeseran kesetimbangan melalui percobaan f. Menafsirkan data percobaan mengenai konsentrasi pereaksi dan hasil reaksi pada keadaan setimbang untuk menentukan derajat disosiasi dan tetapan kesetimbangan g. Menghitung harga Kc berdasarkan konsentrasi zat dalam kesetimbangan h. Menghitung harga Kp berdasarkan tekanan parsial gas pereaksi dan hasil reaksi pada keadaan setimbang i. Menghitung harga Kc berdasarkan Kp atau sebaliknya. j. Menjelaskan kondisi optimum untuk memproduksi bahan-bahan kimia di industri yang didasarkan pada reaksi kesetimbangan	XI– 2	a. (a) explain, in terms of rates of the forward and reverse reactions, what is meant by a reversible reaction and dynamic equilibrium b. Explain the heterogeneous and homogeneous equilibriums. c. Deduce the expressions of equilibrium constants d. (b) state Le Chatelier's Principle and apply it to deduce qualitatively (from appropriate information) the effects of changes in concentration, pressure or temperature, on a system at equilibrium; e. (c) deduce whether changes in concentration, pressure, or temperature, or the presence of a catalyst affect the value of the equilibrium constant for a reaction; f. (f) calculate the quantities present at equilibrium, given appropriate data (such calculations will not involve solving of quadratic equations); g. (d) deduce expressions for equilibrium constants in terms of concentrations, Kc; h. deduce expressions for equilibrium constants in terms of parcial presure, Kp i. Calculate the Kc and Kp of a equilibrium reaction. j. describe and explain the conditions used in the Haber process, as an example of the importance of an understanding of chemical equilibrium in the chemical industry;

13. ANALYTICAL CHEMISTRY

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	-	XII– 2	a. Mengidentifikasi keberadaan unsur-unsur yang ada di alam terutama di Indonesia (gas mulia, halogen, alkali, alkali tanah, aluminium, karbon, silikon, belerang, krom, tembaga, seng, besi, oksigen dan nitrogen) b. Mengidentifikasi produk-produk yang mengandung zat tersebut c. Mengidentifikasi sifat-sifat fisik unsur utama dan unsur transisi (titik didih, titik leleh, kekerasan, warna, kelarutan, dan sifat khusus lainnya) d. Mengidentifikasi sifat-sifat kimia (kereaktifan, kelarutan) melalui percobaan e. Mengidentifikasi daya pengoksidasi halogen dan daya pereduksi halida melalui percobaan f. Mengidentifikasi reaksi nyala senyawa logam (terutama alkali dan alkali tanah) melalui percobaan	XII– 2	a. Identify the existence of elements in nature especially in Indonesia (inert gas, halogen, alkaline, earth alkaline, aluminium, carbon, silicon, brimstone, chrome, copper, zinc, iron, nitrogen and oxygen) b. (a) describe the reactions, if any, of the elements with oxygen (to give Na_2O; MgO; Al_2O_3; P_4O_6; P_4O_{10}; SO_2; SO_3), and chlorine (to give NaCl; $MgCl_2$; Al_2Cl_6; $SiCl_4$; PCl_3; PCl_5); c. Identify the products that consist of the substances d. Identify the physical properties of principal elements and transition elements (boiling point, melting point, hardness, colour, condensation, and the other properties) e. Identify the chemical properties (reactivity, solubility) through an experiment f. Identify the power of halogens as oxidator and halides as reductor through an experiment. g. Identify the flame reaction of metal compounds (especially alkaline and earth alkaline) through experiments

14. FUNCTIONAL GROUPS, HYDROCARBONS AS FUELS, HYDROCARBONS

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	INTRODUCTORY TOPIC (a) interpret, and use the nomenclature, general formulae and displayed formulae of the following classes of compound: (i) alkanes, alkenes and arenes; (ii) halogenoalkanes; (iii) alcohols (including primary, secondary and tertiary); (iv) aldehydes and ketones; (v) carboxylic acids and esters; (vi) amines, nitriles; (b) interpret and use the following terminology associated with organic reactions: (i) functional group; (ii) addition, substitution, elimination, hydrolysis; (iii) oxidation and reduction; [in equations for organic redox reactions, the symbols [O] and [H] are acceptable] (c) describe the shapes of the ethane, ethene and benzene molecules; (d) explain the shapes of the ethane, ethene and benzene molecules in terms of σ and π carbon-carbon	XII-2	a. Mengidentifikasi gugus fungsi senyawa karbon (halo alkana, alkanol, alkoksi alkana, alkanal, alkanon, asam alkanoat, dan alkil alkanoat) b. Menuliskan struktur dan nama senyawa karbon berdasarkan gugus fungsinya. c. Menentukan isomer-isomer senyawa karbon. d. Menjelaskan sifat-sifat fisik senyawa karbon. e. Menjelaskan reaksi identifikasi gugus fungsi senyawa karbon f. Menuliskan reaksi senyawa karbon; reaksi oksidasi, adisi, substitusi, eliminasi g. Mendeskripsikan kegunaan senyawa karbon h. Menuliskan struktur dan nama senyawa benzena dan turunannya. i. Menjelaskan reaksi substitusi atom H pada cincin benzena j. Menjelaskan pengertian ortho, meta dan para. k. Mendeskripsikan sifat fisik dan sifat kimia benzena dan turunannya l. Mendeskripsikan kegunaan dan bahaya senyawa benzena dan turunannya dalam kehidupan sehari-	XII-2	a. (a) Interpret, and use the nomenclature, general formulae and displayed formulae of the following classes of compound: (i) alkanes, alkenes and arenes; (ii) halogenoalkanes; (iii) alcohols (including primary, secondary and tertiary); (iv) aldehydes and ketones; (v) carboxylic acids and esters; (vi) amines, nitriles; b. Explain the structure and the name of carbon compounds based on its functional group. c. Describe the structural isomerism; d. Explain the physical properties of carbon compounds. e. Identify the functional group of carbon compounds f. (b) interpret and use the following terminology associated with organic reactions: (i) functional group; (ii) addition, substitution, elimination, hydrolysis; (iii) oxidation and reduction; g. Describe the use of carbon compounds. h. Construct the structure and the nomenclature of

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Grade	Indicators	Grade	Indikator	Grade	Indicators
	bonds; (e) predict the shapes of, and bond angles in, molecules analogous to those specified in (c); (f) describe structural isomerism; (g) describe geometrical isomerism in alkenes, and explain its origin in terms of restricted rotation due to the presence of π bonds; [use of E, Z nomenclature is not required] (h) deduce the possible structural and/or geometrical isomers for an organic molecule of known molecular formula; (i) Identify geometrical isomerism in a molecule of given structural formula.		hari seperti fenol, anilin, butil hidroksi toluen (BHT), butil hidroksi anisol (BHA), TNT, aspirin, dan zat warna (azo) dan lain-lain		benzene and its derivatives. i. Explain the reaction of H atomic substitution of benzene j. Explain the definition of ortho, meta and para positions. k. Describe the physical and the chemical properties of benzene and its derivatives. l. Describe the use and the danger of benzene compounds and its derivative in daily life e.g. fenol, aniline, butil hidroxy toluen (BHT), butil hidroxy anisol (BHA), TNT, aspirin, and pigments (azo) and others
O	HYDROCARBONS (a) recognise the general unreactivity of alkanes, including towards polar reagents; (b) describe the chemistry of alkanes as exemplified by the following reactions of ethane: (i) combustion; (ii) substitution by chlorine and by bromine; (c) describe the chemistry of alkenes as	X – 2	1. Hidrokarbon a. Mengidentifikasi unsur C, H, dan O dalam senyawa karbon melalui percobaan. b. Mendeskripsikan kekhasan atom karbon dalam senyawa karbon c. Membedakan atom C primer, sekunder, tertier dan kuarterner. d. Mengelompokkan senyawa hidrokarbon berdasarkan kejenuhan ikatan e. Memberi nama senyawa alkana, alkena dan alkuna. f. Menyimpulkan hubungan titik didih senyawa	X – 2	**1. HYDROCARBONS** a. Identify the C, H, and O in the carbon compounds through an experiment b. Describe the specification of carbon atom in the carbon compounds. c. Differ the C primary, secondary, tertiary and quaternary atoms d. Group the hydrocarbon compounds e. Explain the name of alkane, alkene and alkyne compounds f. Conclude the relation between boiling point of

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
	exemplified, where relevant, by the following reactions of ethene: (i) addition of hydrogen, steam, hydrogen halides and halogens; (ii) oxidation by cold, dilute manganate(VII) ions to form the diol; (iii) oxidation by hot, concentrated manganate(VII) ions leading to the rupture of the carbon-to-carbon double bond in order to determine the position of alkene linkages in larger molecules; (d) describe the chemistry of arenes as exemplified by the following reactions of benzene and methylbenzene: (i) substitution reactions with chlorine and with bromine; (ii) oxidation of the side-chain to give a carboxylic acid; (e) explain why arenes undergo substitution reactions (but not addition reactions) based on the stability of the aromatic nucleus; (f) predict whether halogenation will occur in the side-chain or aromatic nucleus in arenes depending on reaction conditions; (g) Recognise the environmental consequences of carbon monoxide,		hidrokarbon dengan massa molekul relatif dan strukturnya. g. Menentukan isomer struktur (kerangka, posisi, fungsi) dan isomer geometri (cis, trans) h. Menuliskan reaksi sederhana pada senyawa alkana, alkena, dan alkuna (reaksi oksidasi, reaksi adisi, reaksi substitusi, dan reaksi eliminasi) i. Mendeskripsikan kegunaan dan komposisi senyawa hidrokarbon dalam bidang pangan j. Mendeskripsikan kegunaan dan komposisi senyawa hidrokarbon dalam bidang sandang, papan, seni dan estetika. 2. Minyak bumi a. Mendeskripsikan proses pembentukan minyak bumi dan gas alam. b. Menjelaskan komponen-komponen utama penyusun minyak bumi. c. Menafsirkan bagan penyulingan bertingkat untuk menjelaskan dasar dan teknik pemisahan fraksi-fraksi minyak bumi. d. Membedakan kualitas bensin berdasarkan bilangan oktannya. e. Menganalisis dampak pembakaran bahan bakar terhadap lingkungan		hydrocarbons and relative molecule mass and its structure g. Determine the structure of isomer (framework, position, function) or geometry isomer (cis, trans) h. Construct the reactions of alkane, alkene, and alkyne compounds i. (c) describe the chemistry of alkenes as exemplified, where relevant, by the following reactions of ethene: (i) addition of hydrogen, steam, hydrogen halides and halogens; (ii) oxidation by cold, dilute manganate(VII) ions to form the diol; (iii) oxidation by hot, concentrated manganate(VII) ions leading to the rupture of the carbon-to-carbon double bond in order to determine the position of alkene linkages in larger molecules; j. Describe the use of hydrocarbons in the food k. Describe the use of hydrocarbons in industries **2. HYDROCARBONS AS FUELS** a. Describe the formation of natural gas and petroleum. b. Explain the major components of petroleum. c. Interprete the distillation schema to explain the

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
	oxides of nitrogen and unburnt hydrocarbons arising from the internal combustion engine and of their catalytic removal. HALOGEN DERIVATITIVES (a) recall the chemistry of halogenoalkanes as exemplified by: (i) the following substitution reactions of bromoethane: hydrolysis; formation of nitriles; formation of primary amines by reaction with ammonia; (ii) the elimination of hydrogen bromide from 2-bromopropane; (b) interpret the different reactivities of halogenoalkanes with particular reference to hydrolysis and to the relative strengths of the C-Hal bonds; (c) explain the uses of fluoroalkanes and fluorohalogenoalkanes in terms of their relative chemical inertness; (d) recognise the concern about the effect of chlorofluoroalkanes (CFCs) on the ozone layer. [the mechanistic details of how CFCs deplete the ozone layer are not required]				petroleum fractions. d. Differ the quality of gasoline based on its octane number. e. (g) recognise the environmental consequences of carbon monoxide, oxides of nitrogen and unburnt hydrocarbons arising from the internal combustion engine and of their catalytic removal. **3. HALOGEN DERIVATITIVES** (a) recall the chemistry of halogenoalkanes as exemplified by: (i) the following substitution reactions of bromoethane: hydrolysis; formation of nitriles; formation of primary amines by reaction with ammonia; (ii) the elimination of hydrogen bromide from 2-bromopropane; (b) interpret the different reactivities of halogenoalkanes with particular reference to hydrolysis and to the relative strengths of the C-Hal bonds; (c) explain the uses of fluoroalkanes and fluorohalogenoalkanes in terms of their relative chemical inertness; (d) recognise the concern about the effect of chlorofluoroalkanes (CFCs) on the ozone layer. [the mechanistic details of how CFCs deplete the ozone layer are not required]

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
	ALCOHOLS (a) recall the chemistry of alcohols, exemplified by ethanol: (i) combustion; (ii) substitution to give halogenoalkanes; (iii) reaction with sodium; (iv) oxidation to carbonyl compounds and carboxylic acids; (v) dehydration to alkenes; (b) (i) classify hydroxy compounds into primary, secondary and tertiary alcohols; (ii) suggest characteristic distinguishing reactions, e.g. mild oxidation; (c) deduce the presence of a $CH_3CH(OH)$- group in an alcohol from its reaction with alkaline aqueous iodine to form tri-iodomethane. CARBONYL COMPOUNDS (a) describe the formation of aldehydes and ketones from, and their reduction to, primary and secondary alcohols respectively; (b) describe the addition reactions of hydrogen cyanide with aldehydes and ketones;				**4. ALCOHOLS** (a) recall the chemistry of alcohols, exemplified by ethanol: (i) combustion; (ii) substitution to give halogenoalkanes; (iii) reaction with sodium; (iv) oxidation to carbonyl compounds and carboxylic acids; (v) dehydration to alkenes; (b) (i) classify hydroxy compounds into primary, secondary and tertiary alcohols; (ii) suggest characteristic distinguishing reactions, e.g. mild oxidation; (c) deduce the presence of a $CH_3CH(OH)$- group in an alcohol from its reaction with alkaline aqueous iodine to form tri-iodomethane. **5. CARBONYL COMPOUNDS** (a) Describe the formation of aldehydes and ketones from, and their reduction to, primary and secondary alcohols respectively; (b) describe the addition reactions of hydrogen cyanide with aldehydes and ketones; (c) describe the use of 2,4-dinitrophenylhydrazine (2,4-DNPH) to detect the presence of carbonyl compounds; (d) deduce the nature (aldehyde or ketone) of an unknown carbonyl compound from the results of

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
	(c) describe the use of 2,4-dinitrophenylhydrazine (2,4-DNPH) to detect the presence of carbonyl compounds; (d) deduce the nature (aldehyde or ketone) of an unknown carbonyl compound from the results of simple tests (i.e. Fehling's and Tollens' reagents; ease of oxidation); (e) describe the reaction of CH_3CO- compounds with alkaline aqueous iodine to give tri-iodomethane. CARBOXYLIC ACIDS AND DERIVATIVES (a) describe the formation of carboxylic acids from alcohols, aldehydes and nitriles; (b) describe the reactions of carboxylic acids in the formation of: (i) salts; (ii) esters on reaction with alcohols, using ethyl ethanoate as an example; (c) explain the acidity of carboxylic acids in terms of their structures; (d) describe the acid and base hydrolysis of esters.				simple tests (i.e. Fehling's and Tollens' reagents; ease of oxidation); (e) describe the reaction of CH_3CO- compounds with alkaline aqueous iodine to give tri-iodomethane. **6. CARBOXYLIC ACIDS AND DERIVATIVES** (a) describe the formation of carboxylic acids from alcohols, aldehydes and nitriles; (b) describe the reactions of carboxylic acids in the formation of: (i) salts; (ii) esters on reaction with alcohols, using ethyl ethanoate as an example; (c) explain the acidity of carboxylic acids in terms of their structures; (d) describe the acid and base hydrolysis of esters.

15. MACROMOLECULES

Singapore Syllabus		National Syllabus		International Services Syllabus	
Grade	Indicators	Grade	Indikator	Grade	Indicators
O	-	XII– 2	1. polimer a. Mengidentifikasi polimer alam dan polimer sintetik (karet, karbohidrat, protein, plastik) b. Menjelaskan sifat fisik dan sifat kimia polimer c. Menuliskan reaksi pembentukan polimer (adisi dan kondensasi) dari monomernya d. Mendeskripsikan kegunaan polimer dan mewaspadai dampaknya terhadap lingkungan 2. karbohidrat a. Menggolongkan monosakharida menjadi aldosa dan ketosa. b. Menjelaskan reaksi hidrolisis disakharida dan polisakharida dengan bantuan enzim. c. Mengidentifikasi karbohidrat dengan reagen 3. protein a. Menuliskan rumus struktur asam amino esensial. b. Menentukan gugus peptida pada protein. (d) Lemak a. Menuliskan rumus struktur dan nama lemak dan minyak b. Menggolongkan lemak berdasarkan kejenuhan ikatannya c. Mengamati dan menguraikan sifat fisik dan sifat kimia lemak dan minyak d. Mendeskripsikan fungsi dan peran lemak dan minyak dalam kehidupan	XII– 2	1. POLYMER a. Identify the natural and synthetic polymers (rubber, carbohydrate, protein, plastic) b. Explain the physical and chemical properties of polymer. c. Construct the formation reaction of polymer (condensation and addition) from its imonomer. d. Describe the use of polymer and solve the environment problem. 2. CARBOHYDRATE a. Classify the monosaccharide on to aldose and ketose. b. Explain the hydolisis reaction of disaccharide and polisaccharide with the help of enzyme. c. Identify the carbohydrate with reagents. 3. PROTEIN a. Write the formula of esensial amino acid. b. Determine the group of peptide on protein. 4. LIPID a. Construct the structure formula and the name of lipid and oil. b. Classify the lipid based on the saturation of the bonding. c. Observe and describe of physical and chemical properties of lipid and oil. d. Describe the function and the role of oil and lipid in daily life

Lampiran 3

MAPPING THE STANDARD OF COMPETENCE

Education unit : SMAN 7 Purworejo
Class/Semester : X/1
Subject matter : Chemistry

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
1. Understanding the atomic structure, properties of periodic element, and chemical bond	1.1 Understanding the atomic structure pursuant to atomic theory of Bohr, properties of element, relative atomic mass, and properties of periodic element in periodic tables and also realize its regularity, passing the understanding of electron configuration.	C4	a. Compare the development of element periodic tables to identify the advantages and the disadvantages.	C4	The development of the periodic tables of element	10 hours
			b. Explain the classification of elements.	C2	Physical and chemical properties of elements	
			c. Classify the elements into metal, non metal and metalloid.	C2		
			d. Analyze the tables and graph to determine the regularity of atom radii, ionization energy, electron affinity, and electro negativity.	C4	Periodic properties of elements	
			e. Describe qualitatively (and indicate the periodicity in) the variations in atomic radius, ionic radius, melting point and electrical conductivity of the elements.	C2		
			f. Explain the development of atomic theory to show the advantages and the disadvantages of the atomic theory.	C2	Development of atomic theory from Dalton up to Bohr's Atomic Theory.	

Note: *Blue Color = Adapted from Singapore

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			g. Identify and describe protons, neutrons and electrons in terms of their relative charges and relative masses.	C2	Atomic structure.	
			h. Deduce the behavior of beams of protons, neutrons and electrons in an electric field.	C4		
			i. Deduce the numbers of protons, neutrons and electrons present in both atoms and ions given proton and nucleon numbers (and charge).	C4		
			j. Arrange the electronic configuration of atoms and ions given the proton number (and charge).	C5	Electron configuration	
			k. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table.	C3		
			l. Explain relative atomic mass pursuant to periodic tables.	C2	Relative atomic mass	
			m. Classify elements into isotope, isobar and isotones.	C2	Isotope, isobar, isotones.	
	1.2 Comparing the formation of ionic bond, covalent bond,	C4	a. Explain the trend of element stability.	C2	Element stability	8 hours

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
	coordination bond, and metallic bond and also its relation with characteristics of formed compound physics.		b. Describe the duplet and octet rules and Lewis structures.	C2	Lewis structure	
			c. Describe ionic (electrovalent) bonding, as in sodium chloride and magnesium oxide, including the use of 'dot-and-cross' diagrams.	C2	Ionic bond and covalent bond	
			d. Describe, using the 'dot-and-cross' diagrams: covalent bonding, as in hydrogen; oxygen; nitrogen; chlorine; hydrogen chloride; carbon dioxide; methane; ethane.	C2		
			e. Explain the properties of ionic and covalent compounds.	C2		
			f. Describe, using 'dot-and-cross' diagrams: co-ordinate (dative covalent) bonding, as in the formation of the ammonium ion and in the Al_2Cl_6 molecule.	C2	Coordinated covalent bond	
			g. Explain the terms bond energy, bond length and bond polarity and use them to compare the reactivities of covalent bonds.	C2	Polar and non polar covalent compounds	
			h. Describe metallic bonding in terms of a lattice of positive ions surrounded by mobile electrons.	C2	Metallic bond	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
2. Understanding the elementary laws of chemistry and its application in chemical calculation (stoichiometry)	2.1 Describing the name of organic and inorganic compound modestly and also equation of reaction	C2	a. Explain the name of compounds based on the IUPAC rule.	C2	Nomenclature of compound	10 hours
			b. Explain the name of binary compounds.	C2		
			c. Explain the name of polyatomic compounds.	C2		
			d. Explain the name of familiar organic compounds.	C2		
			e. Construct the balanced of equations.	C3	Equation of simple reaction	
	2.2 Prove and communicate the effect of elementary laws of chemistry through experiment and also apply mole concept in finishing calculation of chemistry.	C4	a. Deduce Lavoisier's Law trough experiments.	C4	Lavoisier's law	8 hours
			b. Deduce Proust's Law trough experiments.	C4	Proust's law	
			c. Analyze the composition of compound to prove Dalton's Law.	C4	Dalton's law	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			d. Analyze the composition of compound to prove Gay Lussac's Law.	C4	Gay Lussac's Law	
			e. Analyze the composition of compound to prove Avogadro's Law.	C4	Avogadro's Law.	
			f. Explain the term mole in terms of the Avogadro constant.	C2		
			g. Perform the calculations, including use of the mole concept, involving: 1) reacting masses (from formulae and equations); 2) volumes of gases (e.g. in the burning of hydrocarbons); 3) volumes and concentrations of solutions.	C3	Calculation in chemistry	
			h. Calculate the empirical and molecular formulae, using combustion data or composition by mass.	C4	Empirical and molecular formulae	
			i. Explain the formulae of hydrate.	C2	Hydrate	
			j. Explain the concentration of substance in a compound.	C2	Stoichiometric	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			k. Explain the limiting reactant in a reaction.	C2		
			l. Calculate the poduct of reaction	C4		
			m. Calculate the concentration of solution.	C4		
			n. Deduce stoichiometric relationships from calculations.	C4		

MAPPING THE STANDARD OF COMPETENCE

Education unit : SMAN 7 Purworejo
Class/Semester : X/2
Subject matter : Chemistry

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
3. Understanding the properties of non electrolyte and electrolyte solution and oxidation-reduction reaction.	3.1 Identifying the properties of non electrolyte and electrolyte pursuant to data result of experiment.	C2	a. Identify the properties of electrolyte and non electrolyte solutions through an experiment.	C2	Electrolyte and non electrolyte solution	4 hours
			b. Classify the solution into electrolyte and non electrolyte solutions based on the properties of its electrics conductivity.	C2	Solution types	
			c. Explain the ability of the electrolyte solution conducting the electricity.	C2	Solution electrolyte types and its conductivity.	
			d. Describe the electrolyte solutions (ionic and polar covalent compound) in term of polarity	C2		
	3.2 Explaining the development of concept oxidation-reduction reaction and its relation to nomenclature and also its application.	C2	a. Describe and explain redox processes in terms of electron transfer and/or of changes in oxidation number (oxidation state), as exemplified by Fe^{3+}/Fe^{2+}, MnO_4 /Mn^{2+} and $Cr_2O_7^{2-}$ /Cr^{3+}.	C2	Oxidation and reduction concept	10 hours
			b. Explain the oxidation number of atom in a compound.	C2	Oxidation and reduction concept	

Note: *Blue Color = Adapted from Singapore

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			c. Explain the oxidatior and reductor in a redox reaction.	C2		
			d. Describe the concept of redox reaction and electrochemistry to solve the environmental problem.	C2	Application of Redox in environment problem solving	
4. Understanding the properties of organic compounds on the basis of functional group and macromolecule compounds.	4.1 Describe the specification of carbon atom in hydrocarbon compound.	C2	a. Identify the C, H, and O in the carbon compounds through an experiment.	C2	Identify of C,H and O atom	2 hours
			b. Describe the specification of carbon atom in the carbon compounds.	C2	Specification of carbon atom	
			c. Differentiate the C primary, secondary, tertiary and quaternary atoms.	C4	Primary , secondary, tertiary and quaternary C atoms	
	4.2 Classify the hydrocarbon compound pursuant to its structure and its relation with properties of compound and also apply mole concept in finishing calculation of chemistry.	C2	a. Classify the hydrocarbon compounds.	C2	Alkane, alkene and alkyne	8 hours
			b. Explain the name of alkane, alkene and alkyne compounds.	C2		
			c. Conclude the relation between boiling point of hydrocarbons and relative molecule mass and its structure.	C4	Physical properties of alkane, alkenes and alkynes	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			d. Explain the structure of isomer (framework, position, function) or geometry isomer (cis, trans).	C2	Isomer	
			e. Construct the reactions of alkane, alkene, and alkyne compounds.	C3		
			f. Describe the chemistry of alkenes as exemplified, where relevant, by the following reactions of ethene: 1) addition of hydrogen, steam, hydrogen halides and halogens; 2) oxidation by cold, dilute manganate(VII) ions to form the diol; 3) oxidation by hot, concentrated manganate(VII) ions leading to the rupture of the carbon-to-carbon double bond in order to determine the position of alkene linkages in larger molecules.	C2	Reaction of carbon compound	
	4.3 Explaining the formation and dissociation technique of petroleum fractions and also its usefulness.	C2	a. Describe the formation of natural gas and petroleum.	C2	Petroleum	4 hours
			b. Explain the major components of petroleum.	C2		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			c. Interprete the distillation schema to explain the petroleum fractions.	C3	Petroleum fraction	
			d. Compare the quality of gasoline based on its octane number.	C4	Quality of gasoline	
			e. Recognize the environmental consequences of carbon monoxide, oxides of nitrogen and unburnt hydrocarbons arising from the internal combustion engine and of their catalytic removal. f. Describe the organic waste treatment at school (acccording to the condition of Senior High School 7 Purworejo). g. Describe the use of organic compost in agriculture (according to the condition of Purworejo).	C2	Impact combustion of fuel	
	4.4 Explaining the composition and the usefulness of hydrocarbon compound in everyday life in the field of food, clothing, board, commerce, artistic, and esthetics.	C2	a. Describe the use of hydrocarbons in the food.	C2	Hydrocarbon compound in everyday life	4 hours
			b. Describe the use of hydrocarbons in industries. c. Describe the composition and the use of hydrocarbon compunds in arts and esthetics.	C2		

MAPPING THE STANDARD OF COMPETENCE

Education unit : SMAN 7 Purworejo
Class/Semester : XI/1
Subject matter : Chemistry

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
5. Understanding the atomic structure to study the periodical properties of elements, the molecular structures, and the properties of compounds.	5.1 Explaining the Bohr atomic and quantum mechanics theory to draw the electronic configuration and the diagram of orbital and also to determine the element position in the periodic table.	C2	a. Explain the quantum atomic theory.	C2	The quantum mechanics theory	12 hours
			b. Describe the number and relative energies of the s, p and d orbital's for the principal quantum numbers 1, 2 and 3 and also the 4s and 4p orbital's.	C2	Quantum numbers and orbital shapes	
			c. Explain the shell and sub shell and its relation with the quantum number.	C2		
			d. Describe the forms of orbital.	C2		
			e. Using the Aufbau principle, the Hund rule and the principality of prohibition Pauli to arrange electron configuration and diagram of orbital.	C3	The Electronic configuration (Aufbau principle, Hund rule and Pauli exclusion principle) and its relation to the periodic system	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			f. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table.	C3		
	5.2 Explaining the electron paired sum theory around the atomic core and the hybridization theory to predict the molecular shapes.	C2	a. Explain the shapes of, and bond angles in, molecules such as BF_3 (trigonal planar); CO_2 (linear); CH_4 (tetrahedral); NH_3 (trigonal pyramidal); H_2O (non-linear); SF_6 (octahedral) by using the Valence Shell Electron Pair Repulsion theory.	C2	Molecular shapes	2 hours
			b. Using the hybridization theory to predict the shape of molecules.	C3		
	5.3 Explaining the intermolecular interaction (intermolecular forces) based on their characteristics.	C2	a. Describe covalent bonding in terms of orbital overlap, giving σ and π bonds (see also Section Introductory organic chemistry).	C2	Intermolecular force.	2 hours
			b. Predict the shapes and bond angles molecules.	C3		
			c. Describe hydrogen bonding, using ammonia and water as examples of molecules containing -NH and -OH groups.	C2		
			d. Describe intermolecular forces (van der Waals' forces), based on permanent and induced dipoles as in $CHCl_3$ (l), Br_2 (l) and the liquid noble gases.	C2		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			e. Describe, interpret and/or predict the effect of different types of bonding (ionic bonding; covalent bonding; hydrogen bonding; other intermolecular interactions; metallic bonding) on the physical properties of substances.	C2, C3		
6. Comprehending the change energy in chemical reaction and way of its measurement.	6.1 Describing the reaction change enthalpy reaction, exothermic reaction, and endothermic reaction.	C2	a. Explain the law of energy conservation.	C2	The law of energy conservation.	6 hours
			b. Deduce the environment and system.	C4	The System and the environment	
			c. Explain that some chemical reactions are accompanied by energy changes, principally in the form of heat energy; the energy changes can be exothermic (ΔH negative) or endothermic (ΔH positive).	C2	The Exothermic and the endothermic reactions	
			d. Explain the enthalpy changes.	C2	Enthalpy changes	
	6.2 Determining the ΔH of reaction by experiment, and using the Hess law, the standardized formation enthalpy changes data, and	C1, C4	a. Calculate enthalpy changes from appropriate experimental results, including the use of the relationship heat change = mc ΔT	C4	Hess law	12 hours
			b. Explain and use the terms: 1) enthalpy change of reaction and standard conditions, with particular reference to:	C2, C4		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
	bonding energy data, and data of energy bonding.		formation; combustion; neutralisation; 2) bond energy (ΔH positive, i.e. bond breaking); 3) lattice energy (ΔH negative, i.e. gaseous ions to solid lattice).			
			c. Construct and interpret a reaction pathway diagram, in terms of the enthalpy change of the reaction and of the activation energy.	C5, C3		
7. Understanding the reaction kinetics, equilibrium, and the factors, and also its application in industrial and everyday life.	7.1 Describing the definition of the reaction rate by conducting experiment about factors influencing the reaction rate.	C2	a. Calculate the concentration of a solution (molarity a solution).	C4	Concentration of the solution (molarities)	4 hours
			b. Analyze the factors influencing the rate of reaction (concentrations, area of the surfaces , temperatures, and catalysts) using an experiment.	C4	Factors influencing the reaction rate	
			c. Interpret the data of the factors influencing the rate of reactions.	C3		
	7.2 Understanding the theory of collision to explain the rate determinant factors and the order of reaction and also its	C4	a. Explain the influence of the concentration, surface area, and temperature to rate of reaction based on the collision theory.	C2	The Collision theory	10 hours
			b. Differentiate the potential energy diagram of chemical reaction using a catalyst.	C4		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
	application in everyday life.		c. Explain that, in the presence of a catalyst, a reaction follows a different pathway, i.e. one of lower activation energy, giving a larger rate constant.	C2		
			d. Construct and use rate equations of the form rate = k[A]m[B]n (limited to simple cases of single step reactions, for which m and n are 0, 1 or 2), including: 1) Deducing the order of a reaction by the initial rates method; 2) Justifying, for zero- and first-order reactions, the order of reaction from concentration-time graphs; 3) Calculating an initial rate using concentration data. [integrated forms of rate equations are not required]	C5 C4 C4 C4	The Reaction order	
			e. Describe enzymes as biological catalysts which may have specific activity.	C2	The Role of catalyst in industry and everyday life	
	7.3 Explaining the equilibrium and the factors influencing the shift of equilibrium using an experiment.	C2	a. Explain in terms of rates of the forward and reverse reactions, what is meant by a reversible reaction and dynamic equilibrium.	C2	Dynamics equilibrium	4 hours
			b. Explain the heterogeneous and homogeneous equilibriums.	C2		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			c. Deduce the expressions of equilibrium constants.	C4		
			d. Explain Le Chatelier's Principle and apply it to deduce qualitatively (from appropriate information) the effects of changes in concentration, pressure or temperature, on a system at equilibrium.	C2	Factors influencing the direction of the equilibrium.	
			e. Deduce whether changes in concentration, pressure, or temperature, or the presence of a catalyst affect the value of the equilibrium constant for a reaction.	C4		
	7.4 Deducing the quantitative relation ship between the reactants and products reaction from an equilibrium reaction.	C4	a. Calculate the quantities present at equilibrium, given appropriate data (such calculations will not involve solving of quadratic equations).	C4	Quantitative relationship between the reactant of the equilibrium reaction	12 hours
			b. Deduce expressions for equilibrium constants in terms of concentrations.	C4		
			c. Deduce expressions for equilibrium constants in terms of parcial presure.	C4		
			d. Calculate the Kc and Kp of a equilibrium reaction.	C4		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
	7.5 Explaining the application of the equilibrium principle in the industries and the everyday life		a. Describe and explain the conditions used in the Haber process, as an example of the importance of an understanding of chemical equilibrium in the chemical industry.	C2	The Haber Bosch and contact process	2 hours

MAPPING THE STANDARD OF COMPETENCE

Education unit : SMAN 7 Purworejo
Class/Semester : XI/2
Subject matter : Chemistry

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
8. Understanding the properties of acid-base solutions, measurement methods, and its applications.	8.1 Describing the acid-base theory by determining the properties of solutions and calculate the pH of solutions.	C2	a. Outline the Arrhenius theory of acids and bases.	C2	The Acid-base theories	12 hours
			b. Outline the Bronsted-Lowry theory of acids and bases.	C2		
			c. Show the understanding of, and apply the Bronsted-Lowry theory of acids and bases, including the concept of conjugate acids and bases.	C4		
			d. Outline the Lewis theory of acids and bases.	C2		
			e. Identify the acids and bases using an indicator of pH.	C2	The Properties of acid and base solutions	
			f. Predict the pH an electrolyte solution based on the change of colour indicators.	C3	Degree of Acidity (pH)	

Note: *Blue Color = Adapted from Singapore

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			g. Explain qualitatively the differences in behaviour between strong and weak acids and bases in terms of the extent of dissociation.	C2	Ionization degree and constant of acids and bases	
			h. Explain the terms pH; Ka; Kb; Kw; [the relationship Kw = KaKb is not required].	C2		
			i. Calculate $[H^+(aq)]$ and pH values for strong acids, and strong bases.	C4		
			j. Develop the concept of pH of the environment.	C3	The concept of pH of the environment	
	8.2 Calculating the number of reactants and products in an electrolyte solution in the acid-base titration.	C4	a. Calculate the concentration of acid and base solution by titration	C4	Acid and base titration	8 hours
			b. Explain the concentration of substance by titration.	C2		
			c. Explain the choice of suitable indicators for acid-base titrations, given appropriate data, in terms of the strengths of the acids and bases.	C2		
			d. Explain the concentration of substance of the titration data.	C2		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			e. Draw the titration graph of an experiment data.	C2		
	8.3 Describing the properties of buffer solutions and the function of buffer solutions in the human body.	C2	a. Analyze a buffer and non buffer solutions through an experiment.	C4	Buffer solutions	8 hours
			b. Calculate the pH or pOH of buffers.	C4	pH of buffer solutions	
			c. Calculate the pH of buffer solution after acid or base addition or dillution.	C4		
			d. Describe and explain the uses of buffers, including the role of $H_2CO_3/HCO3^-$ in controlling pH in blood.	C2	The uses of buffer solution	
	8.4 Analyzing the salt type hydrolysis in the water and the pH of salt solution.	C4	a. Explain the character of salts which is hydrolyzed in water through an experiment.	C2	The hydrolysis of salt	8 hours
			b. Explain the character of salts which is hydrolyzed from the ionization reaction.	C2	The Character of hydrolyzed salt	
			c. Calculate the pH of hydrolyzed salt solution.	C4	The pH of solution of hydrolyzed salt	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
	8.5 Using the curve pH change of acid-base titration to explain the buffer solution and the hydrolysis.	C3	a. Analyze the graph of titration of strong acid and base, strong acid and weak base, weak acid and strong base to explain the buffer solution and hydrolysis through discussion.	C4	Graphs of titration acid and base	2 hours
	8.6 Predict the forming of precipitation from a reaction based on the to solubility principle and solubility products.	C3	a. Explain the equilibrium of saturated solution or poorly soluble salt solution.	C2	Solubility and solubility products	10 hours
			b. Connect the constant solubility product with the solubility or its precipitation.	C4		
			c. Restate the expression of Ksp of poorly soluble substances.	C2		
			d. Calculate the solubility of poorly soluble electrolyte using data of Ksp or vice versa.	C4		
			e. Explain the influence of addition of common ion to the solution.	C2	Common ion effect	
			f. Explain the pH of the solution using the Ksp.	C2	Relation pH of base with Ksp	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			g. Approximate the precipate formation based on the Ksp.	C2	Precipitation	
9. Explaining the system and properties of colloid and also its application in everyday life	9.1 Producing the various colloid system using materials from in the environment	C3	a. Describe the process of a colloid preparation through an experiment.	C2	Making a colloid (condensation, disperse, and peptisation methods)	4 hours
	9.2 Grouping the properties of colloid and its application in everyday life.	C2	b. Classify the suspension, solution, and colloid based on the observations (Tyndall effect, homogeneous/heterogeneous, and filtration).	C2	Colloid system	6 hours
			c. Classify the colloid type based on the dispersed phase and the dispersant.	C2		
			d. Describe the properties of colloid (Tyndall effect, Brownian movement, dialysis, electrophoresis, emulsion, coagulation).	C2	Properties of colloid	
			e. Describe the lyofob and lyophil colloid.	C2		
			f. Describe the function of colloid in cosmetic industries, foods, and pharmacies.	C2	The use of colloid in life	

MAPPING THE STANDARD OF COMPETENCE

Education unit : SMAN 7 Purworejo
Class/Semester : XII/1
Subject matter : Chemistry

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
10. Explaining the colligative properties of non electrolyte and electrolyte solution.	10.1 Explaining the degradation of vapors pressure, increase of boiling point, depression of freezing point of solution, and osmosis pressure including the colligative properties of solution.	C2	a. Calculate the concentration of solution (mole fraction and molality).	C4	Concentration of solution	10 hours
			b. Explain the definition of properties of non-electrolyte colligative solution (Raoulth's law) and electrolyte solution.	C2	Explain the colligative properties of non electrolyte and electrolyte solution	
			c. Explain the influence of nonvolatile solute the vapour pressure of the solution.	C2	Saturated vapor pressure of solution	
			d. Calculate the solution vapour pressure based on experiment data.	C4		
			e. Investigate the depression of the freezing point because of solute addition through an experiment.	C4	Freezing and boiling points of electrolyte and non electrolyte solutions	
			f. Calculate the depression of the freezing point of electrolyte and non electrolyte solution based on experiment data.	C4		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			g. Investigate the increase of boiling point as result of dissolve substance addition through an experiment.	C4		
			h. Calculate the increase of electrolyte and non electrolyte boiling point solution based on experiment data.	C4		
			i. Analyze the PT diagram to interpret decreasing of the vapour pressure, depression of the freezing point and increasing of the boiling point solution.	C4		
			j. Explain the definition of osmosis and the osmosis pressure and also its applications.	C2	Osmosis pressure of electrolyte and non electrolyte solutions	
			k. Calculate the osmosis pressure of electrolyte and non electrolyte solution.	C4		
	10.2 Comparing between colligative characters of non electrolyte with colligative properties of electrolyte solution which its same concentration pursuant to experiment data.	C3	a. Analyze the experiment data to compare the colligative properties of electrolyte and nonelectrolyte solution.	C4	Difference of colligative properties of electrolyte and non electrolyte solutions	4 hours

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
11. Applying the concept of oxidation-reduction and electrochemistry in everyday life and technology.	11.1 Applying the concept of oxidation-reduction reaction in electrochemistry system entangling electrics energy and its usefulness in preventing corrosion and in industry.	C3	a. Balance the redox equations using the half-equations method.	C5	Equation of redox reaction	10 hours
			b. Balance the redox equations using the oxidation number (oxidation state) method.	C5		
			c. Conclude the character of the spontan redox reaction through an experiment.	C4		
			d. Describe Voltaic cell formation or Galvanis cell and explain every components.	C2	Volta cell	
			a. Explain how electrics energy are generated from the redox reaction in the Voltaic cell.	C2		
			e. Explain the cell notation and the reactions of Voltaic cell.	C2		
			f. Calculate the potential cell based on the standard potential data.	C4		
			g. Explain the princip of Voltaic cell used in daily life (battery, accumulator, etc).	C2	Application Voltaic cell in life	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
	11.2 Explaining the oxidation-reduction reaction in electrolysis cell	C2	a. Observe the reaction on the cathode and the anode in electrolysis reaction through an experiment.	C5	Electrolysis reaction	6 hours
			b. Balance the reaction on the cathode and the anode in the dillution or the solution with the active or inert electrode.	C3		
			c. Explain the factors of corrosion through an experiment.	C2	Corrosion	
			d. Explain the ways to prevent of the corrosion.	C2		
	11.3 Applying the Faraday law for the electrolysis of electrolyte solution.	C3	a. Apply the Faraday's Law concept in the calculation of the electrolysis cell.	C3	Faraday law	8 hours
			b. Construct the electrolysis reaction of the electropating and in a metal refining.	C3		
12. Comprehending the properties of important elements, usefulness and its danger, and also	12.1 Identifying the overflow of principle elements and transition in nature and product that	C2	a. Identify the existence of elements in nature especially in Indonesia (inert gas, halogen, alkaline, earth alkaline, aluminium, carbon, silicon, sulphur, chrome, copper, zinc, iron, nitrogen and oxygen).	C2	The principle elements and transition in nature and product that contain the element	2 hours

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
there are in nature.	contain the element.		b. Describe the reactions, if any, of the elements with oxygen (to give Na_2O; MgO; Al_2O_3; P_4O_6; P_4O_{10}; SO_2; SO_3), and chlorine (to give NaCl; $MgCl_2$; Al_2Cl_6; $SiCl_4$; PCl_3; PCl_5).	C2	The elements of 3rd period	
			c. Identify the products that consist of the substances.	C2		
	12.2 Describing the tendency of chemical and physical behavior especially in principal element and transition element (boiling point, melting point, hardness, color, solubility, reactivity, and the other properties).	C2	a. Identify the physical properties of principal elements and transition elements (boiling point, melting point, hardness, colour, condensation, and the other properties).	C2	Physical and chemical properties of elements	16 hours
			b. Identify the chemical properties (reactivity, solubility) through an experiment.	C2		
			c. Identify the power of halogens as oxidator and halides as reductor through an experiment.	C2		
			d. Identify the flame reaction of metal compounds (especially alkaline and earth alkaline) through experiments.	C2		
			e. Identify the regularity of physical properties and chemical properties of third period elements through experiments.	C2		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			f. Identify the regularity of physical properties and chemical properties of fourth period elements through an experiment.	C2		
			g. Describe how to eliminate the hardness of water through experiment. h. Describe the methods of water purification by using the tools and materials properly (according to the condition of Purworejo)	C2		
	12.3Explaining the usefulness, impact and process preparation compound and elements in everyday life.		a. Explain the impact and the benefit of elements and compounds in daily life and industrials (e.g. inert gases, halogens, alkalines, earth alkalines, aluminium, carbon, silicon, sulfur, chrome, copper, zinc, iron, nitrogen and oxygen).	C2	The benefit and effect of elements in everyday life and industries	4 hours
			b. Explain the processes of compounds and elements preparation in industries and laboratories (e.g. H_2SO_4, N_2, Fe, Al, NH_3 and of O_2).	C2		
			a. Explain the composition of fertilizer. b. Predict the characteristic properties of an element in a given Group by using knowledge of chemical periodicity. c. Deduce the nature, possible position in the Periodic Table, and identity of unknown elements from given information of physical	C2 C3 C4		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			and chemical properties.			
	12.4 Describing the radioactive elements facet of physical properties and chemical properties, usefulness, and its danger.		a. Describe the invention of radioactive radiation.	C2	Invention of radioactive radiation	4 hours
			b. Identify the properties of radioactive radiation.	C2	Properties of radioactive radiation	
			c. Explain the stability of nucleus.	C2		
			d. Construct the equation of nuclear reaction.	C3	Equation of nuclear reaction	
			e. Describe the use of radioactive elements.	C2	The uses of radioactive element	
			f. Describe the impact of radioactive elements.	C2	The danger of radioactive radiation	

MAPPING THE STANDARD OF COMPETENCE

Education unit : SMAN 7 Purworejo
Class/Semester : XII/2
Subject matter : Chemistry

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
13. Comprehending the organic compound and its reaction, benzene and its generation, and macromolecules.	13.1 Describing the structure, the way of writing, arrange name, behavior, usefulness, and identify the carbon compound (halo alkane, alkanol, alkoxy alkane, alkanal, alkanon, alkanoat, and alkanoat alkyl, amine and amide).	C2	a. Interpret, and using the nomenclature, general formulae and displayed formulae of the following classes of compound: 1) alkanes, alkenes and arenes; 2) halogenoalkanes; 3) alcohols (including primary, secondary and tertiary); 4) aldehydes and ketones; 5) carboxylic acids and esters; 6) amines, nitriles.	C4	Structure and nomenclature of carbon compounds	12 hours
			b. Construct the structure and the nomenclature of benzene and its derivatives.	C3		
			c. Describe the structural isomerism.	C2	Isomer	
			d. Explain the physical properties of carbon compounds.	C2	Physical and chemical properties of carbon compounds	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			e. Identify the functional group of carbon compounds	C2		
	13.2 Describing the structure, the way of writing, nomenclature, properties and usefulness of benzene and its derivative.	C2	a. Interpret and using the following terminology associated with organic reactions: (i) functional group; (ii) addition, substitution, elimination, hydrolysis; (iii) oxidation and reduction.	C4	Structure and nomenclature of benzene and its derivative	18 hours
			b. Describe the use of carbon compounds.	C2	The uses of carbon compounds	
			c. Construct the structure and the nomenclature of benzene and its derivatives.	C3		
			d. Explain the reaction of H atomic substitution of benzene.	C2	Reaction of benzena	
			e. Explain the definition of ortho, meta and para positions.	C2		
			f. Describe the physical and the chemical properties of benzene and its derivatives.	C2	Physical and chemical properties of benzene and its derivative	

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			g. Describe the use and the danger of benzene compounds and its derivative in daily life e.g. fenol, aniline, butil hidroxy toluen (BHT), butil hidroxy anisol (BHA), TNT, aspirin, and pigments (azo) and others.	C2	The uses of benzene and its derivative.	
	13.3Describing the structure, nomenclature, classification, physical properties and usefulness of macromolecules (polymer, carbohydrate, and protein).	C2	a. Identify the natural and synthetic polymers (rubber, carbohydrate, protein, plastic).	C2	Polymer	14 hours
			b. Explain the physical and chemical properties of polymer.	C2		
			c. Construct the formation reaction of polymer (condensation and addition) from its imonomer and addition) from its imonomer.	C2		
			d. Describe the use of polymer and solve the environment problem.	C2		
			e. Classify the monosaccharide on to aldose and ketose.	C2	Carbohydrate	
			f. Explain the hydolisis reaction of disaccharide and polisaccharide with the help of enzyme.	C2		

Standard of competence	Basic Competence	Cognitive Domain of Basic Competence	Indicators	Cognitive Domain of Indicator	Material	Time Allocation
			g. Identify the carbohydrate with reagents.	C2		
			h. Write the formula of esensial amino acid.	C2	Protein	
			i. Determine the group of peptide on protein.	C2		
	13.4 Describing the structure, nomenclature, classification, properties and usefulness of lipid.	C2	a. Construct the structure formula and the name of lipid and oil.	C2	The structure formula and the nomenclature of lipid	10 hours
			b. Classify the lipid based on the saturation of the bonding.	C2	Classification of oil and lipid	
			c. Observe and describe of physical and chemical properties of lipid and oil.	C2	Physical and chemical properties of lipid and oil	
			d. Observe the function and the role of oil and lipid in daily life.	C2	The uses of lipid and oil	

Lampiran 4

SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : X/1
Subject matter : Chemistry
Service : International
Time allocation : 18 hours
Standard of competence : 1. Understanding the atomic structure, properties of periodic element, and chemical bond

Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
1.1 Understanding the atomic structure pursuant to atomic theory of Bohr, properties of element, relative atomic mass, and properties of periodic element in periodic tables and also realize its regularity, passing the understanding of electron configuration.	The development of the periodic tables of element	▪ Studying the literature about the development of element periodic tables to identify the advantages and the disadvantages in team-work. ▪ Presentation the result of study to conclude the grouping of elements. ▪ Classifying the elements into metal, non metal and metalloid based on	a. Compare the development of element periodic tables to identify the advantages and the disadvantages.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Source • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 39-107 & 293-306) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 41-110) • Cristina Padolina. 2007. Conceptual and Functional	Teaming skills
	Physical and chemical properties of elements		b. Explain the classification of elements.				Oral and written communication skills
			c. Classify the elements into metal, non metal and metalloid.				Self reliant
	Periodicity properties of elements		d. Analyze the tables and graph to determine the regularity of atom radii, ionization energy, electron affinity and electro negativity.				Decision making process

Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		physical and chemical properties of it's element ▪ Studying the tables and graph to determine the regularity of atom radii, ionization energy, electron affinity and electro negativity through group discussion. ▪ Connecting the regularity properties of atom radii, ionization energy, electron affinity and electro negativity. ▪ Studying the element periodic tables to determine the basic particles, electron configuration, relative atomic mass. ▪ Classifying the	e. Describe qualitatively (and indicate the periodicity in) the variations in atomic radius, ionic radius, melting point and electrical conductivity of the elements (see the Data Booklet).			Chemistry (Modular Approach). Manila: Vibal Publishing (PP 52-96) • Internet - http://www.fordhamprep.org/gcurran/sho/sho/lessons/lesson32.htm - http:www.mhhe.com/physsci/chemistry/essentialchemistry/flash/ruther14.swf - http://www.unit5.org/christjs/Develop%20Periodic%20Table.htm - http://www.webelements.org Material	Research (gathering information) skills
	Development of atomic theory from Dalton up to Bohr's Atomic Theory.		f. Explain the development of atomic theory to show the advantages and the dis-advantages of the atomic theory.				Asking question
	Atomic structure.		g. Identify and describe protons, neutrons and electrons in terms of their relative charges and relative masses.				Active participation
			h. Deduce the behavior of beams of protons, neutrons and electrons in an electric field.				Cooperation
			i. Deduce the numbers of protons, neutrons and electrons present in both				

Note:
*Blue Color = Adapted from Singapore
*PP = Provided on Page

Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		elements into isotope, isobar and isotones through team-work. ▪ Studying the literature about the development of element periodic tables and atomic theory (at home after assigned at previous meeting).	atoms and ions given.			▪ Work sheet ▪ Presentation ▪ LCD, computer	
	Electron configuration		j. Arrange the electronic configuretion of atoms and ions given the proton number (and charge).				
			k. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table.				Communication
	Relative atomic mass		l. Explain relative atomic mass pursuant to periodic tables.				
	Isotope, isobar, isotones.		m. Classify elements into isotope, isobar and isotones.				
1.2 Comparing the formation of ionic bond, covalent bond, coordination bond, and metalic	Element stability	▪ Explaining trend of element stability through group discussion. ▪ Describing the duplet	a. Explain the trend of element stability.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple	8 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry	Active participation
	Lewis structure		b. Describe the duplet and octet rules and Lewis structures.				Self reliant

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Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
bond and also its relation with characteristics of formed compound physics.	Ionic bond and covalent bond	and octet rules and Lewis structures through class discussion. ▪ Comparing the formation of ionic bond and covalent bond in class discussion. ▪ Discussing the formation of coordinate covalent bond from some simple compound example. ▪ Design and conduct the experiment to investigate compounds polarity in laboratory. ▪ Identifying the properties of metal physical and connecting with process forming of	c. Describe ionic (electrovalent) bonding, as in sodium chloride and magnesium oxide, including the use of 'dot-and-cross' diagrams.	choice test ▪ Essay test Assigment : • Individual task • Group assigment		(PP 47-86) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 111-146) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 114-140) • Internet - http://www.bbc.co.uk/schools/gcsebitesize/chemistry/clssifyingmaterialsss/ionic_bondingrev1.shtml	Creativity
			d. Describe, using the 'dot-and-cross' diagrams: covalent bonding, as in hydrogen; oxygen; nitrogen; chlorine; hydrogen chloride; carbon dioxide; methane; ethane chloride; carbon dioxide; methane; ethane.				Acceptance of ideas
			e. Explain the properties of ionic and covalent compounds.				
	Coordinated covalent bond		f. Describe, using 'dot-and-cross' diagrams: co-ordinate (dative covalent) bonding, as in the formation of the ammonium ion and in the Al_2Cl_6 molecule.				Decision making process
	Polar and non polar covalent compounds		g. Explain the terms bond energy, bond length and bond polarity and use them to compare the reactivities of covalent bonds.				

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Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	Metallic bond	metallic bond in group discussion in laboratory ▪ Explaining molecule form with molymood.	h. Describe metallic bonding in terms of a lattice of positive ions surrounded by mobile electrons.			- http://ithacasciencezone.com/chemzone/lessons/03bonding/mlebonding/covalent_bonds.htm Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	Drawing conclusion

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : X/1
Subject matter : Chemistry
Service : International
Time allocation : 18 hours
Standard of competence : 2. Understanding the elementary laws of chemistry and its application in chemical calculation (stoichiometry)

Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
2.1 Describing the name of organic and inorganic compound modestly and also equation of reaction	Nomenclature of compound	▪ Determine the binary compound (ion compound) formed of the tables of cation (principal group) and anion and also give its name in group discussion. ▪ Determine the name of compounds based on the IUPAC rule. ▪ Determine the name compound of polyatomic formed tables cation (principal group and NH_4^+) and is anion of polyatomic and also give	a. Explain the name of compounds based on the IUPAC rule.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 80-130) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 147-174) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 146-164)	Self reliant
			b. Explain the name of binary compounds.				Carefully
			c. Explain the name of polyatomic compounds.				Dicipline
			d. Explain the name of familiar organic compounds.				Active participation
	Equation of simple reaction		e. Construct the balanced of equations.				Basic professional skills

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Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		its name in group discussion. ▪ Concluding the order of giving binary compound name and polyatomic. ▪ Construct the name of some simple organic compound. ▪ Discussing the way of putting an equal reaction. ▪ Exercise on equation of reaction.				• Internet - http://www.acdlabs.com/iupac/nomenclature - http://funbasedlearning.com/chemistry/chembalancer/default.html Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
2.2 Prove and communicate the effect of elementary laws it of chemistry through experiment and also apply mole concept in finishing	Lavoisier's law	▪ Design and conduct an experiment to prove Lavoisier's Law, and Proust's Law in the laboratory. ▪ Conclude from data result of an experiment. ▪ Discussing experiment data to prove Dalton's	a. Deduce Lavoisier's Law trough experiments.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual	8 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 80-107) • Johari and Rachmawati. 2010. Chemistry. Jakarta:	Research (gathering information) skills
	Proust's law		b. Deduce Proust's Law trough experiments.				
	Dalton's law		c. Analyze the composition of compound to prove Gay Lussac's Law s.				Active participation

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*PP = Provided on Page

Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
calculation of chemistry.	Gay Lussac's Law	law, Gay Lussac's and Avogadro's law in group discussion class. ▪ Calculating gas volume reactant or product pursuant to law of Gay Lussac's Law s. ▪ Finding relation between gas volume with amount of its molecule which measured at same pressure and temperature (Avogadro law). ▪ Discussion of concerning conception mole ▪ Counting mole, amount of particle, and mass of volume gas, determining empirical formula, molecule formula,	d. Analyze the composition of compound to prove Dalton's Law.	task • Group assigment		Esis (PP 175-236) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 170-186) • Internet - http://www.chemheritage.org/classroom/chemach/forerunners/lavoisier.html Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	Teaming skills
	Avogadro's Law.		e. Analyze the composition of compound to prove Avogadro's Law.				
			f. Explain the term mole in terms of the Avogadro constant.				Decision making process
	Calculation in chemistry		g. Perform the calculations, including use of the mole concept, involving: 1) reacting masses (from formulae and equations); 2) volumes of gases (e.g. in the burning of hydrocarbons); 3) volumes and concentrations of solutions.				Elaboration
	Empirical and molecular formulae		h. Calculate the empirical and molecular formulae, using combustion data or composition by mass.				Active participation

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Basic Competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	Hydrate	crystal water, substance degree in compound, and reactant of constrictor.	i. Explain the formulae of hydrate.				Acceptance of ideas
	Stoichiometric		j. Explain the concentration of substance in a compound.				communication skills
			k. Explain the limiting reactant in a reaction.				
			l. Calculate the poduct of reaction.				Decision making process
			m. Calculate the concentration of solution.				
			n. Deduce stoichiometric relationships from calculations.				Creativity

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : X/2
Subject matter : Chemistry
Service : International
Time allocation : 14 hours
Standard of competence : 3. Understanding the properties of non electrolyte and electrolyte solution and oxidation-reduction reaction.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
3.1 Identifying the properties of non electrolyte and electrolyte pursuant to data result of experiment.	▪ Electrolyte and non electrolyte solution. ▪ Solution types. ▪ Solution electrolyte types and its conductivity	▪ Design and conduct an experiment to identify the properties of electrolyte and non electrolyte solutions through an experiment. ▪ Draw conclusion on the difference properties and type of electrolyte and non electrolyte solution.	a. Identify the properties of electrolyte and non electrolyte solutions through an experiment. b. Clasify the solution into electrolyte and non electrolyte solutions based on the properties of its electrics conductivity. c. Explain the ability of the electrolyte solution conducting the electricity. d. Describe the electrolyte solutions (ionic and polar covalent compound) in term of polarity.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	4 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 131-162) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 237-252)	▪ Research (gathering information) skills ▪ Decision making process

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
3.2. Explaining the development of concept oxidation-reduction reaction and its relation to nomenclature and also its application.	▪ Oxidation and reduction concept. ▪ Number oxidize element in ion or compound. ▪ Nomenclature according to IUPAC. ▪ Application of Redox in environment problem solving.	▪ Demonstrations the reaction of combustion and electron taking over (for example reaction of between iron nail plunged into accumulator water) ▪ Determining the number oxidize element atom in ion or compound in class discussion. ▪ Exercise to determine oxidation number, oxidation agent, reduction agent, oxidation result, and reduction result. ▪ Determining the name of binary compound (ion compound) formed of the tables of cation and anion and also give its name in group discussion. ▪ Finding concept of redox to solve the environmental problem through discussion.	a. Describe and explain redox processes in terms of electron transfer and/or of changes In oxidation number (oxidation state), as exemplified by Fe^{3+}/Fe^{2+}, MnO_4/Mn^{2+} and $Cr_2O_7^{2-}/Cr^{3+}$. b. Explain the oxidation number of atom in a compoun. c. Explain the oxidatior and reductor in a redox reaction. d. Describe the concept of redox reaction and electrochemistry to solve the environmental problem.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 131-162) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 253-274) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 304-308) • Internet - www.chemtutor.com /redox.htm Material ▪ Work sheet ▪ Presentation	▪ Active participation ▪ Acceptance of ideas ▪ Oral and written communication skills ▪ Self reliant ▪ Creativity

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : X/2
Subject matter : Chemistry
Service : International
Time allocation : 18 hours
Standard of competence : 4. Understanding the properties of organic compounds based on the functional group and macromolecule compounds.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
4.1 Describe the specification of carbon atom in forming hydrocarbon compound.	▪ Identification of C,H and O atom ▪ Specification of carbon atom ▪ Primary , secondary, tertiary and quaternary C atoms.	▪ Design and conduct an experiment to identify the C, H, and O in the carbon compounds through an experiment. ▪ By using molymood discuss specification of carbon atom in group discussion in class. ▪ Determining the C primary, secondary, tertiary and quaternary atoms in class group discussion	a. Identify the C, H, and O in the carbon compounds through an experiment b. Describe the specification of carbon atom in the carbon compounds. c. Differentiate the C primary, secondary, tertiary and quaternary atoms	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	2 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 275-281)	▪ Oral and written communication skills ▪ Self reliant ▪ Creativity ▪ Acceptance of idea

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
4.2 Clasify the hydrocarbon compound pursuant to its structure and its relation with properties of compound.	▪ Alkane, alkene and alkyne ▪ Physical properties of alkane, alkene and alkynes. ▪ Isomer ▪ Reaction of carbon compound.	▪ By using molymood, discussing binding type of carbon atom of the alkane, alkene and alkyne. ▪ Nomenclature practice ▪ Analyzing data boiling point and melting point carbon compound in group discussion. ▪ Using molymood to determine hydrocarbon compound isomer through group discussion. ▪ Formulating simple reaction of alkane compound, alkene and alkyne in class discussion	a. Clasify the hydrocarbon compounds. b. Explain the name of alkane, alkene and alkyne compounds. c. Conclude the relation between boiling point of hydrocarbons and relative molecule mass and its structure. d. Explain the structure of isomer (framework, position, function) or geometry isomer (cis, trans). e. Construct the reactions of alkane, alkene, and alkyne compounds. f. Describe the chemistry of alkenes as exemplified, where relevant, by the following reactions of ethene: 1) addition of hydrogen, steam, hydrogen halides and halogens; 2) oxidation by cold, dilute manganate(VII) ions to form the diol; and	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	8 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 281-311) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 324-336)	▪ Self reliant ▪ Creativity ▪ Acceptance of idea ▪ Research (gathering information) skills ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
			3) oxidation by hot, concentrated manganate(VII) ions leading to the rupture of the carbon-to-carbon double bond in order to determine the position of alkene linkages in larger molecules.				

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
4.3 Explaining the formation and dissociation technique of petroleum fractions and also its usefulness	▪ Petroleum ▪ Petroleum fraction ▪ Quality of gasoline. ▪ Impact combustion of fuel	▪ In team-work study about petroleum exploration, petroleum fraction, quality of gasoline, petrochemical and effect result combustion of fuel ▪ Presentation the result of team-work.	a. Describe the formation of natural gas and petroleum. b. Explain the major components of petroleum. c. Interpret the distillation schema to explain the petroleum fractions. d. Compare the quality of gasoline based on its octane number. e. Recognize the environmental consequences of carbon monoxide, oxides of nitrogen and unburnt hydrocarbons arising from the internal combustion engine and of their catalytic removal. f. Describe the organic waste treatment at school (according to the condition of Senior High School 7 Purworejo) g. Describe the use of organic compost in agriculture (according to the condition of Purworejo)	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	4 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 311-333) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 324-336)	▪ Creativity ▪ Acceptance of idea ▪ Active participation ▪ Acceptance of ideas ▪ Oral and written communication skills

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						• Internet - http://science.howstuffworks.com/oil_refining Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
4.4 Explaining the composition and usefulness of hydrocarbon compound in everyday life in the field of food, clothing, board, commerce, artistic, and esthetics	▪ Hydrocarbon compound in everyday life.	▪ Discussion in team-work to identify the usefulness of hydrocarbon compound in the field of food, clothing, board and in the field of esthetics and art.	a. Describe the use of hydrocarbons in the food. b. Describe the use of hydrocarbons in industries. c. Describe the composition and the use of hydrocarbon compounds in arts and aesthetics.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	4 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP	▪ Creativity ▪ Acceptance of idea ▪ Active participation

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						317-333) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 324-336) <u>Material</u> ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XI/1
Subject matter : Chemistry
Service : International
Time allocation : 16 hours
Standard of competence : 1. Understanding the atomic structure to study the periodical properties of elements, the molecular structures, and the properties of compounds.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
1.1 Explain the Bohr atomic and quantum mechanics theory to draw the electronic configuration and the diagram of orbital and also to determine the element position in the periodic table.	▪ The quantum mechanics theory. ▪ Quantum numbers and orbital shapes ▪ The Electronic configuration (Aufbau principle, Hund rule and Pauli exclusion principle) and its relation to the periodic	▪ Studying about the quantum theory, uncertainty principle and wave mechanics in group discussion. ▪ Determining the quantum numbers and the form of orbital s, p, d and f in the class. ▪ Determining the electron configuration, the diagram of orbital and also its relations to element position in the periodic tables in the class	a. Explain the quantum atomic theory b. Describe the number and relative energies of the s, p and d orbitals for the principal quantum numbers 1, 2 and 3 and also the 4s and 4p orbital's; c. Explain the shell and sub shell and its relation with the quantum number d. Describe the forms of orbital.. e. Using the Aufbau principle, the Hund rule and the principality of prohibition Pauli to arrange electron configuration and diagram of orbital f. Interpret the electron configuration of an element in terms of the	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	12 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 293-306) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 2-28) • Internet - www.chem.ucalgary.ca/courses/351/Carey5th/Ch02/hybrid.swf	▪ Creativity ▪ Acceptance of idea ▪ Active participation ▪ Acceptance of ideas ▪ Oral and written communication skills

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	system	▪ Determining the of electrons configuration and the element position in the periodic tables.	position of that element within the Periodic Table.			Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
1.2. Explain the electron poired sum theory around the atomic core and the hibridisation theory to predict the molecular shapes.	▪ Molecular shapes	▪ Drawing the molecular shapes in groups (used the visualization instruments such as balloons or CD's)	a. Explain the shapes of, and bond angles in, molecules such as BF_3 (trigonal planar); CO_2 (linear); CH_4 (tetrahedral); NH_3 (trigonal pyramidal); H_2O (non-linear); SF_6 (octahedral) by using the Valence Shell Electron Pair Repulsion theory. b. Using the hybridization theory to predict the shape of molecules.	Technique: ▪ Written test Assignment: ▪ Individual assignment	2 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 293-306) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 29-35) • Internet - www.mhhe.com/physsci/chemistry/animations/chang_7e_esp/bom4s2_7swf	▪ Self reliant ▪ Creativity ▪ Acceptance of idea ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
1.3. Explain the intermolecular interaction (intermolecular forces) based on their characteristics	▪ Intermolecular force.	▪ Discussing the moleculer forces. ▪ Analyzing graph showing relation shape between the boiling point with hydrogen bonded molecule. ▪ Identifying the physical properties of molecule based on the inter molecular force in groups.	a. Describe covalent bonding in terms of orbital overlap, giving σ and π bonds (see also Section Introductory organic chemistry);Introductory organic chemistry). b. Predict the shapes and bond angles molecules. c. Describe hydrogen bonding, using ammonia and water as examples of molecules containing -NH and -OH groups. d. Describe intermolecular forces (van der Waals' forces), based on permanent and induced dipoles, as in $CHCl_3(l)$; $Br_2(l)$ and the liquid noble gases. e. Describe, interpret and/or predict the effect of different types of bonding (ionic bonding; covalent bonding; hydrogen bonding; other intermolecular interactions; metallic bonding) on the physical properties of substances.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	2 hours	Sources • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 37-51) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 190-196) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Creativity ▪ Acceptance of idea ▪ Active participation ▪ Acceptance of ideas ▪ Oral and written communication skills ▪ Self reliant

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XI/1
Subject matter : Chemistry
Service : International
Time allocation : 18 hours
Standard of competence : 2. Comprehending change energy in chemical reaction and way of its measurement.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
2.1. Describe the reaction change enthalpy reaction, exothermic reaction, and endothermic reaction.	▪ The law of energy conservation . ▪ The system and the environment ▪ The exothermic and the endothermic reactions ▪ Enthalpy changes	• Identifying the environment and the system through in groups • Designing and conducting an experiment about exothermic and endothermic reactions in groups Concluding the differences between exothermic and endothermic reactions using experiment data. • Drawing graphs showing exothermic and endothermic reactions. • Explaining the change of enthalpy in class.	a. Explain the law of energy conservation. b. Deduce the environment and system. c. Explain that some chemical reactions are accompanied by energy changes, principally in the form of heat energy; the energy changes can be exothermic (ΔH negative) or endothermic (ΔH positive). d. Explain the enthalpy changes	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	6 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 163-191) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 53-95) • Cristina Padolina. 2007. Conceptual and Functional	▪ Creativity ▪ Acceptance of idea ▪ Active participation ▪ Acceptance of ideas ▪ Oral and written communication skills ▪ Self reliant

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						Chemistry (Modular Approach). Manila: Vibal Publishing (PP 286-303) • Internet - http://g.web.umkc.edu/gounevt/Animations/Anamations211/HeatFlow.swf <u>Material</u> ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
2.2 Determining the ΔH of reaction by experiment, and using the Hess law, the standardized formation enthalpy changes data, and bonding energy data, and data of energy bonding.	▪ Hess law	• Designing and conducting an experiment to study the ΔH of reaction using a calorimeter in groups. • Calculating the ΔH of given data.	a. Calculate enthalpy changes from appropriate experimental results, including the use of the relationship heat change = mc ΔT b. Explain and use the terms: 1) enthalpy change of reaction and standard conditions, with particular reference to: formation; combustion; neutralisation; 2) bond energy (ΔH positive, i.e. bond breaking); 3) lattice energy (ΔH negative, i.e. gaseous ions to solid lattice) c. Construct and interpret a reaction pathway diagram, in terms of the enthalpy change of the reaction and of the activation energy	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	12 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 163-191) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 53-95) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 286-303)	▪ Creativity ▪ Acceptance of idea ▪ Active participation ▪ Acceptance of ideas ▪ Oral and written communication skills ▪ Self reliant

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						• Internet - http://www.wwnorton.com/college/chemistry/gilbert/tutorialss/intercace.asp?chapter=chapter_II&folder=hess_law <u>Material</u> ▪ Work sheet ▪ Presentation materials	

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XI/1
Subject matter : Chemistry
Service : International
Time allocation : 38 hours
Standard of competence : 3. Understanding the reaction kinetics, equilibrium, and the factors, and also its application in industrial and everyday life.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
3.1. Describe the definition of the reaction rate by conducting experiment about factors influencing the reaction rate.	▪ Concentration of the solution (molarities) ▪ Factors influencing the reaction rate.	▪ Calculating and preparing solution in groups. ▪ Designing and conducting an experiment about factors influencing the rate of reaction in groups. ▪ Concluding factors influencing the rate of reaction.	a. Calculate the concentration of a solution (molarity a solution). b. Analyze the factors influencing the rate of reaction (concentrations, area of the surfaces , temperatures, and catalysts) using an experiment c. Interpret the data of the factors influencing the rate of reactions.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	4 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 192-249) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 97-113) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 266-276) • Internet - http://www.chemguide.co.uk/physical/basicfratesmenu.html Material ▪ Work sheet	▪ Self reliant ▪ Creativity ▪ Acceptance of idea ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						▪ Presentation materials ▪ LCD, computer	
3.2. Understanding the theory of collision to explain the rate determinant factors and the order of reaction and also its application in everyday life.	▪ The Collision Theory ▪ The reaction order ▪ The role of catalyst in industry and everyday life	▪ Identifying the reaction using and not using catalysts using the collision theory groups ▪ Calculating and determining the order and the rate of reaction in groups. ▪ Determining the order of the reaction,and the equation of reaction rate. ▪ Explaining function of catalyst in reaction of passing discussion.	a. Explain the influence of the concentration, surface area, and temperature to rate of reaction based on the collision theory. b. Differentiate the potential energy diagram of chemical reaction using a catalyst. c. Explain that, in the presence of a catalyst, a reaction follows a different pathway, i.e. one of lower activation energy, giving a larger rate constant. d. Construct and use rate equations of the form rate = k[A]m[B]n (limited to simple cases of single step reactions, for which m and n are 0, 1 or 2), including: 1) Deducing the order of a reaction by the initial rates method; 2) Justifying, for zero- and	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 192-249) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 114-128) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 266-276) • Internet - http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/activa2swf Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity ▪ Acceptance of idea ▪ Decision making process ▪ Honesty ▪ Carefully

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
			first-order reactions, the order of reaction from concentration-time graphs; and 3) Calculating an initial rate using concentration data. [integrated forms of rate equations are not required] e. Describe enzymes as biological catalysts which may have specific activity.				
3.3. Explaining the equlibrium and the factors influencing the shift of equilibrium using an experiment.	▪ Dynamics equilibrium ▪ Factors influencing the direction of the equilibrium shift.	▪ Explaining about dynamic equilibrium, heterogeneous and homogeneous equilibriums and the equilibrium constant through discussion. ▪ Designing and conducting an experiment about factors influencing the direction of	a. Explain in terms of rates of the forward and reverse reactions, what is meant by a reversible reaction and dynamic equilibrium. b. Explain the heterogeneous and homogeneous equilibriums. c. Deduce the expressions of equilibrium constants. d. Explain Le Chatelier's Principle and apply it to deduce qualitatively (from appropriate information) the effects of	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group	4 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 192-249) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 129-150) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 277-281) • Internet	▪ Self reliant ▪ Creativity ▪ Acceptance of idea ▪ Decision making process ▪ Honesty ▪ Carefully

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		equilibrium via in groups. ▪ Concluding the factors influencing the direction of the equilibrium.	changes in concentration, pressure or temperature, on a system at equilibrium. e. Deduce whether changes in concentration, pressure, or temperature, or the presence of a catalyst affect the value of the equilibrium constant for a reaction.	assigment		- http://g.web.umkc.edu/gounevt/Animations/Animations212/chemicalEquilibrium.swf Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
3.4. Determining the quantitative relation ship between the reactants and products reaction from a equilibrium reaction.	▪ Quantitative relationship between the reactant of the equilibrium reaction.	▪ Calculating the value of Kc, Kp and the degree of the dissociation through discussion. ▪ Calculating the Kc, Kp. ▪ Practice calculate value of Kc pursuant to Kp or on the contrary	a. Calculate the quantities present at equilibrium, given appropriate data (such calculations will not involve solving of quadratic equations). b. Deduce expressions for equilibrium constants in terms of concentrations. c. Deduce expressions for equilibrium constants in terms of parcial presure. d. Calculate the Kc and Kp of a equilibrium reaction.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	12 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 192-249) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 144-168) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity ▪ Acceptance of idea ▪ Decision making process ▪ Honesty ▪ Carefully

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
3.5. Explaining the application of the equilibrium principle in the industries and the everyday life	▪ The Haber Bosch and contact process.	▪ Studying the optimum condition to produce chemicals in industries relied equilibrium reaction through discussion.	a. Describe and explain the conditions used in the Haber Bosch process, as an example of the importance of an understanding of chemical equilibrium in the chemical industry.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	2 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 192-249) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 144-168) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 277-281) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XI/2
Subject matter : Chemistry
Service : International
Time allocation : 56 hours
Standard of competence : 4. Understanding the properties of acid-base solutions, measurement methods, and its applications.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
4.1 Describe the acid-base theory by determining the properties of solutions and calculate the pH of solutions	▪ The Acid-base theories ▪ The Properties of acid and base solutions. ▪ Degree of Acidity (pH) ▪ Ionization degree and constant of acids and bases ▪ The Application of	▪ Explaining the definition of Arrhenius, Bronsted and Lowry, and Lowry acid-bases in class ▪ Determining the Bronsted-Lowry acid-base ▪ Designing and conducting an experiment to identify acid-base using various indicator in groups. ▪ Defining of acid or base solutions. ▪ Designing and of conducting metallic bond an experiment to estimate pH of an electrolyte solution based on the change of colour of acid	CONCEPT OF ACIDS AND BASES a. Outline the Arrhenius theory of acids and bases. b. Outline the Bronsted-Lowry theory of acids and bases. c. Show the understanding of, and apply the Bronsted-Lowry theory of acids and bases, including the concept of conjugate acids and bases. d. Outline the Lewis theory of acids and bases. e. Identify the acids and bases using an indicator of pH. CONCEPT OF pH	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	12 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 250-292) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 173-244) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 246-257)	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty ▪ Research

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	pH concept in contamination.	and base indicator in groups. ▪ Concluding the route pH of acid and base. ▪ Through the class the discussion concluding result ofmeasurement of pH of some acid solutions and of base which has a same concentration, correlating the strength of acid or base with degree of ionization (α) and acid constant (Ka) or base constant (Kb) ▪ Calculating the degree and the pH of ionize solutions from concentration data. ▪ Checking and calculating the pH river water around school / house in groups.	a. Predict the pH an electrolyte solution based on the change of colour indicators. b. Explain qualitatively the differences in behaviour between strong and weak acids and bases in terms of the extent of dissociation. c. Explain the terms pH; Ka; Kb; Kw; [the relationship Kw = Ka.Kb is not required]. d. Calculate $[H^+(aq)]$ and pH values for strong acids, and strong bases. e. Develop the concept of pH of the environment.			• Internet - www.purchon.com/chemistry/flash/ph.swf <u>Material</u> ▪ Work sheet ▪ Presentation materials ▪ LCD, computer .	
4.2 Calculating the number of reactants and products in an	Stoichiometry of solution ▪ Acid and base titration.	▪ Designing and conducting an experiment of titration to determine the acid or base concentration.	a. Calculate the concentration of acid and base solution by titration.	Technique : ▪ Written test ▪ Assignment	8 hours	<u>Sources</u> • A Complete Guide (With Practice) To G.C.E. 'O' Level	▪ Self reliant ▪ Creativity ▪ Active participation

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
electrolyte solution in the acid-base titration.		▪ Concluding the experiment. ▪ Design and conduct an experiment to determine the concentration of a substance by titration in groups. ▪ Calculating the concentration of a substance from an experiment data.	b. Explain the concentration of substance by titration. c. Explain the choice of suitable indicators for acid-base titrations, given appropriate data, in terms of the strengths of the acids and bases. d. Explain the concentration of substance of the titration data. e. Draw the titration graph of an experiment data.	Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment		Pure Chemistry (PP 250-292) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 173-244) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 246-257) • Internet - www7.tltc.ttu.edu/kechambe/flash/acid-basev55.swf - http://www.dartmouth.edu/~chemlab/techniques/titration.html <u>Material</u> ▪ Work sheet	▪ Decision making process ▪ Honesty ▪ Research

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						▪ Presentation materials ▪ LCD, computer	
4.3 Describing the properties of buffer solutions and the function of buffer solutions in the human body.	▪ Buffer solutions ▪ pH of buffer solutions. ▪ The use of buffer solution.	▪ Designing and conducting an experiment to analyse buffer solutions and non buffers in laboratory. ▪ Summing up the properties of buffer and non buffer solutions. ▪ Calculating the pH or pOH of buffer solutions through discussion. ▪ Explaining the buffer solutions function in mortal body.	a. Analyze a buffer and non buffer solutions through an experiment. b. Calculate the pH or pOH of buffers c. Calculate the pH of buffer solution after acid or base addition or dillution. d. Describe and explain the uses of buffers, including the role of H_2CO_3/HCO_3^- in controlling pH in blood.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	8 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 250-292) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 245-267) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 262-265) • Internet - www.chembio.uoguelph.ca/educmat/ch	▪ Research ▪ Self reliant ▪ Creativity -Cognitive domain: fluency, flexibility, originality, elaboration, and evaluation -Affective domain: curiosity, imagination, plurality, face the risk, acceptance of ideas

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						m19104/chemtoons/buffer_make.swf - http://www.csudh.edu/oliver/chemdata/buffers.htm Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
4.4 Determining the salt type hydrolysised in the water and the pH of salt solution.	▪ The hydrolysis of salt. ▪ The character of hydrolyzed salt. ▪ The pH of solution of hydrolyzed salt	▪ Designing and conducting an experiment to determine properties of some salt hydrolyzed in the water in groups. ▪ Concluding the salt properties which are hydrolyzed in water. ▪ Calculating the pH of the salt solution which is hydrolyzed in water	a. Explain the character of salts which is hydrolyzed in water through an experiment b. Explain the character of salts which is hydrolyzed from the ionization reaction. c. Calculate the pH of hydrolyzed salt solution.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	8 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 250-292) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 269-286) • Cristina Padolina. 2007. Conceptual and Functional	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty ▪ Oral and written communication skills ▪ Research

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						Chemistry (Modular Approach). Manila: Vibal Publishing (PP 260-265) • Internet - http://www.science.uwaterloo.ca/~cchieh/cact/c123/salts.html	
4.5 Using the curve pH change of acid-base titration to explain the buffer solution and the hydrolysis.	▪ Graphs of titration acid and base.	▪ Analyzing graphs of titration acid strong acid and strong base, strong acid and weak base, weak acid and strong base to explain the buffer solution and hydrolysis through discussion.	a. Analyze the graph of titration of strong acid and base, strong acid and weak base, weak acid and strong base to explain the buffer solution and hydrolysis through discussion.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	2 hours	<u>Sources</u> • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 250-292) • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 219-244) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
						Approach). Manila: Vibal Publishing (PP 260-265) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
4.6 Predict the forming of precipitation from a reaction based on the solubility principle and solubility products.	▪ Solubility and solubility products. ▪ Common ion effect ▪ Relation pH of base with Ksp ▪ Precipitation	▪ Explain the equilibrium in saturated solution or in soluble salt solution through class discussion. ▪ Calculate the solubility of a insoluble electrolyte through class discussion. ▪ To design and do experiment to determine salt solubility and compare with solubility product. ▪ Conclude the solubility of a	a. Explain the equilibrium of saturated solution or poorly soluble salt solution. b. Connect the constant solubility product with the solubility or its precipitation c. Restate the expression of Ksp of poorly soluble substances. d. Calculate the solubility of poorly soluble electrolyte using data of Ksp or vice versa e. Explain the influence of addition of common ion to the solution	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 250-292)y • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 288-302) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila:	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty ▪ Oral and written communication skills ▪ Research

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		salt	f. Explain the pH of the solution using the Ksp g. Approximate the precipate formation based on the Ksp.			Vibal Publishing (PP 260-265) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XI/2
Subject matter : Chemistry
Service : International
ProTime allocation : 12 hours
Standard of competency : 5. Explain the system and properties of colloid and also its application in everyday life.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
5.1. Making the various colloid system using materials from the enviroment	• Making a colloid (condensation), disperse, and peptisation methods)	• Designing and conducting an experiment of making colloid in groups.	a. Describe the process of a colloid preparation through an experiment	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	4 hours	Sources • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 303-330) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 204-245) Material ▪ Lembar kerja, ▪ Material presentasi ▪ LCD, komp	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty ▪ Oral and written communication skills

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
5.2. Grouping the properties of colloid and its application in everyday life.	▪ Colloid system ▪ Properties of colloid ▪ The Use of colloid in life.	• Conducting an experiment in classifying various colloid system. • Identify and classify the type and properties of colloid in groups • Conducting an experiment on properties of colloid in groups.. • Identifying the role of colloid in cosmetic industry, food, and pharmacy	a. Classify the suspension, solution, and colloid based on the observations (Tyndall effect, homogeneous/heterogeneous, and filtration) b. Classify the colloid type based on the dispersed phase and the dispersant.. c. Describe the properties of colloid (Tyndall effect, Brownian movement, dialysis, electrophoresis, emulsion, coagulation) d. Describe the lyofob and lyophil colloid. e. Describe the function of colloid in cosmetic industries, foods, and pharmacies.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	6 hours	Sources • Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 303-330) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 232-245) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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SYLLABUS

Education unit : SMAN 7 Purworejo

Class/Semester : XII/1

Subject matter : Chemistry

Time allocation : 16 hours

Standard of competency : 1. Explaining the colligative properties of non electrolyte and electrolyte solution.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
1.1 Explaining the degradation of vapour pressure, increase of boiling point, depression of freezing point of solution, and osmosis pressure as the colligative properties of solution.	• Concentration of solution. • Colligative properties of non electrolyte and electrolyte solution. • Saturated vapour pressure of solution. • Freezing and	• Calculating concentration a solution (molality, mole fraction and molarity) and relate it with properties of colligative solution through class discussion. • Explaining the influence of dissolve solute which difficult to condense to ward vapour pressure solution and calculate of vapour pressure solution pursuant to	a. Calculate the concentration of solution (mole fraction and molality) b. Explain the definition of properties of non-electrolyte colligative solution (Raoulth's law) and electrolyte solution. c. Explain the influence of nonvolatile solute the vapour pressure of the solution. d. Calculate the solution vapour pressure based on experiment data e. Investigate the	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Sources • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 204-221) • Internet - http://www.polar.re.kr/ - http://www.newtondfd.com/ Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty ▪ Discipline

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	boiling points of electrolyte and non electrolyte solutions. • Osmosis pressure of electrolyte and non electrolyte solutions.	experiment data through class discussion. • Design and conduct an experiment to determine freezing point and boiling point of electrolyte and non electrolyte solution via team-work in laboratory. • Draw conclusion the influence of dissolve solute to depression of freezing point and increase boiling point solution. • Exercise to calculate ΔTf and ΔTb solution. • Analyzing diagram of PT to interpret degradation vapour	depression of the freezing point because of solute addition through an experiment. f. Calculate the depression of the freezing point of electrolyte and non electrolyte solution based on experiment data. g. Investigate the increase of boiling point as result of dissolve substance addition through an experiment. h. Calculate the increase of electrolyte and non electrolyte boiling point solution based on experiment data. i. Analyze the PT diagram to interpret decreasing of the vapour pressure, depression of the				

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		pressure, decrease of freezing point and increase of boiling point solution through class discussion • Explaining definition of osmosis, osmosis pressure and calculate electrolyte and non electrolyte osmosis pressure and also its application	freezing point and increasing of the boiling point solution. j. Explain the definition of osmosis and the osmosis pressure and also its applications. k. Calculate the osmosis pressure of electrolyte and non electrolyte solution.				
1.2 Comparing between colligative characteris of nonelectrolyte with colligative properties of electrolyte solution which it's same concentration pursuant to experiment data.	• Differentiate the colligative properties of electrolyte and non electrolyte solutions.	• Analyzing experiment data to compare the colligative properties of electrolyte and nonelectrolyte solution through group discussion.	a. Analyze experiment data to compare the colligative properties of electrolyte and nonelectrolyte solution.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	4 hours	Sources • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 204-221) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty ▪ Research

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XII/1
Subject matter : Chemistry
Service : International
Time allocation : 26 hours
Standard of competence : 2. Applying concept of oxidation-reduction and electrochemistry in everyday life and technology.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
2.1 Applying the concept of oxidation-reduction reaction in electrochemistry system entangling electrics energy and its usefulness in preventing corrosion and in industry.	▪ Equation of redox reaction. ▪ Volta cell ▪ Application Voltaic cell in life.	▪ Putting on a equivalent equation of redox reaction by half reaction (electron ion) and change of oxidation number through class discussion. ▪ Exercise to put on a par reaction of redox ▪ Design and conduct experiment of volta cell via team-work in laboratory. ▪ Exercise to calculate value of E° cell. ▪ Through class discussion explain Voltaic cell principle which many used in life	a. Balance the redox equations using the half-equations method. b. Balance the redox equations using the oxidation number (oxidation state) method c. Conclude the character of the spontaneous redox reaction through an experiment. d. Describe Voltaic cell formation or Galvanis cell and explain every components e. Explain how electrics energy are generated from the redox reaction in the Voltaic cell f. Explain the cell notation and the reactions of Voltaic cell	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	10 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 131-162) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 304-323) Material ▪ Work sheet ▪ Presentation materials	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		(battery, accumulator, etc)	g. Calculate the potential cell based on the standard potential data h. Explain the principle of Voltaic cell used in daily life (battery, accumulator, etc)			▪ LCD, computer	
2.2. Explaining the oxidation-reduction reaction in electrolysis cell	▪ Electrolysis reaction ▪ Corrosion	▪ Design and conduct an experiment perceive reaction that happened in cathode and anode at electrolysis reaction through team-work in laboratory. ▪ Design and conduct an experiment to identify factors influencing the process of corrosion through team-work in laboratory. ▪ Explaining the ways to prevent the process of	a. Observe the reaction on the cathode and the anode in electrolysis reaction through an experiment. b. Balance the reaction on the cathode and the anode in the dillution or the solution with the. c. Explain the factors of corrosion through an experiment. d. Explain the ways to prevent of the corrosion.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	6 lessons	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 131-162) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 304-323) Material ▪ Work sheet ▪ Presentation materials	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		corrosion through class discussion.				▪ LCD, computer	
2.3. Applying the Faraday law for the electrolysis of electrolyte solution.	• Faraday law	▪ Applying Faraday law concept in calculation of electrolysis cell through class discussion. ▪ Design and conduct an experiment about process metal gilding via team-work in laboratory. ▪ Explaining electrolysis cell application in course of gilding and purification of metal in industry through class discussion.	a. Apply the Faraday's Law concept in the calculation of the electrolysis cell. b. Construct the electrolysis reaction of the electropating and in a metal refining	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	8 lessons	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 131-162) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 304-323) Material ▪ Work sheet	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XII/1
Subject matter : Chemistry
Service : International
Time allocation : 30 hours
Standard of competence : 3. Comprehending properties of important elements, usefulness and its danger, and also there are in nature.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
3.1 Identifying the overflow of principle and transition elements in nature and product that containt the element.	• The elements of principal faction and transition. • The elements of 3rd period.	▪ Listing (table) existence of elements and product that contaiint inert gas, halogen, alkaline, earth alkaline, aluminium, carbon, silicon, brimstone, chrome, copper, zinc, iron, nitrogen and oxygen individually at home and presented. ▪ Studying the properties of 3rd periodic elements. ▪ Studying existence of 3rd periodic elements in nature ▪ Studying the way of	a. Identify the existence of elements in nature especially in Indonesia (inert gas, halogen, alkaline, earth alkaline, aluminium, carbon, silicon, sulphur, chrome, copper, zinc, iron, nitrogen and oxygen) b. Describe the reactions, if any, of the elements with oxygen (to give Na_2O; MgO; Al_2O_3; P_4O_6; P_4O_{10}; SO_2; SO_3), and chlorine (to give NaCl; $MgCl_2$; Al_2Cl_6; $SiCl_4$; PCl_3; PCl_5); c. Identify the products that consist of the substances	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	2 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 293-337) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 92-101) Material ▪ Work sheet ▪ Presentation materials	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		obtaining of 3th periodic elements. ▪ Studying usefulness of 3rd periodic elements.				▪ LCD, computer	
3.2. Describe the tendency of chemical and physical behavior especially in principal element and transition element (boiling point, melting point, hardness, colour, solubility, reactivity, and the other properties)	• Physical and chemical properties of elements	▪ Through class discussion and perception identify the physical properties and chemical properties principal element and transition element (boiling point, melting point, hardness, colour, condensation, reactivity, and the other properties) ▪ Demonstration reaction of Natrium metal in water (conducted by teacher carefully) ▪ Design and conduct an experiment to identify halogen oxidator energy and halogen reduction agent energy via team-work in laboratory.	a. Identify the physical properties of principal elements and transition elements (boiling point, melting point, hardness, colour, condensation, and the other properties) b. Identify the chemical properties (reactivity, solubility) through an experiment c. Identify the power of halogens as oxidator and halides as reductor through an experiment. d. Identify the flame reaction of metal compounds (especially alkaline and earth alkaline) through experiments e. Identify the regularity of physical properties and	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	16 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 293-337) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 92-101) Material ▪ Work sheet ▪ Presentation materials ▪ LCD, computer	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		▪ Design and conduct an experiment to identify aflame reaction of metal compound (especially alkaline and earth alkaline) via team-work in laboratory. ▪ Design and conduct an experiment to identify regularity properties of 3rd periodic elements through team-work in laboratory. ▪ Design and conduct an experiment to investigate and eliminate water hardness via team-work in laboratory.	chemical properties of third period elements through experiments. f. Identify the regularity of physical properties and chemical properties of fourth period elements through an experiment. g. Describe how to eliminate the hardness of water through experiment. h. Describe the methods of water purification by using the tools and materials properly (according to the condition of Purworejo)				
3.3. Explaining the usefulness, impact and process preparation compound and elements in everyday life.	• The benefit and effect of elements in everyday life and	▪ Listing (table) about element impact and benefit like inert gas, halogen, alkaline, earth alkaline, aluminium,	a. Explain the impact and the benefit of elements and compounds in daily life and industrials (e.g. inert gases, halogens, alkalines, earth	Technique : ▪ Written test ▪ Assignment Type :	4 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	industries.	carbon, silicon, brimstone, chrome, copper, zinc, iron, nitrogen and oxygen individually at home and presented. ▪ Explaining making of compound and element in industry and laboratory (for example H_2SO_4, N_2, Fe, Al, NH_3 and of O_2) passing class discussion. ▪ Analyzing and determining element composition in manure passing class discussion.	alkalines, aluminium, carbon, silicon, sulfur, chrome, copper, zinc, iron, nitrogen and oxygen. b. Explain the processes of compounds and elements preparation in industries and laboratories (e.g. H_2SO_4, N_2, Fe, Al, NH_3 and of O_2). c. Explain the composition of fertilizer. d. Predict the characteristic properties of an element in a given Group by using knowledge of chemical periodicity. e. Deduce the nature, possible position in the Periodic Table, and identity of unknown elements from given information of physical and chemical properties.	▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment		(PP 293-337) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 92-101) <u>Material</u> ▪ Work sheet ▪ Presentation mateeial	making process ▪ Honesty ▪ Acceptance of idea
3.4. Describe the radioactive elements facet of physical	▪ Invention of radioactive radiation.	▪ Studying the physical properties and chemical properties, usefulness,	Radioactive a. Describe the invention of radioactive radiation.	Technique : ▪ Written test ▪ Assignment	4 hours	<u>Sources</u> • A Complete Guide (With Practice) To	▪ Self reliant ▪ Creativity ▪ Active

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
properties and chemical properties, usefulness, and its danger.	▪ Properties of radioactive radiation. ▪ Equation of nuclear reaction. ▪ The use of radioactive element. ▪ The danger of radioactive radiation.	and the danger of radioactive elements passing class discussion and presented.	b. Identify the properties of radioactive radiation. c. Explain the stability of nucleus. d. Construct the equation of nuclear reaction. e. Describe the use of radioactive elements. f. Describe the impact of radioactive elements	Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment		G.C.E. 'O' Level Pure Chemistry (PP 293-337) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 92-101) Material ▪ Presentation material	participation ▪ Decision making process ▪ Honesty

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SYLLABUS

Education unit : SMAN 7 Purworejo
Class/Semester : XII/2
Subject matter : Chemistry
Service : International
Time allocation : 62 hours
Standard of competence : 4. Comprehending organic compound and its reaction, benzene and its generation, and macromolecules.

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
4.1. Describe the structure, way of writing, arrange name, behavior, usefulness, and identify carbon compound (halo alkane, alkanol, alkoxy alkane, alkanal, alkanon, alkanoat, and alkanoat alkyl, amine and amide	▪ Structure and nomenclature of carbon compounds. ▪ Isomer ▪ Physical and chemical properties of carbon compounds.	• Conducting identify experiment to identify functional group. • Differentiating functional group and give the name of carbon compound through discussion. • Practice give the name of from various compound type • Studying types of isomer carbon compound through discussion. • Practice determine the happening of isomer and give the name of formed	a. Interpret, and using the nomenclature, general formulae and displayed formulae of the following classes of compound: 1) alkanes, alkenes and arenes; 2) halogenoalkanes; 3) alcohols (including primary, secondary and tertiary); 4) aldehydes and ketones; 5) carboxylic acids and esters; 6) amines, nitriles. b. Construct the structure and the nomenclature of benzene and its derivatives.	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	12 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 324-355) Material ▪ Work sheet ▪ Presentation materials	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

Note:
*Blue Color = Adapted from Singapore
*PP = Provided on Page

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	• The uses of carbon compounds. • Amine and amide. • Reaction of carbon compound.	compound. • Analyzing boiling point data and melting point carbon compound to explain physical properties through discussion. • Searching information of pharmacy media and literature about usefulness of carbon compound individually. ▪ Studying structure, arrange name, types, making, usefulness of amine ▪ Studying structure, arrange name, types, making, usefulness of amide ▪ Studying types reaction of carbon compound. ▪ Practice write down	c. Describe the structural of isomerism; d. Explain the physical properties of carbon compounds. e. Identify the functional group of carbon compounds			▪ LCD, computer	

Note:
*Blue Color = Adapted from Singapore
*PP = Provided on Page

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
		reaction of carbon compound.					
4.2 Describe the structure, way of writing, nomenclature, properties and usefulness of benzene and its derivative.	▪ Structure and nomenclature of benzene and its derivative ▪ Reaction of benzena. ▪ Physical and chemical properties of benzene and its derivative.	• Determining structure and name of benzene compound and its derivative through discussion. ▪ Studying reaction of atom substitution of H at benzene ring. ▪ Discussing definition of ortho, meta and para. ▪ Describe of physical propertie and chemical properties and its derivative through discussion.	a. Interpret and using the following terminology associated with organic reactions: (i) functional group; (ii) addition, substitution, elimination, hydrolysis; (iii) oxidation and reduction; b. Describe the use of carbon compounds. c. Construct the structure and the nomenclature of benzene and its derivatives. d. Explain the reaction of H atomic substitution of benzene	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task • Group assigment	18 hours	Sources • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 324-355) Material	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

Note:
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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	▪ The uses of benzene and its derivative.	• Through class discussion describe of usefulness and danger benzene compound and its derivative in everyday life.	e. Explain the definition of ortho, meta and para positions. f. Describe the physical and the chemical properties of benzene and its derivatives. g. Describe the use and the danger of benzene compounds and its derivative in daily life e.g. fenol, aniline, butil hidroxy toluen (BHT), butil hidroxy anisol (BHA), TNT, aspirin, and pigments (azo) and others			▪ Work sheet ▪ Presentation materials ▪ LCD, computer	
4.3 . Describe the structure, nomenclature, classification, physical properties and usefulness of macromolecules (polymer, carbohydrate, and protein).	▪ Polymer ▪ Carbohydrate	• Perceiving and analyzing to identify type and properties of polymer and synthetic polymer and natural polymer via team-work. • Determining reaction of polymer pursuant to coming and type of its monomer (kopolymer and homopolymer, polymer of addition and condensation polymer) passing	Concept of Polymer a. Identify the natural and synthetic polymers (rubber, carbohydrate, protein, plastic) b. Explain the physical and chemical properties of polymer. c. Construct the formation reaction of polymer (condensation and addition) from its imonomer and addition) from its imonomer. d. Describe the use of polymer	Technique : ▪ Written test ▪ Assignment Type : ▪ Multiple choice test ▪ Essay test Assigment : • Individual task	14 lessons	<u>Sources</u> • A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing	▪ Self reliant ▪ Creativity ▪ Active participation ▪ Decision making process ▪ Honesty

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Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
	▪ Protein	discussion. • Determining classifier of monosaccharide become aldose and ketose in class discussion. • Explaining reaction hydrolysis of disaccharide and polysaccharide constructively enzyme in discussion. • Design and conduct an experiment to identify carbohydrate with various reagents in team-work. • Determining structure formula of essensial amino acid and group of peptide at protein through class discussion.	and solve the environment problem Concept of Carbohydrate a. Classify the monosaccharide on to aldose and ketose. b. Explain the hydolisis reaction of disaccharide and polisaccharide with the help of enzyme. c. Identify the carbohydrate with reagents. Concept of Protein a. Write the formula of esensial amino acid. b. Determine the group of peptide on protein.	• Group assigment		(PP 324-355) Material ▪ Material presentasi ▪ LCD, komp	
4.4. Describe the structure, nomenclature,	▪ The structure formula and	• Describe the structure of, nomenclature,	a. Construct the structure formula and the name of lipid and oil.. b. Classify the lipid based on the	Technique : ▪ Written test ▪ Assignment	10 lessons	Sources • A Complete Guide (With Practice) To	▪ Self reliant ▪ Creativity

Note:
*Blue Color = Adapted from Singapore
*PP = Provided on Page

Basic competence	Topic	Learning Activity	Indicators	Evaluation	Time Allocation	Learning source	Character building
classification, properties and usefulness of lipid.	the nomenclature of lipid. ▪ Classification of oil and lipid. ▪ Physical and chemical properties of lipid and oil. ▪ The uses of oil and lipid.	classification, properties, and usefulness of lipid through discussion.	saturation of the bonding. c. Observe and describe of physical and chemical properties of lipid and oil. d. Observe the function and the role of oil and lipid in daily life.	Type : ▪ Multiple choice test ▪ Essay test Assigment : • An individual task • Group assigment		G.C.E. 'O' Level Pure Chemistry (PP 362-395) • Cristina Padolina. 2007. Conceptual and Functional Chemistry (Modular Approach). Manila: Vibal Publishing (PP 324-355) Material Presentation material	▪ Active participation ▪ Decision making process ▪ Honesty

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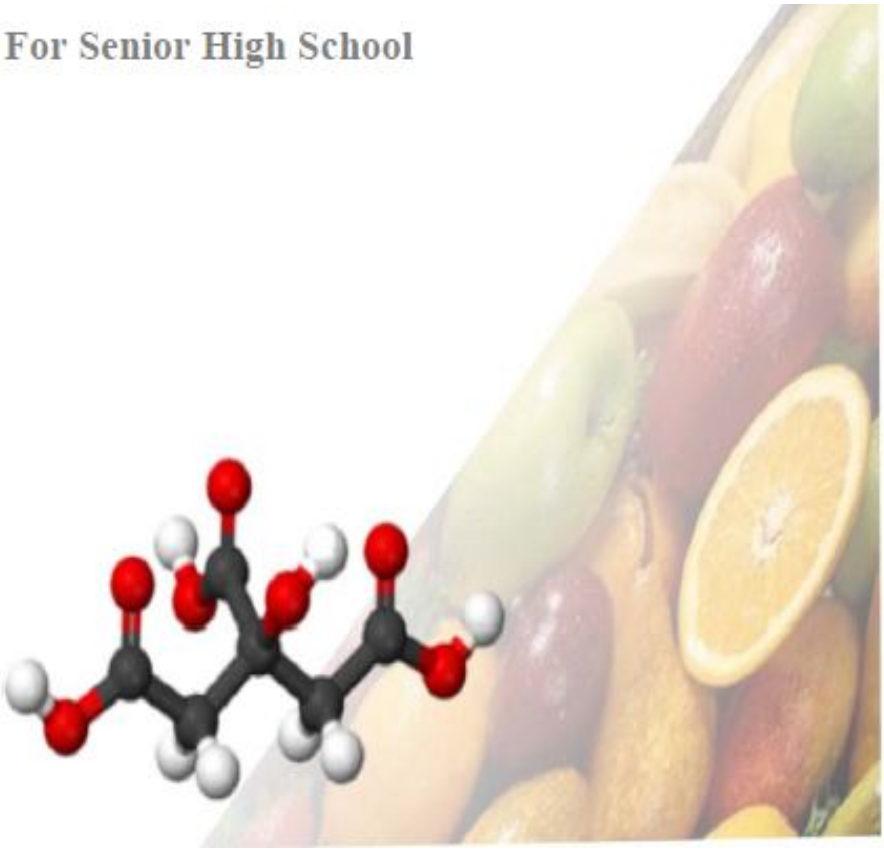
HANDOUT BUFFER SOLUTION



By:

DINI NUGRAHENI SPd. Si

PROGRAM STUDI PENDIDIKAN SAINS

PROGRAM PASCASARJANA

UNIVERSITAS NEGERI YOGYAKARTA

BUFFER SOLUTION

A buffer solution is an aqueous solution that can maintain the pH of system when small quantities of an acid or a base are added to it. If 0.01 mol of HCl is added to 1.0 L of sodium chloride solution, the pH changes from 7.0 to 2.0. On the other hand, if this same amount of hydrochloric acid is added to 1.0 L of ocean or sea water, the pH changes by only 0.1 unit. Obviously, sea water has other substances present that maintain the pH of sea water at a fairly constant level. The pH of sea water ranges from 7.5 to 8.4. This is very important because many aquatic organisms are very sensitive to changes in pH. The pH of mammalian blood is also maintained at a pH of close to 7.38.

A downward drift in the pH of blood from 7.35 toward 7.00 is called ***acidosis***. An upward drift toward 8.00 is called ***alkalosis***. Either condition is a serious medical emergency. Either condition, for example, interferes with respiration. What normally prevents acidosis and alkalosis is solutes in the blood that neutralize hydrogen ions or hydroxide ions as quickly as they are produced. For example, because there is always some carbon dioxide dissolved in blood the blood always has some carbonic acid produced in the following equilibrium reaction.

$$CO_2 + H_2O \Leftrightarrow H_2CO_3 \Leftrightarrow HCO_3^- + H^+$$

And the blood always has some dissolved bicarbonate ion also. The carbonic acid can neutralize hydroxide ions and thereby prevent a rise in pH. The bicarbonate ion, a Brønsted base, can neutralize hydrogen ion and prevent a drop in pH. Because the blood has both a base-neutralizer, carbonic acid, and an acid-neutralizer, the bicarbonate ion, we say that is buffered against changes in pH. The solutes that perform this service constitute the ***buffer***.

There is almost no area of experimental work in chemistry or its applications in microbiology, cell biology, or the science of food, soils, nutrition, clinical analysis, or molecular biology in which buffers and their practical applications are not important. In addition, buffer solutions also should generally be protected against the following contaminant factors:

a) The influence of carbon dioxide, ammonia, oxygen and other gases present in the ambient (laboratory) atmosphere.
b) The influence of ions emitted by the walls of the buffer solution container.
c) The influence of light, especially light of short wave-length, as ordinary daylight.
d) The influence of various types of germs and fungi.

The most appropriate measure known so far for protecting buffer solutions from such sources of contamination is to store them in dark-colored, sterilized and gas-tight all-glass ampoules of great chemical resistances.

The following solutions are simple examples of buffers:

a) A mixture of a weak acid and one of its salts, for pH values between 4 and 7;
b) A mixture of a weak base and one of its salts, for pH values between 7 and 10.

It should be noted that whenever the highest accuracy is required, the buffer solution either must be freshly and carefully prepared from analytical grade reagents, or it must be stored in the manner described above. Buffer solutions that have been used once should never be used again for accurate measurements, partly because they may have become contaminated as described above, and partly because the electrode chain in contact with such solutions also is capable of causing contamination.

1. Buffer Mixtures

Buffer solutions in the intermediate pH range can be prepared by mixing weak acids or bases with their acid or base conjugation. Thus a mixture of ethanoic acid (acetic acid, CH_3COOH) and sodium ethanoate (CH_3COONa) forms slightly acid buffer, and a mixture of ammonia (NH_3) and ammonium chloride (NH_4Cl) give an alkaline buffer solution. The buffer action of the first mixture is explained as follows. In solution a weak acid (HA) is dissociated to a certain degree,

$$HA + H_2O \leftrightarrow A^- + H_3O^+$$

When the sodium salt NaA is added to the solution, the increased concentration of anion A- causes the equilibrium to shift to the left and hydrogen ion concentration becomes very small, i.e. the pH rises. Now, suppose that a small

volume of strong acid (e.g. nitric(V) acid) is added to the solution. Since the original acid is weak acid, the anions A- have a strong affinity for the hydrogen ions which have been introduced, and therefore they combine to form the original acid HA. Consequently, the equilibrium moves further to the left and the added hydrogen ions are therefore ineffective.

If a small volume of a solution of a strong alkali (e.g. potassium hydroxide) is added, the hydroxyl ions consume the hydrogen ions that are already present and the equilibrium moves to the right. In this way the original hydrogen ion concentration is, to a large extent, restored. A similar explanation applies to the buffer action of a solution of a weak base with one of its salts.

2. The Henderson Hasselbalch Equation

The pH of a buffer mixture can be calculated using the appropriate dissociation constant. Consider a solution of a weak acid HA to which one of its salts has been added.

Rearrangement of the equation

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$[H^+] = K_a + \frac{[H^+]}{[A^-]}$$

$$\log[H^+] = \log K_a + \log\frac{[HA]}{[A^-]}$$

$$-\log[H^+] = -\log K_a + \log\frac{[A^-]}{[HA]}$$

Therefore

$$pH = pK_a + \log\frac{[A^-]}{[HA]}$$

Initially the degree of dissociation of the acid is probably between 0.01 and 0.02. When the salt is added this value becomes even smaller, and therefore the value of [HA] can be regarded as equal to the total concentration of weak acid in the solution. Also, the value of [A-] can be equated to the concentration of added salt, since this gives almost all the free anions. The Henderson equation therefore becomes

$$pH = pK_a + \log\frac{[\text{salt of weak acid}]}{[\text{weak acid}]}$$

Thus for a given weak acid the exact pH value depends on the ratio of concentration of weak acid and salt. If a small amount of alkali or acid is added to the buffer mixture this ratio will change to a small extent only. The corresponding form of the Henderson equation for a solution containing a weak base with one of its salts is

$$pH = pK_w - pK_b + \log\frac{[\text{weak base}]}{[\text{salt of weak base}]}$$

(Miessler &Tarr, 2003: 165-205 ; Huheey, Keiter & Keiter, 1993: 318-344)

3. Calculations Involving Buffer Solutions

Example 2:

Buffer solutions are prepared by adding (a) 0.05 mol, (b) 0.10 mol, (c) 0.25 mol of sodium 2-hydroxypropanoate (sodium lactate – $C_3H_5NaO_3$) to 1 dm^3 of a 0.20 M solution of 2- hydroxypropanoic acid (lactic acid). Given that pKa = 3.86, for each solution calculate the decrease of pH when 10 cm3 of 1,0 M hydrochloric acid is added.

Solution:

(a) Substitution in the Henderson Hasselbalch equation,

$$pH = pK_a + \log\frac{[\text{salt of weak acid}]}{[\text{weak acid}]}$$

Gives initial pH = $3.86 + \log\frac{0.05}{0.2}$

= 3.86 + log 0.25 = 3.26

Neglecting volume change and assuming that all the hydrogen ion added (10 cm3 of 1.0 M HCl contains 0.01 mol) combines with the anion forming undissociated acid, substitution in the Henderson equation gives

$$\text{Final pH} = 3.86 + \log\frac{0.05 - 0.01}{0.20 + 0.01}$$

$$= 3.86 + \log\frac{0.04}{0.21} = 3.14$$

Decrease in pH = 3.26 – 3.14 = 0.12

(b) (b), (c), (d) substitution in the Henderson equation gives

(c) initial pH = 3.56

(d) initial pH = 3.86

(e) initial pH = 3.96

Making the same assumption as in (a), on addition of 0.01 mol HCl the values become

(b) final pH = 3.49

(c) final pH = 3.82

(d) final pH = 3.92

Hence,

(b) decrease in pH = 3.56 – 3.49 = 0.07

(c) decrease in pH = 3.86 – 3.82 = 0.04

(d) decrease In pH = 3.96 – 3.92 = 0.04

The above example shows that buffer capacity decreases as the ratio of concentration of weak acid and salt approaches unity. It can also be shown that the ability of a buffer solution to resist pH change increases with increase in the concentration of acid (or base) and salt.

Example 3:

A buffer solution contains equal amounts (in mol) of phenylethanoic acid (phenylacetic acid – $C_8H_8O_2$) and its sodium salt. Given pKa = 4.31, calculate the increase of pH when 10 cm^3 of 0.1 M sodium hydroxide is added to 1 dm^3 of buffer containing (a) 0.005 mol, (b) 0.02 mol, (c) 0.1 mol of each species.

Solution:

Since the initial concentration are equal, substitutions in the Henderson equation

$$\text{pH} = pK_a + \log\frac{[\text{salt of weak acid}]}{[\text{weak acid}]}$$

Gives initial pH = 4.31 + log 1 = 4.31

Neglecting volume change and assuming that all the added hydroxyl ion (0.1 mol x 10/1000 = 0.001 mol) reacts with the undissociated acid, the pH values become

(a) $\text{pH} = 4.31 + \log\frac{0.0005+0.0001}{0.0005-0.0001} = 4.49$

(b) $\text{pH} = 4.31 + \log\frac{0.02+0.001}{0.02-0.001} = 4.35$

(c) $\text{pH} = 4.31 + \log\frac{0.1+0.001}{0.1-0.001} = 4.32$

hence the pH changes as follows:

(a) increase in pH = 4.49 – 4.31 = 0.18

(b) increase in pH = 4.35 – 4.31 = 0.04

(c) increase In pH = 4.32 – 4.31 = 0.01

4. Measurement of Dissociation Constant

The Henderson Hasselbalch equation shows that measurements of the pH of a buffer solution can be used to determine dissociation constant. Since the pH values of such solution are more stable than those of acids or bases this is a more reliable method than that described in Chapter Relative Strength of Acid-Base

Example 4:

When a solution of propanoic acid (propionic acid) is half neutralized with sodium hydroxide, the pH equals 4.87. What is the dissociation constant of this acid?

Solution:

Since the solution is half neutralized the concentrations of free propanoic acid and sodium propanoate are equal. Hence, substitution in the Henderson equation

$$\text{pH} = pK_a + \log\frac{[\text{salt of weak acid}]}{[\text{weak acid}]}$$

Gives $4.87 = pK_a + \log 1$

$4.87 = \text{p}K_a$

$\log K_a = -4.87$

Therefore $K_a = 1.35\ x\ 10^{-5}$ mol dm^{-3}

5. Preparation of Buffer

To prepare a solution that will be buffered at a particular pH, we begin with the Henderson equation. In practice, we generally pick the acid member of the buffer pair by its pK_a because the equation tells us that the desired pH cannot help being near the pK_a. The problem then is to find the ration of [anion] to [acid] whose log, when added to pK_a, gives the pH we want.

The usual guideline is that the pK_a should have such a value that the desired pH = pK_a ± 1. If the value of [anion]/[acid] is 10 (because the ratio is 10

to 1), the pH = pK_a + 1. If the value of [anion]/[acid] is 1/10, the pH = pK_a – 1. Generally, the range in the ratio of [anion] to [acid] should be maintained within the limits of 10 to 1 down to 1 to 10. Outside this range the buffers effectiveness declines.

Example 5:

Solution buffered at pH 5.00 is wanted. Will the pair, acetic acid (pK_a = 4.75) and sodium acetate, work for this purpose and, if so, what ratio of acetate ion to acetic acid is needed?

Solution:

We first have checked the pK_a of acetic acid to see if the desired pH is within ±1 pH unit of pKa. Since pKa = 4.75, these solutes will work. Now we apply the Henderson equation to find the proper ratio of [anion] to [acid]

$$\text{pH} = pK_a + \log\frac{[\text{anion}]}{[\text{acid}]}$$

$$5.00 = 4.75 + \log\frac{[\text{anion}]}{[\text{acid}]}$$

$$\log\frac{[\text{anion}]}{[\text{acid}]} = 5.00 - 4.75 = 0.025$$

$$\frac{[\text{anion}]}{[\text{acid}]} = antilog\ 0.25 = 1.8$$

The answer above is the ratio of the molar concentration of the anion and the acid. However, that the ratio is in this example identical to the ratio of the moles of anion to moles of acid as we can see by this analysis of the units,

$$\frac{[\text{anion}]}{[\text{acid}]} = \frac{\text{mole anion}/\text{liter solution}}{\text{mole acid}/\text{liter solution}} = \frac{\text{mole anion}}{\text{mole acid}}$$

Thus, the answer tells us that a solution containing a ratio of 1.8 mol of the acetate ion to 1.0 mol of acetic acid will be buffered at pH 5.00. To obtain that the ratio we could take 0.18 mol of $NaC_2H_3O_2$ to 0.10 mol of CH_3COOH or it we wanted a larger capacity buffer, we could take 1.8 mol of $NaC_2H_3O_2$ to 1.0 mol of CH_3COOH in the same volume. (If the buffer is to be used with some living organism, then we have to be careful about other factors, such as relative toxicities of the buffer systems compounds).

The Material was adapted by:

a. Anonim. (2010). *Acid-Base in Daily Life*. Diakses dari http://www.styleforfree.com pada tanggal 26 Desember 2011.
b. Chandra, M. (2003). *A guide for the preparation and use of buffers in biological systems*. Diakses pada tanggal 26 Desember 2011 dari http://wolfson.huji.ac.il/purification/PDF/Buffers/Calbiochem_Buffers_Booklet.pdf.
c. Charlesworth, P. (2004). *Chemistry (Fourth Edition)*. Michigan: Prentice Hall.
d. Helmenstine, A.M. (2008). *Acids and Bases.* Diakses dari http://www.chem-cool.com pada tanggal 26 Desember 2011.
e. Padolina, C.D, Antero, E.S, Alumaga, M.J, et al. (2007). *Conceptual and Functional Chemistry: Modular Approach*. Metro Manila: Vibal Publishing House, Inc.

LAMPIRAN 5

RPP

A. The First Meeting

LESSON PLAN

Education unit	**: SMAN 7 Purworejo**
Subject Matter	**: Chemistry**
Topic	**: Buffer Solution**
Sub topic	**: Buffers Solutions Work**
Grade/Semester	**: XI/II**
Time Allocation	**: 1 X 45 minutes**

A. STANDARD OF COMPETENCE

4. Understanding the properties of acid-base solutions, measurement methods, and its applications.

B. BASIC COMPETENCE

4.3 Describing the properties of buffer solutions and the function of buffer solutions in the body.

C. INDICATOR

Analysing on how do buffer solution work.

D. TEACHING LEARNING OBJECTIVES

Cognitive

- The students should be able to understand how does buffer solution react when it is added by acid
- The students should be able to understand how does buffer solution react when it is added by base
- The students should be able to analize on how does buffer solution work in maintaining its pH

Affective

- The students can work in a group discussion
- The students give response to the teacher actively

E. TOPIC IN DETAIL

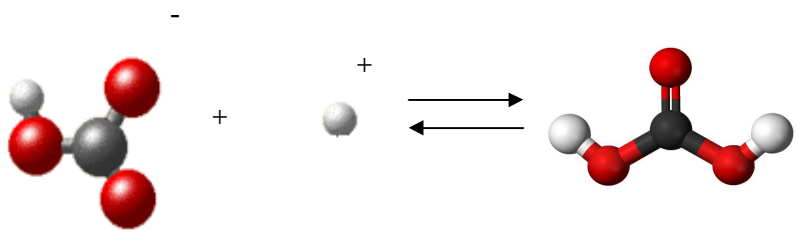
Buffers

Buffers are aqueous that resist changes in pH when small amounts of acid or base added. A buffer contains a weak acid and its conjugate base or a

weak base and its conjugate acid. Thus a buffer solution contains both an acid species and a base species. The buffer in sea water is mostly due to the presence of carbonic acid, H_2CO_3, and its conjugate base, the bicarbonate ion HCO_3^-. In blood, both the carbonate and phosphate buffers are present.

1. **Adding an acid to the buffer:** The buffer solution must remove most of the new hydrogen ions otherwise the pH would drop markedly. The hydrogen ions will combine with the bicarbonate ion to make carbonic acid:

$$HCO_{3\,(aq)}^{-} + H^{+}_{(aq)} \Leftrightarrow H_2CO_{3\,(aq)}$$



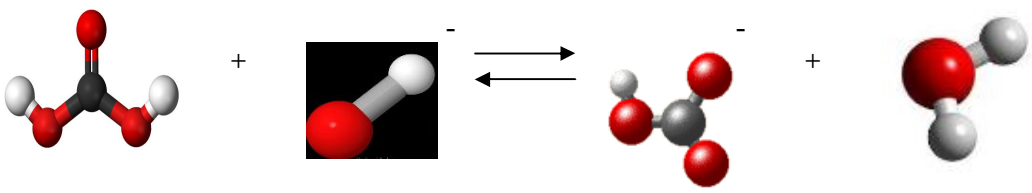
(It takes from http://wiki.ask.com/bicarbonate)

Even though the reaction is reversible, most of the new hydrogen ions have been removed, so the pH won't change very much. But *because* the reaction is reversible, the pH will decrease a very small amount.

2. **Adding a base to the buffer solution:** Bases contain hydroxide ions or react to form them, so the buffer solution must remove most of these ions. There are two ways in which the carbonic/bicarbonate buffer can remove the hydroxide ion. Either carbonic acid or bicarbonate ion reacts:

$$H_2CO_{3\,(aq)} + OH^{-}_{(aq)} \Leftrightarrow HCO_{3\,(aq)}^{-} + H_2O_{(l)}$$

$$HCO_{3\,(aq)}^{-} + OH^{-}_{(aq)} \Leftrightarrow CO_{3\,(aq)}^{2-} + H_2O_{(\ )}$$



(It takes from http://wiki.ask.com/bicarbonate)

Since most of the hydroxide has been removed, the pH of the buffer changes very little.

Buffer capacity:

Buffer capacity is the amount of acid or base that can be added to a buffer solution before a major pH change (more than +- 0.5 units) occurs. All buffers have a buffer capacity. They will resist change to pH when only small amounts of acid or base added. If large amounts of acid or base are added, then the buffer's capacity is exceeded and a major pH change will occur. The buffer's capacity is determined by the amount of acid and conjugate base. A buffer with a large capacity has a large concentration of HA and of A^-, so that it can absorb a relatively large amount of H_3O^+ or OH^-. The pH of a buffered solution is determined by the ratio $[HA]/[A^-]$. The capacity of a buffer is determined by the magnitude of [HA] and $[A^-]$.

The material was adapted by:

a. Chandra, M. (2003). *A guide for the preparation and use of buffers in biological systems*. Diakses pada tanggal 26 Desember 2011 dari http://wolfson.huji.ac.il/purification/PDF/Buffers/Calbiochem_Buffers_Booklet.pdf.
b. Charlesworth, P. (2004). *Chemistry (Fourth Edition)*. Michigan: Prentice Hall.
c. Miessler, G.A. & Tarr, D.A. (2003). *Inorganic chemistry (3rd ed.)*. Englewood Cliffs. New Jersey: Prentice Hall.
d. Huheey, J.E., Keiter, E.A., & Keiter, R.L. (1993). *Inorganic chemistry: principle of structure and reactivity (4th ed.)*. New York: Harper Collins College.

F. LESSON METHODE

Teaching method	:	Discussion and doing exercise
Teaching approach	:	Constructivism based on macroscopic, symbolic, and submicroscopic integrated dimension.
Teaching model	:	Cooperative learning

G. LESSON STEPS

Steps	Activities		Time allocation
Opening	Teacher	Students	5 minutes
	Greeting, praying, checking the attendance	Greeting, praying, checking the attendance	
	1. Apperception The teacher asks to the students what is the characteristic of solution that contains 10 mL of acetic acid solution (CH_3COOH) 0.1 M and 10 mL of CH_3COONa solution 0.1 M (K_a= $1.8x10^{-5}$)	1. Apperception The students answer the question based on their concept about buffer solution	
	2. Problem Asking the students to: Analyze the pH of solution that contains CH_3COOH and CH_3COONa by adding a small amount of acid (H^+) or base (OH^-), or by dilution (adding H_2O)	2. Problem Students relate the concept of buffer by adding a small amount of acid (H^+) or base (OH^-), or by dilution (adding H_2O)	
	3. The teacher explain the aims of study	3. The students know what the aims of study	
Main activity	1. The teacher divides the class into small groups based on their ability	1. The students work in their group	35 minutes
	2. The teacher give a work sheet to each group	2. Each group accept a work sheet	
	Exploration	**Elaboration**	
	3. The teacher explain how to arrange the equal of reaction and draw the ion or molecule structure in a reaction	3. The students on their group practice to arrange the equal of reaction and draw the ion or molecule structure in a reaction (submicroscopic dimension) to answer the question on work sheet (trying to find out the ideas)	
	4. The teacher observes and acts as facilitator in discussion	4. The students discuss the problem with their group	
	5. The teacher asks the students to present the result of discussion	5. Each group present the result of their discussion and the other groups give responses (restructure the ideas)	

Steps	Activities		Time allocation
	Confirmation	**Confirmation**	
	6. The teacher confirms the ideas of student	6. The students understand what their do and have the new knowledge	
Closure	1. The teacher asks students to sum up the conclusion of the study	1. The student sum up the material.	5 minutes
	2. The teacher closes the study n gives greeting	2. The students give greeting	

H. SOURCE/MATERIALS/TOOLS:

1. Source

   Chemistry book:

   a. Ang, C. B. (2009). *A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry.* Singapore: Fairfield Book Publisher.

   b. Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 245-267).

   c. Padolina, C.D, Antero, E.S, Alumaga, M.J, et al. (2007). *Conceptual and Functional Chemistry: Modular Approach*. Metro Manila: Vibal Publishing House, Inc. (PP 262-265).

   Internet

   a. www.chembio.uoguelph.ca/educmat/chm19104/chemtoons/buffer_make.swf

   b. http://www.csudh.edu/oliver/chemdata/buffers.htm

   c. http://wiki.ask.com/bicarbonate

2. Material

   Work sheet

   Hand out

3. Tools

   Computer

   LCD

   White board

I. ASSESMENT

Individual task, group task, performance assessment (occupation and attitude)

Scoring Guideline for Individual Task

Students Activity	Score
A buffer solution is made by mixing 50 mL of acetic acid solution (CH_3COOH) 0.2M and 10 mL of CH_3COONa solution 0.2M ($K_a=10^{-5}$). Calculate the pH of buffer solution!	
Solution :	
$CH_3COOH\ (aq) + NaOH\ (aq) \rightarrow CH_3COONa\ (aq) + H_2O\ (l)$	
i : 50 mL x 0,2 M 10mLx0,2M _ _	20
= 10 mmol = 2 mmol	20
r : -2 mmol -2mmol 2mmol 2mmol	
rm : 8 mmol 0 2mmol 2mmol	20
$[H^+] = K_a x \frac{mmol\ of\ remaining\ acid}{mmol\ salt}$	
$= 10^{-5} x \frac{8mmoles}{2mmoles} = 4x10^{-5} M$	20
$pH = -\log[H^+] = -\log 4 \times 10^{-5} = 5 - \log 4$	20
TOTAL SCORE	100

Acknowledge by
Chemistry Teacher of SMA N 7 Purworejo

A Muzaki, S.Pd
19670424 199603 1 003

Purworejo, 15 Februari 2012
Chemistry Teacher

Dini Nugraheni, SPd. Si
NIM. 10708251057

WORK SHEET

The Buffers Solutions Work

A. Problem

Why the buffer solution can resist a change in the pH even when we add to them acids or bases or diluting (adding H_2O)?

B. Discuss the question below and than draw the princip of buffer solution!

1. Prof. Muzaky adds the CH_3COOH (*aq*) by CH_3COONa (*aq*), what is the molecule or ion in this solution after its be a mixture? Draw the molecule or ion in this solution after its be a mixture!

2. If the substance in the solution 1 is added by acid (HCl), who is the substance which keep in pH by adding a small amount of acid (HCl)? Draw its molecule or ion!

3. If the substance in the solution 1 is added by base (NaOH), who is the substance which keep in pH by adding a small amount of base (NaOH)? Draw its molecule or ion!

4. If the substance in the solution 1 is added by H_2O, who is the substance which keep in pH by dilution (adding H_2O)? Draw its molecule or ion!

C. Deduce the result of your discussion to explain the problem!

SCORING GUIDELINE

pH of mixing solution

Student activity	Score
1. Prof. Muzaky adds the CH_3COOH (*aq*) by CH_3COONa (*aq*), what is the molecule or ion in this solution after its be a mixture? Draw the molecule or ion in this solution after its be a mixture! Reaction: $CH_3COOH\ (aq) + H_2O\ (l) \leftrightarrow CH_3COO^-\ (aq) + H_3O^+\ (aq)$ $CH_3COONa\ (aq) \longrightarrow CH_3COO^-\ (aq) + Na^+\ (aq)$ The molecule or ion in this solution after its be a mixture is $CH_3COO^-\ (aq)$	10
2. If the substance in the solution 1 is added by acid (HCl), who is the substance which keep in pH by adding a small amount of acid (HCl)? Draw its molecule or ion! In water solution, HCl completely ionized to form H^+ ions $HCl\ (aq) \longrightarrow H^+\ (aq) + Cl^-\ (aq)$ H^+ ions from HCl will be neutralized by the base component, CH_3COO^-	10
3. If the substance in the solution 1 is added by base (NaOH), who is the substance which keep in pH by adding a small amount of base (NaOH)? Draw its molecule or ion! In water solution, NaOH completely ionized to form OH^- ions $NaOH\ (aq) \longrightarrow Na^+\ (aq) + OH^-\ (aq)$ OH^- ions from NaOH will be neutralized by the acid component, CH_3COOH	10
4. The addition of water affects a buffer solution (dilutes of a buffer). When water is added to a buffer solution, the pH remains unchanged. Let usexamine this. $HA \leftrightarrow H^+ + A^-$ $K_a = [H^+]\,[A^-] / [HA]$ Rearranging this, we can see that: $[H^+] = K_a\,[HA] / [A^-]$. The addition of more water to the buffer does not change the ratio $[HA]/[A^-]$,since the same amount of water is being added to both. If this ratio remains unchanged, the pH stays the same. This analysis does not consider new effects that appear if the solution becomes extremely dilute.	10

Student activity	Score
The result of discussion A buffer resists change to pH when small amounts of acid or base or water are added	10

Total test scores = ∑ scores x 2

THE RESULT OF STUDENT'S WORK

No.	Name	Skor
		The 1st Work Sheet (The Buffers Solution Work)
1.	Amd	90
2.	Bgk	90
3.	Dhi	90
4.	Dia	90
5.	Ek	80
6.	Fzl	100
7.	Fkr	90
8.	Frh	80
9.	Hsn	90
10.	Hng	90
11.	Ihn	90
12.	Ink	90
13.	Ins	90
14.	Irm	100
15.	Jti	90
16.	Kha	90
17.	Mnc	90
18.	Nia	90
19.	Rkh	100
20.	Ref	80
21.	Rif	90
22.	Rij	80
23.	Rik	90
24.	Son	90
25.	Spr	90
26.	Whd	90
27.	Ynr	100
28.	Ylt	90

Observer

A. Muzaki, S.Pd
19670424 199803 1 003

Observer

Chemistry's Teacher

Dini Nugraheni, SPd. Si
NIM :10708251057

THE OBSERVATION OF SOCIAL SKILL

(The first meeting)

Education Unit : SMAN 7 Purworejo

Class : XI IPA 2

Date :

No.	Name	The aspects of social skill			
		Asking question	Active participation	Cooperation	Communication
1.	Amd	4	4	4	4
2.	Bgk	4	5	5	5
3.	Dhi	4	3	4	4
4.	Dia	3	4	5	3
5.	Ek	3	3	4	4
6.	Fzl	3	3	4	4
7.	Fkr	3	4	4	3
8.	Frh	5	5	5	5
9.	Hsn	5	4	4	4
10.	Hng	4	4	4	4
11.	Ihn	3	3	3	3
12.	Ink	3	3	4	3
13.	Ins	4	5	4	4
14.	Irm	5	5	5	4
15.	Jti	4	5	5	4
16.	Kha	4	3	4	3
17.	Mnc	4	4	4	4
18.	Nia	3	4	3	3
19.	Rkh	5	4	4	4
20.	Ref	4	4	5	4
21.	Rif	4	4	4	4
22.	Rij	5	4	4	3
23.	Rik	4	4	4	4
24.	Son	3	3	3	3
25.	Spr	4	3	4	4
26.	Whd	4	4	5	4
27.	Ynr	4	4	4	5
28.	Ylt	4	4	4	4

Observer

A Muzaki, S.Pd

19670424 199603 1 003

Observer

Chemistry's Teacher

Dini Nugraheni, SPd. Si

NIM :10708251057

The Assesment criteria of social skills

No.	Option	Criteria
1.	5	If the student is very active in asking question about the topic
	4	If the student is active in asking question about the topic
	3	If the student is active enough in asking question about the topic l
	2	If the student is less active in asking question about the topic
	1	If the student isn't active in asking question about the topic
2.	5	If the student is very active in giving idea about the topic
	4	If the student is active in giving idea about the topic
	3	If the student is active enough in giving idea about the topic
	2	If the student is less active in giving idea about the topic
	1	If the student isn't active in giving idea about the m topic
3.	5	If the student is very active in cooperation with the other friends
	4	If the student is active in cooperation with the other friends
	3	If the student is active enough in cooperation with the other friends
	2	If the student is less active in cooperation with the other friends
	1	If the student isn't active in cooperation with the other friends
4.	5	If the student is very active in communication with the other friends
	4	If the student is active in communication with the other friends
	3	If the student is active enough in communication with the other friends
	2	If the student is less active in communication with the other friends
	1	If the student isn't active in communication with the other friends

THE RESULT OF SOCIAL SKILL

(The first meeting)

Education Unit : SMAN 7 Purworejo

Class : XI IPA 2

Date :

No.	Name	The aspects of social skill				Rerata skor	Kategori
		I	II	III	IV		
1.	Amd	4	4	4	4	4	Baik
2.	Bgk	4	5	5	5	4,75	Sangat baik
3.	Dhi	4	3	4	4	3,75	Sangat baik
4.	Dia	3	4	5	3	3,75	Sangat baik
5.	Ek	3	3	4	4	3,5	Baik
6.	Fzl	3	3	4	4	3,5	Baik
7.	Fkr	3	4	4	3	3,5	Baik
8.	Frh	5	5	5	5	5	Baik
9.	Hsn	5	4	4	4	4,25	Sangat baik
10.	Hng	4	4	4	4	4	Baik
11.	Ihn	3	3	3	3	3	Cukup
12.	Ink	3	3	4	3	3,25	Baik
13.	Ins	4	5	4	4	4,25	Sangat baik
14.	Irm	5	5	5	4	4,75	Sangat baik
15.	Jti	4	5	5	4	4,5	Sangat baik
16.	Kha	4	3	4	3	3,5	Baik
17.	Mnc	4	4	4	4	4	Baik
18.	Nia	3	4	3	3	3,25	Baik
19.	Rkh	5	4	4	4	4,25	Sangat baik
20.	Ref	4	4	5	4	4,25	Sangat baik
21.	Rif	4	4	4	4	4	Baik
22.	Rij	5	4	4	3	4	Baik
23.	Rik	4	4	4	4	4	Baik
24.	Son	3	3	3	3	3	Cukup
25.	Spr	4	3	4	4	3,75	Baik
26.	Whd	4	4	5	4	4,25	Sangat baik
27.	Ynr	4	4	4	5	4,25	Sangat baik
28.	Ylt	4	4	4	4	4	Baik
Rerata						**3,94**	**Baik**

B. The Second Meeting

LESSON PLAN

Education unit	**: SMAN 7 Purworejo**
Subject Matter	**: Chemistry**
Topic	**: Buffer Solution**
Sub topic	**: pH of Buffer**
Grade/Semester	**: XI/II**
Time Allocation	**: 2 X 45 minutes**

A. STANDARD OF COMPETENCE

4. Understanding the properties of acid-base solutions, measurement methods, and its applications.

B. BASIC COMPETENCE

4.3 Describing the properties of buffer solutions and the function of buffer solutions in the body.

C. INDICATOR

Calculating the pH or pOH of buffer solution

D. TEACHING LEARNING OBJECTIVES

Cognitive

- The students shloud be able to define a buffer solution and its components using the Brønsted-Lowry theory.
- The students should be able to calculate the pH or pOH of a system that contais a buffer solution.

Affective

- The students should be able to express their creativity in a small group

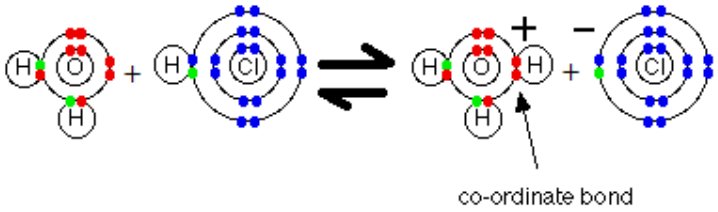
E. TOPIC IN DETAIL

1. Prerequisite concepts

We frequently encounter acids and bases in our daily life. Fruits, such as oranges, apples, etc., contain acids. Household ammonia, a cleaning agent, and Liquid Plumber are bases. Acids are compounds that can donate a proton (hydrogen ion). Bases are compounds that can accept a proton. This classification system was proposed simultaneously by Johannes Brønsted and

Thomas Lowry in 1923, and it is known as the Brønsted-Lowry theory. Thus any proton donor is an acid, and a proton acceptor is a base.

When HCl reacts with water



HCl is an acid and H_2O is a base because HCl donated a proton thereby becoming Cl^- and water accepted a proton thereby becoming H_3O^+.

In the reverse reaction (from right to left) the H_3O^+ is an acid and Cl^- is a base. As the arrow indicates, the equilibrium in this reaction lies far to the right. That is, out of every 1000 HCl molecules dissolved in water, 990 are converted to Cl^- and only 10 remain in the form of HCl at equilibrium. But H_3O^+ (hydronium ion) is also an acid and can donate a proton to the base, Cl^{--} . Why do hydronium ions not give up protons to Cl^- with equal ease and form more HCl? This is because different acids and bases have different strengths. HCl is a stronger acid than hydronium ion, and water is a stronger base than Cl^-.

In the Brønsted-Lowry theory, every acid–base reaction creates its conjugate acid–base pair. In the above reaction HCl is an acid which, after giving up a proton, becomes a conjugate base, Cl^-. Similarly, water is a base which, after accepting a proton, becomes a conjugate acid, the hydronium ion.

Conjugate base-acid pair

$$HCl + H_2O \Leftrightarrow H_3O^+ + Cl^-$$

Conjugate acid-base pair

Some acids can give up only one proton. These are monoprotic acids. Examples are HCl, HNO_3, HCOOH , and CH_3COOH . The hydrogens circled are the ones donated. Other acids yield two or three protons. These are called diprotic or triprotic acids. Examples are H_2SO_4, H_2CO_3, and H_3PO_4. However, in the Brønsted-Lowry theory, each acid is considered monoprotic,

and a diprotic acid (such as carbonic acid) donates its protons in two distinct steps:

$$H_2CO_3 + H_2O \Leftrightarrow H_3O^+ + HCO_3^-$$
$$HCO_3^- + H_2O \Leftrightarrow H_3O^+ + CO_3^{2-}$$

Thus the compound HCO_3^- is a conjugate base in the first reaction and an acid in the second reaction. A compound that can act either as an acid or a base is called amphiprotic.

In the self-ionization reaction

$$H_2O + H_2O \leftrightarrow H_3O^+ + OH^-$$

one water acts as an acid (proton donor) and the other as a base (proton acceptor). In pure water, the equilibrium lies far to the left, that is, only very few hydronium and hydroxyl ions are formed. In fact, only 1 $x10^{-7}$ moles of hydronium ion and $1x10^{-7}$ moles of hydroxide ion are found in one liter of water. The dissociation constant for the self ionization of water is

$$K_d = \frac{[H_3O^+][OH^-]}{[H_2O]^2}$$

This can be rewritten as

$$K_w = K_d[H_2O]^2 = [H_3O^+][OH^-]$$

K_w, the ion product of water, is still a constant because very few water molecules reacted to yield hydronium and hydroxide ions; hence the concentration of water essentially remained constant. At room temperature, the K_w has the value of

$$K_w = 1x10^{-14} = [1x10^{-7}][1x10^{-7}]$$

This value of the ion product of water applies not only to pure water but to any aqueous (water) solution. This is very convenient because if we know the concentration of the hydronium ion, we automatically know the concentration of the hydroxide ion and vice versa. For example, if in a 0.01 M HCl solution HCl dissociates completely, the hydronium ion concentration is

$$[H_3O^+] = 1x10^{-2}\ M$$

This means that the $[OH^-]$ is

$$[OH^-] = \frac{K_w}{[H_3O^+]} = \frac{1x10^{-14}}{1x10^{-2}} = 1x10^{-12}M$$

To measure the strength of an aqueous acidic or basic solution, P. L. Sorensen introduced the pH scale.

$$pH = -\log [H_3O^+]$$

In pure water, we have seen that the hydronium ion concentration is 1 $x10^{-7}$ M. The logarithm of this is -7 and, thus, the pH of pure water is 7. Since water is an amphiprotic compound, pH 7 means a neutral solution. On the other hand, in a 0.01 M HCl solution (dissociating completely), we have

$$[H_3O^+] = 1x10^{-2}\ M$$

Thus its pH is 2. The pH scale shows that acidic solutions have a pH less than 7 and basic solutions have a pH greater than 7.

pH	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Acidic						Neutral				Basic			

The pH of a solution can be measured conveniently by special instruments called pH meters. All that must be done is to insert the electrodes of the pH meter into the solution to be measured and read the pH from a scale. pH of a solution can also be obtained, although less precisely, by using a pH indicator paper. The paper is impregnated with organic compounds that change their color at different pH values. The color shown by the paper is then compared with a color chart provided by the manufacturer.

2. Main Concept

BUFFERS AND pH OF BUFFERS

There are certain solutions that resist a change in the pH even when we add to them acids or bases. Such systems are called **buffers**. A mixture of a weak acid and its conjugatebase usually forms a good buffer system. An example is carbonic acid, which is the most important buffer in our blood and maintains it close to pH 7.4. Buffers resist large changes in pH because of the Le Chatelier principle governing equilibrium conditions. In the carbonic acid–bicarbonate (weak acid–conjugate base) buffer system,

$$H_2CO_3 + H_2O \Leftrightarrow H_3O^+ + HCO_3^-$$

any addition of an acid, H_3O^+, will shift the equilibrium to the left. Thus this reduces the hydronium ion concentration, returning it to the initial value so that it stays constant; hence the change in pH is small. If a base, OH^-, is added to such a buffer system, it will react with the H_3O^+ of the buffer. But the

equilibrium then shifts to the right, replacing the reacted hydronium ions, hence again, the change in pH is small.

Buffers stabilize a solution at a certain pH. This depends on the nature of the buffer and its concentration. For example, the carbonic acid–bicarbonate system has a pH of 6.37 when the two ingredients are at equimolar concentration. A change in the concentration of the carbonic acid relative to its conjugate base can shift the pH of the buffer. The Henderson-Hasselbalch equation below gives the relationship between pH and concentration.

$$pH = pK_a + \log\frac{[A^-]}{[HA]}$$

In this equation the pKa is the -logK_a, where K_a is the dissociation constant of carbonic acid

$$K_a = \frac{[HCO_3^-][H_3O^+]}{[H_2CO_3]}$$

[HA] is the concentration of the acid and [A^-] is the concentration of the conjugate base. The pK_a of the carbonic acid–bicarbonate system is 6.37. When equimolar conditions exist, then [HA] = [A^-]. In this case, the second term in the Henderson-Hasselbalch equation is zero. This is so because [A^-]/[HA] =1, and the log 1 = 0. Thus at equimolar concentration of the acid–conjugate base, the pH of the buffer equals the pKa; in the carbonic acid–bicarbonate system this is 6.37. If, however, we have ten times more bicarbonate than carbonic acid, [A^-]/[HA] = 10, then log 10 = 1 and the pH of the buffer will be

$$pH = pK_a + \log\frac{[A^-]}{[HA]} = 6.37 + 1.0 = 7.37$$

This is what happens in our blood, the bicarbonate concentration is ten times that of the carbonic acid and this keeps our blood at a pH of 7.4. Any large change in the pH of our blood may be fatal (acidosis or alkalosis). Other buffer systems work the same way. For example, the second buffer system in our blood is

$$H_2PO_4 + H_2O \Leftrightarrow HPO_4^{2-} + H_3O^+$$

The pK_a of this buffer system is 7.21. It requires a 1.6 to 1.0 molar ratio of HPO_4^{2-} to $H_2PO_4^-$ to maintain our blood at pH 7.4.

There are four perfectly correct ways to write the H-H equation. They are:

$$pH = pKa - \log\frac{[HA]}{[A^-]}$$

$$pH = pKa + \log\frac{[A^-]}{[HA]}$$

$$pOH = pKb + \log\frac{[\text{conjugate cation}]}{[\text{base}]}$$

$$pOH = pKb - \log\frac{[\text{base}]}{[\text{conjugate cation}]}$$

The material was adapted by:

a. Anonim. (2010). *Acid-Base in Daily Life*. Diakses dari http://www.styleforfree.com pada tanggal 26 Desember 2011.
b. Chandra, M. (2003). *A guide for the preparation and use of buffers in biological systems*. Diakses pada tanggal 26 Desember 2011 dari http://wolfson.huji.ac.il/purification/PDF/Buffers/Calbiochem_Buffers_Booklet.pdf.
c. Charlesworth, P. (2004). *Chemistry (Fourth Edition)*. Michigan: Prentice Hall.
d. Helmenstine, A.M. (2008). *Acids and Bases*. Diakses dari http://www.chem-cool.com pada tanggal 26 Desember 2011.

F. LESSON METHODE

Teaching method	:	Discussion and doing exercise
Teaching approach	:	Constructivism based on macroscopic, symbolic, and submicroscopic integrated dimension.
Teaching model	:	Cooperative learning

G. LESSON STEPS

Steps	Activities		Time allocation
Opening	Teacher	Students	10 minutes
	Greeting, praying, checking the attendance	Greeting, praying, checking the attendance	
	1. Apperception Asking to the students about the definition of acidic an base according to the Brønsted-Lowry theory	1. Apperception Describing the definition of acidic an base according to the Brønsted-Lowry theory	
	2. Problem Asking to the students: What is the system name if CH_3COOH aqueous is added by CH_3COOH aqueous? How the compositions of its system? How do to calculate its pH?	2. Problem Students give response: The system is called buffer. The compositions of its system are acidic and base conjugation.	
	3. The teacher explain the aims of study	3. The students know what the aims of study	
Main activity	1. The teacher divides the class into small groups based on their ability	1. The students work in their group	70 minutes
	Exploration 1		
	2. The teacher give a work sheet to each group	2. Each group accept a work sheet	
	Elaboration 1		
	3. The teacher observes and acts as facilitator in discussion	3. The students discuss the problem with their group (trying to find out the ideas)	
	Confirmation 1		
	4. The teacher asks the students to present the result of discussion	4. Each group present the result of their discussion and the other groups give responses (restructure the ideas)	
	5. The teacher confirms the ideas of student (showing the presentation of buffer solution)	5. The students understand what they do and have the new knowledge	
Closure	1. The teacher asks students to sum up the conclusion of the study	1. The student sum up the material.	10 minutes
	2. The teacher closes the study and gives greeting	2. The students give greeting	

H. SOURCE/MATERIALS/TOOLS :

1. Source

   Chemistry book:

   a. Ang, C. B. (2009). *A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry*. Singapore: Fairfield Book Publisher (PP 250-292)

   b. Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 245-267)

   c. Padolina, C.D, Antero, E.S, Alumaga, M.J, et al. (2007). *Conceptual and Functional Chemistry: Modular Approach*. Metro Manila: Vibal Publishing House, Inc (PP 262-265)

   Internet

   a. www.chembio.uoguelph.ca/educmat/chm19104/chemtoons/buffer_make.swf

   b. http://www.csudh.edu/oliver/chemdata/buffers.htm

2. Material

   Work sheet

   Hand out

3. Tools

   Computer

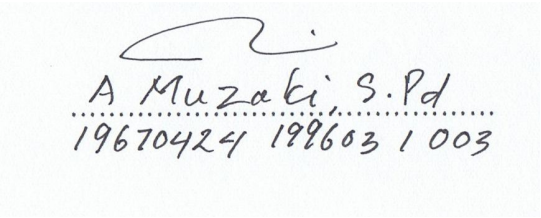
   LCD

   White board

I. ASSESMENT

Individual task, group task, performance assessment (occupation and attitude)

Acknowledge by
Chemistry Teacher of SMA N 7 Purworejo



Purworejo, 16 Februari 2012
Chemistry Teacher

Dini Nugraheni, SPd. Si
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WORK SHEET

pH of mixing solution

A. Problem

How do we calculate the pH of mixing solution which contains a conjugate acid-base pair?

B. Before you answer the question above, discuss with friends in your group about the question below:

1. Calculate the pH 10 mL of 0.1 M CH_3COOH (*aq*), K_a CH_3COOH (*aq*) = 1.7×10^{-5}!
2. In laboratory Prof. Sogi adds 10 mL CH_3COONa (*aq*) 0.1 M to 10 mL CH_3COOH (*aq*) 0.1 M, K_a CH_3COOH (*aq*) = 1.7×10^{-5}
   a. Does CH_3COOH react with CH_3COONa? Explain your ideas and write down the equation of this reaction!
   b. Determine the K_a of mixing solution!
   c. If we considered that in the initial and the final concentration of CH_3COOH are same and the source of CH_3COO^- is considered only from CH_3COONa, and the CH_3COO^- from CH_3COOH is discounted, calculate $[H_3O^+]$!
   d. Determine the pH formula of mixing solution which contains of weak acid and it's conjugate base!

C. Deduce the result of your discussion!

SCORING GUIDELINE

pH of mixing solution

<table>
<tr><th>Student activity</th><th>Score</th></tr>
<tr><td>
1. CH_3COOH (aq) + H_2O (l) ↔ CH_3COO^- (aq) + H_3O^+ (aq)
<table>
<tr><td></td><td>CH_3COOH</td><td>H_2O</td><td>CH_3COO^-</td><td>H_3O^+</td></tr>
<tr><td>Initial</td><td>0.1</td><td></td><td></td><td></td></tr>
<tr><td>Change</td><td>-0.1 α</td><td></td><td>0.1 α</td><td>0.1 α</td></tr>
<tr><td>Equilibrium</td><td>0.1(1- α)</td><td></td><td>0.1 α</td><td>0.1 α</td></tr>
</table>
In this solution
Ka = [H_3O^+] [CH3COO$^-$] / [CH3COOH].
1.7 x 10^{-5} = (0.1 α) (0.1 α) / 0.1(1- α)
α is too small, so it can be assumed (1- α) ≈ 1
After rearranging, we get
0.1 α^2 = 1.7 x 10^{-5}
α = √(1.7 x 10^{-5} : 0.1)
α = 0.0130
[H_3O^+] = 0.1 α = 0.1 x 0.0130 = 1.3 x 10^{-3} M
pH = - log [1.3 x 10^{-3} M] = 2.89
</td><td>10</td></tr>
<tr><td>
2. In laboratory Prof. Sogi adds 10 mL CH_3COONa (aq) 0.1 M to 10 mL CH_3COOH (aq) 0.1 M, K_a CH_3COOH (aq) = 1.7 x 10^{-5}
a. Do CH_3COOH react with CH_3COONa? Explain your ideas and write down the equation of this reaction!
In water solvent, the CH_3COOH forms small amount of H_3O^+ and conjugate base CH_3COO^-. The presence of the conjugate base CH_3COO^- from CH_3COONa will change the equilibrium of the CH_3COOH.
Reaction:
CH_3COOH (aq) + H_2O (l) ↔ CH_3COO^- (aq) + H_3O^+ (aq)
CH_3COONa (aq) ⟶ CH_3COO^- (aq) + Na^+ (aq)
</td><td>10</td></tr>
<tr><td>
b. Ka = [H_3O^+] [CH3COO$^-$] / [CH3COOH].
</td><td>5</td></tr>
</table>

Student activity	Score
c. If we considered that in the initial and the result concentration of CH_3COOH are same and the source of CH_3COO^- is considered only from CH_3COONa, and the CH_3COO^- from CH_3COOH is discounted, calculate $[H_3O^+]$! ➢ The K_a of acetic acid is 1.7×10^{-5}. ➢ The equilibrium reaction is $CH_3COOH_{(aq)} + H_2O_{(l)} \leftrightarrow CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$. ➢ The total volume of the mixture solution is 20 mL. ➢ The concentration of acetic acid is 0.1 *M.* ➢ The concentration of the acetate ion is 0.1 *M* Filling in the ICE concentration table:	10

	CH_3COOH	H_2O	CH_3COO^-	H_3O^+
Initial	0.1 M		0.1 M	
Change	-x		+ x	+x
Equilibrium	0.1M - x		0.1 M +x	x

In this solution

$Ka = [H_3O^+] [CH3COO^-] / [CH3COOH]$.

We substitute the equilibrium concentrations in the above equation. In doing so we can assume that X is small compared with 0.1 M. So the net equation is:

$1.7 \times 10^{-5} = [X] [0.1 M]/ [0.1 M]$

After rearranging, we get

$[H_3O^+] = (1.7 \times 10^{-5}) [0.1 M]/ [0.1 M]$

$[H_3O^+] = 1.7 \times 10^{-5} M$

$pH = - \log [1.7 \times 10^{-5} M] = 4.76$ which is in the acid range

Student activity	Score
The result of discussion The pH of mixing solution which contains a conjugate acid-base pair: $$pH = pKa - \log\frac{[HA]}{[A^-]}$$ $$pH = pKa + \log\frac{[A^-]}{[HA]}$$ $$pOH = pKb + \log\frac{[\text{conjugate cation}]}{[\text{base}]}$$ $$pOH = pKb - \log\frac{[\text{base}]}{[\text{conjugate cation}]}$$	20

Total test scores = (∑ scores/55) x 100

THE RESULT OF STUDENT'S WORK

No.	Name	Skor
		The 2nd Work Sheet (pH of mixing solution)
1.	Amd	60
2.	Bgk	60
3.	Dhi	80
4.	Dia	80
5.	Ek	70
6.	Fzl	60
7.	Fkr	60
8.	Frh	70
9.	Hsn	80
10.	Hng	80
11.	Ihn	60
12.	Ink	60
13.	Ins	60
14.	Irm	75
15.	Jti	60
16.	Kha	80
17.	Mnc	80
18.	Nia	75
19.	Rkh	60
20.	Ref	70
21.	Rif	60
22.	Rij	70
23.	Rik	75
24.	Son	60
25.	Spr	60
26.	Whd	80
27.	Ynr	75
28.	Ylt	80

Observer

A Muzaki, S.Pd

19670424 198603 1 003

Observer

Chemistry's Teacher

Dini Nugraheni, SPd. Si

NIM :10708251057

CREATIVITY SCORING GIUDELINE

(The second meeting)

Education Unit : SMAN 7 Purworejo
Class : XI IPA 2
Date :

No.	Name	Domain									
		Cognitive					Affective				
		A	B	C	D	E	A	B	C	D	E
1.	Amd	4	3	3	4	4	4	4	4	4	4
2.	Bgk	4	4	4	4	4	4	5	5	5	4
3.	Dhi	4	3	3	3	4	4	3	4	4	5
4.	Dia	4	5	4	4	4	3	4	5	3	4
5.	Ek	3	4	4	3	3	3	3	4	4	4
6.	Fzl	3	3	3	4	4	3	3	4	4	4
7.	Fkr	4	3	3	3	3	3	4	4	3	4
8.	Frh	4	4	5	5	5	5	5	5	5	4
9.	Hsn	4	4	4	4	4	5	4	4	4	4
10.	Hng	4	5	4	4	5	4	4	4	4	4
11.	Ihn	4	3	3	3	3	3	3	3	3	4
12.	Ink	3	4	4	3	3	3	3	4	3	3
13.	Ins	4	4	4	4	5	4	5	4	4	4
14.	Irm	4	5	5	5	4	5	5	5	4	4
15.	Jti	4	4	5	4	4	4	5	5	4	4
16.	Kha	3	4	4	3	4	4	3	4	3	4
17.	Mnc	4	4	4	3	4	4	4	4	4	3
18.	Nia	3	4	4	3	3	3	4	3	3	4
19.	Rkh	4	4	4	4	3	5	4	4	4	3
20.	Ref	4	4	3	4	4	4	4	5	4	4
21.	Rif	3	4	4	4	4	4	4	4	4	5
22.	Rij	3	3	4	3	3	5	4	4	3	4
23.	Rik	4	4	4	4	3	4	4	4	4	3
24.	Son	3	3	3	3	3	3	3	3	3	3
25.	Spr	4	3	4	4	4	4	3	4	4	4
26.	Whd	4	4	5	5	5	4	4	5	4	4
27.	Ynr	4	4	4	5	4	4	4	4	5	5
28.	Ylt	5	4	4	4	4	4	4	4	4	4

Observer

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Observer

SUGIHARTO
NIP. 19650318 198803 1008

Chemistry's Teacher

Dini Nugraheni, SPd. Si
NIM :10708251057

THE ASPECTS OF CREATIVITY

I. **Cognitive Domain**

A. Fluency

3 = if the student respons to questions and produces a good idea fluently

2 = if the student respons to questions with a simple idea

1 = if the student respons to question without giving an idea

0 = if the student unable to answer questions and give ideas

B. Flexibility

3 = if the student able to provides three or more answering alternatives in problem solving

2 = if the student able to provides two answering alternatives in problem solving

1 = if the student able to provides one answering alternative in problem solving

0 = if the student unable to provides the answering alternative in problem solving

C. Originality

3 = if the student always gives the original ideas without imitiating the other friends

2 = if the student gives the original ideas without imitiating the other friends occasionally

1 = if the student ever gives the original ideas without imitiating the other friends occasionally

0 = if the student never gives the original ideas without imitiating the other friends occasionally

D. Elaboration

3 = if the student solves the problem by describing the idea in detail

2 = if the student solves the problem by describing the simple idea

1 = if the student solves the problem by describing the idea in detail but not true

0 = if the student can't solve the problem

E. Evaluation

3 = if the student gives evaluation based on the right reason

2 = if the student gives evaluation without the right reason

1 = if the student gives evaluation but not true

0 = if the student unable to give evaluation

II. Affective Domain

A. Curiosity

3 = if the students always asks question to the teacher if they have problems

2 = if the students asks question to the teacher occasionally

1 = if the students ever asks question to the teacher

0 = if the students never asks question to the teacher

B. Imagination

3 = if the student always able to imagine the abstract material

2 = if the student able to imagine the abstract material occasionally

1 = if the student ever able to imagine the abstract material

0 = if the student never able to imagine the abstract material

C. Plurality

3 = if the student always gives respon by looking at various aspects

2 = if the student gives respon by looking at various aspects occasionally

1 = if the student ever gives respon by looking at various aspects

0 = if the student never gives respon by looking at various aspects

D. Face the risk

3 = if the student always solves the task although its too difficult

2 = if the student solves the difficult task accasionally

1 = if the student ever solves the difficult task

0 = if the student never solves the difficult task

E. Acceptance of ideas

3 = if the student always able to appreciate the other friend's opinion

2 = if the student gives appreciation to the other friend's opinion accasionally

1 = if the student ever gives appreciation to the other friend's opinion

0 = if the student never give appreciation to the other friend's opinion

THE RESULT OF CREATIVITY

(The second meeting)

Education Unit : SMAN 7 Purworejo

Class : XI IPA 2

Date :

No.	Name	Domain										Rerata Skor	Kategori
		Cognitive					Affective						
		A	B	C	D	E	A	B	C	D	E		
1.	Amd	4	3	3	4	4	4	4	4	4	4	3,8	Baik
2.	Bgk	4	4	4	4	4	4	5	5	5	4	4,3	Sangat baik
3.	Dhi	4	3	3	3	4	4	3	4	4	5	3,7	Baik
4.	Dia	4	5	4	4	4	3	4	5	3	4	4	Baik
5.	Ek	3	4	4	3	3	3	3	4	4	4	3,5	Baik
6.	Fzl	3	3	3	4	4	3	3	4	4	4	3,5	Baik
7.	Fkr	4	3	3	3	3	3	4	4	3	4	3,4	Baik
8.	Frh	4	4	5	5	5	5	5	5	5	4	4,7	Sangat baik
9.	Hsn	4	4	4	4	4	5	4	4	4	4	4,1	Baik
10.	Hng	4	5	4	4	5	4	4	4	4	4	4,2	Baik
11.	Ihn	4	3	3	3	3	3	3	3	3	4	3,2	Cukup
12.	Ink	3	4	4	3	3	3	3	4	3	3	3,3	Cukup
13.	Ins	4	4	4	4	5	4	5	4	4	4	4,2	Baik
14.	Irm	4	5	5	5	4	5	5	5	4	4	4,6	Sangat baik
15.	Jti	4	4	5	4	4	4	5	5	4	4	4,3	Sangat baik
16.	Kha	3	4	4	3	4	4	3	4	3	4	3,6	Baik
17.	Mnc	4	4	4	3	4	4	4	4	4	3	3,8	Baik
18.	Nia	3	4	4	3	3	3	4	3	3	4	3,4	Cukup
19.	Rkh	4	4	4	4	3	5	4	4	4	3	3,9	Baik
20.	Ref	4	4	3	4	4	4	4	5	4	4	4	Baik
21.	Rif	3	4	4	4	4	4	4	4	4	5	4	Baik
22.	Rij	3	3	4	3	3	5	4	4	3	4	3,6	Baik
23.	Rik	4	4	4	4	3	4	4	4	4	3	3,8	Baik
24.	Son	3	3	3	3	3	3	3	3	3	3	3	Cukup
25.	Spr	4	3	4	4	4	4	3	4	4	4	3,8	Baik
26.	Whd	4	4	5	5	5	4	4	5	4	4	4,4	Sangat baik
27.	Ynr	4	4	4	5	4	4	4	4	5	5	4,3	Sangat baik
28.	Ylt	5	4	4	4	4	4	4	4	4	4	4,1	Baik
Rerata Skor												**3,88**	**Baik**

C. The Third Meeting

Lesson Plan

Education unit : SMAN 7 Purworejo

Subject Matter : Chemistry

Topic : Buffer Solution

Sub topic : Analyzing of Buffer Solution

Grade/Semester : XI/II

Time Allocation : 2 X 45 minutes

A. Competency Standards

4. Understanding the properties of acid-base solutions, measurement methods, and its applications.

B. Basic Competency

4.3 Describing the properties of buffer solutions and the function of buffer solutions in the body.

C. Indicators

- Analyzing a buffer solution through an experiment
- Analyzing non buffer solution through an experiment
- Analyzing and explaining the use of buffers, including the role of H_2CO_3/HCO_3^- in controlling pH in blood.

D. Teaching Learning Objectives

Cognitive

- Students should be able to analyze buffer solution through an experiment
- Students should be able to analyze unbuffer solution through an experiment
- Students should be able to analyze and explain the uses of buffers, including the role of H_2CO_3/ HCO_3^- controlling pH in blood

Affective

- The students can work together in small groups

Psychomotor

- The students can practice buffer rightly

E. Material Analysis

a. Prerequisite concepts

Solution stoichiometry

b. Main concepts

Buffer solution

The function of buffer solution

c. Supplemental concepts

The application of buffer solution in daily life

Material for buffer solution is presented on handout in the end of this lesson plan.

F. The Method, Approach and Model

Teaching method : Experiment (Instruction for buffer experiment is presented in this lesson plan)

Teaching approach : Process skill

Teaching model : Experiment

G. The Step of Lesson

Steps	Cognitive domain	Activities	Time allocation
Opening	• Repeating • Stating	Pre-opening 1. Greeting 2. The teacher checks the attendance 3. The teacher sets the class (dividing the students into the groups) 4. Making sure that the situation are conducive 5. Opening a. Apperception 1) The students answer the question about solution in stoichiometry 2) The teacher asks students to recall the concept of acid and base b. Motivation The teacher makes a good situation that interest	10 minutes

Steps	Cognitive domain	Activities	Time allocation
		students to study about buffer solution. c. The teacher explains the aims of study	
Main activity	• Listening • Writing • Analyzing • Exploring • Observing	**Exploration** a. Problem Recognition 1) The students are asked to explore the information about buffer solution and the kinds of buffer solution by handout or another source. 2) The students are given a problem about buffer solution (e. g. the students analyze and explain the uses of buffers, including the role of H_2CO_3/HCO_3^- controlling pH in blood) b. Problem Definition 3) The students discuss about buffer solution on each group 4) The students arrange the strategy to do experiment about buffer solution based on the problem **Elaboration** c. The students do buffer experiment to investigate buffer properties after acid base adding. d. The students observe, note, and record during experiment e. The students analyze the buffer solution based on experiment f. The students deduce the result of experiment **Confirmation** g. The students estimate and generalize the conclusion of experiment h. The teacher confirms the answer, gives the alternative, and develops material about buffer solution	70 minutes
Clossure	Analyzing	• The student sum up the material. • The students do the report individually at home	10 minutes

H. Instruments and Sources

1. Instruments

For learning process in laboratory:

- Graduated cylinder 25 ml

- Beaker glass 100 ml
- Pipette
- Universal ph indicator
- Worksheet
- Hand out

2. Material

- Deionized water
- 1.0 M HCl
- 0.1 M $NaHCO_3$

3. Sources

Chemistry book:

a. Ang, C. B. (2009). *A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry*. Singapore: Fairfield Book Publisher. (PP 250-292)

b. Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 245-267)

c. Padolina, C.D, Antero, E.S, Alumaga, M.J, et al. (2007). *Conceptual and Functional Chemistry: Modular Approach*. Metro Manila: Vibal Publishing House, Inc (PP 262-265).

Internet

a. www.chembio.uoguelph.ca/educmat/chm19104/chemtoons/buffer_make.swf

b. http://www.csudh.edu/oliver/chemdata/buffers.htm.

c. Cosmato, D. (15 Desember 2009). *Acid-Base Buffer Lab*. Diambil pada tanggal 10 Januari 2012, dari http://brighthub.com/education/k-12/articles/25797.aspx

4. Tools

Computer

LCD

White board

I. Evaluation

a. Evaluation type : Essay Problem

b. Time allotted : 2 X 45 minute

c. Evaluation purpose : Formative,

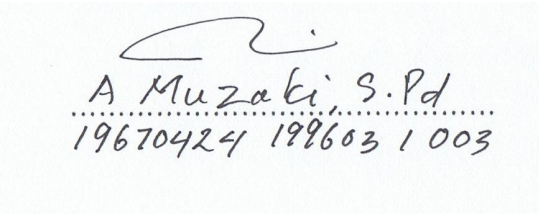
d. Problem item

Indicator	Problem item	Answer	Score
To analyze buffer solution through practice	Explain what the meaning of buffer solution?	Buffer is a solution containing substances that inhibit the solution's change in pH.	10
To analyze non buffer solution through practice	How the change of pH non buffer if we adding acid or base solution?	pH will change	5
To describe the function of buffer solution in living thing body	Describe why buffer system important for our life?	For maintain blood in neutral pH, and protect against large change in pH.	10

e. Follow up of evaluation results:

1) Students are passed if the achieved level 75 % or more.
2) Give the remedial program to the students who have the achieved level under 75%.
3) Give the supplemental program to the students who have achieved level 75 % or more

Acknowledge by
Chemistry Teacher of SMA N 7 Purworejo



A Muzaki, S.Pd
19670424 199603 1 003

Purworejo, 18 Februari 2012
Chemistry Teacher

Dini Nugraheni, SPd. Si
NIM. 10708251057

EXPERIMENT OF BUFFER SOLUTION

A. Introduction

There are certain solutions that resist a change in the pH even when we add to them acids or bases. Such systems are called buffers. A mixture of a weak acid and its conjugate base usually forms a good base usually forms a good buffer system. An example is carbonic acid, which is the most important buffer in our blood and maintains it close to pH 7.4.

If carbonic buffer system was absent from our blood, the eating acidic or basic foods would cause the pH would swing too high (alkalosis) or too low (acidosis) and the result could be deadly. This lab will demonstrate the buffering solution found in your blood. Our blood cannot tolerate a drastic shift in pH. It's a good thing, then, that human blood contains a bufffer of carbonic acid, H_2CO_3, and sodium bicarbonate, $NaHCO_3$. This buffer regulates drastic shifts in the pH of our blood.

B. Objectives

Analyzing a buffer solution through an experiment:

1. To analyze buffer solution through practice
2. To analyze non buffer solution through practice
3. To describe the function of buffer solution in living thing body

C. Instrumentation

Instrumentations

- Graduated cylinder 25 ml
- Beaker glass 100 ml
- Pipette
- Universal ph indicator

Materials

- Deionized water
- 1.0 M HCl
- 0.1 M $NaHCO_3$

D. Procedure

1. **Procedure for non buffer solution**
   a. Place 50-ml of deionized water in a beaker and add 6 drops of universal pH indicator. Note the color and record.
   b. Add 3 drops of 1.0 M HCl. Note the new color and record the pH here:
   c. Save this beaker & solution for comparison to situation #2.
2. **Procedure for buffer solution**
   a. Make a buffer solution in a new beaker. Do this by putting 50-ml of 0.1 M $NaHCO_3$ solution in the beaker and blowing exhaled breath into the solution for at least 2 minutes.
   b. Add 6 drops of universal pH indicator. Note the color and record the pH.
   c. Add 3 drops of 1.0 M HCl as you did above and note the color and record the pH.
   d. Continue to add acid drop by drop, counting the drops (swirl to mix) until the color matches the unbuffered solution from step 2 in situation #1. How many drops did you use? Record.
   e. Continue to Acid-Base Buffer Lab for a data table, Post-Lab Questions, and Notes.

E. Data Table

Non buffer solution	Buffer solution
Initial color and pH of beaker 1:	Initial color and pH of beaker 2:
Final color and pH of beaker 1:	pH and color of beaker 2 after HCl addition:
	Number of drops of HCl added to beaker:

F. Post-Lab Questions

1. Did the buffer system work? Give evidence.
2. Exhaled breath contains CO_2. This carbon dioxide reacted with the water in the beaker to form carbonic acid, H_2CO_3. Write the chemical reaction.
3. Write a reaction for how this buffer acts when an acid (contributes hydrogen ions) is added.
4. Write a reaction for how this buffer would react if a base (hydroxide ions) were added.

COGNITIVE DOMAIN EXERCISE (PROCESS AND PRODUCT)

1. Did the buffer system work? Give evidence.
2. Exhaled breath contains CO_2. This carbon dioxide reacted with the water in the beaker to form carbonic acid, H_2CO_3. Write the chemical reaction.
3. Write a reaction for how this buffer acts when an acid (contributes hydrogen ions) is added.
4. Write a reaction for how this buffer would react if a base (hydroxide ions) were added

SCORING GUIDELINE FOR COGNITIVE DOMAIN EXERCISE (PROCESS AND PRODUCT)

Solution	Score
1. In this lab, students are directed to make a buffer system that simulates one found in human blood. The buffer should work, allowing students to add quite a large amount of hydrochloric acid before they see a color (pH) change.	**25**
2. $CO_2 + H_2O \rightarrow H_2CO_3$	**25**
3. $H^+ + HCO_3^- \longrightarrow H_2CO_3$ (adding an acid to the buffer creates more of the acidic component already present in the buffer.)	**25**
4. $OH^- + H_2CO_3 \longrightarrow H_2O + HCO_3^-$ (adding a base to the buffer produces more of the bicarbonate ion, the basic component of the buffer.)	**25**
Total scores	**100**

Total test scores = ∑ Scores

COGNITIVES PROCESS & PSYCOMOTOR DOMAIN

Student's name :
Class :
No :
Date :

1. **Procedure for non buffer solution**
   a. Place 50-ml of deionized water in a beaker and add 6 drops of universal pH indicator. Note the color and record.
   b. Add 3 drops of 1.0 M HCl. Note the new color and record the pH here:
   c. Save this beaker & solution for comparison to situation #2.
2. **Procedure for buffer solution**
   a. Make a buffer solution in a new beaker. Do this by putting 50-ml of 0.1 M $NaHCO_3$ solution in the beaker and blowing exhaled breath into the solution for at least 2 minutes.
   b. Add 6 drops of universal pH indicator. Note the color and record the pH.
   c. Add 3 drops of 1.0 M HCl as you did above and note the color and record the pH.
   d. Continue to add acid drop by drop, counting the drops (swirl to mix) until the color matches the unbuffered solution from step 2 in situation #1. How many drops did you use? Record.
   e. Continue to Acid-Base Buffer Lab for a data table, Post-Lab Questions, and Notes.

PERFORMANCE ASSESMENT FOR COGNITIVES PROCESS & PSYCOMOTOR DOMAIN

Name :

No. :

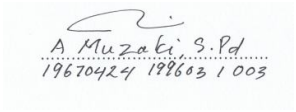
No.	Details of Performance Task	Maximum Scores	Scores are assesed by	
			Student	**Teacher**
	Non buffer Solution			
1.	Placing 50-ml of deionized water in a beaker	10		
2.	Adding 6 drops of universal pH indicator	10		
3.	Note the color and record	5		
4.	Adding 3 drops of 1.0 M HCl	10		
5.	Note the new color and record the pH	5		
6.	Save this beaker & solution for comparison to situation #2	5		
	Buffer solution			
7.	Putting 50-ml of 0.1 M NaHCO3 solution in the beaker	10		
8.	Blowing exhaled breath into the solution for at least 2 minutes	20		
9.	Adding 6 drops of universal pH indicator	10		
10.	Note the color and record the pH	5		
11.	Adding 3 drops of 1.0 M HCl as you did above and note the color and record the pH	10		
12.	Continue to add acid drop by drop, counting the drops (swirl to mix) until the color matches the unbuffered solution from step 2 in situation #1	20		
	Total Scores	**120**		

Total Test Scores = (∑ Scores/12) x 10

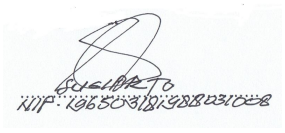
THE RESULT OF STUDENT'S EXPERIMENT

No.	Name	Cognitive domain	Performance assesment for cognitives process&psycomotor domain Scores are assesed by		Rerata skor	Kategori
		Process and Product	Student	Teacher		
1.	Amd	90	81.67	81.67	84.45	Tuntas
2.	Bgk	90	81.67	81.67	84.45	Tuntas
3.	Dhi	90	81.67	81.67	84.45	Tuntas
4.	Dia	90	81.67	81.67	84.45	Tuntas
5.	Ek	85	80	83.33	82.78	Tuntas
6.	Fzl	85	80	83.33	82.78	Tuntas
7.	Fkr	85	80	83.33	82.78	Tuntas
8.	Frh	85	80	87.50	84.17	Tuntas
9.	Hsn	85	86.67	79.17	83.61	Tuntas
10.	Hng	85	86.67	79.17	83.61	Tuntas
11.	Ihn	85	90	79.17	84.72	Tuntas
12.	Ink	85	90	79.17	84.72	Tuntas
13.	Ins	85	87.50	82.50	85.00	Tuntas
14.	Irm	85	87.50	82.50	85.00	Tuntas
15.	Jti	85	87.50	82.50	85.00	Tuntas
16.	Kha	85	87.50	82.50	85.00	Tuntas
17.	Mnc	85	85	80	83.33	Tuntas
18.	Nia	85	85.83	80	83.61	Tuntas
19.	Rkh	85	85	80	83.33	Tuntas
20.	Ref	85	85.83	80	83.61	Tuntas
21.	Rif	87	90	78.33	85.11	Tuntas
22.	Rij	87	90	78.33	85.11	Tuntas
23.	Rik	87	90	78.33	85.11	Tuntas
24.	Son	87	90	78.33	85.11	Tuntas
25.	Spr	80	85.83	82.50	82.78	Tuntas
26.	Whd	80	85.83	82.50	82.78	Tuntas
27.	Ynr	80	85.83	82.50	82.78	Tuntas
28.	Ylt	80	85.83	82.50	82.78	Tuntas

Observer



Observer



Chemistry's Teacher

Dini Nugraheni, SPd. Si
NIM :10708251057

D. The Fourth Meeting

LESSON PLAN

Education unit	**: SMAN 7 Purworejo**
Subject Matter	**: Chemistry**
Topic	**: Buffer Solution**
Sub topic	**: How to calculate the pH of buffer solution**
Grade/Semester	**: XI/II**
Time Allocation	**: 2 X 45 minutes**

A. STANDARD OF COMPETENCE

4. Understanding the properties of acid-base solutions, measurement methods, and its applications.

B. BASIC COMPETENCE

4.3 Describing the properties of buffer solutions and the function of buffer solutions in the body.

C. INDICATOR

Calculating the pH or pOH of buffer solution after adding a small amount of acid, a small amount of base, or by dilution based on equilibrium principle.

D. TEACHING LEARNING OBJECTIVES

Cognitive

- The students should be able to calculate the pH of buffer solution after adding a small amount of acid
- The students should be able to calculate the pH of buffer solution after adding a small amount of base
- The students should be able to calculate the pH of buffer solution after dilution (adding H_2O)

Affective

- The students have a self-reliance in doing exercise

E. TOPIC IN DETAIL

MATERIAL

The pH of Buffer

The pH of buffers can vary from being in the acid range of the pH scale all the way to the basic range. The pH of a buffer is determined by the relative amounts of acid and conjugate base that are present in the solution and the *K*a of the acid. Let us examine a buffer made of acetic acid and sodium acetate. This is similar to one of citric acid and sodium citrate that is often found in commercial fruit juices, to maintain the pH of the juice.

Let us compare the pH of two different buffer solutions.

1. (a) A buffer made of 50.0 mL of a 0.10 *M* solution of acetic acid, CH_3COOH, and 50.0 mL of 0.10 *M* sodium acetate, CH_3COONa.
   - The K_a of acetic acid is 1.7×10^{-5}.
   - The equilibrium reaction is $CH_3COOH\ (aq) + H_2O\ (l) \leftrightarrow CH_3COO^-\ (aq) + H_3O^+\ (aq)$.
   - The total volume of the buffer is 100.0 mL.
   - The concentration of acetic acid is 0.0050 moles of acid/0.100L = 0.050 *M.*
   - The concentration of the acetate ion is 0.0050 moles of acetate ion/0.100 L = 0.050 *M*.

     Filling in the ICE concentration table:

	CH_3COOH	H_2O	CH_3COO^-	H_3O^+
Initial	0.050 M		0.050 M	0
Change	-x		+ x	+x
Equilibrium	0.050M - x		0.050 M +x	x

In this solution

Ka = $[H_3O^+]$ [CH3COO$^-$] / [CH3COOH].

We substitute the equilibrium concentrations in the above equation. In doing so we can assume that X is small compared with 0.050 M. So the net equation is:

1.7×10^{-5} = [X] [0.050 M]/ [0.050 M]

After rearranging, we get

$[H_3O^+] = (1.7 \times 10^{-5}) (0.050\ M)/ (0.050\ M)$

$[H_3O^+] = 1.7 \times 10^{-5}\ M$

$pH = - \log [1.7 \times 10^{-5} M] = 4.76$ which is in the acid range

Now in this example the concentrations of the acid and the conjugate base are equal and the concentration of the hydronium ion is equal to Ka. The pH of this buffer can be altered by adjusting the relative concentrations of the acid and the conjugate base.

(b). For example, if the equilibrium concentration of the acetate ion is 0.070 M and the equilibrium concentration of the acetic acid is 0.025 M, the concentration of hydronium ion is

$[H_3O^+] = K_a [HA]/ [A^-]$.

Substituting in the above equation we can see that the ratio $[HA]/[A^-] = 0.025/0.070$, is less than 1, and the resulting $[H^3O^+] = 5.67$ x 10-5 has a pH of 5.25. It is slightly more basic than the previous solution, but still well within the acid range.

A conclusion from the above problem:

If the ratio [HA]/[A-] = 1 then the pH of the resulting solution will be equal to pK_a

If the ratio [HA]/[A-] > 1 then the resulting solution will be more acidic than pK_a.

If the ratio [HA]/[A-] < 1 then the resulting solution will be more basic than pK_a.

2. A buffer solution is made up of 50.0 mL of 0.10 M NH_4^+ and 50.0 mL of 0.10 M NH_3. The K_a of ammonium ion is Kw/ Kb

$K_a = 1 \times 10^{-14} / 1.8 \times 10^{-5}$

$K_a = 5.56 \times 10^{-10}$

The equilibrium reaction is $NH_4^+{}_{(aq)} + H_2O_{(l)} \leftrightarrow NH_{3\,(aq)} + H_3O^+$

The final volume is 100 mL, so the final concentration of $[NH_4^+] = 0.050$ M.

The final concentration of $[NH_3]$ = 0.050 M.

Filling in the ICE concentration table:

	NH_4^+	H_2O	NH_3	H_3O^+
Initial	0.050 M		0.050 M	0
Change	-x		+ x	+x
Equilibrium	0.050M - x		0.050 M +x	x

Now $K_a = [H_3O^+]\,[NH3]/\,[NH_4^+]$.

We can assume that X is small compared to 0.050 M.

Substituting we get:

- $5.56 \times 10^{-10} = (X)\ (0.050\ M) / (0.050\ M)$
- We can see that $X = [H_3O^+] = 5.56 \times 10^{-10}$ M
- $pH = -\log [5.56 \times 10^{-10}]$

This gives a pH of 9.3, which is in the basic range.

From studying the two different buffers, we can clearly see that the pH of the buffer will be determined mainly by the value of Ka.

a. For a buffer with pH 3, we choose an acid/conjugate base combination that has a pK_a close to 3.
b. For a buffer with a pH of 9, we choose an acid/conjugate base combination that has a pK_a close to 9.

3. The addition of water affects a buffer solution (dilutes of a buffer).

   When water is added to a buffer solution, the pH remains unchanged. Let usexamine this.

   $HA \leftrightarrow H^+ + A^-$

   $K_a = [H^+]\,[A^-] / [HA]$

   Rearranging this, we can see that:

   $[H^+] = K_a\,[HA] / [A^-]$.

   The addition of more water to the buffer does not change the ratio $[HA]/[A^-]$,since the same amount of water is being added to both. If this

ratio remains unchanged, the pH stays the same. This analysis does not consider new effects that appear if the solution becomes extremely dilute.

Conclusion: A buffer resists change to pH when small amounts of acid or base are added. We are now going to examine this quantitatively.

The Material was adapted by:

a. Anonim. (2010). *Acid-Base in Daily Life*. Diakses dari http://www.styleforfree.com pada tanggal 26 Desember 2011.
b. Chandra, M. (2003). *A guide for the preparation and use of buffers in biological systems*. Diakses pada tanggal 26 Desember 2011 dari http://wolfson.huji.ac.il/purification/PDF/Buffers/Calbiochem_Buffers_Booklet.pdf.
c. Charlesworth, P. (2004). *Chemistry (Fourth Edition)*. Michigan: Prentice Hall.
d. Helmenstine, A.M. (2008). *Acids and Bases*. Diakses dari http://www.chem-cool.com pada tanggal 26 Desember 2011.

F. LESSON METHODE

Taching method : Discussion and doing exercise
Teaching approach : Problem solving
Teaching model : Inductive

G. LESSON STEPS

Steps	Activities		Time allocation
Opening	Teacher	Students	10 minutes
	Greeting, praying, checking the attendance (step 1)	Greeting, praying, checking the attendance
	1. Apperception	1. Apperception

Steps	Activities		Time allocation
	Asking the student about principal of buffer solution.	The students recall the concept about principal of buffer solution.	
	2. Problem Asking to the students: How do we calculate the pH of buffer by adding a small amount of acid, a small amount of base, or by dilution based on equilibrium principle after we know the principal of buffer solution?	2. Problem The students apply the concept about principal of buffer solution to calculate the pH of buffer by adding a small amount of acid, a small amount of base, or by dilution.	
	3. The teacher explain the basic competence (step 2) and the aims of study (step 3)	3. The students know what the basic competence and the aims of study	
Main activity	**Exploration**	**Exploration**	70 minutes
	1. The teacher explains the material analysis	1. The students give the attention	
	2. The teacher gives an example of problem that is presented in attachment 1 (step 4)	2. The students know how to solve the problem	
	3. The teacher gives chance to the students for asking question (step 5)	3. The students ask to the teacher what they don't know	
	Elaboration	**Elaboration**	
	4. The teacher gives problems to the students (step 6)	4. The students solve the problem independently	
	5. The teacher give chance to student to solve problem (step 7)	5. The students present the solve of problem	
	Confirmation		
	6. The teacher give direction to the students to make a conclusion (step 8)		
	7. The teacher sums up the material based on students' summary (step 9)		
Closure	1. The teacher closes the study (step 10)		10 minutes
	2. The teacher evaluates the study by giving a problem.		

H. SOURCE/MATERIALS/TOOLS :

1. Source

   Chemistry book:

   a. Ang, C. B. (2009). *A Complete Guide (With Practice) To G.C.E. 'O' Level Pure Chemistry*. Singapore: Fairfield Book Publisher. (PP 250-292)

   b. Johari and Rachmawati. 2010. Chemistry. Jakarta: Esis (PP 245-267)

   c. Padolina, C.D, Antero, E.S, Alumaga, M.J, et al. (2007). *Conceptual and Functional Chemistry: Modular Approach*. Metro Manila: Vibal Publishing House, Inc (PP 262-265).

   Internet

   a. www.chembio.uoguelph.ca/educmat/chm19104/chemtoons/buffer_make.swf

   b. http://www.csudh.edu/oliver/chemdata/buffers.htm

2. Material

   Work sheet

   Hand out

3. Tools

   Computer

   LCD

   White board

I. ASSESMENT

Individual task, group task, performance assessment (occupation and attitude)

Scoring Guideline for Individual task

Students Activity	Score
A buffer solution is made by mixing 50 mL of acetic acid solution (CH_3COOH) 0.2M and 10 mL of CH_3COONa solution 0.2M ($K_a=10^{-5}$). Calculate the pH of buffer solution!	
Solution :	
$CH_3COOH\ (aq) + NaOH\ (aq) \rightarrow CH_3COONa\ (aq) + H_2O\ (l)$	20
i : 50 mL x 0,2 M = 10 mmol; 10mLx0,2M = 2 mmol; _ ; _	20
r : -2 mmol; -2mmol; 2mmol; 2mmol	20
rm : 8 mmol; 0; 2mmol; 2mmol	
$[H^+] = K_a x \frac{mmol\ of\ remaining\ acid}{mmol\ salt}$	20
$= 10^{-5} x \frac{8mmoles}{2mmoles} = 4x10^{-5} M$	20
$pH = -\log[H^+] = -\log 4 \times 10^{-5} = 5 - \log 4$	
TOTAL SCORE	100

Acknowledge by
Chemistry Teacher of SMA N 7 Purworejo

A Muzaki, S.Pd
19670424 199603 1 003

Purworejo, 23 Februari 2012
Chemistry Teacher

Dini Nugraheni, SPd. Si
NIM. 10708251057

SELF-EXERCISE

PROBLEM

Suppose we have a buffer consisting of 0.10 M nitrous acid and 0.20 M sodium nitrite. The K_a of nitrous acid is 4.5×10^{-4}. To 95.0 mL of this buffer solution we add 5.0 mL of 0.10 M hydrochloric acid. This type of problem becomes a two-part problem.

1. This first part is a stoichiometric calculation where we assume that all the H_3O^+ from the strong acid reacts with the nitrite ion forming nitrous acid.
2. The second part is an equilibrium problem where the concentrations from the first part are used.

GUIDELINE SCORING

Solution	Score
Part 1 Stoichiometric Calculation When a hydronium ion is added to the buffer it reacts with the nitrite ion: $H_3O^+_{(aq)} + NO_2^-{}_{(aq)} \longrightarrow HNO_{2\ (aq)} + H_2O_{(l)}$ Because the nitrous acid is a weak acid, we assume that the reaction goes to completion. 1. We must calculate amounts of hydrogen ions, nitrous acid and nitrite ions in the solution before the reaction. Because HCl is a strong acid, the hydrogen ion concentration is equal to the molarity of the acid. a. HCl is 0.10 M, therefore the concentration of H_3O^+ is 0.10 M. b. The moles of H_3O^+ = (0.10 moles/L) (0.005L) = 0.00050 moles. c. The moles of HNO_2 = (0.10 moles/L) (0.095L) = 0.0095 moles.	**50**

<table>
<tr><th>Solution</th><th>Score</th></tr>
<tr><td>
d. The moles of NO_2^- = (0.20 moles/L) (0.095L) = 0.019 moles.
2. We assume that all the H3O+ added reacts with the nitrite ion. Therefore, 0.00050 moles of acid is produced and 0.00050 moles of nitrite ion is used up.
a. Moles of nitrite ion remaining = (0.019 – 0.00050) mol = 0.0185 mol.
b. Moles of nitrous acid after reaction = (0.0095 + 0.00050) mol = 0.010 mol.
c. $[HNO_2]$ = 0.010 mol/0.10 L = 0.10 M.
d. $[NO_2^-]$ = 0.0185 moles/ 0.10L = 0.185M.
</td><td></td></tr>
<tr><td>
Part 2—Equilibrium Problem
Using the concentration found in Part 1, you construct the following ICE table:
<table>
<tr><th></th><th>$HNO_2(\frac{mol}{L})$</th><th>$H_3O^+(\frac{mol}{L})$</th><th>$NO_3^-(\frac{mol}{L})$</th></tr>
<tr><td>Initial</td><td>0.10 M</td><td>0</td><td>0.185 M</td></tr>
<tr><td>Change</td><td>-X</td><td>+ X</td><td>+ X</td></tr>
<tr><td>Equilibrium</td><td>0.10 - X</td><td>X</td><td>0.185 +X</td></tr>
</table>
The equilibrium constant equation is:
Ka = $[H_3O^+]\,[NO_2^-] / [HNO_2]$
Substituting, you get:
4.5 x 10^{-4} = [X] [0.185 + X] / [0.10 – X]
Assuming that X is small enough that 0.1855 + x ≈ 0.185 and 0.10 – X ≈ 0.10,
x 10^{-4} = (X) (0.185) /0.10
$[H_3O^+]$ = X = 2.43 x 10^{-4}
</td><td>50</td></tr>
</table>

Solution	Score
The pH of the original buffer was 3.65; the pH after the addition of the 5.0 mL of 0.10 M HCl (aq) is 3.61. So the pH changed by only 0.04 units The buffer pH changed much less than 0.5 units, which is considered the maximum change that a buffer should have and continue to be effective at pH control.	
Total score	**100**

Total test scores = ∑ Scores

SCORING GUIDELINE FOR SELF-RELIANCE OF STUDENTS

Education unit : Senior High School 7 Purworejo

Subject Matter : Chemistry

No.	Name	The aspects of independence learning				
		Strong motivation	Plan	How to Implement the plan	Initiatives	How to solve the difficulties
1	Amd	4	4	4	4	4
2	Bgk	5	4	4	5	4
3	Dhi	5	4	4	3	4
4	Dia	4	4	5	4	4
5	Ek	3	3	3	4	4
6	Fzl	4	4	4	4	4
7	Fkr	4	5	3	4	4
8	Frh	5	5	5	5	5
9	Hsn	4	5	4	4	4
10	Hng	4	5	4	4	4
11	Ihn	3	3	3	3	4
12	Ink	3	3	3	3	3
13	Ins	4	5	5	5	4
14	Irm	4	5	4	5	4
15	Jti	4	4	5	4	4
16	Kha	4	4	4	3	4
17	Mnc	4	5	4	4	3
18	Nia	3	4	3	3	3
19	Rkh	4	4	4	4	4
20	Ref	4	4	4	4	4
21	Rif	3	3	3	3	5
22	Rij	4	4	4	3	3
23	Rik	4	5	4	4	4
24	Son	3	3	3	4	3
25	Spr	4	4	4	4	4
26	Whd	4	4	4	4	4
27	Ynr	4	4	4	4	5
28	Ylt	4	3	4	4	4

Observer

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Observer

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Chemistry's Teacher

Dini Nugraheni, SPd. Si
NIM :10708251057

THE RESULT OF STUDENTS SELF-RELIANCE

No	Name	The aspects of independence learning					Rata-rata score	Kategori
		Strong motivation	Plan	How to Implement the plan	Initiatives	How to solve the difficulties		
1	Amd	4	4	4	4	4	4	Baik
2	Bgk	5	4	4	5	4	4.4	Sangat Baik
3	Dhi	5	4	4	3	4	4	Baik
4	Dia	4	4	5	4	4	4.2	Baik
5	Ek	3	3	3	4	4	3.4	Cukup
6	Fzl	4	4	4	4	4	4	Baik
7	Fkr	4	5	3	4	4	4	Baik
8	Frh	5	5	5	5	5	5	Sangat Baik
9	Hsn	4	5	4	4	4	4.2	Baik
10	Hng	4	5	4	4	4	4.2	Baik
11	Ihn	3	3	3	3	4	3.2	Cukup
12	Ink	3	3	3	3	3	3	Cukup
13	Ins	4	5	5	5	4	4.6	Sangat Baik
14	Irm	4	5	4	5	4	4.4	Sangat Baik
15	Jti	4	4	5	4	4	4.2	Baik
16	Kha	4	4	4	3	4	3.8	Baik
17	Mnc	4	5	4	4	3	4	Baik
18	Nia	3	4	3	3	3	3.2	Cukup
19	Rkh	4	4	4	4	4	4	Baik
20	Ref	4	4	4	4	4	4	Baik
21	Rif	3	3	3	3	5	3.4	Cukup
22	Rij	4	4	4	3	3	3.6	Baik
23	Rik	4	5	4	4	4	4.2	Baik
24	Son	3	3	3	4	3	3.2	Cukup
25	Spr	4	4	4	4	4	4	Baik
26	Whd	4	4	4	4	4	4	Baik
27	Ynr	4	4	4	4	5	4.2	Baik
28	Ylt	4	3	4	4	4	3.8	Baik
Rerata Skor							**3.94**	**Baik**

PRACTICE FOR STUDENTS

1. Calculate the pH when 5 mL of 0.02 M CH_3COOH is added to 10 mL of 0.04 M CH_3COONa, K_a $CH_3COOH = 1.8 \times 10^{-5}$!
2. Calculate the pH when 100 mL of 0.25 M NH_4OH is added to 50 mL of 0.3 M NH_4Cl, K_b $NH_4OH = 1 \times 10^{-5}$!
3. Calculate the pH when 50 mL of 0.1 M NH_4OH is added to 50 mL of 0.2 M $(NH_4)_2SO_4$, K_b $NH_4OH = 1.8 \times 10^{-5}$!
4. The pH when 0.1 mole of NaOH is added to 500 mL a weak acid HX 1 M is 5-log 2. Determine the K_a of HX!
5. To make 120 mL of buffer solution which have pH = 5 - log 1.8 ia needed 0.1 M of NaOH and 0.1 M CH_3COOH. Determine the volume of each solution (K_a $CH_3COOH = 1.8 \times 10^{-5}$)!
6. Calculate the pH when 100 mL of 0.2 M CH_3COOH is added to 25 mL of 0.1 M $Ba(OH)_2$, K_a $CH_3COOH = 1.8 \times 10^{-5}$!
7. Calculate the volume of 0.2 M HCl which is added to 50 mL of 1 M NH_4OH (K_b $NH_4OH = 1 \times 10^{-5}$) to make buffer solution which have pH = 9!
8. Calculate the pH when 5 mL of 1 M HCl is added to the system that contains a buffer solution CH_3COOH/CH_3COO^- with 0.05 mole of CH_3COOH and 0.05 mole of CH_3COO^-, K_a $CH_3COOH = 1.8 \times 10^{-5}$!
9. Calculate the pH when 800 mL oh H_2O is added to the system that contains a mixing 100 mL of 0.2 M NH_4OH and 100 mL of 0.1 M NH_4Br!

LAMPIRAN 6

INSTRUMEN PENELITIAN

A. INSTRUMEN PENILAIAN KUALITAS SILABUS DAN RPP UNTUK AHLI MATERI DAN AHLI KURIKULUM DAN PEMBELAJARAN, SERTA *PEER REVIEWE*R

PETUNJUK PENGISIAN

NAMA :

NIP :

INSTANSI :

1. Berilah tanda (√) pada kolom yang sesuai dengan penilaian Bapak/Ibu dengan kriteria sebagai berikut:
   - SB (Sangat Baik) = 5
   - B (Baik) = 4
   - C (Cukup) = 3
   - K (Kurang) = 2
   - SK (Sangat Kurang) = 1
2. Tiap kolom harus diisi. Jika ada penilaian yang tidak sesuai atau terdapat suatu kekurangan tulislah kritik dan saran Bapak/Ibu pada kolom catatan penilaian kualitas silabus dan RPP.
3. Mohon silabus dan RPP dikembalikan karena akan digunakan untuk kelanjutan penilaian.

Kami ucapkan terimakasih atas kerjasama yang diberikan.

1. INSTRUMEN PENILAIAN KUALITAS SILABUS

Untuk : Ahli Materi Kimia, Ahli Media dan Ahli Kurikulum dan Pembelajaran, serta *Peer Reviewer*

No	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
1.	SK dan KD mata pelajaran sesuai dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
2.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan potensi peserta didik						
3.	Pemilihan materi pembelajaran relevan dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
4.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan alokasi waktu						
5.	Ketepatan pemilihan kegiatan pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
6.	Indikator dikembangkan sesuai dengan karakteristik peserta didik						
7.	Indikator dikembangkan sesuai dengan karakteristik daerah						
8.	Indikator menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.						
9.	Pemilihan teknik dan bentuk penilaian sesuai dengan indikator						
10.	Penentuan alokasi waktu pada setiap KD didasarkan pada jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD						

No	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
11.	Penentuan sumber belajar sesuai dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						

Saran :

Yogyakarta, ……..2012

Penelaah

……

Deskripsi Penilaian Kualitas Silabus

No.	Aspek yang direview / dinilai	Skor	Penjabaran
1.	SK dan KD mata pelajaran sesuai dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika SK dan KD mata pelajaran **sangat sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika SK dan KD mata pelajaran **sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika SK dan KD mata pelajaran **cukup sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika SK dan KD mata pelajaran **kurang sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika SK dan KD mata pelajaran **tidak sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
2.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan potensi peserta didik	5	Jika pemilihan materi pembelajaran **sangat sesuai** dengan potensi peserta didik
		4	Jika pemilihan materi pembelajaran **sesuai** dengan potensi peserta didik
		3	Jika pemilihan materi pembelajaran **cukup sesuai** dengan potensi peserta didik
		2	Jika pemilihan materi pembelajaran **kurang sesuai** dengan potensi peserta didik
		1	Jika pemilihan materi pembelajaran **tidak sesuai** dengan potensi peserta didik
3.	Pemilihan materi pembelajaran relevan dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika pemilihan meteri pembelajaran **sangat relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika pemilihan meteri pembelajaran **relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika pemilihan meteri pembelajaran **cukup relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika pemilihan meteri pembelajaran **kurang relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika pemilihan meteri pembelajaran **tidak relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD

No.	Aspek yang direview / dinilai	Skor	Penjabaran
4.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan alokasi waktu	5	Jika pembelajaran materi pembelajaran **sangat sesuai** dengan alokasi waktu
		4	Jika pembelajaran materi pembelajaran **sesuai** dengan alokasi waktu
		3	Jika pembelajaran materi pembelajaran **cukup sesuai** dengan alokasi waktu
		2	Jika pembelajaran materi pembelajaran **kurang sesuai** dengan alokasi waktu
		1	Jika pembelajaran materi pembelajaran **tidak sesuai** dengan alokasi waktu
5.	Ketepatan pemilihan kegiatan pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika pemilihan kegiatan pembelajaran **sangat tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika pemilihan kegiatan pembelajaran **tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika pemilihan kegiatan pembelajaran **cukup tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika pemilihan kegiatan pembelajaran **kurang tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika pemilihan kegiatan pembelajaran **tidak tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
6.	Indikator dikembangkan sesuai dengan karakteristik peserta didik	5	Jika indikator yang dikembangkan **sangat sesuai** dengan karakteristik peserta didik
		4	Jika indikator yang dikembangkan **sesuai** dengan karakteristik peserta didik
		3	Jika indikator yang dikembangkan **cukup sesuai** dengan karakteristik peserta didik
		2	Jika indikator yang dikembangkan **kurang sesuai** dengan karakteristik peserta didik
		1	Jika indikator yang dikembangkan **tidak sesuai** dengan karakteristik peserta didik
7.	Indikator dikembangkan sesuai dengan karakteristik RSMA BI	5	Jika indikator yang dikembangkan **sangat sesuai** dengan karakteristik RSMA BI
		4	Jika indikator yang dikembangkan **sesuai** dengan karakteristik RSMA BI
		3	Jika indikator yang dikembangkan **cukup sesuai** dengan karakteristik RSMA BI
		2	Jika indikator yang dikembangkan **kurang sesuai** dengan karakteristik RSMA BI
		1	Jika indikator yang dikembangkan **tidak sesuai** dengan karakteristik RSMA BI

No.	Aspek yang direview / dinilai	Skor	Penjabaran
8.	Indikator menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.	5	Jika indikator **sangat jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		4	Jika indikator **jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		3	Jika indikator **cukup jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		2	Jika indikator **kurang jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		1	Jika indikator **tidak jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
9.	Pemilihan teknik dan bentuk penilaian sesuai dengan indikator.	5	Jika pemilihan teknik dan bentuk penilaian **sangat sesuai** dengan indikator
		4	Jika pemilihan teknik dan bentuk penilaian **sesuai** dengan indikator
		3	Jika pemilihan teknik dan bentuk penilaian **cukup sesuai** dengan indikator
		2	Jika pemilihan teknik dan bentuk penilaian **kurang sesuai** dengan indikator
		1	Jika pemilihan teknik dan bentuk penilaian **tidak sesuai** dengan indikator
10.	Penentuan alokasi waktu pada setiap KD didasarkan pada jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.	5	Jika alokasi waktu **sangat sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		4	Jika alokasi waktu **sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		3	Jika alokasi waktu **cukup sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		2	Jika alokasi waktu **kurang sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		1	Jika alokasi waktu **tidak sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.

No.	Aspek yang direview / dinilai	Skor	Penjabaran
11.	Penentuan sumber belajar sesuai dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD.	5	Jika penentuan sumber belajar **sangat sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		4	Jika penentuan sumber belajar **sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		3	Jika penentuan sumber belajar **cukup sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		2	Jika penentuan sumber belajar **kurang sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		1	Jika penentuan sumber belajar **tidak sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**

2. INSTRUMEN PENILAIAN KUALITAS RPP

Untuk : Ahli Materi Kimia, Ahli Media dan Ahli Kurikulum dan Pembelajaran, serta *Peer Reviewer*

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
1.	Kejelasan perumusan tujuan pembelajaran (mengandung perilaku hasil belajar yang meliputi aspek kognitif, afektif, dan psikomotorik)						
2.	Kejelasan perumusan tujuan pembelajaran (tidak menimbulkan penafsiran ganda)						
3.	Pemilihan materi ajar sesuai dengan tujuan pembelajaran dan potensi daerah						
4.	Pengorganisasian materi ajar (keruntutan, sistematika meteri)						
5.	Pengorganisasian materi ajar berdasarkan kesesuaian dengan alokasi waktu						
6.	Pemilihan sumber/media pembelajaran sesuai dengan tujuan dan materi pembelajaran						
7.	Kejelasan skenario pembelajaran mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup						
8.	Kerincian skenario pembelajaran (setiap langkah mencerminkan strategi/metode dan alokasi waktu pada setiap tahap)						
9.	Ketepatan pemilihan metode, pendekatan, dan model pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
10.	Kesesuaian teknik dengan tujuan pembelajaran						
11.	Kelengkapan instrumen evaluasi (soal, kunci jawaban, pedoman penskoran)						
12.	Alat penilaian belajar dapat mengukur kemampuan peserta didik secara mendalam berdasarkan indikator yang ada						

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
13.	Alat penilaian belajar dapat mengukur kemampuan kognitif, afektif, dan psikomotorik						
14.	Petunjuk penilaian yang digunakan mudah dipahami, tepat dan jelas.						

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Guru penilai

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Deskripsi Penilaian Kualitas RPP

No.	Aspek yang direview/dinilai	Skor	Penjabaran
1.	Kejelasan perumusan tujuan pembelajaran (mengandung perilaku hasil belajar yang meliputi aspek kognitif, afektif, dan psikomotorik)	5	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **sangat jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		4	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		3	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **cukup jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		2	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **kurang jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		1	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **tidak jelas** meliputi aspek kognitif, afektif, dan psikomotorik
2.	Kejelasan perumusan tujuan pembelajaran (tidak menimbulkan penafsiran ganda)	5	Jika perumusan tujuan pembelajaran **tidak menimbulkan penafsiran ganda**
		4	Jika perumusan tujuan pembelajaran **sedikit menimbulkan penafsiran ganda**
		3	Jika perumusan tujuan pembelajaran **cukup menimbulkan penafsiran ganda**
		2	Jika perumusan tujuan pembelajaran **menimbulkan penafsiran ganda**
		1	Jika perumusan tujuan pembelajaran **sangat menimbulkan penafsiran ganda**
3.	Pemilihan materi ajar sesuai dengan tujuan pembelajaran	5	Jika materi **sangat sesuai** dengan tujuan pembelajaran
		4	Jika materi **sesuai** dengan tujuan pembelajaran
		3	Jika materi **cukup sesuai** dengan tujuan pembelajaran
		2	Jika materi **kurang sesuai** dengan tujuan pembelajaran
		1	Jika materi **tidak sesuai** dengan tujuan pembelajaran
4.	Sistematika materi ajar	5	Jika materi **sangat** sistematis
		4	Jika materi sistematis
		3	Jika materi **cukup** sistematis
		2	Jika materi **kurang** sistematis

No.	Aspek yang direview/dinilai	Skor	Penjabaran
		1	Jika materi **tidak** sistematis
5.	Kesesuaian materi dengan alokasi waktu	5	Jika materi **sangat sesuai** dengan alokasi waktu
		4	Jika materi **sesuai** dengan alokasi waktu
		3	Jika materi **cukup sesuai** dengan alokasi waktu
		2	Jika materi **kurang sesuai** dengan alokasi waktu
		1	Jika materi **tidak sesuai** dengan alokasi waktu
6.	Pemilihan sumber/media pembelajaran sesuai dengan tujuan dan materi pembelajaran	5	Jika sumber/media ppembelajaran yang digunakan **sangat sesuai** dengan tujuan dan materi pembelajaran
		4	Jika sumber/media ppembelajaran yang digunakan **sesuai** dengan tujuan dan materi pembelajaran
		3	Jika sumber/media ppembelajaran yang digunakan **cukup sesuai** dengan tujuan dan materi pembelajaran
		2	Jika sumber/media ppembelajaran yang digunakan **kurang sesuai** dengan tujuan dan materi pembelajaran
		1	Jika sumber/media ppembelajaran yang digunakan **tidak sesuai** dengan tujuan dan materi pembelajaran
7.	Kejelasan skenario pembelajaran mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup	5	Jika skenario pembelajaran **sangat jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		4	Jika skenario pembelajaran **jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		3	Jika skenario pembelajaran **cukup jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		2	Jika skenario pembelajaran **kurang jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		1	Jika skenario pembelajaran **tidak jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
8.	Kerincian skenario pembelajaran (setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap)	5	Jika skenario pembelajaran pembelajaran **sangat rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
		4	Jika skenario pembelajaran pembelajaran **rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
		3	Jika skenario pembelajaran pembelajaran **cukup rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap

No.	Aspek yang direview/dinilai	Skor	Penjabaran
		2	Jika skenario pembelajaran pembelajaran **kurang rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
		1	Jika skenario pembelajaran pembelajaran **tidak rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
9.	Ketepatan pemilihan metode, pendekatan, dan model pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika pemilihan metode, pendekatan, dan model pembelajaran **sangat tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika pemilihan metode, pendekatan, dan model pembelajaran **tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika pemilihan metode, pendekatan, dan model pembelajaran **cukup tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika pemilihan metode, pendekatan, dan model pembelajaran **kurang tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika pemilihan metode, pendekatan, dan model pembelajaran **tidak tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
10.	Kesesuaian teknik dengan tujuan pembelajaran	5	Jika teknik yang digunakan **sangat sesuai** dengan tujuan pembelajaran
		4	Jika teknik yang digunakan **sesuai** dengan tujuan pembelajaran
		3	Jika teknik yang digunakan **cukup sesuai** dengan tujuan pembelajaran
		2	Jika teknik yang digunakan **kurang sesuai** dengan tujuan pembelajaran
		1	Jika teknik yang digunakan **tidak sesuai** dengan tujuan pembelajaran
11.	Kelengkapan instrument evaluasi (soal, kunci jawaban, pedoman penskoran)	5	Jika instrumen evaluasi **sangat lengkap**
		4	Jika instrumen evaluasi **lengkap**
		3	Jika instrumen evaluasi **cukup lengkap**
		2	Jika instrumen evaluasi **kurang lengkap**

No.	Aspek yang direview/dinilai	Skor	Penjabaran
		1	Jika instrumen evaluasi **tidak lengkap**
12.	Alat penilaian belajar dapat mengukur kemampuan peserta didik secara mendalam berdasarkan indikator yang ada	5	Jika alat penilaian **sangat mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		4	Jika alat penilaian **mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		3	Jika alat penilaian **cukup mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		2	Jika alat penilaian **kurang mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		1	Jika alat penilaian **tidak mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
13.	Alat penilaian belajar dapat mengukur kemampuan kognitif, afektif, dan psikomotorik	5	Jika alat penilaian belajar meliputi aspek **kognitif, afektif dan psikomotorik** serta **tepat** dalam mengukur ketercapaian kemampuan peserta didik
		4	Jika alat penilaian belajar meliputi aspek kognitif dan afektif **atau** kognitif dan psikomotorik saja tetapi **tepat** dalam mengukur ketercapaian kemampuan peserta didik
		3	Jika alat penilaian belajar meliputi aspek **kognitif saja** tetapi **tepat** dalam mengukur ketercapaian kemampuan peserta didik
		2	Jika alat penilaian belajar meliputi aspek **kognitif saja** tetapi **kurang tepat** dalam mengukur ketercapaian kemampuan peserta didik
		1	Jika alat penilaian belajar meliputi aspek **kognitif saja** tetapi **tidak tepat** dalam mengukur ketercapaian kemampuan peserta didik
14.	Petunjuk penilaian yang digunakan mudah dipahami, tepat dan jelas.	5	Jika petunjuk penilaian **mudah dipahami**, **tepat** dan **jelas**
		4	Jika petunjuk penilaian **mudah dipahami**, tetapi **kurang tepat** dan **kurang jelas**
		3	Jika petunjuk penilaian **mudah dipahami**, **tidak tepat** dan **tidak jelas**
		2	Jika petunjuk penilaian hanya **sebagian yang mudah dipahami**, **tepat** dan **jelas**
		1	Jika petunjuk penilaian **tidak mudah dipahami,tidak tepat tepat** dan **tidak jelas**

B. INSTRUMEN PENILAIAN KUALITAS SILABUS DAN RPP UNTUK GURU KIMIA R SMA BI

PETUNJUK PENGISIAN

NAMA :

NIP :

INSTANSI :

4. Berilah tanda (√) pada kolom yang sesuai dengan penilaian Bapak/Ibu dengan kriteria sebagai berikut:
   - SB (Sangat Baik) = 5
   - B (Baik) = 4
   - C (Cukup) = 3
   - K (Kurang) = 2
   - SK (Sangat Kurang) = 1
5. Tiap kolom harus diisi. Jika ada penilaian yang tidak sesuai atau terdapat suatu kekurangan tulislah kritik dan saran Bapak/Ibu pada kolom catatan penilaian kualitas silabus dan RPP.
6. Mohon silabus dan RPP dikembalikan karena akan digunakan untuk kelanjutan penilaian.

Kami ucapkan terimakasih atas kerjasama yang diberikan.

1. INSTRUMEN PENILAIAN KUALITAS SILABUS

Untuk : Guru Kimia R SMA BI

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
1.	SK dan KD mata pelajaran sesuai dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
2.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan potensi peserta didik						
3.	Pemilihan materi pembelajaran relevan dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
4.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan alokasi waktu						
5.	Ketepatan pemilihan kegiatan pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
6.	Indikator dikembangkan sesuai dengan karakteristik peserta didik						
7.	Indikator dikembangkan sesuai dengan karakteristik daerah						
8.	Indikator menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.						
9.	Pemilihan teknik dan bentuk penilaian sesuai dengan indikator						
10.	Penentuan alokasi waktu pada setiap KD didasarkan pada jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD						

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
11.	Penentuan sumber belajar sesuai dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						

Yogyakarta, ……..2012

Guru penilai

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Deskripsi Penilaian Kualitas Silabus

No.	Aspek yang direview / dinilai	Skor	Penjabaran
1.	SK dan KD mata pelajaran sesuai dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika SK dan KD mata pelajaran **sangat sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika SK dan KD mata pelajaran **sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika SK dan KD mata pelajaran **cukup sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika SK dan KD mata pelajaran **kurang sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika SK dan KD mata pelajaran **tidak sesuai** dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
2.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan potensi peserta didik	5	Jika pemilihan materi pembelajaran **sangat sesuai** dengan potensi peserta didik
		4	Jika pemilihan materi pembelajaran **sesuai** dengan potensi peserta didik
		3	Jika pemilihan materi pembelajaran **cukup sesuai** dengan potensi peserta didik
		2	Jika pemilihan materi pembelajaran **kurang sesuai** dengan potensi peserta didik
		1	Jika pemilihan materi pembelajaran **tidak sesuai** dengan potensi peserta didik
3.	Pemilihan materi pembelajaran relevan dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika pemilihan meteri pembelajaran **sangat relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika pemilihan meteri pembelajaran **relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika pemilihan meteri pembelajaran **cukup relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika pemilihan meteri pembelajaran **kurang relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika pemilihan meteri pembelajaran **tidak relevan** dengan karakteristik daerah yang diperkaya dengan mangacu pada

No.	Aspek yang direview / dinilai	Skor	Penjabaran
			kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
4.	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan alokasi waktu	5	Jika pembelajaran materi pembelajaran **sangat sesuai** dengan alokasi waktu
		4	Jika pembelajaran materi pembelajaran **sesuai** dengan alokasi waktu
		3	Jika pembelajaran materi pembelajaran **cukup sesuai** dengan alokasi waktu
		2	Jika pembelajaran materi pembelajaran **kurang sesuai** dengan alokasi waktu
		1	Jika pembelajaran materi pembelajaran **tidak sesuai** dengan alokasi waktu
5.	Ketepatan pemilihan kegiatan pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika pemilihan kegiatan pembelajaran **sangat tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika pemilihan kegiatan pembelajaran **tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika pemilihan kegiatan pembelajaran **cukup tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika pemilihan kegiatan pembelajaran **kurang tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika pemilihan kegiatan pembelajaran **tidak tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
6.	Indikator dikembangkan sesuai dengan karakteristik peserta didik	5	Jika indikator yang dikembangkan **sangat sesuai** dengan karakteristik peserta didik
		4	Jika indikator yang dikembangkan **sesuai** dengan karakteristik peserta didik
		3	Jika indikator yang dikembangkan **cukup sesuai** dengan karakteristik peserta didik
		2	Jika indikator yang dikembangkan **kurang sesuai** dengan karakteristik peserta didik
		1	Jika indikator yang dikembangkan **tidak sesuai** dengan karakteristik peserta didik
7.	Indikator dikembangkan sesuai dengan karakteristik RSMA BI	5	Jika indikator yang dikembangkan **sangat sesuai** dengan karakteristik RSMA BI
		4	Jika indikator yang dikembangkan **sesuai** dengan karakteristik RSMA BI
		3	Jika indikator yang dikembangkan **cukup sesuai** dengan karakteristik RSMA BI
		2	Jika indikator yang dikembangkan **kurang sesuai** dengan karakteristik RSMA BI
		1	Jika indikator yang dikembangkan **tidak sesuai** dengan karakteristik RSMA BI

No.	Aspek yang direview / dinilai	Skor	Penjabaran
8.	Indikator menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.	5	Jika indikator **sangat jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		4	Jika indikator **jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		3	Jika indikator **cukup jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		2	Jika indikator **kurang jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
		1	Jika indikator **tidak jelas** menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.
9.	Pemilihan teknik dan bentuk penilaian sesuai dengan indikator.	5	Jika pemilihan teknik dan bentuk penilaian **sangat sesuai** dengan indikator
		4	Jika pemilihan teknik dan bentuk penilaian **sesuai** dengan indikator
		3	Jika pemilihan teknik dan bentuk penilaian **cukup sesuai** dengan indikator
		2	Jika pemilihan teknik dan bentuk penilaian **kurang sesuai** dengan indikator
		1	Jika pemilihan teknik dan bentuk penilaian **tidak sesuai** dengan indikator
10.	Penentuan alokasi waktu pada setiap KD didasarkan pada jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.	5	Jika alokasi waktu **sangat sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		4	Jika alokasi waktu **sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		3	Jika alokasi waktu **cukup sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		2	Jika alokasi waktu **kurang sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.
		1	Jika alokasi waktu **tidak sesuai** dengan jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.

No.	Aspek yang direview / dinilai	Skor	Penjabaran
11.	Penentuan sumber belajar sesuai dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD.	5	Jika penentuan sumber belajar **sangat sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		4	Jika penentuan sumber belajar **sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		3	Jika penentuan sumber belajar **cukup sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		2	Jika penentuan sumber belajar **kurang sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**
		1	Jika penentuan sumber belajar **tidak sesuai** dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD**.**

2. INSTRUMEN PENILAIAN KUALITAS RPP

Untuk : Guru Kimia R SMA BI

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
1.	Kejelasan perumusan tujuan pembelajaran (mengandung perilaku hasil belajar yang meliputi aspek kognitif, afektif, dan psikomotorik)						
2.	Kejelasan perumusan tujuan pembelajaran (tidak menimbulkan penafsiran ganda)						
3.	Pemilihan materi ajar sesuai dengan tujuan pembelajaran dan potensi daerah						
4.	Pengorganisasian materi ajar (keruntutan, sistematika meteri)						
5.	Pengorganisasian materi ajar berdasarkan kesesuaian dengan alokasi waktu						
6.	Pemilihan sumber/media pembelajaran sesuai dengan tujuan dan materi pembelajaran						
7.	Kejelasan skenario pembelajaran mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup						
8.	Kerincian skenario pembelajaran (setiap langkah mencerminkan strategi/metode dan alokasi waktu pada setiap tahap)						
9.	Ketepatan pemilihan metode, pendekatan, dan model pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
10.	Kesesuaian teknik dengan tujuan pembelajaran						
11.	Kelengkapan instrumen evaluasi (soal, kunci jawaban, pedoman penskoran)						
12.	Alat penilaian belajar dapat mengukur kemampuan peserta didik secara mendalam berdasarkan indikator yang ada						

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
13.	Alat penilaian belajar dapat mengukur kemampuan kognitif, afektif, dan psikomotorik						
14.	Petunjuk penilaian yang digunakan mudah dipahami, tepat dan jelas.						

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Deskripsi Penilaian Kualitas RPP

No.	Aspek yang direview/dinilai	Skor	Penjabaran
1.	Kejelasan perumusan tujuan pembelajaran (mengandung perilaku hasil belajar yang meliputi aspek kognitif, afektif, dan psikomotorik)	5	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **sangat jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		4	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		3	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **cukup jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		2	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **kurang jelas** meliputi aspek kognitif, afektif, dan psikomotorik
		1	Jika kandungan perilaku hasil belajar dalam perumusan tujuan pembelajaran **tidak jelas** meliputi aspek kognitif, afektif, dan psikomotorik
2.	Kejelasan perumusan tujuan pembelajaran (tidak menimbulkan penafsiran ganda)	5	Jika perumusan tujuan pembelajaran **tidak menimbulkan penafsiran ganda**
		4	Jika perumusan tujuan pembelajaran **sedikit menimbulkan penafsiran ganda**
		3	Jika perumusan tujuan pembelajaran **cukup menimbulkan penafsiran ganda**
		2	Jika perumusan tujuan pembelajaran **menimbulkan penafsiran ganda**
		1	Jika perumusan tujuan pembelajaran **sangat menimbulkan penafsiran ganda**
3.	Pemilihan materi ajar sesuai dengan tujuan pembelajaran	5	Jika materi **sangat sesuai** dengan tujuan pembelajaran
		4	Jika materi **sesuai** dengan tujuan pembelajaran
		3	Jika materi **cukup sesuai** dengan tujuan pembelajaran
		2	Jika materi **kurang sesuai** dengan tujuan pembelajaran
		1	Jika materi **tidak sesuai** dengan tujuan pembelajaran
4.	Sistematika materi ajar	5	Jika materi **sangat** sistematis
		4	Jika materi sistematis
		3	Jika materi **cukup** sistematis
		2	Jika materi **kurang** sistematis

No.	Aspek yang direview/dinilai	Skor	Penjabaran
		1	Jika materi **tidak** sistematis
5.	Kesesuaian materi dengan alokasi waktu	5	Jika materi **sangat sesuai** dengan alokasi waktu
		4	Jika materi **sesuai** dengan alokasi waktu
		3	Jika materi **cukup sesuai** dengan alokasi waktu
		2	Jika materi **kurang sesuai** dengan alokasi waktu
		1	Jika materi **tidak sesuai** dengan alokasi waktu
6.	Pemilihan sumber/media pembelajaran sesuai dengan tujuan dan materi pembelajaran	5	Jika sumber/media ppembelajaran yang digunakan **sangat sesuai** dengan tujuan dan materi pembelajaran
		4	Jika sumber/media ppembelajaran yang digunakan **sesuai** dengan tujuan dan materi pembelajaran
		3	Jika sumber/media ppembelajaran yang digunakan **cukup sesuai** dengan tujuan dan materi pembelajaran
		2	Jika sumber/media ppembelajaran yang digunakan **kurang sesuai** dengan tujuan dan materi pembelajaran
		1	Jika sumber/media ppembelajaran yang digunakan **tidak sesuai** dengan tujuan dan materi pembelajaran
7.	Kejelasan skenario pembelajaran mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup	5	Jika skenario pembelajaran **sangat jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		4	Jika skenario pembelajaran **jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		3	Jika skenario pembelajaran **cukup jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		2	Jika skenario pembelajaran **kurang jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
		1	Jika skenario pembelajaran **tidak jelas** mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup
8.	Kerincian skenario pembelajaran (setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap)	5	Jika skenario pembelajaran pembelajaran **sangat rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
		4	Jika skenario pembelajaran pembelajaran **rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
		3	Jika skenario pembelajaran pembelajaran **cukup rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap

No.	Aspek yang direview/dinilai	Skor	Penjabaran
		2	Jika skenario pembelajaran pembelajaran **kurang rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
		1	Jika skenario pembelajaran pembelajaran **tidak rinci** yaitu setiap langkah mencerminkan strategi/metode dan terdapat alokasi waktu pada setiap tahap
9.	Ketepatan pemilihan metode, pendekatan, dan model pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	5	Jika pemilihan metode, pendekatan, dan model pembelajaran **sangat tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika pemilihan metode, pendekatan, dan model pembelajaran **tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		3	Jika pemilihan metode, pendekatan, dan model pembelajaran **cukup tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika pemilihan metode, pendekatan, dan model pembelajaran **kurang tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika pemilihan metode, pendekatan, dan model pembelajaran **tidak tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
10.	Kesesuaian teknik dengan tujuan pembelajaran	5	Jika teknik yang digunakan **sangat sesuai** dengan tujuan pembelajaran
		4	Jika teknik yang digunakan **sesuai** dengan tujuan pembelajaran
		3	Jika teknik yang digunakan **cukup sesuai** dengan tujuan pembelajaran
		2	Jika teknik yang digunakan **kurang sesuai** dengan tujuan pembelajaran
		1	Jika teknik yang digunakan **tidak sesuai** dengan tujuan pembelajaran
11.	Kelengkapan instrument evaluasi (soal, kunci jawaban, pedoman penskoran)	5	Jika instrumen evaluasi **sangat lengkap**
		4	Jika instrumen evaluasi **lengkap**
		3	Jika instrumen evaluasi **cukup lengkap**
		2	Jika instrumen evaluasi **kurang lengkap**

No.	Aspek yang direview/dinilai	Skor	Penjabaran
		1	Jika instrumen evaluasi **tidak lengkap**
12.	Alat penilaian belajar dapat mengukur kemampuan peserta didik secara mendalam berdasarkan indikator yang ada	5	Jika alat penilaian **sangat mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		4	Jika alat penilaian **mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		3	Jika alat penilaian **cukup mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		2	Jika alat penilaian **kurang mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
		1	Jika alat penilaian **tidak mampu** mengukur kemampuan peserta didik sesuai dengan indikator hasil belajar
13.	Alat penilaian belajar dapat mengukur kemampuan kognitif, afektif, dan psikomotorik	5	Jika alat penilaian belajar meliputi aspek **kognitif, afektif dan psikomotorik** serta **tepat** dalam mengukur ketercapaian kemampuan peserta didik
		4	Jika alat penilaian belajar meliputi aspek kognitif dan afektif **atau** kognitif dan psikomotorik saja tetapi **tepat** dalam mengukur ketercapaian kemampuan peserta didik
		3	Jika alat penilaian belajar meliputi aspek **kognitif saja** tetapi **tepat** dalam mengukur ketercapaian kemampuan peserta didik
		2	Jika alat penilaian belajar meliputi aspek **kognitif saja** tetapi **kurang tepat** dalam mengukur ketercapaian kemampuan peserta didik
		1	Jika alat penilaian belajar meliputi aspek **kognitif saja** tetapi **tidak tepat** dalam mengukur ketercapaian kemampuan peserta didik
14.	Petunjuk penilaian yang digunakan mudah dipahami, tepat dan jelas.	5	Jika petunjuk penilaian **mudah dipahami**, **tepat** dan **jelas**
		4	Jika petunjuk penilaian **mudah dipahami**, tetapi **kurang tepat** dan **kurang jelas**
		3	Jika petunjuk penilaian **mudah dipahami**, **tidak tepat** dan **tidak jelas**
		2	Jika petunjuk penilaian hanya **sebagian yang mudah dipahami**, **tepat** dan **jelas**
		1	Jika petunjuk penilaian **tidak mudah dipahami,tidak tepat tepat** dan **tidak jelas**

C. INSTRUMEN OBSERVASI KETERLAKSANAAN RPP UNTUK *OBSERVER*

PETUNJUK PENGISIAN

NAMA *OBSERVER* :

NIP :

INSTANSI :

1. Berilah tanda (√) pada kolom yang sesuai dengan penilaian Bapak/Ibu dengan kriteria sebagai berikut:
   - SB (Sangat Baik) = 5
   - B (Baik) = 4
   - C (Cukup) = 3
   - K (Kurang) = 2
   - SK (Sangat Kurang) = 1
2. Tiap kolom harus diisi. Jika ada penilaian yang tidak sesuai atau terdapat suatu kekurangan tulislah kritik dan saran Bapak/Ibu pada kolom catatan penilaian keterlaksanaan RPP.
3. Mohon lembar observasi keterlaksanaan RPP dikembalikan karena akan digunakan untuk kelanjutan penilaian

Kami ucapkan terimakasih atas kerjasama yang diberikan.

LEMBAR OBSERVASI KETERLAKSANAAN RPP

Untuk : *Observer* Keterlaksanaan RPP

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
	A. Kegiatan Pendahuluan						
1.	Persiapan peserta didik untuk belajar						
2.	Kegiatan apersepsi						
	B. Kegiatan Inti Pembelajaran						
3.	Kejelasan penyampaian materi						
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai						
5.	Pembelajaran secara sistematis						
6.	Penggunaan media secara efektif dan efisien						
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.						
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.						
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.						
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD						
11.	Penumbuhan partisipasi aktif peserta didik						

No.	Aspek yang ditelaah	Skor					Catatan
		5	4	3	2	1	
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran						
13.	Penilaian akhir						
	C. Kegiatan Penutup						
14.	Kegiatan refleksi atau membuat kesimpulan						
15.	Kegiatan tindak lanjut						
	D. Alokasi Waktu						
16.	Alokasi waktu untuk setiap kegiatan						

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Guru pengamat

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Deskripsi Instrumen untuk Observasi Keterlaksanaan RPP

No.	Aspek yang dinilai	Skor	Penjabaran
A. Kegiatan Pendahuluan			
1.	Persiapan peserta didik untuk belajar	5	Jika persiapan peserta didik untuk belajar **sangat sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		4	Jika persiapan peserta didik untuk belajar **sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		3	Jika persiapan peserta didik untuk belajar **cukup sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		2	Jika persiapan peserta didik untuk belajar **kurang sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		1	Jika persiapan peserta didik untuk belajar **tidak sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
2.	Kegiatan apersepsi	5	Jika kegiatan apersepsi **sangat sesuai** dengan rencana dalam membangkitkan kreativitas dan kemandirian belajar kimia peserta didik
		4	Jika kegiatan apersepsi **sesuai** dengan rencana dalam membangkitkan kreativitas dan kemandirian belajar kimia peserta didik
		3	Jika kegiatan apersepsi **cukup sesuai** dengan rencana dalam membangkitkan kreativitas dan kemandirian belajar kimia peserta didik
		2	Jika kegiatan apersepsi **kurang sesuai** dengan rencana dalam membangkitkan kreativitas dan kemandirian belajar kimia peserta didik
		1	Jika kegiatan apersepsi **tidak sesuai** dengan rencana dalam membangkitkan kreativitas dan kemandirian belajar kimia peserta didik
B. Kegiatan Inti Pembelajaran			
3.	Kejelasan penyampaian materi	5	Jika materi disampaikan dengan **sangat jelas**
		4	Jika materi disampaikan dengan **jelas**

No.	Aspek yang dinilai	Skor	Penjabaran
		3	Jika materi disampaikan dengan **cukup jelas**
		2	Jika materi disampaikan dengan **kurang jelas**
		1	Jika materi disampaikan dengan **tidak jelas**
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	Jika proses pembelajaran **sangat sesuai** dengan tujuan pembelajaran yang akan dicapai
		4	Jika proses pembelajaran **sesuai** dengan tujuan pembelajaran yang akan dicapai
		3	Jika proses pembelajaran **cukup sesuai** dengan tujuan pembelajaran yang akan dicapai
		2	Jika proses pembelajaran **kurang sesuai** dengan tujuan pembelajaran yang akan dicapai
		1	Jika proses pembelajaran **tidak sesuai** dengan tujuan pembelajaran yang akan dicapai
5.	Pembelajaran secara sistematis	5	Jika pembelajaran dilakukan dengan **sangat sistematis**
		4	Jika pembelajaran dilakukan dengan **sistematis**
		3	Jika pembelajaran dilakukan dengan **cukup sistematis**
		2	Jika pembelajaran dilakukan dengan **kurang sistematis**
		1	Jika pembelajaran dilakukan dengan **tidak sistematis**
6.	Penggunaan media secara efektif dan efisien	5	Jika media digunakan dengan **sangat efektif dan efisien**
		4	Jika media digunakan dengan **efektif dan efisien**
		3	Jika media digunakan dengan **cukup efektif dan efisien**
		2	Jika media digunakan dengan **kurang efektif dan efisien**
		1	Jika media digunakan dengan **tidak efektif dan efisien**
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	Jika metode pembelajaran yang digunakan **sangat sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		4	Jika metode pembelajaran yang digunakan **sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		3	Jika metode pembelajaran yang digunakan **cukup sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		2	Jika metode pembelajaran yang digunakan **kurang sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		1	Jika metode pembelajaran yang digunakan **tidak sesuai** dengan situasi dan kondisi peserta

No.	Aspek yang dinilai	Skor	Penjabaran
			didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	Jika pendekatan pembelajaran yang digunakan **sangat sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		4	Jika pendekatan pembelajaran yang digunakan **sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		3	Jika pendekatan pembelajaran yang digunakan **cukup sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		2	Jika pendekatan pembelajaran yang digunakan **kurang sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		1	Jika pendekatan pembelajaran yang digunakan **tidak sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	Jika model pembelajaran yang digunakan **sangat sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		4	Jika model pembelajaran yang digunakan **sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		3	Jika model pembelajaran yang digunakan **cukup sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		2	Jika model pembelajaran yang digunakan **kurang sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
		1	Jika model pembelajaran yang digunakan **tidak sesuai** dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu	5	Jika sumber belajar yang digunakan **sangat tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		4	Jika sumber belajar yang digunakan **tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD

No.	Aspek yang dinilai	Skor	Penjabaran
	negara anggota OECD	3	Jika sumber belajar yang digunakan **cukup tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		2	Jika sumber belajar yang digunakan **kurang tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
		1	Jika sumber belajar yang digunakan **tidak tepat** dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD
11.	Penumbuhan partisipasi aktif peserta didik	5	Jika kegiatan pembelajaran **sangat tepat** dalam menumbuhkan partisipasi aktif peserta didik
		4	Jika kegiatan pembelajaran **tepat** dalam menumbuhkan partisipasi aktif peserta didik
		3	Jika kegiatan pembelajaran **cukup tepat** dalam menumbuhkan partisipasi aktif peserta didik
		2	Jika kegiatan pembelajaran **kurang tepat** dalam menumbuhkan partisipasi aktif peserta didik
		1	Jika kegiatan pembelajaran **tidak tepat** dalam menumbuhkan partisipasi aktif peserta didik
12.	Pemantauan kemajuan belajar peserta didik selama proses belajar	5	Jika dalam kegiatan pembelajaran **sangat dapat** memantau kemajuan belajar peserta didik selama proses belajar
		4	Jika dalam kegiatan pembelajaran **dapat** memantau kemajuan belajar peserta didik selama proses belajar
		3	Jika dalam kegiatan pembelajaran **cukup dapat** memantau kemajuan belajar peserta didik selama proses belajar
		2	Jika dalam kegiatan pembelajaran **kurang dapat** memantau kemajuan belajar peserta didik selama proses belajar
		1	Jika dalam kegiatan pembelajaran **tidak dapat** memantau kemajuan belajar peserta didik selama proses belajar
13.	Penilaian akhir	5	Jika penilaian akhir **sangat sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		4	Jika penilaian akhir **sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian

No.	Aspek yang dinilai	Skor	Penjabaran
			belajar kimia peserta didik
		3	Jika penilaian akhir **cukup sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		2	Jika penilaian akhir **kurang sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		1	Jika penilaian akhir **tidak sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
C. Penutup			
14.	Kegiatan refleksi atau membuat kesimpulan	5	Jika kegiatan refleksi atau membuat kesimpulan **sangat sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		4	Jika kegiatan refleksi atau membuat kesimpulan **sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		3	Jika kegiatan refleksi atau membuat kesimpulan **cukup sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		2	Jika kegiatan refleksi atau membuat kesimpulan **kurang sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		1	Jika kegiatan refleksi atau membuat kesimpulan **tidak sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
15.	Kegiatan tindak lanjut	5	Jika kegiatan tindak lanjut terlaksana **sangat sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		4	Jika kegiatan tindak lanjut terlaksana **sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		3	Jika kegiatan tindak lanjut terlaksana **cukup sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		2	Jika kegiatan tindak lanjut terlaksana **kurang sesuai** dengan rencana dalam meningkatkan kreativitas dan kemandirian belajar kimia peserta didik
		1	Jika kegiatan tindak lanjut terlaksana **tidak sesuai** dengan rencana dalam meningkatkan

No.	Aspek yang dinilai	Skor	Penjabaran
			kreativitas dan kemandirian belajar kimia peserta didik
D. Alokasi waktu			
16.	Alokasi waktu untuk setiap kegiatan	5	Jika alokasi waktu **sangat sesuai** untuk setiap kegiatan yang dilakukan
		4	Jika alokasi waktu **sesuai** untuk setiap kegiatan yang dilakukan
		3	Jika alokasi waktu **cukup sesuai** untuk setiap kegiatan yang dilakukan
		2	Jika alokasi waktu **kurang sesuai** untuk setiap kegiatan yang dilakukan
		1	Jika alokasi waktu **tidak sesuai** untuk setiap kegiatan yang dilakukan

D. KISI-KISI ANGKET KREATIVITAS BELAJAR KIMIA PESERTA DIDIK

Kisi-kisi Butir Instrumen Kreativitas Belajar Kimia Peserta Didik

No	Aspek	Positif	Negatif	Jumlah
1.	Flusesnsi	-	11	1
2.	Fleksibilitas	5	2	2
3.	Originalitas	6	7, 12	3
4.	Elaborasi	1, 4, 15	3	4
5.	Redefinisi	8, 9, 10, 13, 14, 16	-	6
Jumlah		11	5	16

E. INSTRUMEN KREATIVITAS BELAJAR KIMIA PESERTA DIDIK

PETUNJUK PENGISIAN

NAMA :

No. Absen :

INSTANSI :

1. Berilah tanda (√) pada kolom yang sesuai dengan penilaian Anda dengan kriteria sebagai berikut:
   - STS : Apabila Anda merasa bahwa pernyataan tersebut **sangat tidak sesuai**
   - TS : Apabila Anda merasa bahwa pernyataan tersebut **tidak sesuai**
   - KS : Apabila Anda merasa bahwa pernyataan tersebut **kurang sesuai**
   - S : Apabila Anda merasa bahwa pernyataan tersebut **sesuai**
   - SS : Apabila Anda merasa bahwa pernyataan tersebut **sangat sesuai**
2. Tiap kolom harus diisi.
3. Mohon angket dikembalikan karena akan digunakan untuk kelanjutan penelitian.

   Kami ucapkan terimakasih atas kerjasama yang diberikan.

ANGKET KREATIVITAS PESERTA DIDIK

Untuk: Peserta didik

No.	Pernyataan	SS	S	KS	TS	STS
1.	Apabila ada suatu metode penyelesaian soal kimia yang sifatnya baru, maka saya merasa ingin tahu lebih jauh mengenali hal itu.					
2.	Saya tidak suka mengerjakan suatu soal kimia yang sulit dan belum pernah saya dapati soal tersebut sebelumnya					
3.	Saya tidak senang melakukan coba-coba terhadap penyelesaian suatu soal kimia					
4.	Saya senang melakukan penelitian ilmiah yang berhubungan dengan kimia					
5.	Saya senang bila mengerjakan soal-soal kimia yang mempunyai bermacam-macam kemungkinan dalam penyelesaian					
6.	Saya berusaha menemukan sendiri penyelesaian suatu soal kimia yang saya hadapi meskipun dengan berpikir keras					
7.	Saya senang mempertahankan pendapat mengenai penyelesaian suatu soal kimia meskipun pendapat tersebut keliru					
8.	Dengan berkhayal atau berfantasi, saya menemukan metode penyelesaian suatu soal kimia					
9.	Saya cepat mengetahui letak kesalahan bilaa ada yang salah dalam pekerjaan soal kimia saya					
10.	Bila ada yang salah dalam pekerjaan soal kimia saya, saya langsung mengetahui penyelesaian soal yang dimaksud					
11.	Saya akan membiarkan soal-soal kimia yang sulit sekali untuk dipecahkan					
12.	Saya khawatir mengemukakan pendapat dalam suatu diskusi yang berhubungan dengan kimia karena takut pendapat saya itu tidak benar					
13.	Saya senang melakukan sesuatu yang berbeda dengan orang laindalam menyelesaikan soal kimia					
14.	Saya senang membuat kejutan dengan menunjukkan hasil penyelesaian soal kimia yang saya buat					
15.	Saya merasa terdorong untuk mengetahui lebih lanjut mengenai metode-metode baru yang digunakan guru dalam menyelesaikan soal kimia					

No.	Pernyataan	SS	S	KS	TS	STS
16.	Saya senang apabila dalam menyelesaikan soal kimia saya menggunakan cara yang tidak diajarkan oleh guru					

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Peserta didik

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ASPEK YANG DINILAI DAN KRITERIA PENILAIAN KREATIVITAS PESERTA DIDIK

I. Ciri Kognitif

A. Keterampilan berpikir lancar

3 = denngan lancar menanggapi pertanyaan dan menghasilkan gagasan-gagasan yang baik

2 = menanggappi pertanyaan dengan gagasan yang sederhana

1 = menanggapi pertanyaan tanpa memberikan gagasan

0 = tidak dapat menjawab pertanyaan dan memberikan gagasan

B. Keterampilan berpikir luwes

3 = mampu memberikan tiga atau lebih alternatif jawaban dalam memecahkan masalah

2 = mampu memberikan tiga dua alternatif jawaban dalam memecahkan masalah

1 = mampu memberikan satu alternatif jawaban dalam memecahkan masalah

0 = tidak memberikan alternatif jawaban untuk memecahkan masalah

C. Keterampilan berpikir orisinil

3 = selalu mencetuskan gagasan-gagasan asli tanpa meniru teman lain

2 = kadang-kadang mampu mencetuskan gagasan-gagasan asli tanpa meniru teman lain

1 = pernah mampu mencetuskan gagasan-gagasan asli tanpa meniru teman lain

0 = tidak memcetuskan gagasan-gagasan asli tanpa meniru teman lain

D. Keterampilan memperinci

3 = memecahkan permasalahan dengan menguraikan ide secara terperinci, detail, dan benar

2 = memecahkan permasalahan dengan ide yang sederhana dan benar

1 = memecahkan permasalahan dengan menguraikan ide secara terperinci dan detail, namun kurang benar

0 = tidak memecahkan permasalahan dan mengungkapkan ide

E. Keterampilan menilai

3 = memberikan pertimbangan dengan alas an yang dapat dipertanggungjawabkan atas dasar sudut pandangnya sendiri

2 = memberikan pertimbangan namun tidak mengungkapkan alas an

1 = memberikan pertimbangan dengan alas an yang tidak dapat dipertanggungjawabkan atas dasar sudut pandangnya sendiri

0 = tidak memberikan pertimbangan dan pendapat

II. Ciri Afektif

A. Rasa ingin tahu

3 = sering memberikan pertanyaan kepada pendidik

2 = kadang-kadang memberikan pertanyaan kepada pendidik

1 = pernah memberikan pertanyaan kepada pendidik

0 = tidak pernah memberikan pertanyaan kepada pendidik

B. Sifat imajinatif

3 = selalu dapat membayangkan materi yang bersifat abstrak sekalipun

2 = kadang-kadang dapat membayangkan materi yang bersifat abstrak

1 = pernah membayangkan materi yang bersifat abstrak

0 = tidak pernah bisa membayangkan materi yang bersifat abstrak

C. Sifat kemajemukan

3 = selalu mampu menanggapi permasalahan dengan melihat dari berbagai segi

2 = kadang-kadang mampu menanggapi permasalahan dengan melihat dari berbagai segi

1 = pernah mampu menanggapi permasalahan dengan melihat dari berbagai segi

0 = tidak mampu menanggapi masalah

D. Sifat menghadapi resiko

3 = selalu dapat mengerjakan tugas dari guru sesulit apapun

2 = kadang-kadang dapat mengerjakan tugas dari guru yang sulit

1 = pernah mengerjakan tugas dari guru yang sulit

0 = tidak pernah mengerjakan tugas dari guru

E. Sifat menghargai

3 = selalu dapat menghargai pendapat orang lain walaupun berbeda dengan pendapat diri sendiri

2 = kadang-kadang dapat menghargai pendapat orang lain walaupun berbeda dengan pendapat diri sendiri

1 = pernah dapat menghargai orang lain walaupun berbeda dengan pendapat diri sendiri

0 = tidak pernah menghargai pendapat orang lain walaupun berbeda dengan pendapat diri sendiri

F. KISI-KISI ANGKET KEMANDIRIAN BELAJAR KIMIA PESERTA DIDIK

Kisi-kisi Butir Instrumen Kemandirian Belajar Kimia

No	Indikator	Sifat Pernyataan		Jumlah
		Positif	Negatif	
		Nomor Butir	Nomor Butir	
1.	Kemauan yang keras	1, 5, 20	13, 24	5
2.	Perencanaan	2, 6, 9, 18, 21	14, 25, 27	8
3.	Pelaksanaan	3, 10, 19, 28	15	5
4.	Inisiatif	4, 7, 11, 16, 22	26, 29	7
5.	Mengatasi kesulitan	8, 12, 17, 23, 30, 31	-	6
Jumlah		23	8	31

G. INSTRUMEN KEMANDIRIAN BELAJAR KIMIA PESERTA DIDIK

PETUNJUK PENGISIAN

NAMA :

No. Absen :

INSTANSI :

1. Berilah tanda (√) pada kolom yang sesuai dengan penilaian Anda dengan kriteria sebagai berikut:
   - STS : Apabila Anda merasa bahwa pernyataan tersebut **sangat tidak sesuai**
   - TS : Apabila Anda merasa bahwa pernyataan tersebut **tidak sesuai**
   - KS : Apabila Anda merasa bahwa pernyataan tersebut **kurang sesuai**
   - S : Apabila Anda merasa bahwa pernyataan tersebut **sesuai**
   - SS : Apabila Anda merasa bahwa pernyataan tersebut **sangat sesuai**
2. Tiap kolom harus diisi.
3. Mohon angket dikembalikan karena akan digunakan untuk kelanjutan penelitian.

   Kami ucapkan terimakasih atas kerjasama yang diberikan.

ANGKET KEMANDIRIAN BELAJAR KIMIA

Untuk: Peserta didik

No.	Pernyataan	SS	S	KS	TS	STS
1.	Saya memiliki semangat yang tinggi dalam belajar kimia					
2.	Saya selalu belajar kimia secara teratur, tidak hanya pada waktu luang					
3.	Belajar kimia secara mandiri selalu dapat saya laksanakan dengan baik					
4.	Belajar kimia saya lakukan atas kemauan sendiri					
5.	Ada ulangan atau tidak, saya selalu belajar kimia dengan tekun					
6.	Saya selalu membuat jadwal dalam belajar kimia					
7.	Sebelum belajar kimia, saya mempersiapkan sendiri perlengkapan yang diperlukan					
8.	Saya menyediakan waktu lebih banyak untuk mempelajari konsep kimia yang saya anggap sulit					
9.	Saya selalu menepati jadwal belajar kimia yang telah saya buat					
10.	Untuk menghadapi ulangan kimia pada akhir semester, saya mempersiapkan dengan belajar kimia sejak jauh-jauh hari					
11.	Saya berusaha menciptakan suasana belajar yang mendukung saya mempelajari kimia dengan baik					
12.	Untuk mengatasi kesulitan dalam pelajaran kimia saya berusaha menambah jam belajar kimia					
13.	Kesulitan yang saya hadapi dalam mempelajari kimia membuat saya patah semangat					
14.	Saya sering tidak menepati jadwal belajar kimia yang telah saya buat					
15.	Belajar kimia hanya saya lakukan jika ada ulangan saja					
16.	Saya selalu mengerjakan tugas kimia dengan kemauan dan kemampuan sendiri					
17.	Saya berusaha menyederhanakan konsep-konsep kimia yang rumit agar lebih mudah dalam mempelajarinya					
18.	Materi kimia yang akan saya pelajari selalu saya tentukan sebelumnya					
19.	Saya selalu siap menghadapi ulangan ki ia, sehingga tidak akan mencontek pekerjaan teman					
20.	Saya berusaha keras untuk mencapai nilai rapor kimia yang saya targetkan semester ini					

No.	Pernyataan	SS	S	KS	TS	STS
21.	Saya selalu mempersiapkan konsep kimia yang akan dibahas pada pertemuan berikutnya					
22.	Dengan kemauan sendiri, saya mencoba mengerjakan soal-soal kimia dari berbagai buku acuan belajar					
23.	Apabila belum jelas mengenai pelajaran kimia yang baru saja diterangkan, saya akan mencari informasi dari sumber belajar lain					
24.	Saya tidak tertantang untuk menyelesaikan soal-soal kimia yang sulit					
25.	Dalam belajar kimia, saya tidak mempunyai target khusus yang harus saya capai					
26.	Saya merasa terpaksa untuk belajar kimia					
27.	Saya sering mengikuti pelajaran kimia tanpa persiapan belajar terlebih dahulu					
28.	Saya selalu mengulang kembali pelajaran kimia yang baru saja diberikan					
29.	Saya tidak pernah mencari informasi dari sumber belajar lain untuk pengayaan materi pelajaran kimia					
30.	Untuk mempelajari konsep-konsep kimia yang bersifat hafalan saya mempunyai trik-trik khusus yang saya buat sendiri.					
31.	Saya biasa membuat catatan kecil untuk membantu memahami konsep kimia yang sulit					

Purworejo, ……..2012

Peserta didik

……

H. KISI-KISI TES HASIL BELAJAR KOGNITIF MATERI LARUTAN PENYANGGA

Kisi-kisi Soal Hasil Belajar Kimia Materi Larutan Penyangga

Indikator	Aspek Kognitif				Jumlah Soal Pilihan Ganda	Jumlah Soal Essay
	C1	C2	C3	C4		
Analyze a buffer and non buffer solutions through an experiment	1, 4,	2, 3		5	5	
Calculate the pH or pOH of buffers		15,	10, 23,	6, 8, 18, 24	7	Aspek kognitif : C4 Nomor Soal: 2*
Calculate the pH of buffer solution after acid or base addition or dillution		20,	19,	7, 9, 16, 17, 21, 22, 25	9	Aspek kognitif : C4 Nomor Soal: 1*
Describe and explain the uses of buffers, including the role of H_2CO_3/HCO_3^- in controlling pH in blood.	14,	12, 13,	11,		4	
Jumlah	3	6	4	12	**25**	**2**
Presentase	12%	24%	16%	48%	**100%**	

I. INSTRUMEN TES HASIL BELAJAR KOGNITIF MATERI LARUTAN PENYANGGA

Subject Matter : Chemistry

Topic : Buffer Solution

Time Allocation : 2 X 45 minutes

Data :

Note:

- ✓ Write your name and your number on the work sheet
- ✓ Sign (X) to the right answer
- ✓ Pray before you do assessment

---

1. Which is buffer solution?
   A. $HCl_{(aq)} + NH_4Cl_{(aq)}$
   B. $CH_3COOH_{(aq)} + C_6H_5COOK_{(aq)}$
   C. $C_2H_5OH_{(aq)} + C_2H_5ONa_{(aq)}$
   D. $Ca(OH)_{2(aq)} + HCOONa_{(aq)}$
   E. $HCOOH_{(aq)} + HCOONa_{(aq)}$
2. Identify which is buffer solution?
   A. 50 mL of 0.2 M NaOH + 50 mL of 0.1 M CH_3COOH
   B. 35 mL of 0.2 M NaOH + 70 mL of 0.1 M $NH_{3\,(aq)}$
   C. 40 mL of 0.1 M NaOH + 60 mL of 0.1 M $NH_{3\,(aq)}$
   D. 50 mL of 0.1 M NaOH + 50 mL of 0.2 M CH_3COOH
   E. 50 mL of 0.2 M NaOH + 70 mL of 0.1 M CH_3COOH
3. The buffer solution resists a change in the pH, except of condition below….
   A. Adding H_2O two times
   B. Adding a small amount of weak acid
   C. Adding a small amount of strong acid
   D. Adding a large amount of strong acid
   E. Adding a small amount of strong base
4. A small amount of strong acid is added to buffer solution that contains of $NH_{3\,(aq)}$ and $NH_4Cl_{(aq)}$, which is the true statement?

A. Solution changes to be yellow when it is added to BTB

B. Solution changes to be red when it is added to MM

C. Solution changes to be red when it is added to extracts of *Hibiscus rosa-sinensis* L extracts

D. Solution changes to be green when it is added to extracts of *Canna indica*

E. Solution doesn't change when it is added to phenolphthalein indicator

5. The data below show the result of experiment when some solutions are dropped by acid and base:

Solution	The change of pH when adding:	
	Acid	Base
1	2	6
2	0.1	0.01
3	4	0
4	0	4
5	3	4

Which is a buffer solution?

A. 1

B. 2

C. 3

D. 4

E. 5

6. How many grams of CH_3COONa (Mr = 82) should be added to 100 mL of 0.1 M CH_3COOH (K_a CH_3COOH = 1 x 10^{-5}) to find out the pH of buffer is 5.

A. 0.01 grams

B. 0.42 grams

C. 0.82 grams

D. 1.00 grams

E. 1.64 grams

7. To make a buffer solution which has pH = 9, 100 mL of 0.1 M HCl must be added by 0.2 of $NH_4OH_{(aq)}$ = …… mL (K_b NH_4OH = 1 x 10^{-5})

A. 100

B. 150

C. 200

D. 250

E. 300

8. When the sodium acetic is added to the 1 liter of 0.1 acetic acid (pH=3) make the pH change to be two times (K_a CH_3COOH = 1 x 10^{-5}). How many sodium acetic which was added to the system?

   A. 1 mole

   B. 0.1 mole

   C. 0.01 mole

   D. 0.001 mole

   E. 0.0001 mole

9. A HNO_2 is added to NaOH to make buffer solution. There are 0.02 mole of $NaNO_2$ and 0.47 gram of HNO_2 in the end of reaction. The pH of this buffer is…. (K_a HNO_2 = 4 x 10^{-4}, Mr HNO_2 = 47)

   A. 8 + log 4

   B. 8 + log 2

   C. 4 - log 2

   D. 4 - log 4

   E. 4 - log 8

10. The mixing of 0.1 $NH_4OH_{(aq)}$ and 0.1 M NH_4Cl has pH = 10, K_b NH_4OH = 1 x 10^{-5}. The volume ratio of $NH_4OH_{(aq)}$ and $NH_4Cl_{(aq)}$ is…

    A. 1 : 1

    B. 1 : 5

    C. 2 : 1

    D. 5 : 1

    E. 10 : 1

11. There are statements:

i. The blood resists a change in the pH because there is buffer system $H_2CO_{3\,(aq)}/HCO_{3\,(aq)}^-$ in the blood

ii. $H_2PO_4^-$ $_{(aq)}$/HPO_4^{2-} $_{(aq)}$ is a buffer system in eritrosit

iii. CH_3COOH $_{(aq)}$ and CH_3COO^- $_{(aq)}$ is a buffer component in the blood

iv. H_2CO_3 $_{(aq)}$/CO_3^{2-} $_{(aq)}$ causes the pH of blood have a range 7.35-7.45

Which is the true statement?

A. i and ii

B. i and iii

C. i and iv

D. ii and iii

E. iii and iv

12. Which is the true statement about the function of buffer solution in human body?

A. Keeping the equilibrium of liquid inner or outer cell

B. Keeping the blown up of the blood vessel

C. Keeping the blood resists a change in the pH

D. Keeping the liquid enter the cell

E. Keeping the solvent enter the cell into semi permeable membrane

13. Which is the solution will make a buffer when its added by H_2CO_3 $_{(aq)}$?

A. $Al(OH)_3$

B. Na_2CO_3

C. $NaHCO_3$

D. CH_3COOH

E. NaCN

14. Which is the false statement about buffer?

A. The buffer solution resists a change in the pH

B. The buffer solution resists a change in the pH by adding a small amount of strong acid

C. The buffer solution resists a change in the pH by adding H_2O

D. The pH of buffer always equal to pK_a or pK_b

E. The pH of buffer doesn't change cause of CO_2 in the air

15. A buffer system is made by CH_3COOH and CH_3COONa. The buffer capacity will be higher when it is added by base if

A. To the buffer system is added by H_2O

B. To the buffer system is added by HCl

C. To the buffer system is added by CH_3COOH

D. To the buffer system is added by NaOH

E. To the buffer system is added by NH_3

16. A weak acid HX 0.4 M 150 mL has pH = 2.7. If the weak acid HX is added to 100 mL of NaOH 0.5 M, so the pH will be… (log 2 = 0.3; log 5 = 0.7)

    A. 5.3

    B. 3.0

    C. 2.0

    D. 5.7

    E. 1.30

17. To the 1 L of 0.2 M acetic acid is added $NaOH_{(s)}$ so its pH=4. If the Molecule relative of NaOH = 40 and Ka = 2 x 10^{-5} M, how many grams of $NaOH_{(s)}$ which is added to the system?

    A. 1.33

    B. 2.00

    C. 2.33

    D. 3.00

    E. 3.33

18. As much as 0.1 L of HCOOH has pH=3 (Ka = 1 x 10^{-5} M). If we want to make buffer with pH = 6, so we add HCOONa ….. mole

    A. 0.1

    B. 0.5

    C. 1

    D. 5

    E. 10

19. There are buffer systems:

    I. 50 mL of 0.1 M NaOH + 50 mL of 0.2 M CH_3COOH

    II. 100 mL of 0.1 M NaOH + 50 mL of 0.2 M CH_3COOH

III. 50 mL of 0.2 M H_2CO_3 + 100 mL of 0.1 M NH_3 *(aq)*

IV. 50 mL of 0.1 M HCl + 50 mL of 0.2 M NH_3 *(aq)*

V. 50 mL of 0.1 M HCl + 50 mL of 0.2 M NaOH

Which is buffer solution that wouldn't change drastically when its added a small amount of strong base?

A. I and II

B. I and III

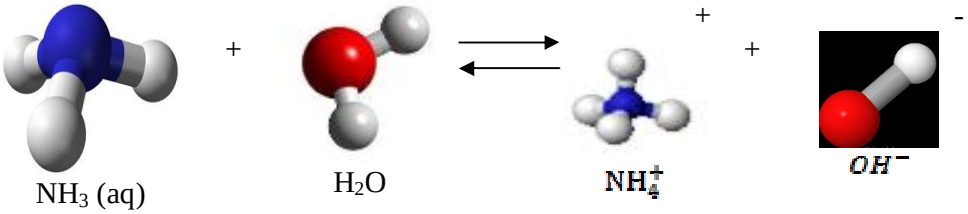
C. I and IV

D. II and II

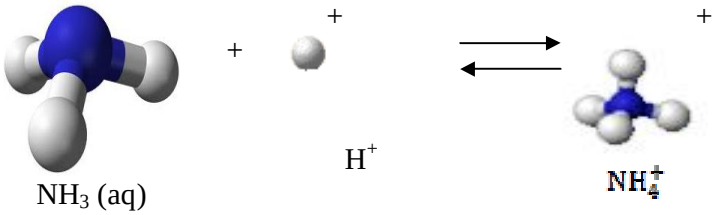
E. I and V

20. To the buffer system that contains of NH_3 and NH_4Cl is added to strong acid H_2SO_4, the reaction acts as pH resistor of buffer is shown by:

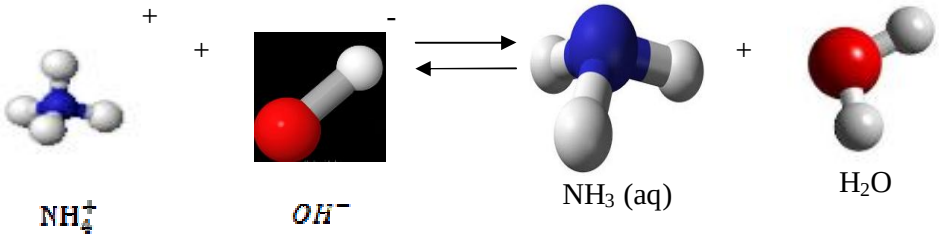
Picture 1.



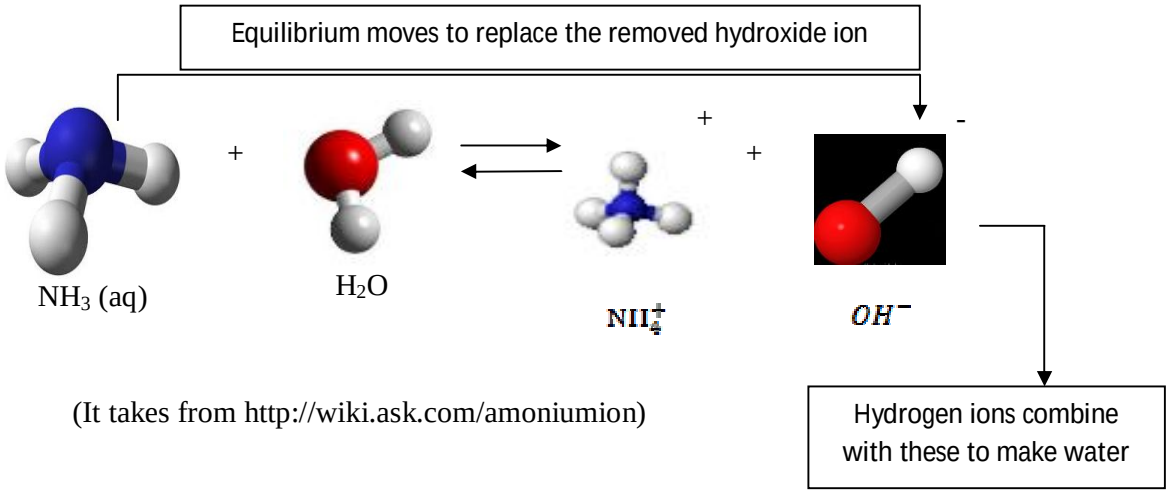
Picture 2.



Picture 3.



Picture 4.



(It takes from http://wiki.ask.com/amoniumion)

A. 1 dan 2

B. 1 dan 3

C. 2 dan 3

D. 2 dan 4

E. 4

21. The pH of buffer system which is made by 25 mL of 0.2 M CH_3COOH (K_a=1x10^{-5}) and 25 mL of 0.1 M NaOH is….

A. 2.0

B. 2.5

C. 3.0

D. 5.0

E. 5.5

22. pH of solution which is made by 200 mL of 0.4M NH_3 + 200 mL of 0.2M HCl is.. (K_b $NH_{3\ (aq)}$ =1x10^{-5})

A. 5

B. 9

C. 10

D. 11

E. 12

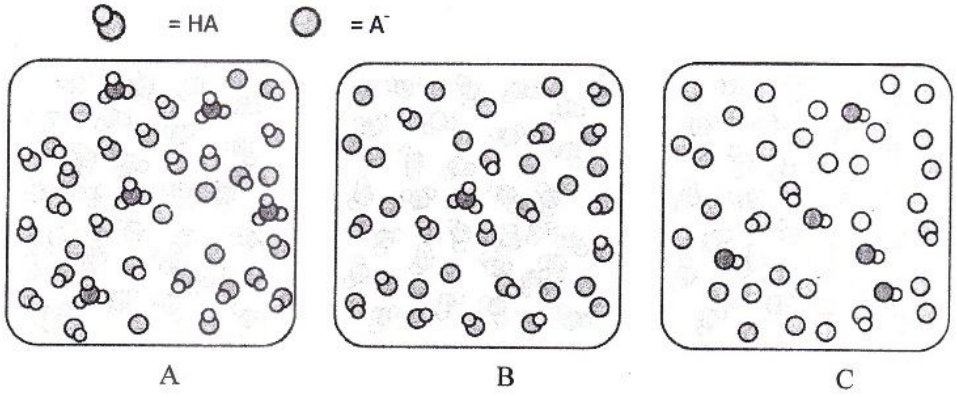
23. The mixture of solution below which have pH = 8 is….
(K_a CH_3COO = 1 x 10^{-5}; K_b $NH_{3\ (aq)}$ =1x10^{-5}; K_w H_2O =1 x 10^{-14})
    A. 50 cm^3 of 0.1 M CH_3COOH + 50 cm^3 of 0.1 M CH_3COONa
    B. 50 cm^3 of 0.1 M CH_3COOH + 50 cm^3 of 1.0 M CH_3COONa
    C. 50 cm^3 of 0.1 M $NH_{3\ (aq)}$ + 50 cm^3 of 1.0 M NH_4Cl
    D. 50 cm^3 of 0.1 M $NH_{3\ (aq)}$ + 50 cm^3 of 0.2 M NH_4Cl
    E. 50 cm^3 of 0.1 M $NH_{3\ (aq)}$ + 50 cm^3 of 0.1 M NH_4Cl

24. Calculate the pH of 100 mL of 0.15 M CH_3COOH is added to 50 mL of 0.2 NaOH 0.2 M (K_a CH_3COO = 1.8 x 10^{-5})
    A. 3 - log 5
    B. 5 - log 3
    C. 6 - log 5
    D. 6 - log 9
    E. 9 - log 3

25. To make buffer solution pH=9, 40 mL of 0.5 NH_3 (K_b $NH_{3\ (aq)}$ =1x10^{-5}) must be added by 0.2 M of HCl ….. mL
    A. 10
    B. 20
    C. 30
    D. 40
    E. 50

ESSAY

1. 50 mL of 0.1 M NH_4OH ($K_b\ CH_3COO = 1.8 \times 10^{-5}$) is added by 0.1 of HCl. Determine the pH of solution when:
   a. The initial of titration
   b. After adding 1 mL of HCl
   c. After adding 25 mL of HCl
2. The pictures below show the buffer solutions which contain weak acid HA, and the salt of sodium NaA.



Explain which is the buffer which has the biggest capacity of buffer if it is added to strong base?

SCORING GUIDELINE

Multiple Choices

1. E	6. C	11. A	16. D	21. D
2. D	7. A	12. C	17. A	22. B
3. D	8. A	13. C	18. A	23. C
4. D	9. C	14. D	19. C	24. D
5. B	10. E	15. C	20. D	25. E

Essay

1. 50 mL of 0.1 M NH_4OH (K_b CH_3COO = 1.8 x 10^{-5}) is added by 0.1 of HCl. The pH of solution when:

   a. The initial of titration

   There isn't HCl, just NH_4OH, so:

   $$[OH^-] = \sqrt{Kb \times [basa]}$$

   $$= \sqrt{1.8x10^{-5}x[0.1]}$$

   $$= 1.3 \times 10^{-3}$$

   pH = 14 - (- log 1.3 x 10^{-3})

   = 11 + log 1.3 = 11.11 **2**

   b. After adding 1 mL of HCl

   $$NH_4OH_{(aq)} + HCl_{(aq)} \longrightarrow NH_4Cl_{(aq)} + H2O_{(l)}$$

Initial	5 mmol	0.1 mmol	
Reaction	-0.1 mmol	-0.1 mmol	+0.1 mmol
Remain	4.9 mmol	-	0.1 mmol

   $$[OH^-] = Kb \times \frac{[basa\ lemah]}{[asam\ konjugasi]}$$

   $$= 1.8x10^{-5}x\frac{4.9}{0.1} = 8.8x10^{-4}$$

   pH = 14 - (- log $8.8x10^{-4}$)

   = 10 + log 8.8 = 10.94 **4**

c. After adding 25 mL of HCl

$$NH_4OH_{(aq)} + HCl_{(aq)} \longrightarrow NH_4Cl_{(aq)} + H2O_{(l)}$$

Initial	5 mmol	2.5 mmol	
Reaction	-2.5 mmol	-2.5 mmol	+2.5 mmol
Remain	2.5 mmol	-	2.5 mmol

$$[OH^-] = Kb \times \frac{[\text{basa lemah}]}{[\text{asam konjugasi}]}$$

$$= 1.8x10^{-5} x \frac{2.5}{2.5} = 1.8x10^{-5}$$

pH = 14 - (- log $1.8x10^{-5}$)

= 9 + log 1.8 = 9.26 **4**

2. The buffer capacity based on buffer's component, they are concentration of weak acid and its conjugate base. If buffer solution is added to base, the acid will neutralize OH- immediately so the pH doesn't change drastically. So the solution which contains more weak acid (HA) is the biggest capacity of buffer.

   Solution (a) = 8 A^- , 24 HA

   Solution (b) = 16 A^- , 16 HA

   Solution (c) = 28 A^- , 4 HA

   So the capacity of buffer when adding to base is (a) > (b) > (c) **5**

Total score : (25 + 15)/4

J. LEMBAR VALIDASI INSTRUMEN PENELITIAN

PERNYATAAN VALIDATOR

Saya yang bertanda tangan dibawah ini menerangkan bahwa saya telah memvalidasi instrumen penelitian tesis yang disusun oleh:

Nama	:	Dini Nugraheni, SPd. Si
NIM	:	10708251057
Program Studi	:	Pendidikan Sains Konsentrasi Pendidikan Kimia
Judul Tesis	:	Pengembangan Kurikulum Kimia R SMA BI Menggunakan Kurikulum Rujukan dari Singapura

Melalui surat ini saya menyatakan bahwa instrumen penelitian tesis yang telah disusun sudah layak untuk dipergunakan dalam penelitian atau diterapkan dalam proses pembelajaran. Demikian surat ini dibuat untuk dapat dipergunakan sebagaimana mestinya.

Yogyakarta, _____ 2012

Validator

Prof. Suparwoto
NIP.

,

PERNYATAAN VALIDATOR

Saya yang bertanda tangan dibawah ini menerangkan bahwa saya telah memvalidasi instrumen penelitian tesis yang disusun oleh:

Nama	:	Dini Nugraheni, SPd. Si
NIM	:	10708251057
Program Studi	:	Pendidikan Sains Konsentrasi Pendidikan Kimia
Judul Tesis	:	Pengembangan Kurikulum Kimia R SMA BI Menggunakan Kurikulum Rujukan dari Singapura

Melalui surat ini saya menyatakan bahwa instrumen penelitian tesis yang telah disusun sudah layak untuk dipergunakan dalam penelitian atau diterapkan dalam proses pembelajaran. Demikian surat ini dibuat untuk dapat dipergunakan sebagaimana mestinya.

Yogyakarta, _____ 2012

Validator

Dr. Eli Rohaeti
NIP. 19691229 199903 2 001

LAMPIRAN 7

REKAP DATA HASIL PENELITIAN

a. URAIAN SK DAN KD HASIL PENGEMBANGAN BESERTA ANALISIS PENGEMBANGANNYA.

Education unit : SMAN 7 Purworejo
Class/Semester : X/1
Subject matter : Chemistry

Basic Competence	Indicators	Analisis
1.1 Understanding the atomic structure pursuant to atomic theory of Bohr, properties of element, relative atomic mass, and properties of periodic element in periodic tables and also realize its regularity, passing the understanding of electron configuration.	a. Compare the development of element periodic tables to identify the advantages and the disadvantages.	Indikator tetap sesuai dengan KTSP
	b. Explain the classification of elements.	Indikator tetap sesuai dengan KTSP
	c. Classify the elements into metal, non metal and metalloid.	Indikator tetap sesuai dengan KTSP
	d. Analyze the tables and graph to determine the regularity of atom radii, ionization energy, electron affinity, and electro negativity.	Indikator tetap sesuai dengan KTSP
	e. Describe qualitatively (and indicate the periodicity in) the variations in atomic radius, ionic radius, melting point and electrical conductivity of the elements.	Peserta didik diharapkan mampu mendeskripsikan tentang periodisitas yang meliputi jari-jari atom, titik leleh, dan konduktivitas listrik dari sebuah unsur dengan melihat tabel periodik unsur. Hal ini penting karena materi ini berkaitan erat dengan konsep fisika, sehingga diharapkan pengeta-huan peserta didik utuh tentang atom dan mudah mempelajari kimia dan fisika.
	f. Explain the development of atomic theory to show the advantages and the disadvantages of the atomic theory.	Indikator tetap sesuai dengan KTSP
	g. Identify and describe protons, neutrons and electrons in terms of their relative charges and relative masses.	Pengetahuan dasar tentang struktur atom ini akan dijadikan landasan peserta didik dalam belajar kimia mengingat materi kimia saling berkaitan. Konsep dasar mengenai struktur atau komposisi sebuah atom akan mengantarkan peserta didik dalam mempelajari materi selanjutnya antara lain ikatan kimia, stoikiometri atau perhitungan kimia, dan juga mempelajari unsur-unsur yang ada di

Basic Competence	Indicators	Analisis
		sekeling manusia, mengingat segala sesuatu yang ada di sekitar makhluk hidup dan juga makhluk hidup sendiri tersusun dari zat-zat kimia yang salah satu bagian kecilnya disebut atom.
	h. Deduce the behavior of beams of protons, neutrons and electrons in an electric field.	Pengetahuan tentang perilaku partikel-partikel penyusun atom dalam medan listrik berguna bagi peserta didik karena berhubungan dengan materi fisika gelombang elektro-magnetik, sehingga dengan mempelajari materi ini peserta didik mendapatkan pengetahuan kimia dan fisika yang tidak terpisahkan.
	i. Deduce the numbers of protons, neutrons and electrons present in both atoms and ions given proton and nucleon numbers (and charge).	Untuk point i dan j tersebut merupa-kan hasil adaptasi dari segi waktu penyampaian materi. Penyampaian materi atom di sekolah-sekolah sebagian besar masih terpisah-pisah (kelas X Semester 1 dan kelas XI Semester 1). Harapan--nya materi atom untuk sekolah RSMABI yang input peserta didiknya lebih bagus daripada sekolah biasa bisa diajarkan secara utuh satu materi dan tidak dipisah, sehingga peserta didik mendapatkan pengetahuan yang utuh sebagai dasar mempelajari konsep kimia berikutnya.
	j. Arrange the electronic configuration of atoms and ions given the proton number (and charge).	
	k. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	l. Explain relative atomic mass pursuant to periodic tables.	Indikator tetap sesuai dengan KTSP
	m. Classify elements into isotope, isobar and isotones.	Indikator tetap sesuai dengan KTSP
1.2 Comparing the formation of ionic bond, covalent bond, coordination bond, and metallic bond and also its relation with characteristics of formed	a. Explain the trend of element stability.	Indikator tetap sesuai dengan KTSP
	b. Describe the duplet and octet rules and Lewis structures.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	Analisis
compound physics.	c. Describe ionic (electrovalent) bonding, as in sodium chloride and magnesium oxide, including the use of 'dot-and-cross' diagrams.	Pembelajaran ikatan kimia, baik ikatan ion maupun ikatan kovalen akan lebih sederhana dan mudah diterima oleh peserta didik dengan menggunakan diagram "dot-and-cross". Dengan menggunakan diagram tersebut peserta didik melihat objek kimia yang mikroskopis menjadi lebih mudah untuk dipelajari.
	d. Describe, using the 'dot-and-cross' diagrams: covalent bonding, as in hydrogen; oxygen; nitrogen; chlorine; hydrogen chloride; carbon dioxide; methane; ethane.	Pembelajaran ikatan kimia, baik ikatan ion maupun ikatan kovalen akan lebih sederhana dan mudah diterima oleh peserta didik dengan menggunakan diagram "dot-and-cross". Dengan menggunakan diagram tersebut peserta didik melihat objek kimia yang mikroskopis menjadi lebih mudah untuk dipelajari.
	e. Explain the properties of ionic and covalent compounds.	Indikator tetap sesuai dengan KTSP
	f. Describe, using 'dot-and-cross' diagrams: co-ordinate (dative covalent) bonding, as in the formation of the ammonium ion and in the Al_2Cl_6 molecule.	Pembelajaran ikatan kimia, baik ikatan ion maupun ikatan kovalen akan lebih sederhana dan mudah diterima oleh peserta didik dengan menggunakan diagram "dot-and-cross". Dengan menggunakan diagram tersebut peserta didik melihat objek kimia yang mikroskopis menjadi lebih mudah untuk dipelajari.
	g. Explain the terms bond energy, bond length and bond polarity and use them to compare the reactivities of covalent bonds.	Karena peserta didik di RSMABI diharapkan memiliki pengetahuan yang lebih tinggi dari pada peserta didik di SMA mandiri, maka dalam pembelajaran ikatan kovalen dijelaskan pula energi ikatan, panjang ikatan, dan polaritas ikatan untuk membandingkan reaktivitas ikatan kovalen. Sehingga ketika bertemu dengan senyawa yang mengandung ikatan kovalen, peserta didik dapat menganalisis reaktivitas dari senyawa tersebut.
	h. Describe metallic bonding in terms of a lattice of positive ions surrounded by mobile electrons.	Konsep ikatan logam akan digunakan sebagai dasar dalam konsep selanjutnya antara lain saat mempelajari konsep unsur-unsur periode ketiga yang banyak terdapat di alam Indonesia. Oleh karena itu ikatan

Basic Competence	Indicators	Analisis
		logam perlu dipelajari dari konsep dasar yang paling mudah dalam hal kisi ion positif yang dikelilingi elektron.
1.1 Describing the name of organic and inorganic compound modestly and also equation of reaction	a. Explain the name of compounds based on the IUPAC rule.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi disbandingkan dengan peserta didik di sekolah standar nasional.
	b. Explain the name of binary compounds.	Indikator tetap sesuai dengan KTSP
	c. Explain the name of polyatomic compounds.	Indikator tetap sesuai dengan KTSP
	d. Explain the name of familiar organic compounds.	Indikator tetap sesuai dengan KTSP
	e. Construct the balanced of equations.	Indikator tetap sesuai dengan KTSP
1.2 Prove and communicate the effect of elementary laws of chemistry through experiment and also apply mole concept in finishing calculation of chemistry.	a. Deduce Lavoisier's Law trough experiments.	Indikator tetap sesuai dengan KTSP
	b. Deduce Proust's Law trough experiments.	Indikator tetap sesuai dengan KTSP
	c. Analyze the composition of compound to prove Dalton's Law.	Indikator tetap sesuai dengan KTSP
	d. Analyze the composition of compound to prove Gay Lussac's Law.	Indikator tetap sesuai dengan KTSP
	e. Analyze the composition of compound to prove Avogadro's Law.	Indikator tetap sesuai dengan KTSP
	f. Explain the term mole in terms of the Avogadro constant.	Konsep mol merupakan konsep dasar dari seluruh perhitungan kimia, sehingga peserta didik dalam mempelajari konsep kimia harus paham dan mengerti benar tentang konsep mol, termasuk konsep mol dalam tetapan Avogadro. Pengeta-huan tentang konsep mol tersebut harus dihadirkan dalam perhitungan
	g. Perform the calculations, including use of the mole concept, involving: 1) reacting masses (from formulae and equations);	

Basic Competence	Indicators	Analisis
	2) volumes of gases (e.g. in the burning of hydrocarbons); 3) volumes and concentrations of solutions.	kimia yang menggunakan konsep mol, meliputi: massa zat yang bereaksi, volume gas, serta volume dan konsentrasi larutan.
	h. Calculate the empirical and molecular formulae, using combustion data or composition by mass.	Indikator tetap sesuai dengan KTSP
	i. Explain the formulae of hydrate.	Indikator tetap sesuai dengan KTSP
	j. Explain the concentration of substance in a compound.	Indikator tetap sesuai dengan KTSP
	k. Explain the limiting reactant in a reaction.	Indikator tetap sesuai dengan KTSP
	l. Calculate the poduct of reaction	Indikator tetap sesuai dengan KTSP
	m. Calculate the concentration of solution.	Indikator tetap sesuai dengan KTSP
	n. Deduce stoichiometric relationships from calculations.	Setelah melalui perhitungan kimia, maka diharapkan peserta didik dapat menarik kesimpulan sendiri tentang hubungan stoikiometri, yang pada biasanya peserta didik mendapatkan dari guru sehingga daya retensinya akan lebih lama jika peserta didik mampu mengambil kesimpulan sendiri.

Lanjutan

Education unit : SMAN 7 Purworejo
Class/Semester : X/2
Subject matter : Chemistry

Basic Competence	Indicators	keterangan
1.1 Identifying the properties of non electrolyte and electrolyte pursuant to data result of experiment.	a. Identify the properties of electrolyte and non electrolyte solutions through an experiment.	Indikator tetap sesuai dengan KTSP
	b. Classify the solution into electrolyte and non electrolyte solutions based on the properties of its electrics conductivity.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	c. Explain the ability of the electrolyte solution conducting the electricity.	Indikator tetap sesuai dengan KTSP
	d. Describe the electrolyte solutions (ionic and polar covalent compound) in term of polarity	Indikator tetap sesuai dengan KTSP
1.2 Explaining the development of concept oxidation-reduction reaction and its relation to nomenclature and also its application.	a. Describe and explain redox processes in terms of electron transfer and/or of changes in oxidation number (oxidation state), as exemplified by Fe^{3+}/Fe^{2+}, MnO_4/Mn^{2+} and $Cr_2O_7^{2-}/Cr^{3+}$.	Indikator tetap sesuai dengan KTSP
	b. Explain the oxidation number of atom in a compound.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	c. Explain the oxidatior and reductor in a redox reaction.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	d. Describe the concept of redox reaction and electrochemistry to solve the environmental problem.	Indikator tetap sesuai dengan KTSP
1.1 Describe the specification of carbon atom in hydrocarbon compound.	a. Identify the C, H, and O in the carbon compounds through an experiment.	Indikator tetap sesuai dengan KTSP
	b. Describe the specification of carbon atom in the carbon compounds.	Indikator tetap sesuai dengan KTSP
	c. Differ the C primary, secondary, tertiary and quaternary atoms.	Indikator tetap sesuai dengan KTSP
1.2 Classify the hydrocarbon compound pursuant to its structure and its relation with properties of compound and also apply mole concept in finishing calculation of chemistry.	a. Classify the hydrocarbon compounds.	Indikator tetap sesuai dengan KTSP
	b. Explain the name of alkane, alkene and alkyne compounds.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih

Basic Competence	Indicators	keterangan
		tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	c. Conclude the relation between boiling point of hydrocarbons and relative molecule mass and its structure.	Indikator tetap sesuai dengan KTSP
	d. Explain the structure of isomer (framework, position, function) or geometry isomer (cis, trans).	Indikator tetap sesuai dengan KTSP
	e. Construct the reactions of alkane, alkene, and alkyne compounds.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	f. Describe the chemistry of alkenes as exemplified, where relevant, by the following reactions of ethene: 1) addition of hydrogen, steam, hydrogen halides and halogens; 2) oxidation by cold, dilute manganate(VII) ions to form the diol; 3) oxidation by hot, concentrated manganate(VII) ions leading to the rupture of the carbon-to-carbon double bond in order to determine the position of alkene linkages in larger molecules.	Hasil adaptasi dengan kurikulum Singapura terutama untuk point 3), dengan pertimbangan bahwa Indonesia merupakan negara dengan kekayaan alam yang sangat besar, sementara hampir semua kekayaan alam adalah material organik sehingga diharapkan peserta didik benar-benar memahami dalam konsep kimia organik agar dapat mengolah kekayaan alam dengan sebaik-baiknya.
1.3 Explaining the formation and dissociation technique of petroleum fractions and also its usefulness.	a. Describe the formation of natural gas and petroleum.	Indikator tetap sesuai dengan KTSP
	b. Explain the major components of petroleum.	Indikator tetap sesuai dengan KTSP
	c. Interprete the distillation schema to explain the petroleum fractions.	Indikator tetap sesuai dengan KTSP
	d. Compare the quality of gasoline based on its octane number.	Indikator tetap sesuai dengan KTSP
	e. Recognize the environmental consequences of carbon monoxide, oxides of nitrogen and unburnt hydrocarbons	✓ Di balik kekayaan alam Indonesia yang melimpah, jika manusia tidak dapat memanfaatkan kekayaan alam dengan sebaik-

Basic Competence	Indicators	keterangan
	arising from the internal combustion engine and of their catalytic removal. f. Describe the organic waste treatment at school (acccording to the condition of Senior High School 7 Purworejo). g. Describe the use of organic compost in agriculture (according to the condition of Purworejo).	baiknya maka akan mendatangkan dampak lingkungan yang tentunya merugikan juga buat manusia. Oleh karena itu, peserta didik harus diberikan pengetahuan khusus bagaimana menjaga lingkungan dari dampak ulah tangan manusia yang akan merugikan manusia itu sendiri. ✓ Oleh karena itu mengingat SMAN 7 Purworejo merupakan salah satu sekolah dengan lingkungan yang banyak pepohonan dan tanaman, maka diharapkan peserta didik diberikan pengetahuan untuk mengolah sampah organik sehingga dapat memberikan manfaat untuk peserta didik sendiri dan juga lingkungan. ✓ Jika peserta didik dapat mengolah sampah dengan baik, maka diharapkan peserta didik dapat menerapkannnya dalam kehidupan sehari-hari, mengingat Kabupaten Purworejo adalah negara agraris dengan penghasilan utama di bidang pertanian, maka pemanfaatan sampah dapat digunakan sebagai pupuk dalam pertanian sehingga menghasilkan produk pertanian organik yang bebas dari bahan kimia berbahaya.
1.4 Explaining the composition and the usefulness of hydrocarbon compound in everyday life in the field of food, clothing, board, commerce, artistic, and esthetics.	a. Describe the use of hydrocarbons in the food.	Indikator tetap sesuai dengan KTSP
	b. Describe the use of hydrocarbons in industries. c. Describe the composition and the use of hydrocarbon compunds in arts and esthetics.	Indikator tetap sesuai dengan KTSP

Lanjutan

Education unit : SMAN 7 Purworejo
Class/Semester : XI/1
Subject matter : Chemistry

Basic Competence	Indicators	keterangan
1.1 Explaining the Bohr atomic and quantum mechanics theory to draw the electronic configuration and the diagram of orbital and also to determine the element position in the periodic table.	a. Explain the quantum atomic theory.	Indikator tetap sesuai dengan KTSP
	b. Describe the number and relative energies of the s, p and d orbital's for the principal quantum numbers 1, 2 and 3 and also the 4s and 4p orbital's.	Pemahaman tentang atom dengan mengguankan teori kuantum ini perlu diajarkan detail berkaitan dengan tantangan teknologi terkni yang memanfaatkan energi dari hal mikro tetapi bermanfaat secara makroskopik. Sebagai contoh pemanfaatan teknologi nano untuk berbagai keperluan manusia. Hal ini berkaitan dengan atom-atom yang berukuran mikroskopis dan dengan pemahaman konsep menggunakan teori kuantum.
	c. Explain the shell and sub shell and its relation with the quantum number.	Indikator tetap sesuai dengan KTSP
	d. Describe the forms of orbital.	Indikator tetap sesuai dengan KTSP
	e. Using the Aufbau principle, the Hund rule and the principality of prohibition Pauli to arrange electron configuration and diagram of orbital.	Indikator tetap sesuai dengan KTSP
	f. Interpret the electron configuration of an element in terms of the position of that element within the Periodic Table.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
1.2 Explaining the electron paired sum theory around the atomic core and the hybridization theory to predict the molecular shapes.	a. Explain the shapes of, and bond angles in, molecules such as BF_3 (trigonal planar); CO_2 (linear); CH_4 (tetrahedral); NH_3 (trigonal pyramidal); H_2O (non-linear); SF_6 (octahedral) by using the Valence Shell Electron Pair Repulsion theory.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	b. Using the hybridization theory to predict the shape of molecules.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
1.3 Explaining the intermolecular interaction (intermolecular forces) based on their characteristics.	a. Describe covalent bonding in terms of orbital overlap, giving σ and π bonds (see also Section Introductory organic chemistry).	Adaptasi KD 5.3 ini dilakukan dengan membrikan KD 5.3 ini di kelas X semester 1, artinya KD ini dimasukkan setelah materi ikatan kovalen di kelas X semester 1. Hal ini karena berdasar-kan silabus dari Singapura, pengetahuan peserta didik tentang ikatan kimia sebaiknya utuh tidak terpisah-pisah, karena pada umumnya soal-soal prestasi belajar terutama untuk peserta didik bertaraf inter-nasional adalah konsep secara utuh, bukan terpisah-ppisah untuk kelas X dan kelas XI.
	b. Predict the shapes and bond angles molecules.	
	c. Describe hydrogen bonding, using ammonia and water as examples of molecules containing -NH and -OH groups.	
	d. Describe intermolecular forces (van der Waals' forces), based on permanent and induced dipoles as in $CHCl_3$ (l), Br_2 (l) and the liquid noble gases.	
	e. Describe, interpret and/or predict the effect of different types of bonding (ionic bonding; covalent bonding; hydrogen bonding; other intermolecular interactions; metallic bonding) on the physical properties of substances.	
1.1 Describing the reaction change enthalpy reaction, exothermic reaction, and endothermic reaction.	a. Explain the law of energy conservation.	Indikator tetap sesuai dengan KTSP
	b. Deduce the environment and system.	Indikator tetap sesuai dengan KTSP
	c. Explain that some chemical reactions are accompanied by energy changes, principally in the form of heat energy; the energy changes can be exothermic (ΔH negative) or endothermic (ΔH positive).	Indikator tetap sesuai dengan KTSP
	d. Explain the enthalpy changes.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
1.2 Determining the ΔH of reaction by experiment, and using the Hess law, the standardized formation enthalpy changes data, and bonding energy data, and data of energy bonding.	a. Calculate enthalpy changes from appropriate experimental results, including the use of the relationship heat change = mc ΔT	Adaptasi ini dilakukan berkaitan dengan penyampaian konsep perubahan panas dalam suatu sistem dengan secara eksperimen karena dengan eksperimen diharapkan peserta didik bisa menemukan konsep baru sendiri sehingga daya retensi dalam kognitf peserta didik akan lebih lama dari pada peserta didik langsung disuguhkan dengan teori atau rumus-rumus.
	b. Explain and use the terms: 1) enthalpy change of reaction and standard conditions, with particular reference to: formation; combustion; neutralisation; 2) bond energy (ΔH positive, i.e. bond breaking); 3) lattice energy (ΔH negative, i.e. gaseous ions to solid lattice).	Pengetahuan tentang entalpi ini berguna bagi peserta didik terutama peserta didik yang akan melanjutkan di bidang teknik. Karena peserta didik SMA berorientasi melanjutkan ke perguruan tinggi, maka pemahaman tentang entalpi ini akan diberikan lagi di perguruan tinggi. Selain itu mengingat di Indonesia banyak pabrik-pabrik, maka diharapkan peserta didik yang tidak bisa melanjutkan di perguruan tinggi bisa memahami tentang konsep perubahan entalpi ini secara utuh agar dalam perusahaan tidak hanya bertugas sebagai tanaga kasar, tetapi juga sedikit memahami tentang prinsip perubahan energi dan katalis.
	c. Construct and interpret a reaction pathway diagram, in terms of the enthalpy change of the reaction and of the activation energy.	
7.1 Describing the definition of the reaction rate by conducting experiment about factors influencing the reaction rate.	a. Calculate the concentration of a solution (molarity a solution).	Indikator tetap sesuai dengan KTSP
	b. Analyze the factors influencing the rate of reaction (concentrations, area of the surfaces , temperatures, and catalysts) using an experiment.	Indikator tetap sesuai dengan KTSP
	c. Interpret the data of the factors influencing the rate of reactions.	Indikator tetap sesuai dengan KTSP
7.2 Understanding the theory of collision to explain the rate determinant factors and the order of reaction and also its application in everyday life.	a. Explain the influence of the concentration, surface area, and temperature to rate of reaction based on the collision theory.	Indikator tetap sesuai dengan KTSP
	b. Differ the potential energy diagram of chemical reaction using a catalyst.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	c. Explain that, in the presence of a catalyst, a reaction follows a different pathway, i.e. one of lower activation energy, giving a larger rate constant.	Indikator tetap sesuai dengan KTSP
	d. Construct and use rate equations of the form rate = k[A]m[B]n (limited to simple cases of single step reactions, for which m and n are 0, 1 or 2), including: 1) Deducing the order of a reaction by the initial rates method; 2) Justifying, for zero- and first-order reactions, the order of reaction from concentration-time graphs; 3) Calculating an initial rate using concentration data. [integrated forms of rate equations are not required]	Indikator tetap sesuai dengan KTSP
	e. Describe enzymes as biological catalysts which may have specific activity.	Pemahaman tentang enzim ini juga erat kaitannya dengan mata pelajaran biologi, dan enzim ini juga sangat penting manfaatnya dalam tubuh makhluk hidup. Oleh karena itu dengan mempelajari enzim, peserta didik diharapkan mengerti tentang prinsip kerja dan pemanfaatannya dalam tubuh makhluk hidup khususnya dan lingkungan pada umumnya.
7.3 Explaining the equilibrium and the factors influencing the shift of equilibrium using an experiment.	a. Explain in terms of rates of the forward and reverse reactions, what is meant by a reversible reaction and dynamic equilibrium.	Indikator tetap sesuai dengan KTSP
	b. Explain the heterogeneous and homogeneous equilibriums.	Indikator tetap sesuai dengan KTSP
	c. Deduce the expressions of equilibrium constants.	Indikator tetap sesuai dengan KTSP
	d. Explain Le Chatelier's Principle and apply it to deduce qualitatively (from appropriate information) the effects of changes in concentration, pressure or temperature, on a system at equilibrium.	Prinsip Le Chatelier's ini digunakan atau diterapak untuk menjelaskan secara kualitatif sistem kesetimbangan. Dengan menerapkan prinsip ini, diharapkan peserta didik tidak sekedar menghapal konsep, akan tetapi mampu menguraikan pengaruh

Basic Competence	Indicators	keterangan
	e. Deduce whether changes in concentration, pressure, or temperature, or the presence of a catalyst affect the value of the equilibrium constant for a reaction.	perubahan konsentrasi, tekanan, atau temperatur pada sistem kesetimbangan.
7.4 Deducing the quantitative relation ship between the reactants and products reaction from an equilibrium reaction.	a. Calculate the quantities present at equilibrium, given appropriate data (such calculations will not involve solving of quadratic equations).	Memberikan contoh perhitungan dalam konsep kesetimbangan dengan menyajikan data, sehingga selain melatih peserta didik untuk cermat berhitung juga mengajak peserta didik untuk menganalisis data. Hal ini akan berimplikasi dalam materi yang lain, jika suatu permasalahan disajikan dalam data, peserta didik akan mudah menganalisis dan mengambil kesimpu-lan dari data atau masalah yang terjadi.
	b. Deduce expressions for equilibrium constants in terms of concentrations.	
	c. Deduce expressions for equilibrium constants in terms of parcial presure.	
	d. Calculate the Kc and Kp of a equilibrium reaction.	Indikator tetap sesuai dengan KTSP
7.5 Explaining the application of the equilibrium principle in the industries and the everyday life	a. Describe and explain the conditions used in the Haber process, as an example of the importance of an understanding of chemical equilibrium in the chemical industry.	Kemajuan industri saat ini mendorong para pengusaha untuk bersaing secara sehat dalam menghasilkan barang produksi skala besar dan dengan bahan baku yang seoptimal mungkin. Pada pembuatan ammonia, pekerja juga harus mengetahui kondisi yang seoptimal mungkin terutama terkait dengan penggunaan energi, mengatur tekanan, dan penggunaan katalis. Oleh karena itu, peserta didik diharapkan bisa menjelaskan kondisi-kondisi yang optimum dalam produksi suatu bahan, sebagai contoh ammonia.

Lanjutan

Education unit : SMAN 7 Purworejo
Class/Semester : XI/2
Subject matter : Chemistry

Basic Competence	Indicators	keterangan
8.1 Describing the acid-base theory by determining the properties of solutions and calculate the pH of solutions.	a. Outline the Arrhenius theory of acids and bases.	Indikator tetap sesuai dengan KTSP
	b. Outline the Bronsted-Lowry theory of acids and bases.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	c. Show the understanding of, and apply the Bronsted-Lowry theory of acids and bases, including the concept of conjugate acids and bases.	Setelah peserta didik mengerti konsep Bronsted-Lowry dalam asam basa, peserta didik diharapkan mampu menunjukkan pengetahuannya tersebut dalam teori asam basa, termasuk konsep asam basa konjugasi, karena hal ini akan berguna pada konsep asam basa selanjutnya terutama pada konsep larutan penyangga. Jika peserta didik paham konsep asam basa konjugasi maka akan lebih mudah dalam mempelajari konsep larutan penyangga.
	d. Outline the Lewis theory of acids and bases.	Indikator tetap sesuai dengan KTSP
	e. Identify the acids and bases using an indicator of pH.	Indikator tetap sesuai dengan KTSP
	f. Predict the pH an electrolyte solution based on the change of colour indicators.	Indikator tetap sesuai dengan KTSP
	g. Explain qualitatively the differences in behaviour between strong and weak acids and bases in terms of the extent of dissociation.	Konsep asam basa merupakan konsep yang banyak terkait dengan kehidupan praktis. Dalam kehidupan sehari, di dalam tubuh makhluk hidup dan juga lingkungan sekitar dijumpai zat-zat yang bersifat asam maupun basa. Karena kondisi asaam basa zat-zat tersebut tidak sama, maka diharapkan peserta didik dapat mengetahui dan menghitung nilai keasaman atau kebasaan suatu zat agar lebih berhati-hati dalam penanganan suatu zat. Asam kuat seperti asam klorida bisa berbahaya jika mengenai tubuh, demikian juga basa kuat seperti NaOH juga bisa berbahaya jika mengenai tubuh.
	h. Explain the terms pH; Ka; Kb; Kw; [the relationship Kw = KaKb is not required].	
	i. Calculate [H^+(aq)] and pH values for strong acids, and strong bases.	
	j. Develop the concept of pH of the environment.	Indikator tetap sesuai dengan KTSP
8.2 Calculating the number of reactants and products in an electrolyte solution in the acid-base titration.	a. Calculate the concentration of acid and base solution by titration	Indikator tetap sesuai dengan KTSP
	b. Explain the concentration of substance by titration.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3,

Basic Competence	Indicators	keterangan
		dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	c. Explain the choice of suitable indicators for acid-base titrations, given appropriate data, in terms of the strengths of the acids and bases.	Terkait dengan banyak zat disekitar makhluk hidup yang bersifat asam maupun basa, maka peserta didik diharapkan mampu menjelaskan indikator yang sesuai untuk titrasi asam basa.
	d. Explain the concentration of substance of the titration data.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	e. Draw the titration graph of an experiment data.	Indikator tetap sesuai dengan KTSP
8.3 Describing the properties of buffer solutions and the function of buffer solutions in the human body.	a. Analyze a buffer and non buffer solutions through an experiment.	Indikator tetap sesuai dengan KTSP
	b. Calculate the pH or pOH of buffers.	Indikator tetap sesuai dengan KTSP
	c. Calculate the pH of buffer solution after acid or base addition or dillution.	Indikator tetap sesuai dengan KTSP
	d. Describe and explain the uses of buffers, including the role of H_2CO_3/HCO_3^- in controlling pH in blood.	Berdasarkan pengembangan dengan kurikulum acuan Singapura, konsep larutan penyangga diberikan dengan menggunakan eksperimen. Eksperimen dipilih berdasarkan pemanfaatan larutan penyangga dalam tubuh makhluk hidup, sehingga eksperimen dipilih dengan menggunakan bahan H_2CO_3/HCO_3^- yang merupakan komponen penyangga yang mengontrol pH darah.
8.4 Analyzing the salt type hydrolysis in the water and the pH of salt solution.	a. Explain the character of salts which is hydrolyzed in water through an experiment.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi disbandingkan dengan peserta didik di sekolah standar nasional.

Basic Competence	Indicators	keterangan
	b. Explain the character of salts which is hydrolyzed from the ionization reaction.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi di-bandingkan dengan peserta didik di sekolah standar nasional.
	c. Calculate the pH of hydrolyzed salt solution.	Indikator tetap sesuai dengan KTSP
8.5 Using the curve pH change of acid-base titration to explain the buffer solution and the hydrolysis.	a. Analyze the graph of titration of strong acid and base, strong acid and weak base, weak acid and strong base to explain the buffer solution and hydrolysis through discussion.	Indikator tetap sesuai dengan KTSP
8.6 Predict the forming of precipitation from a reaction based on the to solubility principle and solubility products.	a. Explain the equilibrium of saturated solution or poorly soluble salt solution.	Indikator tetap sesuai dengan KTSP
	b. Connect the constant solubility product with the solubility or its precipitation.	Indikator tetap sesuai dengan KTSP
	c. Restate the expression of Ksp of poorly soluble substances.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi di-bandingkan dengan peserta didik di sekolah standar nasional.
	d. Calculate the solubility of poorly soluble electrolyte using data of Ksp or vice versa.	Indikator tetap sesuai dengan KTSP
	e. Explain the influence of addition of common ion to the solution.	Indikator tetap sesuai dengan KTSP
	f. Explain the pH of the solution using the Ksp.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi di-bandingkan dengan peserta didik di sekolah standar nasional.
	g. Approximate the precipate formation based on the Ksp.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
9.1 Producing the various colloid system using materials from in the environment	a. Describe the process of a colloid preparation through an experiment.	Indikator tetap sesuai dengan KTSP
9.2 Grouping the properties of colloid and its application in everyday life.	b. Classify the suspension, solution, and colloid based on the observations (Tyndall effect, homogeneous/heterogeneous, and filtration).	Indikator tetap sesuai dengan KTSP
	c. Classify the colloid type based on the dispersed phase and the dispersant.	Indikator tetap sesuai dengan KTSP
	d. Describe the properties of colloid (Tyndall effect, Brownian movement, dialysis, electrophoresis, emulsion, coagulation).	Indikator tetap sesuai dengan KTSP
	e. Describe the lyofob and lyophil colloid.	Indikator tetap sesuai dengan KTSP
	f. Describe the function of colloid in cosmetic industries, foods, and pharmacies.	Indikator tetap sesuai dengan KTSP

Lanjutan

Education unit : SMAN 7 Purworejo
Class/Semester : XII/1
Subject matter : Chemistry

Basic Competence	Indicators	keterangan
10.1Explaining the degradation of vapors pressure, increase of boiling point, depression of freezing point of solution, and osmosis pressure including the colligative properties of solution.	a. Calculate the concentration of solution (mole fraction and molality).	Indikator tetap sesuai dengan KTSP
	b. Explain the definition of properties of non- electrolyte colligative solution (Raoulth's law) and electrolyte solution.	Indikator tetap sesuai dengan KTSP
	c. Explain the influence of nonvolatile solute the vapour pressure of the solution.	Indikator tetap sesuai dengan KTSP
	d. Calculate the solution vapour pressure based on experiment data.	Indikator tetap sesuai dengan KTSP
	e. Investigate the depression of the freezing point because of solute addition through an experiment.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	f. Calculate the depression of the freezing point of electrolyte and non electrolyte solution based on experiment data.	Indikator tetap sesuai dengan KTSP
	g. Investigate the increase of boiling point as result of dissolve substance addition through an experiment.	Indikator tetap sesuai dengan KTSP
	h. Calculate the increase of electrolyte and non electrolyte boiling point solution based on experiment data.	Indikator tetap sesuai dengan KTSP
	i. Analyze the PT diagram to interpret decreasing of the vapour pressure, depression of the freezing point and increasing of the boiling point solution.	Indikator tetap sesuai dengan KTSP
	j. Explain the definition of osmosis and the osmosis pressure and also its applications.	Indikator tetap sesuai dengan KTSP
	k. Calculate the osmosis pressure of electrolyte and non electrolyte solution.	Indikator tetap sesuai dengan KTSP
10.2Comparing between colligative characters of non electrolyte with colligative properties of electrolyte solution which its same concentration pursuant to experiment data.	a. Analyze the experiment data to compare the colligative properties of electrolyte and nonelectrolyte solution.	Indikator tetap sesuai dengan KTSP
11.1Applying the concept of oxidation-reduction reaction in electrochemistry system entangling electrics energy and its usefulness in preventing corrosion and in industry.	a. Balance the redox equations using the half-equations method.	Adaptasi ini dilakukan berkaitan dengan waktu pelaksanaan, artinya untuk KD 11.1 ini sebaiknya diberikan satu konsep utuh pada waktu kelas X, selain agar peserta didik memahami konsep redox secara utuh, hal ini juga bermanfaat dengan efisiensi waktu, mengingat pada umumnya kelas XII terkejar Ujian Nasional, sehingga pendidik hanya memberikan sekilas. Jika peserta didik memahami konsep utuh, pada saat kelas XII pendidik bisa memberikan tambahan pengetahuan agar peserta didik RSMABI mempunyai pengetahuan lebih dari pada sekolah biasa.

Basic Competence	Indicators	keterangan
	b. Balance the redox equations using the oxidation number (oxidation state) method.	Indikator tetap sesuai dengan KTSP
	c. Conclude the character of the spontan redox reaction through an experiment.	Indikator tetap sesuai dengan KTSP
	d. Describe Voltaic cell formation or Galvanis cell and explain every components.	Indikator tetap sesuai dengan KTSP
	a. Explain how electrics energy are generated from the redox reaction in the Voltaic cell.	Indikator tetap sesuai dengan KTSP
	e. Explain the cell notation and the reactions of Voltaic cell.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	f. Calculate the potential cell based on the standard potential data.	Indikator tetap sesuai dengan KTSP
	g. Explain the princip of Voltaic cell used in daily life (battery, accumulator, etc).	Indikator tetap sesuai dengan KTSP
11.2Explaining the oxidation-reduction reaction in electrolysis cell	a. Observe the reaction on the cathode and the anode in electrolysis reaction through an experiment.	Indikator tetap sesuai dengan KTSP
	b. Balance the reaction on the cathode and the anode in the dillution or the solution with the active or inert electrode.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi di-bandingkan dengan peserta didik di sekolah standar nasional.
	c. Explain the factors of corrosion through an experiment.	Indikator tetap sesuai dengan KTSP
	d. Explain the ways to prevent of the corrosion.	Indikator tetap sesuai dengan KTSP
11.3Applying the Faraday law for the electrolysis of electrolyte solution.	a. Apply the Faraday's Law concept in the calculation of the electrolysis cell.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	b. Construct the electrolysis reaction of the electropating and in a metal refining.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi di-bandingkan dengan peserta didik di sekolah standar nasional.
12.1 Identifying the overflow of principle elements and transition in nature and product that contain the element.	a. Identify the existence of elements in nature especially in Indonesia (inert gas, halogen, alkaline, earth alkaline, aluminium, carbon, silicon, sulphur, chrome, copper, zinc, iron, nitrogen and oxygen).	Indikator tetap sesuai dengan KTSP
	b. Describe the reactions, if any, of the elements with oxygen (to give Na_2O; MgO; Al_2O_3; P_4O_6; P_4O_{10}; SO_2; SO_3), and chlorine (to give NaCl; $MgCl_2$; Al_2Cl_6; $SiCl_4$; PCl_3; PCl_5).	Hal ini diperlukan mengingat Indonesia merupakan negara yang melimpah akan kekayaan alam, sehingga jika peserta didik mengerti reaksi-reaksi yang terjadi antara unsur-unsur di alam dengan oksigen, maka peserta didik dapat memanfaatkan pengetahuannya untuk mengolah kekayaan alam sebaik-baiknya.
	c. Identify the products that consist of the substances.	Indikator tetap sesuai dengan KTSP
12.2 Describing the tendency of chemical and physical behavior especially in principal element and transition element (boiling point, melting point, hardness, color, solubility, reactivity, and the other properties).	a. Identify the physical properties of principal elements and transition elements (boiling point, melting point, hardness, colour, condensation, and the other properties).	Indikator tetap sesuai dengan KTSP
	b. Identify the chemical properties (reactivity, solubility) through an experiment.	Indikator tetap sesuai dengan KTSP
	c. Identify the power of halogens as oxidator and halides as reductor through an experiment.	Indikator tetap sesuai dengan KTSP
	d. Identify the flame reaction of metal compounds (especially alkaline and earth alkaline) through experiments.	Indikator tetap sesuai dengan KTSP
	e. Identify the regularity of physical properties and chemical properties of third period elements through experiments.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	f. Identify the regularity of physical properties and chemical properties of fourth period elements through an experiment	Indikator tetap sesuai dengan KTSP
	g. Describe how to eliminate the hardness of water through experiment.	Indikator tetap sesuai dengan KTSP
	h. Describe the methods of water purification by using the tools and materials properly (according to the condition of Purworejo)	Adaptasi ini dilakukan mengingat beberapa daerah di Purworejo merupakan daera tandus dimana air-air sumur di sebagian penduduk tidak bersih, oleh karena itu dengan mem-berikan pengalaman untyk penjernihan air, peserta didik di-harapkan dapat menerapkannya dalam kehidupan sehari-hari apabila di daerah tempat tinggalnya air sumur atau air untuk konsumsi rumah tangga tidak bersih.
12.3Explaining the usefulness, impact and process preparation compound and elements in everyday life.	a. Explain the impact and the benefit of elements and compounds in daily life and industrials (e.g. inert gases, halogens, alkalines, earth alkalines, aluminium, carbon, silicon, sulfur, chrome, copper, zinc, iron, nitrogen and oxygen).	Indikator tetap sesuai dengan KTSP
	b. Explain the processes of compounds and elements preparation in industries and laboratories (e.g. H_2SO_4, N_2, Fe, Al, NH_3 and of O_2).	Indikator tetap sesuai dengan KTSP
	a. Explain the composition of fertilizer. b. Predict the characteristic properties of an element in a given Group by using knowledge of chemical periodicity. c. Deduce the nature, possible position in the Periodic Table, and identity of unknown elements from given information of physical and chemical properties.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
12.4Describing the radioactive elements facet of physical properties and chemical	a. Describe the invention of radioactive radiation.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
properties, usefulness, and its danger.	b. Identify the properties of radioactive radiation.	Indikator tetap sesuai dengan KTSP
	c. Explain the stability of nucleus.	Indikator tetap sesuai dengan KTSP
	d. Construct the equation of nuclear reaction.	Indikator tetap sesuai dengan KTSP
	e. Describe the use of radioactive elements.	Indikator tetap sesuai dengan KTSP
	f. Describe the impact of radioactive elements.	Indikator tetap sesuai dengan KTSP

Lanjutan

Education unit : SMAN 7 Purworejo
Class/Semester : XII/2
Subject matter : Chemistry

Basic Competence	Indicators	keterangan
13.1 Describing the structure, the way of writing, arrange name, behavior, usefulness, and identify the carbon compound (halo alkane, alkanol, alkoxy alkane, alkanal, alkanon, alkanoat, and alkanoat alkyl, amine and amide).	a. Interpret, and using the nomenclature, general formulae and displayed formulae of the following classes of compound: 1) alkanes, alkenes and arenes; 2) halogenoalkanes; 3) alcohols (including primary, secondary and tertiary); 4) aldehydes and ketones; 5) carboxylic acids and esters; 6) amines, nitriles.	Adaptasi dilakukan dengan meningkatkan kata kerja domain kognitif. Dalam KTSP, peserta didik dituntut memahami yang berada dalam kognitif C2, sementara dengan meng-adaptasi ini, peserta didik dituntut untuk menginterpretasikan dan meng-gunakan pengetahuannya tentang grup senyawa organik. Hal tersebut mem-pertimbangakan bahwa alam sekitar beserta isinya banyak mengandung senyawa organik, sehingga peserta didik bisa memanfaatkan dengan sebaik-baiknya.
	b. Construct the structure and the nomenclature of benzene and its derivatives.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	c. Describe the structural isomerism.	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
	d. Explain the physical properties of carbon compounds.	Indikator tetap sesuai dengan KTSP
	e. Identify the functional group of carbon compounds	Indikator tetap sesuai dengan KTSP
13.2Describing the structure, the way of writing, nomenclature, properties and usefulness of benzene and its derivative.	a. Interpret and using the following terminology associated with organic reactions: (i) functional group; (ii) addition, substitution, elimination, hydrolysis; and (iii) oxidation and reduction.	Indikator tersebut merupakan hasil adaptasi dari segi kata kerjanya, diharapkan bahwa pesserta didik tidak sekedar tahu, melainkan bisa menerapkan reaksi organik dalam kehidupan nyata mengingat sebagian besar tubuh kita tersusun dari senyawa organik dan sebagian besar kekayaan alam Indonesia tersusun atas senyawa organik. Pembelajaran konsep senyawa organik ini tidak berhenti pada jenjang SMA, tetapi hingga perguruan tinggi di derbagai bidang yang luas seperti kimia, kedokteran, pertanian, farmasi, dan sebagainya.
	b. Describe the use of carbon compounds.	Indikator tetap sesuai dengan KTSP
	c. Construct the structure and the nomenclature of benzene and its derivatives.	Indikator tetap sesuai dengan KTSP
	d. Explain the reaction of H atomic substitution of benzene.	Indikator tetap sesuai dengan KTSP
	e. Explain the definition of ortho, meta and para positions.	Indikator tetap sesuai dengan KTSP
	f. Describe the physical and the chemical properties of benzene and its derivatives.	Indikator tetap sesuai dengan KTSP
	g. Describe the use and the danger of benzene compounds and its derivative in daily life e.g. fenol, aniline, butil hidroxy toluen (BHT), butil hidroxy anisol (BHA), TNT, aspirin, and pigments (azo) and others.	Indikator tetap sesuai dengan KTSP
13.3Describing the structure, nomenclature, classification, physical	a. Identify the natural and synthetic polymers (rubber, carbohydrate, protein, plastic).	Indikator tetap sesuai dengan KTSP

Basic Competence	Indicators	keterangan
properties and usefulness of macromolecules (polymer, carbohydrate, and protein).	b. Explain the physical and chemical properties of polymer.	Indikator tetap sesuai dengan KTSP
	c. Construct the formation reaction of polymer (condensation and addition) from its imonomer and addition) from its imonomer.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	d. Describe the use of polymer and solve the environment problem.	Indikator tetap sesuai dengan KTSP
	e. Classify the monosaccharide on to aldose and ketose.	Indikator tetap sesuai dengan KTSP
	f. Explain the hydolisis reaction of disaccharride and polisaccharide with the help of enzyme.	Indikator tetap sesuai dengan KTSP
	g. Identify the carbohydrate with reagents.	Indikator tetap sesuai dengan KTSP
	h. Write the formula of esensial amino acid.	Indikator tetap sesuai dengan KTSP
	i. Determine the group of peptide on protein.	Indikator tetap sesuai dengan KTSP
13.4Describing the structure, nomenclature, classification, properties and usefulness of lipid.	a. Construct the structure formula and the name of lipid and oil.	Indikator tetap sesuai dengan KTSP
	b. Classify the lipid based on the saturation of the bonding.	Indikator tetap sesuai dengan KTSP
	c. Observe and describe of physical and chemical properties of lipid and oil.	Peningkatan domain kognitif perserta didik RSMABI dari level terendah (C1) menjadi level yang lebih tinggi (C2, C3, dan seterusnya) agar mempunyai pengetahuan yang lebih tinggi dibandingkan dengan peserta didik di sekolah standar nasional.
	d. Describe the function and the role of oil and lipid in daily life.	Indikator tetap sesuai dengan KTSP

b. KONVERSI SKOR PENILAIAN MENJADI SKALA LIMA UNTUK KUALITAS SILABUS

Kriteria Penilaian Ideal

No.	Rentang Nilai	Kategori Kualitas
1.	$Xi + 1{,}8\ SBi < \overline{X}$	Sangat Baik (SB)
2.	$Xi + 0{,}6\ SBi < \overline{X} \leq Xi + 1{,}8\ SBi$	Baik (B)
3.	$Xi - 0{,}6\ SBi < \overline{X} \leq Xi + 0{,}6\ SBi$	Cukup (C)
4.	$Xi - 1{,}8\ SBi < \overline{X} \leq Xi - 0{,}6\ SBi$	Kurang (K)
5.	$\overline{X} \leq Xi - 1{,}8\ SBi$	Sangat Kurang (SK)

(Anas Sudjiono, 1987: 161)

Keterangan :

$\overline{X}$: Skor akhir rata-rata

Xi : Rerata ideal, dapat dicari dengan menggunakan rumus;

Xi = (1/2) (skor tertinggi ideal + skor terendah ideal)

Xi = ½ (5+1) = ½ (6) = 3

SBi: Simpangan baku ideal, dapat dicari dengan menggunakan rumus;

SBi = (1/2) (1/3) (skor tertinggi ideal – skor terendah ideal)

Skor tertinggi ideal = $\sum$ butir kriteria x skor tertinggi

Skor terendah ideal = $\sum$ butir kriteria x skor terendah

SBi = 1/6 (5-1) = 1/6 (4) = 0,67

Jika harga Xi dan SBi disubstitusikan ke dalam kriteria penilaian ideal, maka dapat dituliskan sebagai berikut:

No	Rentang Nilai	Kategori
1	$\overline{X} > 4{,}206$	Sangat Baik (SB)
2	$3{,}402 < \overline{X} \leq 4{,}206$	Baik (B)
3	$2{,}598 < \overline{X} \leq 3{,}402$	Cukup (C)
4	$1{,}794 < \overline{X} \leq 2{,}598$	Kurang (K)
5	$\overline{X} \leq 1{,}794$	Sangat Kurang (SK)

KONVERSI SKOR PENILAIAN MENJADI SKALA LIMA UNTUK KUALITAS SILABUS

No	Aspek yang ditelaah	Interval skor	Nilai	Kategori
1	SK dan KD mata pelajaran sesuai dengan SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
2	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan potensi peserta didik.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
3	Pemilihan materi pembelajaran relevan dengan karakteristik daerah yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
4	Pemilihan materi pembelajaran berdasarkan kesesuaian dengan alokasi waktu.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
5	Ketepatan pemilihan kegiatan pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
6	Indikator dikembangkan sesuai dengan karakteristik peserta didik.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
7	Indikator dikembangkan sesuai dengan karakteristik daerah.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik

No	Aspek yang ditelaah	Interval skor	Nilai	Kategori
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
8	Indikator menunjukkan perubahan perilaku peserta didik pada aspek sikap, pengetahuan, dan keterampilan.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
9	Pemilihan teknik dan bentuk penilaian sesuai dengan indikator.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
10	Penentuan alokasi waktu pada setiap KD didasarkan pada jumlah minggu efektif dan alokasi waktu mata pelajaran per minggu dengan mempertimbangkan jumlah KD, keluasan, kedalaman, tingkat kesulitan, dan tingkat kepentingan KD.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
11	Penentuan sumber belajar sesuai dengan SK dan KD serta materi pembelajaran, kegiatan pembelajaran, dan indikator pencapaian kompetensi yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang

c. KONVERSI SKOR PENILAIAN MENJADI SKALA LIMA UNTUK KUALITAS RPP

No	Aspek	Interval skor	Nilai	Kategori
1	Kejelasan perumusan tujuan pembelajaran (mengandung perilaku hasil belajar yang meliputi aspek kognitif, afektif, dan psikomotorik)	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
2	Kejelasan perumusan tujuan pembelajaran (tidak menimbulkan penafsiran ganda)	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
3	Pemilihan materi ajar sesuai dengan tujuan pembelajaran dan potensi daerah	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
4	Pengorganisasian materi ajar (keruntutan, sistematika meteri)	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
5	Pengorganisasian materi ajar berdasarkan kesesuaian dengan alokasi waktu	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
6	Pemilihan sumber/media pembelajaran sesuai dengan tujuan dan materi pembelajaran	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
7	Kejelasan skenario pembelajaran mengungkap langkah-langkah kegiatan pembelajaran yang terdiri dari awal, inti dan penutup	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang

No	Aspek	Interval skor	Nilai	Kategori
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
8	Kerincian skenario pembelajaran (setiap langkah mencerminkan strategi/metode dan alokasi waktu pada setiap tahap)	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
9	Ketepatan pemilihan metode, pendekatan, dan model pembelajaran dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
10	Kesesuaian teknik dengan tujuan pembelajaran	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
11	Kelengkapan instrumen evaluasi (soal, kunci jawaban, pedoman penskoran)	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
12	Alat penilaian belajar dapat mengukur kemampuan peserta didik secara mendalam berdasarkan indikator yang ada	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
13	Alat penilaian belajar dapat mengukur kemampuan kognitif, afektif, dan psikomotorik	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang
14	Petunjuk penilaian yang digunakan mudah dipahami, tepat dan jelas.	$\overline{X} > 4{,}206$	A	Sangat Baik
		$3{,}402 < \overline{X} \leq 4{,}206$	B	Baik
		$2{,}598 < \overline{X} \leq 3{,}402$	C	Cukup
		$1{,}794 < \overline{X} \leq 2{,}598$	D	Kurang
		$\overline{X} \leq 1{,}794$	E	Sangat Kurang

d. REKAP DATA HASIL *PRETEST* ANGKET KREATIVITAS BELAJAR KIMIA PESERTA DIDIK

Skor Masing-masing Butir Angket Kreativitas Belajar Kimia Peserta Didik

Nomor Butir	Skor untuk Pilihan				
	SS	S	KS	TS	STS
1.	5	4	3	2	1
2.	1	2	3	4	5
3.	1	2	3	4	5
4.	5	4	3	2	1
5.	5	4	3	2	1
6.	5	4	3	2	1
7.	1	2	3	4	5
8.	5	4	3	2	1
9.	5	4	3	2	1
10.	5	4	3	2	1
11.	1	2	3	4	5
12.	1	2	3	4	5
13.	5	4	3	2	1
14.	5	4	3	2	1
15.	5	4	3	2	1
16.	5	4	3	2	1

Hasil Pengukuran Kreativitas Peserta Didik Sebelum Pembelajaran

Menggunakan Perangkat Hasil Pengembangan

No	Nama	Butir																Rerata Skor	Nilai
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
1.	Ahmad	5	2	4	4	4	4	3	3	4	4	2	3	4	3	4	5	3.63	B
2.	Cikal	5	2	3	2	3	3	2	1	3	3	3	2	3	3	4	3	2.81	C
3.	Dhias	5	1	3	4	4	2	3	3	4	4	2	2	2	2	5	2	3.00	C
4.	Diah	5	2	2	3	3	3	4	4	4	3	3	3	3	3	4	3	3.25	C
5.	Eka	4	3	4	3	4	3	3	3	3	3	3	3	3	3	3	3	3.19	C
6.	Faizal	5	1	1	3	4	3	2	3	3	3	2	2	4	4	5	5	3.13	C
7.	Fakhri	5	2	3	2	3	4	3	2	3	3	3	2	3	4	5	4	3.19	C
8.	Farhan	5	1	1	3	2	5	2	5	5	3	1	2	5	5	5	5	3.44	B
9.	Hasna	5	3	3	4	4	3	3	3	3	4	3	3	3	3	5	3	3.44	B
10.	Hening	4	2	3	4	3	4	3	3	3	3	3	3	2	3	4	3	3.13	C
11.	Ikhwan	4	2	3	4	3	3	3	2	3	4	2	2	3	2	4	3	2.94	C
12.	Inkka	4	3	3	3	3	3	2	3	3	3	1	3	5	2	3	5	3.06	C
13.	Insan	4	3	3	4	5	4	2	3	1	2	3	2	4	1	4	4	3.06	C
14.	Irma	5	2	3	4	2	3	3	2	4	3	3	2	3	3	4	3	3.06	C
15.	Jati	4	3	2	3	2	4	3	2	4	3	2	2	3	4	4	3	3.00	C
16.	Khalifah	5	3	3	4	4	3	4	4	3	3	2	3	2	4	4	3	3.38	C
17.	Monica	4	3	2	3	3	3	3	3	3	3	3	3	3	3	4	3	3.06	C
18.	Nia	4	2	2	3	3	3	3	3	3	4	3	3	4	3	4	4	3.19	C
19.	Rakhma	5	2	3	5	3	4	2	2	4	4	1	2	4	1	4	5	3.19	C
20.	Refa	4	3	3	4	4	3	1	3	4	4	3	3	2	3	3	3	3.13	C
21.	Rifqi	4	2	2	3	3	4	1	4	3	3	4	4	4	3	4	3	3.19	C
22.	Rijkhy	4	3	3	5	1	4	3	4	3	2	2	3	4	5	4	3	3.31	C
23.	Riky	4	3	3	4	3	3	3	4	4	4	4	3	3	4	4	3	3.50	B
24.	Sony	4	1	3	4	3	5	2	4	4	4	3	2	4	4	4	4	3.44	B
25.	Supar	4	3	3	2	3	4	2	4	4	3	3	3	3	4	4	3	3.25	C
26.	Wahida	3	3	3	3	4	3	4	4	3	3	2	3	3	3	3	3	3.13	C
27.	Yanuar	5	3	3	5	5	3	2	4	3	3	3	2	4	4	4	3	3.50	B
28.	Yulita	5	3	4	5	4	4	4	3	4	3	4	3	3	3	5	3	3.75	B

e. REKAP DATA HASIL *POSTEST* ANGKET KREATIVITAS BELAJAR KIMIA PESERTA DIDIK

Hasil pengukuran kreativitas peserta didik sesudah pembelajaran menggunakan perangkat hasil pengembangan

No	Nama	Butir																Rerata Skor	Nilai
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
1.	Ahmad	4	3	4	4	3	4	3	4	3	4	2	4	4	4	4	3	3.56	B
2.	Cikal	4	3	3	2	3	3	3	3	3	3	3	2	3	4	4	4	3.13	C
3.	Dhias	4	2	3	4	3	4	3	2	4	4	2	3	4	4	4	4	3.38	C
4.	Diah	5	2	3	4	4	4	3	3	4	3	3	3	3	3	4	4	3.44	B
5.	Eka	4	3	4	4	3	2	3	3	4	4	3	2	3	3	4	3	3.25	C
6.	Faizal	5	2	2	3	4	3	2	4	2	3	2	2	3	4	3	5	3.06	C
7.	Fakhri	4	3	3	2	3	4	3	3	4	3	3	2	3	4	4	4	3.25	B
8.	Farhan	2	2	2	1	1	3	4	4	5	4	1	4	4	4	3	5	3.06	C
9.	Hasna	4	3	4	4	3	4	3	4	3	3	4	3	3	3	4	3	3.44	B
10.	Hening	4	2	3	3	2	3	4	3	3	3	4	4	3	4	3	4	3.25	C
11.	Ikhwan	4	2	3	4	4	3	3	3	4	4	2	2	3	3	4	3	3.19	C
12.	Inkka	3	3	3	4	3	3	2	3	3	3	3	3	3	3	3	4	3.06	C
13.	Insan	4	3	3	2	5	4	3	1	1	1	3	2	5	3	4	5	3.06	C
14.	Irma	5	2	3	4	3	4	3	2	3	3	3	2	4	3	5	3	3.25	C
15.	Jati	4	3	2	4	2	4	3	3	4	4	2	2	3	4	4	3	3.19	C
16.	Khalifah	4	3	4	4	4	3	4	3	4	4	3	3	2	4	5	3	3.56	B
17.	Monica	4	3	2	3	3	3	3	3	3	4	3	3	3	3	3	3	3.06	C
18.	Nia	4	2	2	3	3	3	3	3	4	4	2	3	4	4	4	4	3.25	C
19.	Rakhma	4	2	4	5	4	3	3	3	4	4	2	3	2	1	4	4	3.25	C
20.	Refa	4	3	3	4	3	3	4	3	4	3	3	3	3	2	3	2	3.13	C
21.	Rifqi	5	2	3	5	4	3	2	1	2	1	5	4	3	5	5	3	3.31	C
22.	Rijkhy	4	3	4	2	2	4	2	5	3	2	2	3	4	5	3	3	3.19	C
23.	Riky	4	4	4	3	3	3	4	4	4	4	3	3	3	3	4	3	3.50	B
24.	Sony	4	2	4	3	4	3	3	4	4	3	2	2	3	4	4	4	3.31	C
25.	Supar	4	4	4	4	4	4	2	4	3	3	3	3	4	4	3	4	3.56	B
26.	Wahida	4	3	3	3	3	2	5	3	2	1	5	5	3	3	3	3	3.19	C
27.	Yanuar	4	5	5	4	4	4	3	3	3	3	4	3	3	4	4	2	3.63	B
28.	Yulita	5	4	4	5	5	5	4	3	4	4	4	4	3	2	4	3	3.94	B

f. REKAP DATA HASIL *PRETEST* DAN *POSTEST* ANGKET KEMANDIRIAN BELAJAR KIMIA PESERTA DIDIK

Skor Masing-masing Butir Angket Kemandirian Belajar Kimia Peserta Didik

1.	5	4	3	2	1	17.	5	4	3	2	1
2.	5	4	3	2	1	18.	5	4	3	2	1
3.	5	4	3	2	1	19.	5	4	3	2	1
4.	5	4	3	2	1	20.	5	4	3	2	1
5.	5	4	3	2	1	21.	5	4	3	2	1
6.	5	4	3	2	1	22.	5	4	3	2	1
7.	5	4	3	2	1	23.	5	4	3	2	1
8.	5	4	3	2	1	24.	1	2	3	4	5
9.	5	4	3	2	1	25.	1	2	3	4	5
10.	5	4	3	2	1	26.	1	2	3	4	5
11.	5	4	3	2	1	27.	1	2	3	4	5
12.	5	4	3	2	1	28.	5	4	3	2	1
13.	1	2	3	4	5	29.	1	2	3	4	5
14.	1	2	3	4	5	30.	5	4	3	2	1
15.	1	2	3	4	5	31.	5	4	3	2	1
16.	5	4	3	2	1						

Hasil pengukuran kemandirian belajar peserta didik sebelum dan sesudah pembelajaran menggunakan perangkat hasil pengembangan (Butir 1 - Butir 8)

No	Nama	Butir 1		Butir 2		Butir 3		Butir 4		Butir 5		Butir 6		Butir 7		Butir 8	
		B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
1.	Ahmad	4	5	3	4	3	3	4	3	3	3	3	3	4	4	4	4
2.	Cikal	3	3	4	3	3	3	4	3	3	3	3	3	4	3	4	4
3.	Dhias	3	4	3	3	3	2	4	3	3	2	4	2	4	4	4	4
4.	Diah	4	4	4	3	3	3	4	4	3	3	4	3	4	3	4	4
5.	Eka	3	4	4	4	4	4	4	4	4	4	3	3	4	4	4	4
6.	Faizal	3	3	2	3	3	3	3	3	2	3	2	3	3	3	2	3
7.	Fakhri	4	4	3	3	2	3	4	2	3	2	3	2	2	2	3	2
8.	Farhan	3	5	1	1	4	5	3	5	1	1	1	1	1	1	2	1
9.	Hasna	4	4	3	3	3	3	4	5	3	3	4	3	4	4	4	3
10.	Hening	4	4	3	3	3	3	4	4	3	3	2	3	4	4	4	4
11.	Ikhwanur	3	4	3	3	3	3	4	4	3	3	3	3	4	3	3	3
12.	Inkka	3	3	3	3	3	3	3	4	3	3	3	3	3	3	3	3
13.	Insan	3	3	2	3	2	3	2	4	2	2	1	2	2	2	2	2
14.	Irma	4	5	3	3	4	3	4	4	3	3	4	4	4	5	4	3
15.	Jati	5	5	3	3	4	4	5	4	3	3	3	3	5	4	4	4
16.	Kholifah	4	4	3	3	3	3	4	4	4	4	3	3	4	5	4	4
17.	Monica	3	4	3	3	3	3	4	4	3	3	3	3	4	4	3	3
18.	Nia	4	4	3	3	4	3	4	4	3	3	3	3	4	4	4	4
19.	Rakhmat	3	5	2	3	3	3	5	4	3	3	3	2	4	3	3	3
20.	Refa	4	4	3	4	3	3	4	4	3	3	4	4	3	4	3	3
21.	Rifqi	4	4	3	4	3	3	4	4	3	3	3	4	5	5	5	5
22.	Rijkhy	3	4	2	2	3	3	3	3	3	3	2	3	4	4	4	2
23.	Riky	4	4	3	3	3	4	4	4	3	3	3	3	4	4	3	3
24.	Sony	4	4	3	3	3	3	4	4	3	2	3	2	4	3	3	3
25.	Supar	3	4	3	3	4	3	4	3	3	2	3	2	4	2	4	3
26.	Wahidah	3	4	2	4	3	3	2	4	2	3	2	4	3	4	2	4
27.	Yanuar	3	4	3	3	4	3	3	4	3	3	2	3	4	3	4	2
28.	Yulita	4	4	4	4	4	3	5	4	4	4	3	3	5	5	5	5

Lanjutan

Hasil pengukuran kemandirian belajar peserta didik sebelum dan sesudah pembelajaran menggunakan perangkat hasil pengembangan (Butir 9 - Butir 20)

No	Nama	Butir 9		Butir10		Butir 11		Butir 12		Butir 13		Butir 14		Butir 15		Butir 16		Butir 17		Butir 18		Butir 19		Butir 20	
		B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
1.	Ahmad	3	4	4	3	5	4	3	4	5	5	4	3	4	2	4	4	4	4	3	4	3	3	5	5
2.	Cikal	3	3	4	4	4	4	4	4	3	3	2	2	2	1	3	3	4	3	5	3	3	3	4	5
3.	Dhias	3	3	4	3	2	4	4	4	1	2	3	3	3	3	4	3	3	4	3	3	4	4	4	4
4.	Diah	4	3	4	3	4	4	4	4	3	3	4	3	3	3	3	3	4	4	3	3	4	4	4	4
5.	Eka	4	4	4	5	4	5	4	5	3	4	3	2	3	4	4	4	4	4	3	4	4	4	4	4
6.	Faizal	2	3	2	3	3	4	3	2	3	2	2	2	1	1	3	3	3	3	3	3	2	3	3	3
7.	Fakhri	3	2	4	3	4	4	3	3	4	2	2	2	2	1	4	3	4	3	4	2	3	2	4	4
8.	Farhan	1	1	2	1	2	5	1	1	4	5	1	1	1	1	4	5	4	5	1	1	5	5	5	5
9.	Hasna	3	3	4	4	4	5	3	4	4	4	3	2	3	4	4	3	4	3	3	3	3	3	4	4
10.	Hening	3	3	3	4	3	4	4	4	4	3	2	2	2	2	4	4	3	3	3	3	4	4	3	3
11.	Ikhwanur	3	3	3	4	4	3	3	4	4	4	2	2	2	3	4	3	3	3	3	3	3	3	4	4
12.	Inkka	3	3	4	3	4	3	3	3	3	2	3	2	2	1	4	3	3	5	3	3	3	3	4	3
13.	Insan	1	2	1	2	1	3	1	4	2	2	2	5	1	2	3	5	3	3	1	2	1	4	1	3
14.	Irma	3	3	3	3	4	5	4	5	3	1	3	2	3	3	4	5	3	3	3	3	3	3	5	5
15.	Jati	3	4	3	4	5	5	4	4	4	3	3	2	3	4	5	4	4	4	4	3	3	4	5	4
16.	Khalifah	3	4	4	4	5	4	4	4	4	4	3	4	4	4	4	4	4	3	4	4	4	4	5	4
17.	Monica	2	3	3	3	4	4	3	4	3	3	2	3	2	2	3	4	3	3	3	3	3	3	4	4
18.	Nia	4	4	4	4	4	4	4	4	4	2	3	3	3	3	4	3	4	4	4	4	4	4	4	4
19.	Rakhmat	3	3	5	5	4	4	3	3	4	3	2	1	3	2	4	4	3	4	3	3	4	4	5	5
20.	Refa	4	4	3	3	4	4	4	4	4	3	4	4	3	3	4	4	4	4	3	3	3	3	4	4
21.	Rifqi	5	5	5	5	5	5	5	3	3	4	2	5	3	4	2	3	4	5	3	5	2	3	5	4
22.	Rijkhy	3	2	3	3	5	3	3	4	3	2	2	2	3	2	3	4	4	2	3	2	2	3	5	3
23.	Riky	3	3	4	4	4	4	4	4	4	5	3	4	4	3	3	4	4	4	4	4	4	4	4	4
24.	Sony	3	2	3	3	4	4	4	3	2	3	3	2	2	2	4	4	4	4	3	3	4	4	4	4
25.	Supar	2	2	3	3	3	3	4	4	3	3	4	3	3	2	4	3	4	3	3	3	3	4	4	4
26.	Wahidah	2	3	3	4	3	4	2	4	4	4	4	3	4	4	3	4	3	4	2	4	2	3	3	5
27.	Yanuar	3	2	4	3	4	3	4	5	4	3	3	4	4	3	3	3	3	3	3	3	4	3	5	5
28.	Yulita	3	3	5	5	5	5	4	4	5	4	5	3	3	3	4	4	5	5	5	4	4	4	5	5

Lanjutan

Hasil pengukuran kemandirian belajar peserta didik sebelum dan sesudah pembelajaran menggunakan perangkat hasil pengembangan (Butir 21 - Butir 31)

No	Nama	Butir 21		Butir 22		Butir 23		Butir 24		Butir 25		Butir 26		Butir 27		Butir 28		Butir 29		Butir 30		Butir 31	
		B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
1.	Ahmad	3	3	3	4	5	4	3	3	5	5	5	4	4	3	3	3	4	3	4	4	2	4
2.	Cikal	3	3	3	3	3	3	2	2	2	3	3	3	1	1	3	3	3	2	4	4	4	4
3.	Dhias	3	1	4	2	4	4	2	2	3	4	4	3	3	3	3	3	3	3	4	4	3	3
4.	Diah	4	4	4	3	5	5	3	3	4	3	5	4	4	3	4	4	5	3	4	4	3	4
5.	Eka	4	4	4	4	4	4	3	3	3	3	3	3	3	3	4	4	3	3	4	4	3	3
6.	Faizal	3	3	3	3	3	3	2	2	3	2	3	3	1	2	3	3	2	2	4	4	3	3
7.	Fakhri	3	2	4	2	3	2	3	2	2	3	3	3	2	1	3	3	3	2	3	3	3	3
8.	Farhan	1	1	1	1	1	5	2	5	3	5	2	5	1	1	1	1	1	1	1	1	1	1
9.	Hasna	3	3	4	4	4	4	4	4	4	4	4	4	3	3	4	4	3	3	3	3	4	4
10.	Hening	2	3	3	3	3	4	3	2	3	3	5	5	4	3	3	4	3	4	3	3	3	3
11.	Ikhwanur	3	3	3	3	4	4	3	4	3	4	4	4	2	3	3	4	3	3	3	3	3	3
12.	Inkka	3	3	3	3	3	3	3	2	3	2	4	3	3	2	3	3	3	2	3	3	3	3
13.	Insan	1	1	3	4	4	4	1	4	1	3	2	3	2	1	2	2	3	2	1	1	1	1
14.	Irma	3	3	4	4	3	4	3	3	3	3	4	3	2	3	3	4	3	3	2	3	3	3
15.	Jati	3	3	2	4	4	4	3	4	4	4	4	4	4	4	3	3	2	3	5	4	4	3
16.	Kholifah	4	4	4	3	5	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
17.	Monica	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
18.	Nia	3	3	4	4	4	4	2	3	3	3	4	4	3	2	4	4	3	4	4	4	4	4
19.	Rakhmat	3	3	3	4	4	3	2	2	4	4	5	5	4	1	3	3	3	2	3	4	3	3
20.	Refa	2	3	3	3	4	4	3	3	4	4	2	4	4	3	2	3	2	3	4	4	2	3
21.	Rifqi	4	5	3	5	5	5	3	5	4	4	4	4	3	3	3	2	2	4	5	5	2	2
22.	Rijkhy	3	2	4	2	4	4	3	4	2	2	4	4	3	2	2	2	4	2	3	2	2	2
23.	Riky	3	3	4	4	4	4	3	5	4	4	5	5	3	3	4	3	4	4	4	4	4	4
24.	Sony	4	3	4	4	4	4	3	3	3	3	3	3	2	3	4	4	3	4	4	4	4	4
25.	Supar	3	3	4	2	4	4	3	3	3	4	4	4	4	3	4	3	3	3	4	3	4	3
26.	Wahidah	2	4	3	4	2	4	3	5	3	5	3	5	3	5	3	4	3	5	3	4	3	3
27.	Yanuar	3	3	3	3	4	4	4	2	4	4	4	4	3	4	3	3	4	3	4	3	4	4
28.	Yulita	4	4	5	5	5	5	3	5	5	2	5	5	3	5	3	4	5	5	5	5	5	5

Daftar Skor Pemahaman Konsep Peserta Didik pada Materi Larutan Penyangga Sebelum dan Sesudah Pelaksanaan Pembelajaran dengan Menggunakan Perangkat Hasil Pengembangan

No.	Nama	Skor	
		Sebelum	Sesudah
1.	Ahmad Gilang R.	28	87,50
2.	Cikal Bagaskara	20	87,50
3.	Dhias Wahyu Wardhani	40	84,38
4.	Diah Tri Murti	44	90,62
5.	Eka Fajarwati	28	75
6.	Faizal F. A.	20	68,75
7.	Fakhri Hidayat	24	73,44
8.	Farhan Yahya H.	40	96,88
9.	Hasna Dyah K.	40	82,81
10.	Heningdyah Putri Arini	32	89,06
11.	Ikhwanur Rizki	12	57,81
12.	Inkka Ruslly Dwitama	12	65,62
13.	Insan A. K.	28	90,62
14.	Irma Mulyawati	8	95,31
15.	Jati Nugroho	36	93,75
16.	Khalifah M.	24	78,12
17.	Monica Anggraeni	36	87,50
18.	Nia Yunita	32	75
19.	Rakhmat S. A. H.	36	89,06
20.	Refa Artika	32	90,62
21.	Rifqi Jizala A.	24	92,19
22.	Rijkhy Syakur A.	32	59,38
23.	Riky Redmawati	16	92,19
24.	Sony Kusuma W.	28	54,69
25.	Suparyanto	8	78,12
26.	Wahidah N. A.	28	84,38
27.	Yanuarika Rizki A.	12	92,19
28.	Yulita Rinaldi	20	71,88

g. REKAP DATA UJI NORMALITAS

Data Rerata Kreativitas dan Kemandirian Belajar Kimia Peserta Didik Sebelum Dan Sesudah Pembelajaran dengan Menggunakan Perangkat Hasil Pengembangan

No	Kreativitas Sebelum	Kreativitas Sesudah	Kemandirian Sebelum	Kemandirian Sesudah
1	3.63	3.56	3.52	3.68
2	2.81	3.13	2.97	3.03
3	3.0	3.38	3.0	3.1
4	3.25	3.44	3.65	3.48
5	3.19	3.25	3.55	3.81
6	3.13	3.06	2.58	2.77
7	3.19	3.25	3.13	2.48
8	3.44	3.06	2.0	2.68
9	3.44	3.44	3.48	3.55
10	3.13	3.25	3.23	3.35
11	2.94	3.19	3.16	3.32
12	3.06	3.06	3.13	2.84
13	3.06	3.06	1.77	2.71
14	3.06	3.25	3.35	3.45
15	3.0	3.19	3.58	3.71
16	3.38	3.56	3.9	3.87
17	3.06	3.06	3.0	3.19
18	3.19	3.25	3.65	3.55
19	3.19	3.25	3.06	3.26
20	3.13	3.13	3.32	3.52
21	3.19	3.31	3.61	4.1
22	3.31	3.19	3.13	2.71
23	3.5	3.5	3.68	3.81
24	3.44	3.31	3.13	3.26
25	3.25	3.56	3.0	3.03
26	3.13	3.19	2.74	4.0
27	3.5	3.63	3.1	3.29
28	3.75	3.94	4.13	4.23

HASIL UJI NORMALITAS

One-Sample Kolmogorov-Smirnov Test

		SkorKreativitasSebelumPembelajaran	SkorKreativitasSesudahPembelajaran	SkorKemandirianSebelumPembelajaran	SkorKemandirianSesudahPembelajaran
N		28	28	28	28
Normal Parameters[a]	Mean	3.2268	3.3018	3.1982	3.3493
	Std. Deviation	.21669	.21224	.50730	.46198
Most Extreme Differences	Absolute	.175	.204	.184	.079
	Positive	.175	.204	.100	.079
	Negative	-.087	-.127	-.184	-.066
Kolmogorov-Smirnov Z		.924	1.077	.971	.419
Asymp. Sig. (2-tailed)		.361	.196	.302	.995

a. Test distribution is Normal.

h. REKAP HASIL UJI PAIRED SAMPLES T-TEST KREATIVITAS BELAJAR KIMIA PESERTA DIDIK

No	Kreativitas Sebelum	Kreativitas Sesudah
1	3.63	3.56
2	2.81	3.13
3	3.0	3.38
4	3.25	3.44
5	3.19	3.25
6	3.13	3.06
7	3.19	3.25
8	3.44	3.06
9	3.44	3.44
10	3.13	3.25
11	2.94	3.19
12	3.06	3.06
13	3.06	3.06
14	3.06	3.25
15	3.0	3.19
16	3.38	3.56
17	3.06	3.06
18	3.19	3.25
19	3.19	3.25
20	3.13	3.13
21	3.19	3.31
22	3.31	3.19
23	3.5	3.5
24	3.44	3.31
25	3.25	3.56
26	3.13	3.19
27	3.5	3.63
28	3.75	3.94

UJI T KREATIVITAS BELAJAR KIMIA PESERTA DIDIK

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	kreativitas_sebelum	3.2268	28	.21669	.04095
	kreativitas_sesudah	3.3018	28	.21224	.04011

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	kreativitas_sebelum & kreativitas_sesudah	28	.729	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	kreativitas_sebelum - kreativitas_sesudah	-.07500	.15798	.02986	-.13626	-.01374	-2.512	27	.018

i. REKAP HASIL UJI PAIRED SAMPLES T-TEST KEMANDIRIAN BELAJAR KIMIA PESERTA DIDIK

No	Kemandirian Sebelum	Kemandirian Sesudah
1	3.52	3.68
2	2.97	3.03
3	3.0	3.1
4	3.65	3.48
5	3.55	3.81
6	2.58	2.77
7	3.13	2.48
8	2.0	2.68
9	3.48	3.55
10	3.23	3.35
11	3.16	3.32
12	3.13	2.84
13	1.77	2.71
14	3.35	3.45
15	3.58	3.71
16	3.9	3.87
17	3.0	3.19
18	3.65	3.55
19	3.06	3.26
20	3.32	3.52
21	3.61	4.1
22	3.13	2.71
23	3.68	3.81
24	3.13	3.26
25	3.0	3.03
26	2.74	4.0
27	3.1	3.29
28	4.13	4.23

UJI T KEMANDIRIAN BELAJAR KIMIA PESERTA DIDIK

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	kemandirian_Sebelum	3.1982	28	.50730	.09587
	kemandirian_sesudah	3.3493	28	.46198	.08731

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	kemandirian_Sebelum & kemandirian_sesudah	28	.714	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	kemandirian_Sebelum - kemandirian_sesudah	-.15107	.36863	.06967	-.29401	-.00813	-2.169	27	.039

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Terbatas

Pertemuan 1

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	5	5	5
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	5	5
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	4	4	4
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	4	4,5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	4	4	4
13.	Penilaian akhir	4	4	4
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	4	4
15.	Kegiatan tindak lanjut	5	4	4,5
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	3	4	3,5
	Rerata	**4,31**	**4,25**	**4,28**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Terbatas

Pertemuan 2

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	5	5	5
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	5	5
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	4	4	4
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	3	5	4
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	4	4,5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	5	5	5
13.	Penilaian akhir	3	3	3
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	4	4
15.	Kegiatan tindak lanjut	4	3	3,5
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	3	4	3,5
	Rerata	**4,19**	**4,25**	**4,22**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Terbatas

Pertemuan 3

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	4	4	4
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	5	5
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	4	4	4
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	5	5
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	5	5
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	4	4,5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	5	5	5
13.	Penilaian akhir	4	4	4
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	4	4
15.	Kegiatan tindak lanjut	4	3	3,5
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	3	3	3
	Rerata	**4,38**	**4,25**	**4,31**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Terbatas

Pertemuan 4

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	3	4	3,5
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	4	4	4
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	3	3	3
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	3	3	3
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	4	3	3,5
13.	Penilaian akhir	3	3	3
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	3	3,5
15.	Kegiatan tindak lanjut	3	3	3
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	3	3	3
	Rerata	**3,75**	**3,69**	**3,72**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Lapangan

Pertemuan 1

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	5	5	5
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	5	5
5.	Pembelajaran secara sistematis	5	4	4,5
6.	Penggunaan media secara efektif dan efisien	4	4	4
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	4	4,5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	4	4	4
13.	Penilaian akhir	4	4	4
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	4	4
15.	Kegiatan tindak lanjut	5	4	4,5
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	4	4	4
	Rerata	**4,44**	**4,25**	**4,34**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Lapangan

Pertemuan 2

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	5	5	5
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	5	5
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	5	5	5
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	5	4,5
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	4	4,5
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	4	4,5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	5	5	5
13.	Penilaian akhir	4	4	4
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	4	4
15.	Kegiatan tindak lanjut	4	4	4
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	4	4	4
	Rerata	**4,5**	**4,44**	**4,47**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Lapangan

Pertemuan 3

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	4	4	4
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	5	5	5
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	4	4	4
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	5	5
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	5	5
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	5	5	5
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	5	5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	5	5	5
13.	Penilaian akhir	4	4	4
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	4	4	4
15.	Kegiatan tindak lanjut	4	4	4
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	4	4	4
	Rerata	**4,5**	**4,5**	**4,5**

HASIL PENILAIAN KETERLAKSANAAN RPP

Uji Coba Lapangan

Pertemuan 4

No	Aspek yang ditelaah	Penilai		Rerata
		PI	PII	
A.	**Kegiatan Pendahuluan**			
1.	Persiapan peserta didik untuk belajar	5	5	5
2.	Kegiatan apersepsi	5	5	5
B.	**Kegiatan Inti Pembelajaran**			
3.	Kejelasan penyampaian materi	4	5	4,5
4.	Kesesuaian proses pembelajaran dengan tujuan pembelajaran yang akan dicapai	4	4	4
5.	Pembelajaran secara sistematis	4	4	4
6.	Penggunaan media secara efektif dan efisien	4	3	3,5
7.	Kesesuaian metode pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
8.	Kesesuaian pendekatan pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
9.	Kesesuaian model pembelajaran dengan situasi dan kondisi peserta didik, serta karakteristik dari setiap indikator dan kompetensi yang hendak dicapai.	4	4	4
10.	Ketepatatan sumber belajar dalam rangka pencapaian SK dan KD yang diperkaya dengan mangacu pada kurikulum salah satu sekolah yang setara dari salah satu negara anggota OECD	4	4	4
11.	Penumbuhan partisipasi aktif peserta didik	5	5	5
12.	Pemantauan kemajuan belajar peserta didik selama proses pembelajaran	4	4	4
13.	Penilaian akhir	4	4	4
C.	**Kegiatan Penutup**			
14.	Kegiatan refleksi atau membuat kesimpulan	5	5	5
15.	Kegiatan tindak lanjut	4	4	4
D.	**Alokasi Waktu**			
16.	Alokasi waktu untuk setiap kegiatan	4	4	4
	Rerata	**4,25**	**4,25**	**4,25**

LAMPIRAN 8

PERIJINAN

Lampiran9.Dokumentasi Penelitian

a. Dokumentasi Ujicoba Kelompok Kecil

b. Dokumen Ujicoba Lapangan