BAHAGIAN PENGURUSAN SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

CHEMISTRY 4541

MODUL
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PERFECT SCORE & X A-PLUS

2013

SEKOLAH BERASRAMA PENUH (SBP)

PANEL PENYEDIA DAN PEMURNI:	SEKOLAH
PN HJH WAN NOOR AFIFAH BT WAN YUSOFF	SBPI GOMBAK
PN. NORINI BT JAAFAR	SEKOLAH SULTAN ALAM SHAH
TN HJ CHE MALEK B MAMAT	SBPI BATU RAKIT
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CHEMISTRY PERFECT SCORE &
X – PLUS MODULE 2013

	TOPICS	CONTENTS
1	Guidelines & Anwering Techniques	▪ Format of an instrument of chemistry ▪ Construct requirement ▪ Guidelines for answering paper 1 ▪ Guidelines for answering paper 2 ▪ The common command words in paper 2
2	Set 1	▪ The structure of Atom, Periodic Table of Elements and Chemical Bonds ▪ Chemical Formulae and equations
3	Set 2	▪ Electrochemistry ▪ Oxidation and Reduction
4	Set 3	▪ Acids and Bases ▪ Salts ▪ Rate of reaction ▪ Thermochemistry
5	Set 4	▪ Carbon compounds ▪ Manufactured Substance in Industry ▪ Chemicals for Consumers
6	Set 5	▪ Guidelines for answering paper 3 ▪ Paper 3 set 1 ▪ Paper 3 set 2 ▪ Paper 3 set 3 ▪ Paper 3 set 4 ▪ Paper 3 set 5 ▪ Paper 3 set 6 ▪ Paper 3 set 7

CHEMISTRY
PERFECT SCORE &
X – A PLUS MODULE

2013

GUIDELINES
&
ANSWERING TECHNIQUES

CHEMISTRY SPM

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1.0 FORMAT OF AN INSTRUMENT OF CHEMISTRY BEGINNING SPM 2003

No	Item	Paper 1 (4541/1)	Paper 2 (4541/2)	Paper 3 (4541/3)
1	Type of instrument	Objective test	Subjective test	Written Practical Test
2	Type of item	Objective it	Section A : Structured Item Section B : Essay restricted response Item Section C : Essay extended response Item	Subjective Item : Structured Item Extended Response Item: (Planning an experiment)
3	Number of question	50 (answers all)	Section A : 6 (answer all) Section B : 2 (choose one) Section C : 2 (choose one)	Structured Item : 1/2 items (answer all) Extended Response Item : 1 item
5	Duration of time	1 hour 15 minutes	2 hour 30 minutes	1 hour 30 minutes

2.0 CONSTRUCT REQUIREMENT

Construct	Paper 1	Paper 2	Paper 3
Knowledge	20 m (No 1- 20)	14	-
Understanding	15 m (No 21 – 35)	21	-
Application	15 m (No 36 – 50)	29	-
Analysis	-	21	-
Synthesizing	-	15	-
Science process	-	-	50
Total mark	50	100	50

3.0 TIPS TO SCORE " A " CHEMISTRY

3.1 Master the topics that contains the basic concepts of chemistry :

1. The structure of the atom
2. Chemical Formulae And Equations
3. Periodic Table
4. Chemical Bond

3.2 Familiarize with different types of questions as listed below and complete the previous SPM papers:

1. Objectives questions (MCQ) (Paper 1)
2. Structured questions (Paper 2 & 3)
3. Essays (Paper 2)
4. Planning an experiment (Paper 3)
5. Draw and label the diagram
6. Writing chemical equation(balanced equation, ionic equation, half equation)

3.3 Try to get :-

- ✓ 45 marks above for paper 1
- ✓ 90 marks above for paper 2
- ✓ 45 marks above for paper 3 (Total= 180/2 = 90 , **A+** in SPM)

4.0 GUIDELINE FOR ANSWERING PAPER 1

4.1 Paper 1 questions test students on

1. Knowledge (Number 1 – 20)
2. Understanding (Number 21 – 35)
3. Application (Number 36 – 50)

4.2 Score in paper 1 Indicates student's level of understanding in chemistry:

Less than 20 – very weak
20 – 25 - weak
26 – 30 - average
31 – 39 - good
40 – 45 - very good
46 – 50 - excellent.

4.3 Answer all SPM objective questions (2003 – 2012). Objective questions for each year contain all topics. If your score in paper 1 is 40 and above, you will able to answer questions in paper 2 & 3 easily.

5.0 GUIDELINE FOR ANSWERING PAPER 2 (STRUCTURE AND ESSAY)

5.1 Paper 2 questions test student on

1. knowledge
2. understanding
3. application
4. analyzing
5. synthesizing

5.2 Steps taken are:

1. Underline the **command word** and **marks** allocated for each question.
2. **Match** the **command word to the mark** allocated for each question. 1 point is awarded 1 mark.
3. Follow the needs of the question (Refer to the command words, page …….)
4. Unnecessary repetition of the statement in the question is not required.

5.3 Three types of questions which involve experiments in paper 2:

I. Type 1

Describe an experiment on……Include a labeled diagram in your answer

1. Diagram
2. Procedure
3. Observation/example/data/calculation/equation/sketch of graph/conclusion

II. Type 2

Describe an experiment……(The diagram will support your answer.)

1. No mark is allocated for a diagram
2. Procedures
3. Observation/example/calculation/equation/sketch of graph/conclusion

III. Type 3

Describe a chemical/confirmatory test for …….

1. Procedure
2. Observation
3. Conclusion

6.0 THE COMMON COMMAND WORDS IN PAPER 2 & PAPER 3 CHEMISTRY

- The question normally starts with a command word.
- Students must know the meaning of the command word to make sure that the **answer given is according to the question's requirement.**
- Match the command word to the mark allocated for each question.

Command word	Explanation/example
Name/State the name (paper 2 & 3)	Give the name , not the formula. Example: Name the main element added to copper to form bronze. Wrong answer :Sn. Correct answer : Tin
State (paper 2 & 3)	Give brief answer only. Explanation is not required. Example : State one substance which can conduct electricity in solid state. Answer : Copper
State the observation (Paper 2 & 3)	Write what is observed physically. ***Example 1*** : State one observation when magnesium powder is added to hydrochloric acid. [1 *mark*] ***Wrong answer*** : Hydrogen gas is released. ***Correct answer*** : Gas bubbles are released
	Indicate the change of colour , give the initial and final colour of the substance/chemical. ***Example 2***: What is the colour change of copper(II) suphate solution. [2 *marks*] ***Wrong answer***: The solution becomes colourless ***Correct answer*** : The blue colour of the solution becomes colourless
Explain (Paper 2 & 3)	Give the answer with reasons to explain certain statement / fact / observation/ principal. ***Example 1*** : Explain why bronze is harder than pure copper [4 *marks*] ***Correct answer*** : - Copper atoms in pure copper are all of the same size and .....1 - they are arranged in layers that can slide easily when force is applied .....1 - The presence of tin atoms in bronze that are different in size disturb the orderly arrangement of atoms in bronze. .....1 - This reduces the layer of atoms from sliding. 1
What is meant by.. (Definition) (Paper 2 & 3)	Give the exact meaning ***Example:*** What is meant by hydrocarbon. ***Wrong answer:*** A compound that contains carbon and hydrogen ***Correct answer***: A compound that contains carbon hydrogen only
Describe chemical test (Paper 2 & 3)	State the**method** to conduct the test , **observation** and **conclusion.** ***Example*** : Describe how to identify the ion present in the solution . [3 *marks*] ***Answer*** : - Pour in 2 cm^3 of the solution in a test tube. Add a few drops of sodium hydroxide *solution* and the test tube is shake the test tube .....1 - A reddish brown precipitate formed. .....1 - Fe^{3+} ions present ……1
Describe gas test. (Paper 2 & 3)	State the method to conduct the test observation and conclusion**.** Example: Describe the confirmatory test for gas released at the anode(oxygen). [3 *marks*] ***Wrong answer***: Test with a glowing wooden splinter. ***Correct answer:***- Place a glowing wooden splinter to the mouth of the test tube ..…….1 - The glowing wooden splinter is lighted up ..……1 - Oxygen gas is released ..…….1
Describe an experiment (8 - 10 marks) (Paper 2)	- No mark is awarded for the diagram. The diagram can help students write the steps taken in the procedure. - List of materials 1m } *Can be obtained from the diagram* - List of apparatus 1m } - Procedure (5 – 8 m) - Observation/tabulation of data/ calculation/sketch of the graph/ chemical equation /ionic equation /conclusion …… etc. - Any additional details relevant derived from the question.

Plan an experiment (17 marks) (Paper 3)	Answer the question according the requirement : – Problem statement/Aim of experiment – Hyphotesis – Variables – List of substances and apparatus – Procedure – Tabulation of data Note: For question 3, unlike PEKA report students only need to answer according to what is stated in the question. - No mark for the diagram. Diagram can help student writing the steps taken in the procedure.
Describe the process … **Describe** the structure …. **Describeand write** equation… **Describe how** … (Paper 2 & 3)	Give relevant details derived from the question.
Predict (Paper 2 & 3)	Make a prediction for something that might happen based on facts *Example*: Experiment 1 is repeated using a larger beaker.Predict the increase in temperature Answer : The increase in temperature is lower than experiment 1.
Compare (Paper 2)	Give the **similarities and differences** between two items/ situations
Differentiate (Paper 2)	**Give differences** between two items/situations Example : State three differences between ionic and covalent compound. Answer : State three properties of ionic compound and three properties covalent compound
Draw a labeled diagram of the apparatus (Paper 2)	Draw a complete set up of apparatus (i) Functional set up of apparatus (ii) Complete label (iii) Shade solid, liquid and gas correctly. (iv) Draw an arrow and label ' heat' if the experiment involves heating.
Draw a diagram to show the bonding formed in the compound (Paper 2)	(i) Ionic compound – The number of electrons in each shell is correct, 2 electrons in the first shell and 8 electrons in the second and third shell. – Show the charge of each particle. – Write the symbol of each element at the centre of the ion. (ii) Covalent compound – The number of electrons in each shell is correct, 2 electrons in the first shell and 8 electrons in the second and third shell. – The number of atoms sharing pair of electrons is correct. – Write the symbol of each element at the center of each atom in the molecule.
Draw graph (Paper 3)	Draw graph as follows : – Label the two axis with the correct unit – Choose suitable scale, the size of the graph should be at least ¾ of the size of the graph paper. – Plot all the points correctly – Smooth graph (curve or straight line) – For the determination of the rate of reaction (i) Draw a tangent at the curve. (ii) Draw a triangle at the tangent Calculate the gradient of the tangent
Draw the energy level diagram (Paper 2)	– Draw an arrow for the vertical axis only and label with energy. – Draw two horizontal lines for the reactants and products

Draw the arrangement of particles in solid, liquid and gas. (Paper 2)	– Solid: Draw at least three layers of particles closely packed in orderly manner and they are not overlap. – Liquid : The particles packed closely but not in orderly manner – Gas : The particles are very far apart from each other
Draw the direction of electron flow (Paper 2 /3)	Draw the direction for the flow of electrons on the circuit, not through the solution.
Write chemical equation (Paper 2 & 3)	– Write the balanced chemical equation – Differentiate : (i) Balanced chemical equation (ii) Ionic equation (iii) Half equation for oxidation (iv) Half equation for reduction
Calculate (Paper 2 & 3)	– Show all the steps taken – Give final answer with unit. –
Classify (Paper 3)	– Draw table to represent the classification.

CHEMISTRY MODULE

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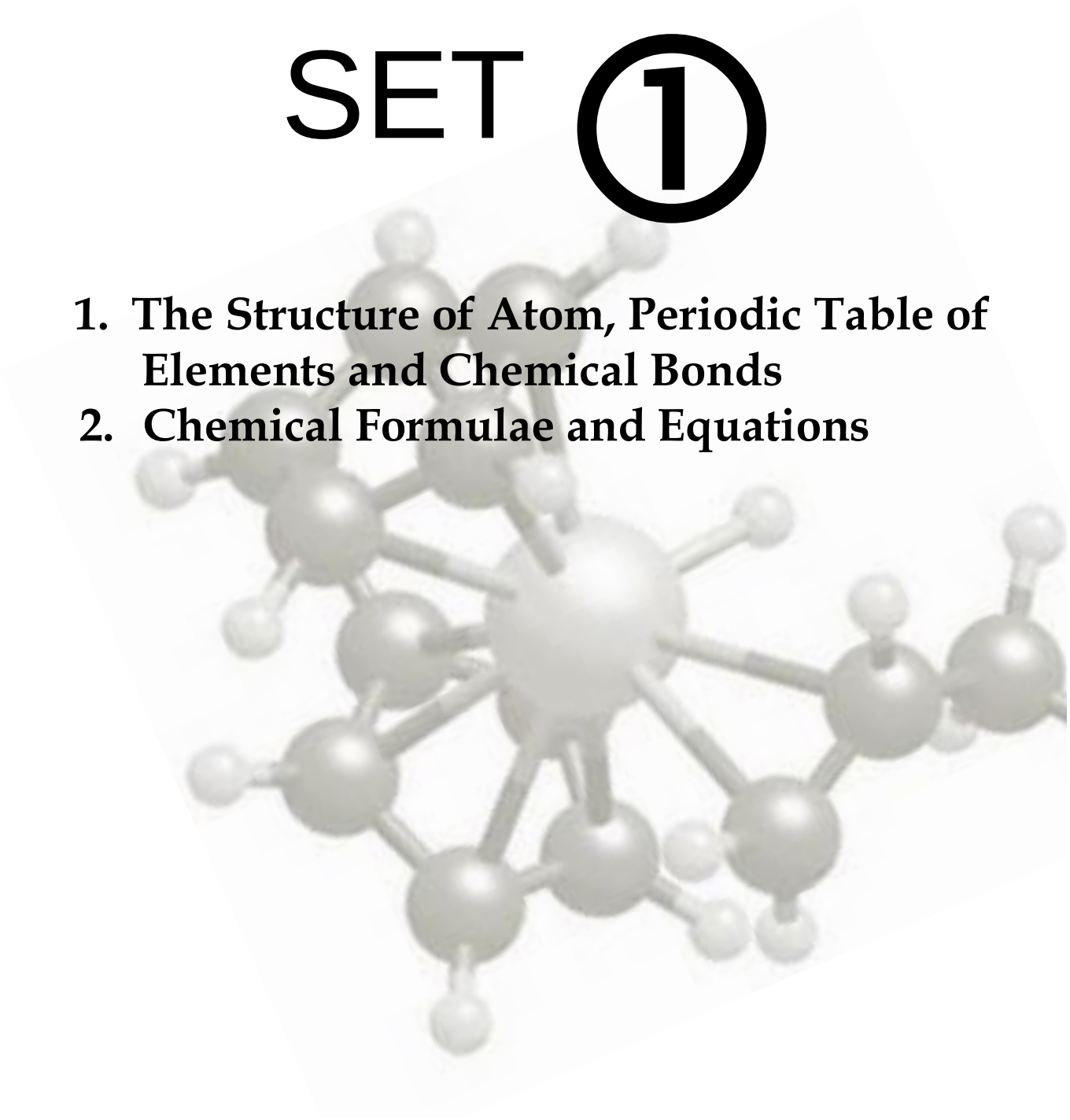
SET ①

1. **The Structure of Atom, Periodic Table of Elements and Chemical Bonds**
2. **Chemical Formulae and Equations**



SET 1 : THE STRUCTURE OF ATOM, PERIODIC TABLE OF ELEMENTS AND CHEMICAL BONDS
(SECTION A)

1 Diagram 1.1 shows the heating curve of solid naphthalene, $C_{10}H_8$.
Rajah 1.1 menunjukkan lengkung pemanasan pepejal naftalena, $C_{10}H_8$.

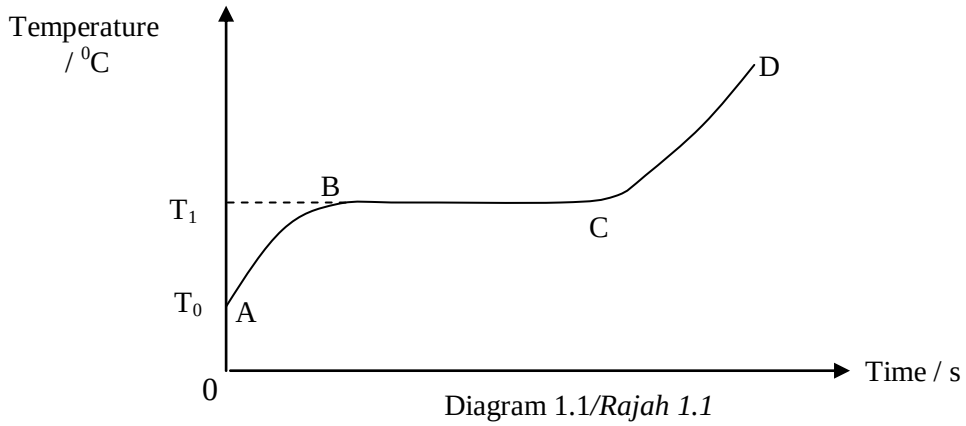


Diagram 1.1/*Rajah 1.1*

(*a*) (i) Name the process involved in Diagram 1.1
Namakan proses yang terlibat dalam Rajah 1.1.

.....

[1 mark]

(ii) State the type of particle present in naphthalene, $C_{10}H_8$.
Nyatakan jenis zarah yang terdapat dalam naftalena, $C_{10}H_8$.

.....

[1 mark]

(*b*) Explain why there is no change in temperature from B to C
Terangkan mengapa tiada perubahan suhu dari B ke C

.....

.....

.....

[2 *marks*]

(*c*) State how the movement of naphthalene particles changes from C to D during heating.
Nyatakan bagaimana pergerakan zarah-zarah naftalena berubah semasa pemanasan dari C ke D.

.....

[1 *mark*]

(*d*) Diagram 1.2 shows the atomic model proposed by Neils Bohr.
Rajah 1.2 menunjukkan model atom yang dicadangkan oleh Neils Bohr.

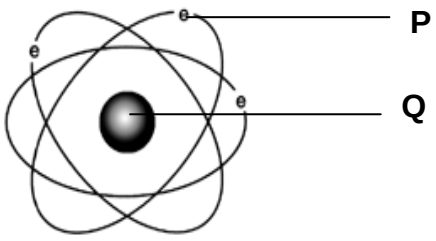


Diagram 1.2/ *Rajah 1.2*

i) Name P and Q.
Namakan P *dan* Q.

P : ..... Q : .....

[1 mark]

ii) Which subatomic particles are involved in a chemical reaction?
Zarah-zarah sub-atom yang manakah terlibat dalam tindak balas kimia?

.....

[1 mark]

(e) Table 1.1 shows the number of protons and neutrons of four different atoms.
Jadual 1.1 menunjukkan bilangan proton dan neutron bagi empat atom yang berlainan.

Atom	Number of protons *Bilangan proton*	Number of neutrons *Bilangan neutron*
W	16	17
X	16	16
Y	3	4
Z	19	20

Table 1.1 / *Jadual 1.1*

i) Which atoms are isotopes?
Atom-atom yang manakah adalah isotop?

.....

[1 mark]

ii) Give a reason for your answer in (e) (i).
Berikan satu sebab bagi jawapan anda di (e) (i).

.....

.....

[2 marks]

2 Diagram 2.1 shows the chemical symbols which represent four elements W, X, Y and Z.
Rajah 2.1 menunjukkan simbol yang mewakili empat unsur iaitu unsur W, X, Y dan Z.

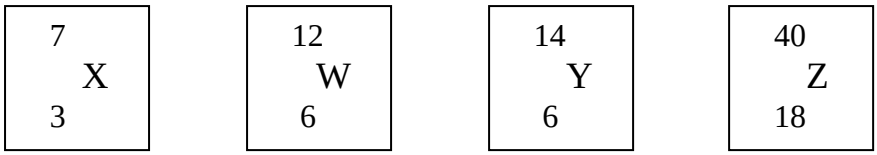


Diagram 2.1/ *Rajah 2.1*

(a) State the number of electrons and neutrons in atom Z.
Nyatakan bilangan elektron dan neutron dalam atom Z.

Number of electrons: ……. Number of neutrons: ……
Bilangan elektron : *Bilangan neutron:*

[2 *marks*]

(b) (i) What is the meaning of nucleon number?
Apakah maksud nombor nukleon.

……...……

..……..

[1 *mark*]

(ii) State the nucleon number of atom Z.
Nyatakan nombor nukleon bagi atom Z

.....……..

[1 *mark*]

(c) (i) Write the electron arrangement of atom X.
Tuliskan susunan elektron bagi atom X

……..

[1 *mark*]

(ii) Draw the atomic structure of of atom X to show the number of protons, neutrons and electrons in the atom.
Lukis susunan elektron bagi atom X untuk menunjukkan kedudukan proton, neutron dan elektron dalam atom.

[2 *marks*]

(d) (i) Which two elements are isotopes?
Manakah dua unsur adalah isotop?

…….....

[1 *mark*]

(ii) Explain why isotopes of an element have the same chemical properties.
Terangkan mengapa isotop sesuatu unsur mempunyai sifat kimia yang sama.

……..……..……..

[1 *mark*]

(iii) Give one use of the isotope mentioned in (d) (i).
Beri satu kegunaan isotop yang dinyatakan dalam jawapan (d (i).

……..

[1 *mark*]

3 a) Table 3.1 shows the information of atoms J, K and L.
Jadual 3.1 *menunjukkan maklumat bagi atom-atom* J, K dan L.

Atom	Number of protons *Bilangan proton*	Number of neutrons *Bilangan neutron*	Nucleon Number *Nombor Nukleon*
J	12	12	24
K		18	35
L	20	20	40

Table 3.1/*Jadual 3.1*

i) What is meant by nucleon number?
Apakah yang dimaksudkan dengan nombor nukleon?

……..

[1 mark]

ii) State the number of proton for atom K .
Nyatakan bilangan proton bagi atom K.

……..

[1 mark]

iii) Draw and label the atomic structure of atom J.
Lukis dan labelkan struktur atom bagi atom J.

[2 marks]

iv) State the number of valence electron for atom L.
Nyatakan bilangan elektron bagi atom L.

……

[1 mark]

b) Table 3.2 shows the melting points and boiling points of 3 substances.
Jadual 3.2 menunjukkan takat beku dan takat didih 3 bahan.

Substance *Bahan*	Melting point/^{o}C *Takat lebur/*^{o}C	Boiling point/^{o}C *Takat didih/*^{o}C
P	-7	65
Q	-110	-35
R	67	90

Table 3.2*/ Jadual 3.2*

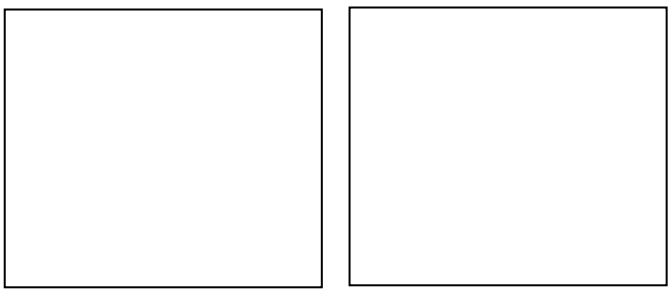
Based on Table 3.2, answer the following questions.
Berdasarkan Jadual 1.2*, jawab soalan-soalan berikut.*

(i) What is the physical state of P at room temperature?
Apakah keadaan fizikal P pada suhu bilik?

……

[1 mark]

(ii) Draw the arrangement of particles of Q and R at room temperature.
Lukis susunan zarah Q *dan* R *pada suhu bilik.*



Q **R**

[2 marks]

c) Sketch the graph of temperature against time when S is heated from room temperature until 100^{o}C.
Lakarkan graf suhu terhadap masa apabila S dipanaskan daripada suhu bilik sehingga 100^{0}C

[2 *marks*]

4 Diagram 4.1 shows part of the Periodic Table of the Elements. Y, D, E, Z, G, and X do not represent the actual symbol of the elements.
Rajah 4.1 *menunjukkan sebahagian daripada Jadual Berkala Unsur. C, D, E ,F,G dan H tidak mewakili simbol sebenar unsur-unsur berkenaan.*

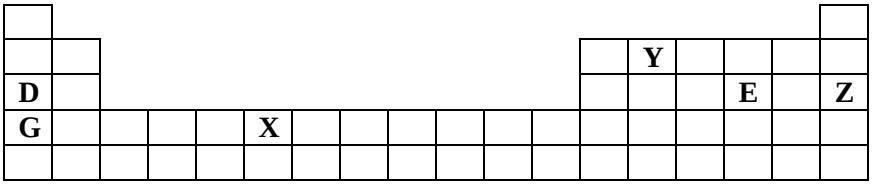


Diagram 4.1 /*Rajah* 4.1

Using the letters in the Periodic Table of the Elements in Diagram 4.1, answer the following questions.
Dengan menggunakan huruf-huruf yang terdapat dalam Jadual Berkala pada Rajah 4.1*, jawab soalan-soalan berikut.*

a) (i) Which element is chemically inert ?
Unsur yang manakah lengai secara kimia ?

…….

[1 *mark*]

ii) Explain your answer in (d) (i) .
Terangkan jawapan anda dalam (d) (i).

…….

[1 *mark*]

b) Element D react with water to produce alkaline solution and hydrogen gas.
Unsur D *bertindak balas dengan air untuk menghasilkan larutan beralkali dan gas hidrogen.*

i) Write the chemical equation of the reaction.
Tuliskan persamaan kimia bagi tindak balas ini.

……

[2 *marks*]

ii) When the experiment is repeated using metal G, metal G moves faster and produce lilac flame. Explain
Apabila eksperimen diulang dengan menggunakan logam G*, logam* G *bergerak dengan pantas dan menghasilkan nyalaan bewarna merah jambu*

……

……

……

[2 *marks*]

c) Element Y reacts with element E to form a compound
UnsurY bertindak balas dengan unsur E untuk membentuk sebatian

i) State the type of chemical bond in this compound
Nyatakan jenis ikatan kimia dalam sebatian ini.

……

[1 *mark*]

ii) Draw the diagram of electron arrangement of the compound formed
Lukiskan susunan elektron bagi sebatian yang terbentuk

[2 *marks*].

iii) State one physical property of compound formed in c (ii)
Nyatakan satu sifat fizik bagi sebatian yang terbentuk di c (ii)

……

[1 *mark*]

d) H is a transition element.
State **one** special characteristic of the transition elements
H *adalah unsur peralihanNyatakan satu sifat istimewa bagi* H

……

[1 *mark*

5 Diagram 5.1 shows part of the Periodic Table of Elements.
Rajah 5.1 *menunjukkan sebahagian daripada Jadual Berkala Unsur.*

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Na	**Mg**												**Al**				**Cl**
								Fe		**Cu**	**Zn**						**Br**

Diagram 5.1 */Rajah* 5.1

Based on Diagram 5.1:
Berdasarkan Rajah 5.1:

a) What is the basic principle used in arranging the elements in the Periodic Table of Elements?
Apakah prinsip asas yang digunakan dalam penyusunan unsus-unsur dalam Jadual Berkala Unsur?

……..

[1 mark]

b) i) State one element that is placed in Period 3.
Nyatakan satu unsur yang terletak dalam Kala 3.

……..

[1 mark]

ii) How does the atomic size of the elements stated in (b) (i) change across the period?
Bagaimanakah saiz atom unsur-unsur dalam (b)(i) *berubah apabila merentasi kala?*

……

[1 mark]

iii) Explain your answer in (b)(ii)
Terangkan jawapan anda dalam (b)(ii)

……

……

[2 marks]

c) Iron wool burns more brightly in chlorine gas than bromine gas. Explain
Kapas besi terbakar lebih terang dalam gas klorin berbanding gas bromin. Terangkan

……

……

[2 marks]

d) Write the formula for the ion formed from an atom of aluminium
Tulis formula bagi ion yang terbentuk dari atom aluminium.

……...

[1 mark]

e) Magnesium reacts with chlorine to form a compound
Magnesium bertindak balas dengan klorin untuk membentuk sebatian

i) State the type of chemical compound in this compound
Nyatakan jenis ikatan dalam sebatian kimia ini

……

[1 mark]

ii) Draw the diagram of electron arrangement of the compound formed
Lukiskan susunan elektron bagi sebatian yang terbentuk

[2 marks]

SET 1 : THE STRUCTURE OF ATOM, PERIODIC TABLE OF ELEMENTS AND CHEMICAL BONDS (SECTION B)

6. Diagram 6.1, shows 3 state of matter that is P, Q and R.
*Rajah 6.*1 *menunjukkan 3 keadaan jirim, iaitu P, Q dan R.*

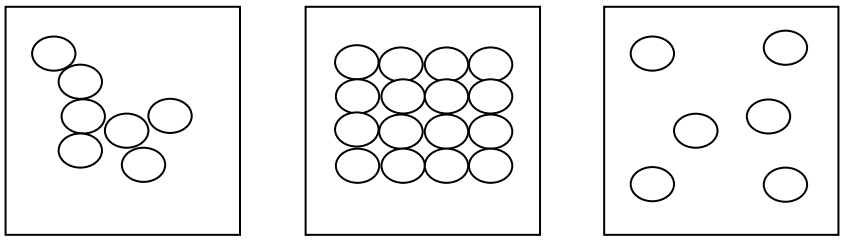


Diagram 6.1/*Rajah* 6.1

a) Based on Diagram 6.1, what is the state of matter for P, Q and R.?
Berdasarkan rajah 6.1, *apakah keadaan jirim bagi P, Q dan R?* [3 marks]

b) By using the kinetic theory of matter, explain how the following changes occur.
Dengan menggunakan teori kinetik jirim, huraikan bagaimana perubahan di bawah berlaku.

- P to Q
  P *ke* Q
- P to R
  P *ke* R
- R to P
  R *ke* P

In your explanation include the process occurs, the energy contents and the movement of the particles.
Huraian anda mestilah meliputi proses yang terlibat, kandungan tenaga dan pergerakan jirim.

[9 marks]

c) Table 6.1shows the temperature from an experiment to determine the freezing point of substance X.
Jadual 6.1*menunjukkan suhu daripada satu eksperimen untuk menentukan takat beku bahan* X.

Time (s)	0	30	60	90	120	150	180	210
Temperature (^{o}C)	95	85	82	80	80	80	80	70

Table 6.1*/ Jadual* 6.1

i) On the graph paper provided, draw the graph of temperature against time for the cooling of substance X.
Pada kertas graf yang disediakan, lukiskan graf suhu melawan masa bagi penyejukan bahan X.

[3 marks]

ii) Using the graph in (c), determine the freezing point of substance X. Show on the graph how you determine this freezing point.
Menggunakan graf di (c), *tentukan takat beku bahan* X. *Tunjukkan pada graf bagaimana anda menentukan takat beku ini.*

[2 marks]

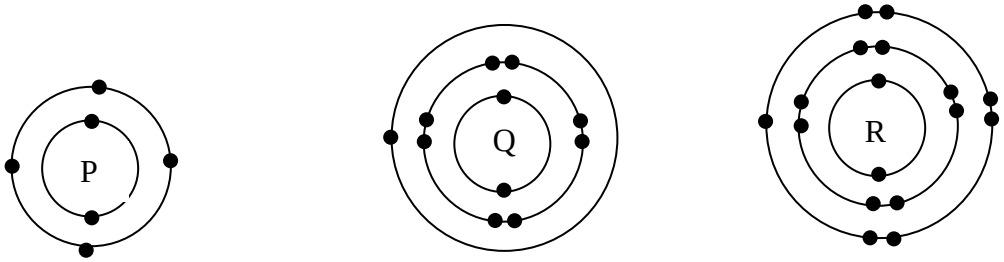
iii) Explain why there is no change in temperature from 90th to 180th second.
Terangkan sebab tiada perubahan suhu dari saat ke 90 sehingga 180.

[2 marks]

iv) What will happen if substance X is not stirred during experiment? .
Apakah yang akan berlaku sekiranya bahan X *tidak dikacau dengan sekata semasa eksperimen dijalankan?*

[1 mark]

7 Diagram 7.1 shows the electron arrangement for atoms P, Q and R.
Rajah 7.1 *menunjukkan susunan elektron bagi atom-atom P, Q dan R.*



Atom P **Atom Q** **Atom R**

Diagram 7.1 / *Rajah* 7.1

Based on diagram 7.1, answer the following questions:
*Berdasarkan rajah 7.*1, *jawab soalan-soalan berikut:*

(a) (i) State the location of atom R in the Periodic Table of Elements.
Nyatakan kedudukan atom R dalam Jadual Berkala Unsur.

(ii) Explain how you determine the group and the period of atom R.
Terangkan bagaimana anda menentukan kumpulan dan kala bagi atom R.

[5 *marks*]

(b) Atoms P and Q can form chemical bonds with atom R.
Atom P dan Q boleh membentuk ikatan kimia dengan atom R.

State the type of chemical bond and explain how the bond is formed between:
Nyatakan jenis ikatan kimia dan terangkan bagaimana ikatan terbentuk antara:

(i) Atoms P and R

(ii) Atoms Q and R

[11 *marks*]

(c) State one physical property of the compound formed in (b) (i) and the compound formed in (b) (ii). Explain the differences in the physical property stated.
Nyatakan satu sifat fizik bagi sebatian yang terbentuk di (b)(i) dan bagi sebatian yang terbentuk di (b)(ii). Terangkan perbezaan bagi sifat fizik yang dinyatakan.

[4 *marks*]

8 Diagram 8.1 shows the symbols which represent three elements, W, X and Y.
*Rajah 8.*1 *menunjukkan simbol yang mewakili tiga unsur* W, X *dan* Y.

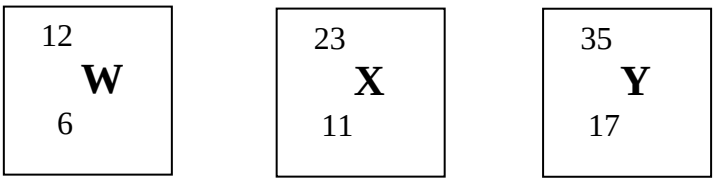


Diagram 8.1/ *Rajah 8.*1

Based on Diagram 8.1 , answer the following questions:
Berdasarkan Rajah 8.1 *, jawab soalan-soalan berikut*

a) What is represented by number 12 and 6 in the symbol of element W?
Apakah yang diwakili oleh angka 12 *dan* 6 *dalam simbol bagi unsur* W*?*

[*2 marks*]

b) Draw the structure of an atom of the element X using the **modern atomic model**.
Lukis struktur atom bagi unsur X *dengan menggunakan* ***model atom moden****.*

[*4 marks*]

c) Atoms W and X can form chemical bonds with atom Y.
State the type of chemical bond and explain how the bond is formed between:
Atom W *dan* X *boleh membentuk ikatan kimia dengan atom* Y.
Nyatakan jenis ikatan kimia dan terangkan bagaimana ikatan terbentuk antara:

i) Atoms W and Y
Atom W *dan* Y

ii) Atoms X and Y
Atom X *dan* Y [10 *marks*]

d) Explain the differences in melting point **or** electrical conductivity of the compound formed in (c) (i) and the compound formed in (c) (ii).
Huraikan perbezaan dalam takat lebur ***atau*** *kekonduksian elektrik bagi sebatian yang terbentuk di* (c)(i) *dan bagi sebatian yang terbentuk di* (c)(ii).

[4 *marks*]

9 Table 9.1 shows the group and period of three elements, P, Q and R in the Periodic Table of Elements.
Jadual 9.1 *menunjukkan kumpulan dan kala bagi tiga unsur,* P, Q *dan* R *dalam Jadual Berkala Unsur.*

Element *Unsur*	Proton number *Nombor proton*
P	6
Q	11
R	17

Table 9.1/*Jadual .1*

Based on Table 9.1, answer the following questions.
Berdasarkan Jadual 8.1*, jawab soalan-soalan berikut.*

a) i) Draw the electron arrangement of atom P.

[2 marks]

(ii) State the position for atom P in the Periodic Table of Elements.
Explain your answer.
Nyatakan kedudukan bagi atom P *dalam Jadual Berkala Unsur*
Terangkan jawapan anda.

[4 marks]

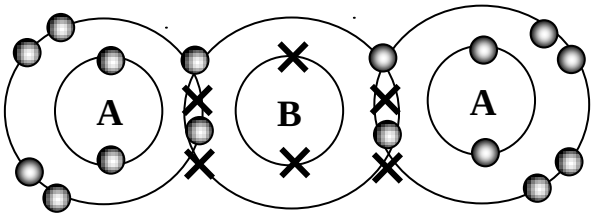
b) i) Atom Q can react with water. State two observations during the reaction.
Atom P boleh bertindak balas dengan air. Nyatakan dua pemerhatian semasa tindak balas berlaku.

[3 marks]

ii) Write a chemical equation for the reaction.
Tulis persamaan kimia bagi tindak balas tersebut

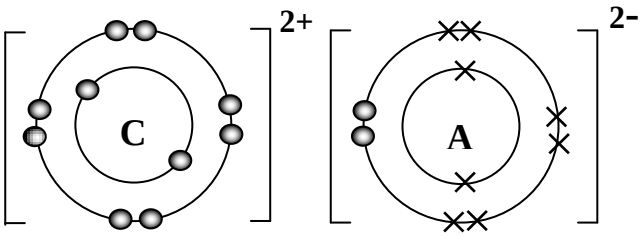
[1 mark]

(c) Diagram 14.2 and 14.3 shows the electron arrangement of compound X and Y.



Compound X

Diagram 8.2/ Rajah 8.2



Compound Y

Diagram 8.3/Rajah 8.3

Based on diagram 8.2 and 8.3/ *Berdasarkan diagram 8.2 dan 8.3*

(i) Which compound is the covalent compound? Give a reason.
Sebatian manakah adalah sebatian kovalen ? berikan alasan.

[2 *marks*]

(ii) Compare the physical properties of compound X and Y.
Explain your answer.
Bandingkan sifat fizik bagi sebatian X dan sebatian Y.Terangkan jawapan anda.

[8 *marks*]

SET 1 : THE STRUCTURE OF ATOM, PERIODIC TABLE OF ELEMENTS AND CHEMICAL BONDS (SECTION C)

10 Diagram 10.1 shows the atomic structure of three elements X, Y and Z.
Rajah 10.1 menunjukkan struktur atom bagi tiga unsur X, Y dan Z.

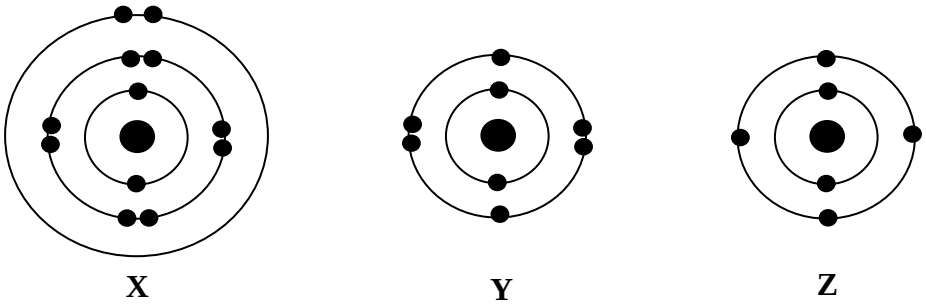


Diagram 10.1/*Rajah 10.1*

a) Based on Diagram 10.1, two types of compounds can be formed.
Explain the differences between the two compounds formed in terms of
- Types of chemical bonds, and
- Boiling and melting points.

Berdasarkan Rajah 10.1*, dua jenis sebatian boleh terbentuk.*
Terangkan perbezaan di antara dua sebatian tersebut dari segi
- *jenis ikatan kimia yang terbentuk, dan*
- *takat lebur dan takat didihnya.*

[4 *marks*]

b) Draw the electron arrangement of the compound formed between X and Y, and explain the formation of the compound.
Lukiskan susunan elektron untuk pembentukan sebatian di antara X dan Y, dan terangkan pembentukan sebatian tersebut.

[6 *marks*]

c) You are given two samples of chemical substances, P and Q.
Both of them are white solids. P is a covalent compound and Q is an ionic compound.
Describe a laboratory experiment to investigate the electrical conductivity of P and Q. Include the observations in your answer.
Suggest a suitable example for each substance P and substance Q.

Anda diberi dua sampel bahan kimia, P dan Q.
Kedua-duanya berwarna putih.P adalah sebatian kovalen dan Q adalah sebatian ion.
Huraikan satu eksperimen makmal untuk mengkaji kekonduksian arus elektrik sebatian P dan Q.
Sertakan pemerhatian yang diperolehi dalam jawapan anda.
Cadangkan satu contoh yang sesuai bagi setiap bahan P dan bahan Q .

[10 *marks*]

11 Diagram 11.1 shows the standard representation of atom for elements X , Y and Z
Rajah 11.1 menunjukkan perwakilan piawai bagi atom untuk unsur-unsur X, Y dan Z.

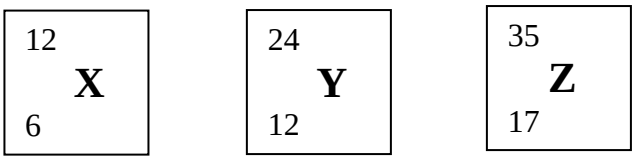


Diagram 11.1/Rajah 11.1

(a) (i) Write the electron arrangements for X atom and Z atom.
Tuliskan susunan elektron bagi atom klorin dan atom karbon.

[2 marks]

(ii) Describe in terms of electron arrangement the chemical bond formed between X atom and Z atom. Include in your answer the molecular formula and the drawing of electron arrangements in the compound.
Huraikan dari segi susunan elektron ikatan kimia yang terbentuk antara atom X *dan atom* Z *.Sertakan sekali dalam jawapan anda formula molekul dan lukisan susunan elektron di dalam sebatian tersebut.*

[10 marks]

(iii) Predict the physical state of this compound at room temperature.
Ramalkan keadaan fizikal sebatian ini pada suhu bilik.

[1 mark]

(b) Describe briefly an experiment you would carry out in the laboratory to investigate the solubility of a compound formed between Y atom and Z atom in water and in a named organic solvent.
Huraikan secara ringkas eksperimen yang boleh anda jalankan dalam makmal untuk menyiasat keterlarutan sebatian yang terbentuk antara atom Z dan Y di dalam air dan di dalam pelarut organik.

[7 marks]

12 (a) An experiment is carried out using Group 1 elements; X, Y and Z react with oxygen gas. The set-up of apparatus and observations of the reaction are shown in Table 12.
Satu eksperimen dijalankan menggunakan unsur Kumpulan 1. X, Y *dan* Z *bertindakbalas dengan gas oksigen . Susunan radas dan pemerhatian tindak balas ditunjukkan dalam Jadual 12*

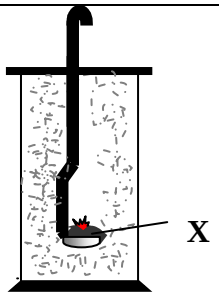
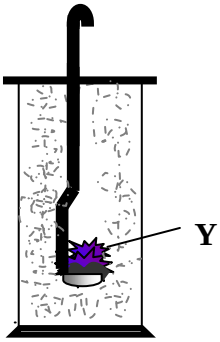
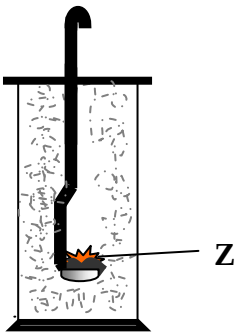
Set	**Set-up of apparatus** ***Susunan Radas***	**Observation** ***Pemerhatian***
I		Burns slowly and white fumes formed *Terbakar perlahan dan wasap putih terbentuk*
II		Burns vigorously and white fumes formed *Terbakar sangat cergas dan wasap putih terbentuk*
III		Burns rapidly and white fumes formed *Terbakar cergas dan wasap putih terbentuk*

Table 12 /*Jadual 12*

(i) Based on the observation in Table 12, compare the reactivity of element X and Y. Explain your answer.
Berdasarkan pemerhatian dalam Jadual 12, bandingkan kereaktifan unsur X dan Y. Terangkan jawapan anda.

[5 *marks*]

(ii) Suggest the name of element Z. Using the symbol of element suggested, write the chemical equation for the reaction in set III.
Cadangkan nama unsur Z. Dengan menggunakan symbol unsur yang dicadangkan, tulis persamaan kimia untuk tindak balas dan set III

[3 *marks*]

(b) State how elements of Group 1 are stored in laboratory and give a reason.
Nyatakan bagaimana unsur Kumpulan 1 disimpan dalam makmal dan berikan satu sebab.

[2 *marks*]

(c)

Group 1 elements react with water to produce alkaline solution. *Unsur Kumpulan 1 bertindakbalas denga air membentuk larutan beralkali*

Using an example of Group 1 element, describe an experiment to prove above statement.
Your description should include the following :

- List of material and apparatus
- Procedures of the experiment
- Observation
- Chemical equation

Menggunakan contoh unsur Kumpulan 1, huraikan eksperimen untuk membuktikan pernyataan di atas.
Huraian anda harus mengandungim yang berikut:

- *Radas dan bahan*
- *Prosedur eksperimen*
- *Pemerhatian*
- *Persamaan kimia*

[10 *marks*]

13 Table 13 shows the melting point, boiling point and electrical conductivity of compound P and compound Q.
Jadual 13 menunjukkan takat lebur dan kekonduksian elektrik sebatian Pdan sebatian Q.

Compound ***Sebatian***	**Melting point and Boiling point*Takat lebur dan takat didih***	**Electrical conductivity** ***Kekonduksian elektrik***	
		Solid ***Pepejal***	**Molten** ***Lebur***
P	Low *Rendah*	No Tidak	No Tidak
Q	High *Tinggi*	No Tidak	Yes *Ya*

Table 13 / *Jadual 13*

(a) Suggest one possible compound for **P** and state the type of compound for **P**.
Explain why **P** has low melting and boiling points
*Cadangkan satu sebatian yang mungkin bagi Pdan n*yatakan jenis sebatian P
Terangkan mengapa P mempunyai takat lebur dan takat didih yang rendah.

[4 *marks*]

(b) Chemical formula of compound **Q** is XY
Formula kimia sebatian Q ialah XY

(i) Suggest one possible electron arrangement of atom X and atom Y.
Cadangkan satu susunan elektron yang mungkin untuk atom X dan atom Y

(ii) State the type of chemical bond in XY and explain how the bond is formed between atom X and atom Y.
Nyatakan jenis ikatan kimia dalam XY dan terangkan bagaimana ikatan terbentuk antara atom X dan atom Y.

[7 *marks*]

(c) Describe one laboratory experiment to investigate the electrical conductivity of compound **Q**. Your answer should include the following:

- A list of material and apparatus
- Procedure of the experiment
- Observation of the experiment
- A labeled diagram showing the apparatus set-up

Huraikan satu eksperimen dalam makmal untuk mengkaji kekonduksian elektrik sebatian Q.
Jawapan anda harus mengandungi yang berikut :

- *Senarai radas dan bahan*
- *Prosedur eksperimen*
- *Pemerhatian*
- *Rajah berlabel menunjukkan susunan radas.* [9 *marks*]

SET 1 : CHEMICAL FORMULAE AND EQUATIONS
(SECTION A)

1 Diagram 1.1 shows the formulae of 4 types of gases released during the eruption of a volcano.
Rajah 1.1 *menunjukkan formula bagi 4 jenis gas yang terbebas semasa letusan gunung berapi.*

N_2	CO_2	H_2S	H_2O

Diagram 1.1 */Rajah* 1.1

a) State the meaning of 'molar mass' of a substance by using one suitable examples.
Nyatakan maksud 'jisim molar' bagi suatu bahan dengan menggunakan satu contoh yang sesuai.

……

[1 mark]

b) Calculate the molar mass of each gas shown in Diagram1.1
[Relative atomic mass : H, 1; C, 12; O, 16; N, 14; S, 32]
Hitung jisim molar bagi setiap gas yang ditunjukkan dalam Rajah 2.
[Jisim atom relatif : H,1 ; C,12 ; O,16 ; N,14 ; S,32]

[4 marks]

c) Compare the number of molecules in 0.9 g of water vapour and 2.2 g of carbon dioxide. Explain.
[Relative atomic mass: H, 1; C, 12; O, 16; Avogadro Constant, $N_A = 6.02 \times 10^{23}$]
Bandingkan bilangan molekul dalam 0.9 g wap air dan 2.2 g karbon dioksida.Terangkan.
[Jisim atom relatif : H,1 ; C,12 ;O,16 : Pemalar Avogadro ,$N_A = 6.02 \times 10^{23}$]

[4 marks]

2 a) A sample contains 0.1 mol carbon dioxide gas at room condition.
[Relative atomic mass : C, 12; O, 16; 1 mol of gas occupies a volume of 24 dm^3 at room condition ; Avogadro Constant, $N_A = 6.02 \times 10^{23}$]
Satu sampel mengandungi 0.1 mol gas karbon dioksida pada keadaan bilik.
[Jisim atom relatif : C, 12; O, 16; 1 mol gas menepati isipadu gas 24 dm^3 pada keadaan bilik , Pemalar Avogadro ,$N_A = 6.02 \times 10^{23}$]

Calculate/ *Hitungkan*

i) the volume*/ isi padu*

ii) the mass*/ jisim*

iii) he number of molecules*/bilangan molekul*

iv) the number of atoms , of the 0.1 mol carbon dioxide gas in the sample.
bilangan atom bagi 0.1 mol karbon dioksida dalam sampel .

[5 marks]

b) Some cobalt(II) chloride crystals are heated in a crucible until all the water of crystallization are removed.
The result of the experiment is as shown.

- Mass of the empty crucible = 31.50 g
- Mass of crucible + cobalt(II) chloride crystals = 36.26 g
- Mass of crucible + anhydrous cobalt(II) chloride = 34.10 g

(Relative atomic mass: H, 1; O, 16; Cl, 35.5; Co, 59)
Sedikit hablur kobalt(II) klorida dipanaskan dalam mangkuk pijar sehingga semua air penghabluran disingkirkan.
Keputusan eksperimen ditunjukkan.

- *Jisim mangkuk pijar = 31.50 g*
- *Jisim mangkuk pijar + hablur kobalt(II) klorida = 36.26 g*
- *Jisim mangkuk pijar + kobalt(II) klorida kontang = 34.10 g*

[Jisim atom relatif : H, 1; O, 16; Cl, 35.5; Co, 59)

i) How to ensure that all the water of crystallization had been removed?
Bagaimana dapat memastikan semua air penghabluran telah disingkirkan ?

……

[1 mark]

ii) If the molecular formula of cobalt(II) chloride crystal is $CoCl_2.xH_2O$, determine the value of x in this formula based on the data given in the table.
Jika formula molekul bagi hablur kobalt(II) klorida ialah $CoCl_2.xH_2O$,
tentukan nilai x dalam formula ini berdasarkan data yang diberi dalam jadual.

[3 marks]

iii) Calculate the percentage of water of crystallization by mass in cobalt(II) chloride crystal.
Hitung peratus air penghabluran per jisim dalam hablur kobalt(II) klorida.

[2 marks]

3 Diagram 3.1 shows the apparatus set-up for an experiment to determine the empirical formula of copper oxide.
Rajah 3.1 menunjukkan susunan radas bagi satu eksperimen untuk menentukan formula empirik kuprum oksida.

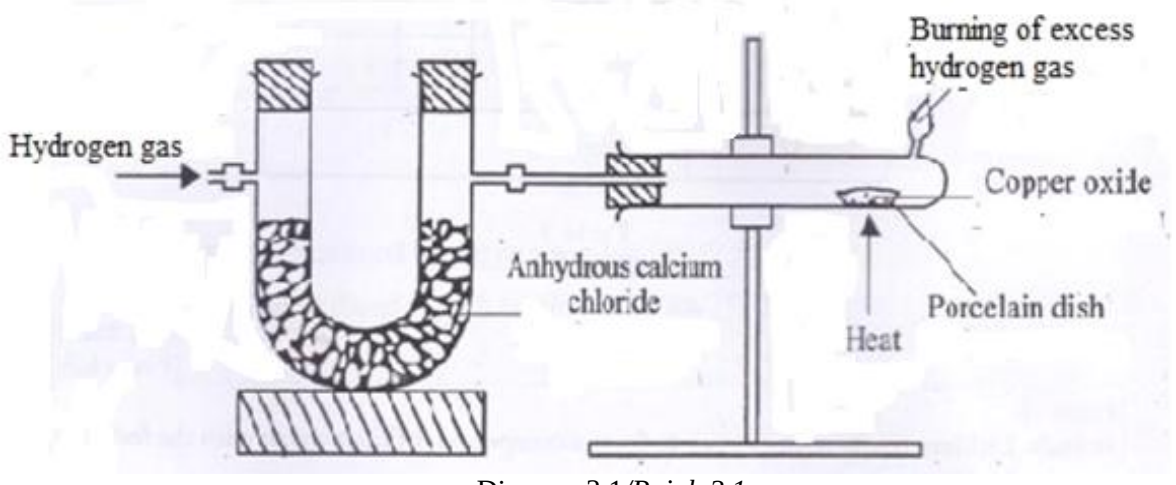


Diagram 3.1/*Rajah 3.1*

a) i) The function of anhydrous calcium chloride is to dry the hydrogen gas.
State another substance that can be used to replaced it in the experiment.
Fungsi kalsium klorida kontang adalah untuk mengeringkan gas hydrogen.
Nyatakan bahan lain yang boleh menggantikannya dalam eksperimen ini.

……

[1 mark]

ii) Name two chemicals used to prepare hydrogen gas in the laboratory.
Namakan dua bahan kimia untuk menyediakan gas hydrogen dalam makmal.

……

[1 mark]

iii) Write an equation for the reaction in (a)(ii).
Tuliskan persamaan kimia bagi tindak balas dalam (a)(ii).

……

[1 mark]

b) Table 3.1 shows the results of the experiment.
Jadual 3.1 *menunjukkan keputusan eksperimen* .

Description *Huraian*	Mass / g *Jisim / g*
Mass of combustion tube + crucible *Jisim tiub pembakaran + mangkuk pijar*	40.35
Mass of combustion tube + crucible + copper oxide *Jisim tiub pembakaran + mangkuk pijar + kuprum oksida*	46.35
Mass of combustion tube + crucible + copper *Jisim tiub pembakaran + mangkuk pijar + kuprum*	45.15

[Relative atomic mass : O, 16; Cu, 64]
[Jisim atom relatif : O, 16; Cu, 64]

Table 3.1 */Jadual* 3.1

Based on Table 3.1, determine
Berdasarkan Jadual 3.1 *, tentukan*

i) The number of mole of oxygen/ *Bilangan mol bagi oksigen*

[1 mark]

ii) The number of mole of copper/*Bilangan mol kuprum*

[1 mark]

iii) The empirical formula of copper oxide/ *Formula empirik bagi kuprum oksida*

[1 mark]

c) i) Before copper oxide is heated, hydrogen gas is allowed to pass through apparatus until all the air in the combustion tube is completely removed.
Describe the steps that should be taken to ensure that all the air in the combustion tube has been expelled.
Sebelum kuprum oksida dipanaskan, gas hidrogen dialirkan menerusi alat radas sehingga semua udara di dalam tiub pembakaran disingkirkan dengan lengkap.
Huraikan langkah-langkah yang perlu diambil untuk memastikan semua udara dalam tiub pembakaran telah disingkirkan.

……..

……...……..

……...……..

[3 marks]

ii) Why is hydrogen gas passed through the combustion tube after heating has stopped?
Mengapakah gas hydrogen masih dialirkan ke dalam tiub pembakaran selepas pemanasan dihentikan ?

…….

[1 mark]

iii) State how to determine that the reaction between copper oxide with hydrogen gas has completed.
Nyatakan bagaimana untuk menentukan tindak balas antara kuprum oksida dengan gas hidrogen telah lengkap.

…….

[1 mark]

4 Table 4.1 shows formula of four ions.
Jadual 4.1menunjukkan formula bagi 4 ion.

Name of ions *Nama ion*	Formula of ions *Formula ion*
Lead ion *Ion Plumbum*	Pb^{2+}
Silver ion *Ion argentum*	Ag^{+}
Nitrate ion *Ion nitrat*	NO_3^{-}
Chloride ion *Ion klorida*	Cl^{-}

Table 4.1/*Jadual* 4.1

a) Write the formula for each compound below :
Tuliskan formula kimia bagi sebatian di bawah :

i) Lead (II) nitrate : ……..
Plumbum(II) nitrat
ii) Silver chloride : …….. …
Argentum klorida

[2 marks]

b) When lead(II) nitrate solution is added to sodium chloride solution , lead(II) chloride and sodium nitrate solution are formed.
Apabila larutan plumbum(II) nitrat ditambahkan kepada larutan natrium klorida , plumbum klorida dan larutan natrium nitrat terbentuk.

i) Write the ionic equation for the reaction occurs.
Tuliskan persamaan ion bagi tindak balas yang berlaku.

……

[2 marks]

ii) State two information obtained from reaction in (b), in term of qualitative aspect and quantitative aspect.
Nyatakan dua maklumat yang boleh didapati daripada tindak balas dalam (b), daripada aspek kualitatif dan kuantitatif.

Qualitative aspect :
Aspek kualitatif:
……

……..…..

[1mark]

Quantitative aspect :
Aspek kuantitatif:

……..

……..

[1 mark]

c) The following equation shows the decomposition of lead(II) nitrate by heat.
Tindak balas berikut menunjukkan penguraian plumbum(II) nitrat oleh haba.

___$Pb(NO_3)_{2\ (s)}$ → ___$PbO_{\ (s)}$ + ___$NO_{2\ (s)}$ + $O_{2\ (g)}$

i) Complete the chemical equation above.
Lengkapkan persamaan kimia di atas.

[1 mark]

ii) State the observation obtained from above reaction .
Nyatakan pemerhatian yang diperolehi daripada tindak balas di atas.

Compound *Sebatian*	Colour of the residue when hot *Warna baki bila panas*	Colour of the residue when cold *Warna baki bila sejuk*
PbO		

Gases *Gas*	Colour of the gas released *Warna gas yang terbebas*
NO_2	
O_2	

[3 marks]

SET 1 : CHEMICAL FORMULAE AND EQUATIONS (SECTION B)

5. (a) The following are the formulae of two compounds.
Berikut adalah formula bagi dua sebatian.

Al_2O_3 PbO_2

(i) Based on the two formulae, write the formula for aluminium ion and lead ion
Berdasarkan kedua-dua formula tersebut, tuliskan formula bagi ion aluminium dan ion plumbum.

[2 *marks*]

(ii) Name both compounds based on the IUPAC nomenclature system.
Namakan kedua-dua sebatian tersebut berdasarkan sistem penamaan IUPAC .

[2 *marks*]

(b) The following information is about an organic compound, K.
Berikut adalah penerangan tentang sebatian karbon K.

- Empirical formula is CH_2O.
  Formula empirical
- Relative molecular mass is 60.
  Jisim molekul relatif
- Reacts with calcium carbonate to produce a type of gas that turns lime water chalky.
  Bertindak balas dengan kalsium karbonat menghasilkan gas yang mengeruhkan air kapur.

Based on the information given:
Berdasarkan penerangan yang diberikan.

(i) Determine the molecular formula of K.
[Relative atomic mass: H = 1, C = 12, O = 16]
Tentukan formula molekul bagi K. [Jisim atom relative : H = 1 , C=12 , O = 16]

[3 *marks*]

(ii) Write a balanced chemical equation for the reaction of compound K with calcium carbonate.
Tuliskan persamaan kimia seimbang bagi tindak balas antara sebatian K dengan kalsium karbonat.

[2 *marks*]

(c) Diagram 5.1 shows the apparatus set up for experiment of decomposition of copper(II) carbonate. In this experiment copper(II) oxide and carbon dioxide gas are formed.
Diagram 8 menunjukkan susunan radas untuk eksperimen penguraian kuprum(II) karbonat. Dalam eksperimen ini kuprum(II)oksida dan karbon dioksida dihasilkan.

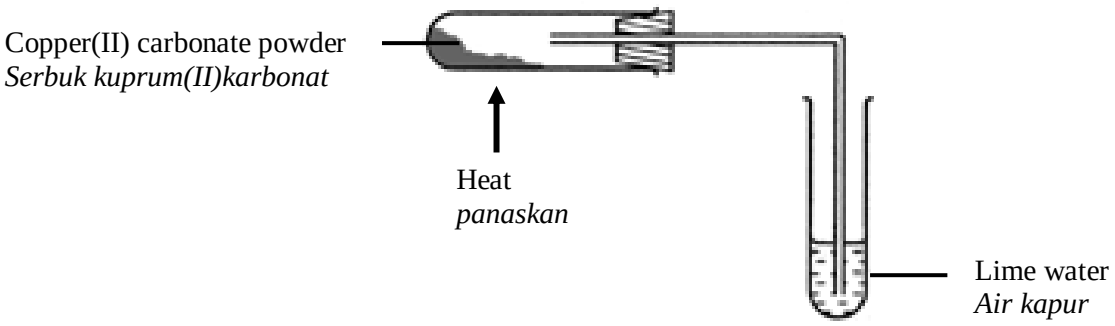


Diagram 5.1/*Rajah 5.1*

Based on Diagram 5.1
Berdasarkan rajah 5.1

(i) State two observations.
Nyatakan dua pemerhatian.

[2 *marks*]

(ii) Write a balanced chemical equation for the reaction
Tuliskan persamaan kimia seimbang bagi tindak balas

[2 *marks*]

(iii) State two informations from the chemical equation in (c)(ii).
Nyatakan dua maklumat dari persamaan kimia dalam (c)(ii)

[2 *marks*]

(iv) Calculate the mass of the copper(II) oxide formed from the decomposition of 12.4 g of copper(II) carbonate.
[Relative atomic mass of C = 12; O = 16; Cu = 64]
Hitungkan jisim kuprum(II)oksida yang terbentuk dari penguraian 12.4 g kuprum(II)karbonat.
[Jisim atom relatif of C = 12, O = 16, Cu = 64]

[3 *marks*]

(v) In other experiment 4.0 g copper(II) oxide is reacted with hydrogen gas to produce copper and water. If the mass of copper in copper(II) oxide is 3.2 g, calculate the mass of oxygen and the simplest mole ratio for the copper atoms to oxygen atoms
[Relative atomic mass of O = 16; Cu = 64]
Dalam eksperimen 4.0 g kuprum(II) oksida bertindak balas dengan hidrogen gas menghasilkan kuprum dan air. Jika jisim kuprum dalam kuprum(II) oksida ialah 3.2g, Hitungkan jisim oksigen dan nisbah teringkas bilangan mol kuprum atom kepada oksigen atoms. [Jisim atom relative of : O = 16; Cu=64

[2 *marks*]

6. a) (i) What is meant by ' empirical formula of a compound '.
Jelaskan apakah yang dimaksudkan 'formula empirik bagi satu sebatian'.

[1 mark]

(ii) Write down the empirical formula for naphthalene , $C_{10}H_8$ and sulphuric acid , H_2SO_4.
Tuliskan formula empirik bagi naftalena , $C_{10}H_8$ dan asid sulfurik H_2SO_4.

[2 marks]

b) An artificial pineapple flavouring has the composition of 62.07% of carbon , 10.34% of hydrogen and 27.59% of oxygen by mass. The relative molecular mass of this compound is 116. Determine the molecular formula of this flavouring.
[Relative atomic mass : C, 12 ; H,1 ; O, 16]

[6 marks]

Bahan tambah perisa dalam nenas mengandungi komposisi karbon, 62.07%, hidrogen, 10.34% dan oksigen, 27.59% per jisim. Jisim molekul relatif sebatian ini ialah 116. Tentukan formula molekul bahan perisa ini.
[*Jisim atom relatif* : C, 12 ; H,1 ; O, 16]

c) Describe how you could determine the empirical formula of magnesium oxide in the laboratory. Your description should include
Huraikan bagaimana anda dapat menentukan formula empirik magnesium oksida dalam makmal. Huraian anda mesti merangkumi

- procedure of experiment */prosedur eksperimen*
- tabulation of result */data bagi keputusan*
- calculation of the results obtained */pengiraan dari keputusan yang diperolehi*

[Relative atomic mass : O, 16; Mg,24] */[Jisim atom relatif : O, 16; Mg,24]*

[11 marks]

SET 1 : CHEMICAL FORMULAE AND EQUATIONS (SECTION C)

7 (a) By using suitable example, explain what are meant by empirical formula and molecular formula.
Dengan menggunakan contoh yang sesuai, terangkan apa yang dimaksudkan dengan formula empirik dan formula molekul.

[3 marks]

(b) The information below is for compound Q
Maklumat berikut adalah bagi sebatian Q.

• Carbon *Karbon*	40.00%
• Hydrogen *Hidrogen*	6.66%
• Oxygen *Oksigen*	53.33%
• Relative molecular mass *Jisim molekul relatif*	180

Based on the information of compound Q, determine:
Berdasarkan maklumat bagi sebatian Q, tentukan:

(i) The empirical formula
Formula empiriknya

(ii) The molecular formula
Formula molekulnya
[Relative atomic mass: C,12; H,1; O,16]
[*Jisim atom relatif: C,12; H,1; O,16]*

[5 marks]

(c) Diagram 7.1 shows the set-up of apparatus to determine the empirical formula of two different compounds.
Rajah 7.1 menunjukkan susunan radas bagi menentukan formula empirik dua sebatian yang berlainan.

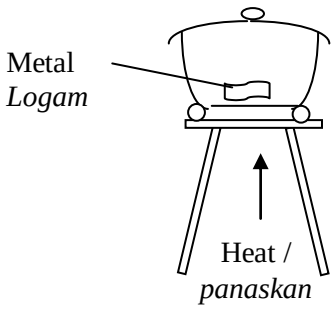
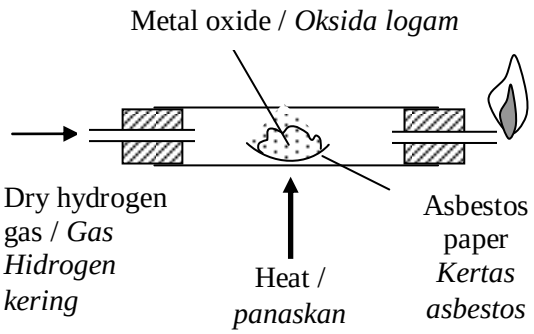
Method I *Kaedah I*	Method II *Kaedah II*
	

Table 7.1/*Rajah 7.1*

(i) Explain why method II is not suitable to determine the empirical formula of magnesium oxide?
Terangkan mengapa kaedah II tidak sesuai bagi menentukan formula empirik bagi magnesium oksida?

[1mark]

(ii) Suggest one metal oxide in method II.
*Cadangkan satu oksida logam dalam kae*dah II.

[1 mark]

(iii) Using a suitable example, describe a laboratory experiment to determine the empirical formula of an oxide of a reactive metal. Your explanation should include:
Dengan menggunakan contoh yang sesuai, huraikan suatu eksperimen di makmal untuk menentukan formula empirik bagi suatu oksida logam reaktif.. Penerangan anda mestilah meliputi :

- Procedure of the experiment
Prosedur bagi eksperimen

- Tabulation of data
Penjadualan data

[10 marks]

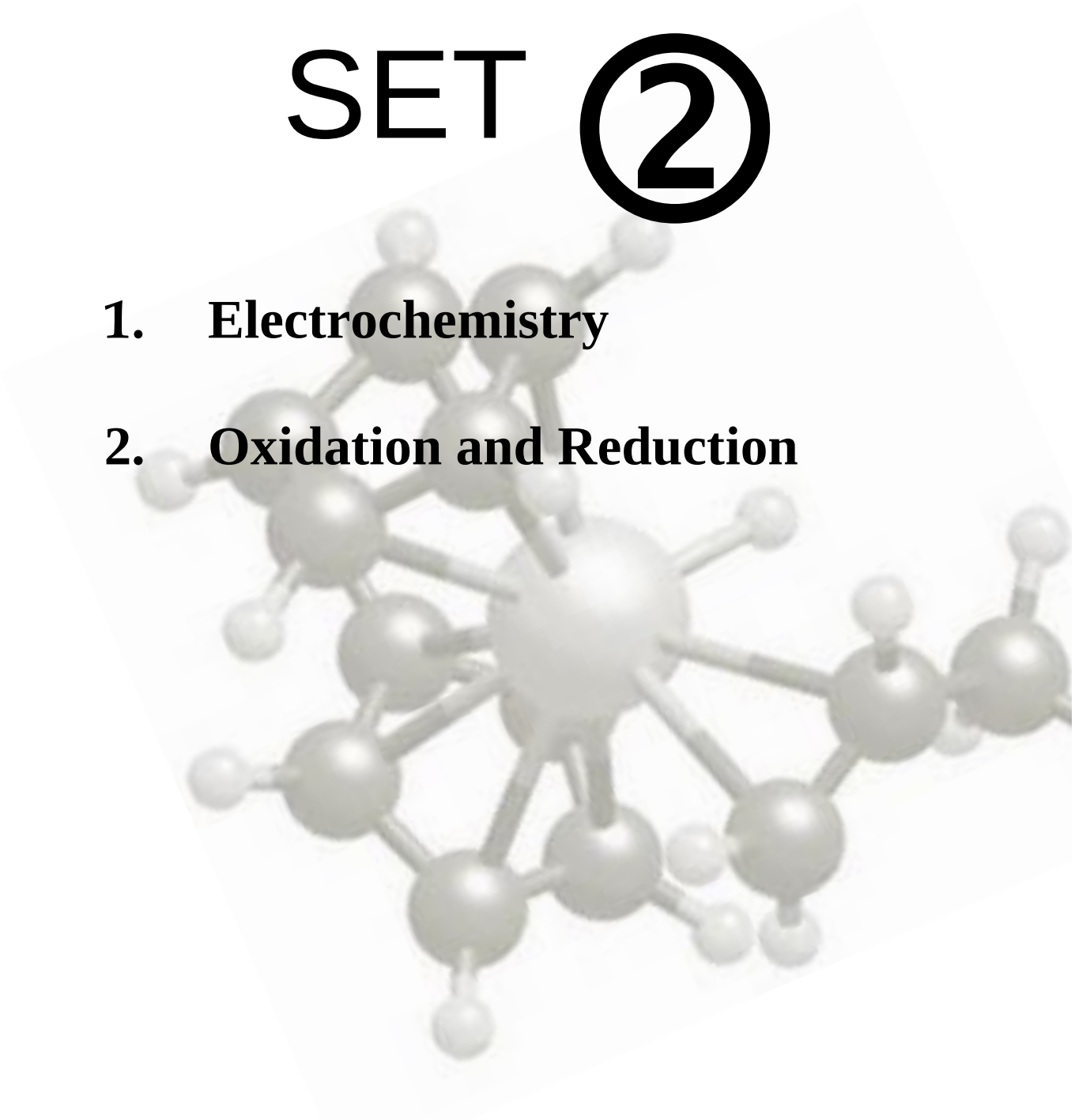
CHEMISTRY MODULE

http://cikguadura.wordpress.com/

SET ②

1. Electrochemistry

2. Oxidation and Reduction



SET 2 : ELECTROCHEMISTRY
(SECTION A)

1. Diagram1.1 shows the apparatus set-up to purify impure copper through electrolysis.
Rajah 1.1 menunjukkan susunan radas untuk menulenkan logam kurum tak tulen menerusi kaedah elektrolisis.

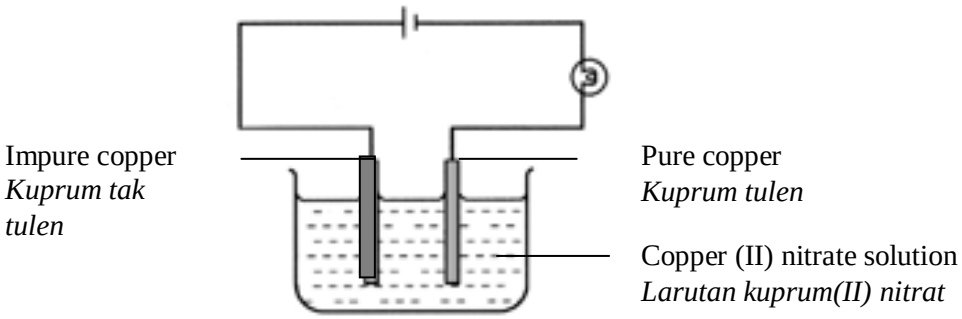


Diagram 1.1/*Rajah 1.1*

(a) State the energy change in the electrolytic cell in Diagram 1.1.
Nyatakan perubahan tenaga dalam sel elektrolisis dalam Rajah 1.1.

……

[1 mark]

(b) Which electrode act as cathode?
Elektrod yang manakah bertindak sebagai katod?

……

[1 mark]

(c) Write the formulae of all cations present in copper(II) nitrate solution.
Tuliskan formula semua kation yang hadir di dalam larutan kuprum(II) nitrat.

……

[1 mark]

(d) (i) State one observation at pure copper electrode.
Nyatakan satu pemerhatian pada elektrod kuprum tulen.

…….

[1 mark]

(ii) Write the half equation that occurs at pure copper electrode.
Tuliskan persamaan setengah yang berlaku pada elektrod kuprum tulen.

……..

[1 mark]

(e) State the change in colour of copper(II) nitrate solution.
Explain your answer.
Nyatakan perubahan warna larutan kuprum(II) nitrat. Terangkan jawapan anda.

……..

……..

……..

[3 marks]

(f) State the type of reaction that occurs at impure copper electrode. Explain.
Nyatakan jenis tindak balas yang berlaku pada elektrod kuprum tak tulen. Terangkan.

……..

……..

[2 marks]

(g) State another use of electrolysis in industry.
Nyatakan keguaan lain elektrolisis dalam industri

……

[1 mark]

2. Table 2.1 shows the descriptions and observations for two experiments.
Jadual 2.1 menunjukkan penerangan dan pemerhatian bagi dua eksperimen.

Experiment *Ekperimen*	Description *Huraian*	Observation *Pemerhatian*
I	Electrolysis of 1.0 mol dm^{-3} sodium chloride solution using carbon electrodes. *Elektrolisis larutan natrium klorida, 1.0 mol dm^{-3} menggunakan elektrod karbon.*	Colourless gas bubbles at the cathode Greenish yellow gas released at anode *Gas yang tak berwarna di katod* *Gas kuning kehijauan terhasil di anod.*
II	Electrolysis of 1.0 mol dm^{-3} sodium sulphate solution using carbon electrodes. *Elektrolisis larutan natrium sulfat , 1.0 mol dm^{-3} menggunakan elektrod karbon*	Colourless gas bubbles at the anode and cathode *Gas yang tak berwarna terhasil di anod dan di katod.*

Table 2.1 /*Jadual 2.1*

(a) Based on experiment I:
Berdasarkan eksperimen I:

(i) State all the ions in sodium chloride solution.
Nyatakan semua ions dalam larutan natrium klorida.

……..

[1 mark]

(ii) Write the formula of the ion that is selectively discharged at the anode.
Explain why?
Tuliskan formula ion yang terpilih untuk dinyahcaskan di anod.
Terangkan mengapa?

…….

…….

[2 marks]

(iii) Write the half-equation for the reaction that occurs at the anode.
Tuliskan persamaan setengah untuk tindak balas yang berlaku di anod.

…….

[1 mark]

(b) Based on experiment II:
Berdasarkan eksperimen II:

(i) Draw the apparatus set-up to carry out this experiment. In your diagram, show how the products at the anode and cathode are collected.
Lukis gambar rajah susunan radas bagi eksperimen tersebut. Dalam rajah anda, tunjukkan bagaimana hasil di anod dan di katod dikumpulkan.

[2 *marks*]

(ii) State how you would verify that the gas released at the cathode is hydrogen.
Nyatakan bagaimana anda memastikan bahawa gas yang terhasil di katod ialah gas hidrogen.

……..

……

[2 marks]

(iii) Explain how hydrogen gas is produced at the cathode.
Nyatakan bagaiman gas hidrogen terhasil di katod.

……

……

[2 marks]

3. Diagram 3.1 shows the apparatus set-up for the combination of Cell A and Cell B.
Rajah 3.1 menunjukkan sususan radas kombinasi sel A dan sel B.

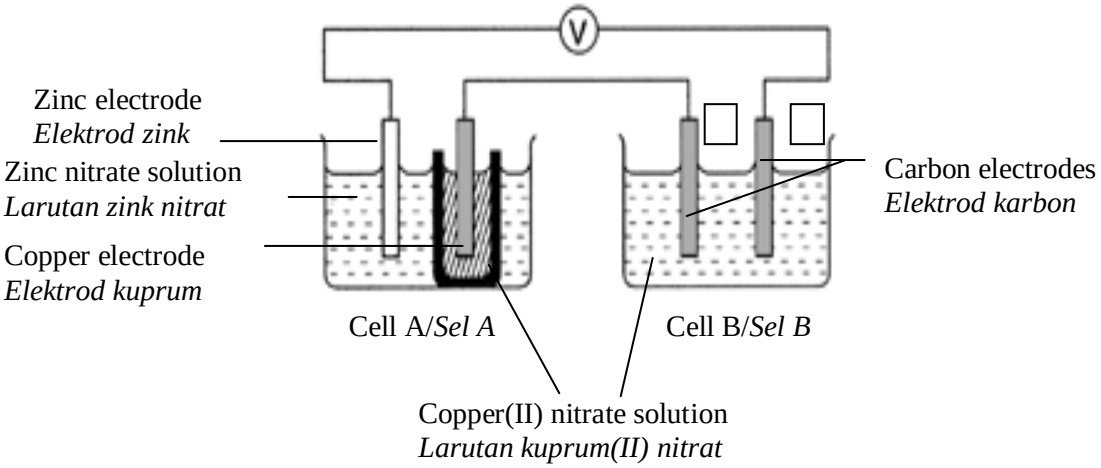


Diagram 3.1/*Rajah 3.1*

(a) Write the formulae of cations in the copper(II) nitrate solution.
Tulis formula kation yang terdapat dalam larutan kuprum(II) nitrat

……..

[1 mark]

(b) In Diagram 3.1 mark (X) in the box provided to show which electrode is the anode in Cell B. Explain your answer.
Dalam Rajah 3.1 tandakan (X) dalam kotak yang disediakan untuk menunjukkan elektrod yang manakah anod dalam sel B. Terangkan jawapan anda.

……

[2 marks]

(c) Diagram 3.2 shows the set-up of apparatus set-up to electroplate an iron ring with silver, which is followed by purification of silver.
Rajah 3.2 menunjukkan susunan radas untuk menyadurkan cincin besi dengan argentum diikuti dengan penulenan logam argentum.

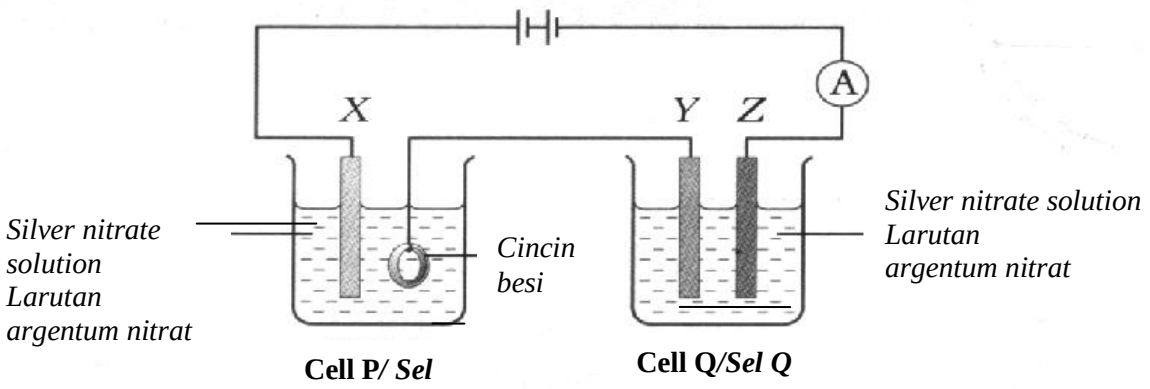


Diagram 3.2/*Rajah 3.2*

(i) Suggest a substance that can be used as
Cadangkan bahan yang boleh digunakan sebagai :

X : ……

Y : ……

[2 marks]

(ii) Write the half-equation of reaction that takes place at the iron ring.
Tuliskan persamaan setengah bagi tindak balas yang berlaku pada cincin besi.

…….

[1 mark]

(d) After twenty minutes,
Selepas dua minit,

(i) State the observation at Y electrode in cell Q. Explain.
Nyatakan pemerhatian pada elektod Y bagi sel Q. Terangkan.

……..…..

……..…..

[2 marks]

(ii) Write the half-equations for the reaction occurred at electrode
Tulis persamaan setengah bagi tindakbalas yang berlaku pada

Y : ……..

Z : ……..

[2 marks]

(e) What is the effect of the electroplating industries to our environment?
Apakah kesan industri penyaduran logam kepada alam sekitar?

…….

[1 mark]

4. Table 4 shows the apparatus set-up, description and observation for experiment I and II.
Jadual 4 menunjukkan susunan radas, penerangan dan pemerhatian bagi eksperimen I dan II.

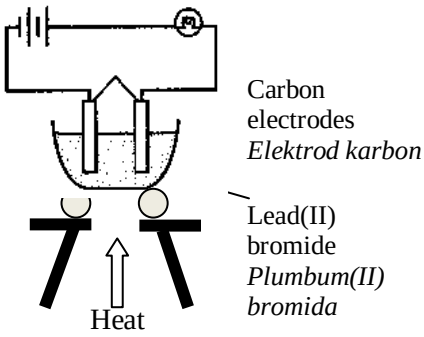
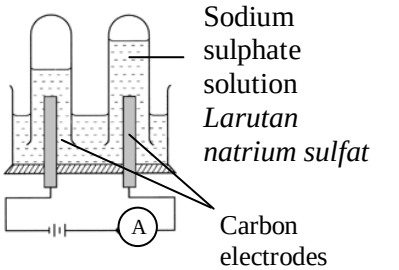
Experiment	I	II
Apparatus Set-up *Susunan radas*		
Description *Huraian*	Electrolysis of molten lead(II) bromide using carbon electrodes *Elektrolisis leburan plumbum(II) bromida menggunakan elektrod karbon*	Electrolysis of 1.0 mol dm^{-3} sodium sulphate solution using carbon electrodes *Elektrolsis* 1.0 mol dm^{-3} *larutan natrium sulfat menggunakan elektrod karbon*
Observation *Pemerhatian*	Grey solid is formed at the cathode *Pepejal kelabu terenap di katod*	Gas bubbles are released at the anode and cathode *Gelembung –gelembung gas dibebaskan di anod dan di katod*

Table 4.1/*Jadual 4.1*

(a) State all the ions present in
Nyatakan semua ion yang hadir dalam

(i) Molten lead(II) bromide
Leburan plumbum(II) bromide

……..……..

(ii) Sodium sulphate solution
Larutan natrium sulfat

……..……..

[2 mrks]

(b) Based on experiment I:
Berdasarkan eksperimen I:

(i) Name the grey solid produced
Namakan pepejal kelabu yang terhasil.

……..

[1 mark]

(ii) Write the half-equation for the formation of grey solid.
Tuliskan persamaan setengah bagi pembentukan pepejal kelabu.

……

[1 mark]

(iii) State the observation at anode.
Nyatakan pemerhatian di anod.

……..

[1 mark]

(c) Based on experiment II:
Berdasarkan eksperimen II:

(i) Name the ion that is discharged at anode.
Namakan ion yang dinyahcaskan di anod.

……..

[1 mark]

(ii) Name the product formed at
Namakan hasil tindak balas yang terbentuk di

Anode : ……..
Anod:

Cathode : ……
Katod :

[2 marks]

(iii) Name another solution that will give the same products of electrolysis as in experiment II.
Namakan larutan lain yang boleh memberikan hasil yang sama seperti di eksperimen II.

……..……..

[1 mark]

SET 2 : ELECTROCHEMISTRY
(SECTION B)

5. (a) Table 5.1 show the results of series of experiments carried out to construct the Electrochemical Series. The positive terminal and value for the potential difference for the pair of metals S and copper, Cu is not given. Q, R and S are not actual symbols of the metals.
Jadual 5.1 menunjukkan keputusan satu siri eksperimen yang dijalankan untuk membina Siri Elektrokimia. Terminal positif dan nilai beza keupayaan bagi pasangan logam P dan kuprum, Cu tidak diberi, Q, R dan S bukan simbol sebenar logam-logam itu.

Pair of metals *Pasangan logam*	Positive terminal *Terminal positif*	Potential difference(V) *Beza keupayaan, (V)*
Q , Cu	Cu	2.7
R , S	S	0.5
Q , R	R	1.5
S , Cu		

Table 5.1/*Jadual 5.1*

(i) Based on the values of the potential differences, arrange the metals in descending order in the Electrochemical Series.
Berdasarkan nila beza keuayaan, susun logam-logam tersebut dalam tertib menurun dalam Siri Elektrokimia.

[1 mark]

(ii) Predict the positive terminal and potential difference for the pair of metal S and metal Cu. Explain your answer.
Ramalkan nilai terminal positif dan beza keupayaan bagi pasangan logam S *dan* Cu.

[3 marks]

(b) Diagram 5.1 shows a voltaic cell. Metal P is situated above copper in the electrochemical series.
Rajah 5.1menunjukkan suatu sel kimia. Logam P terletak di atas kuprum dalam siri elekrokimia.

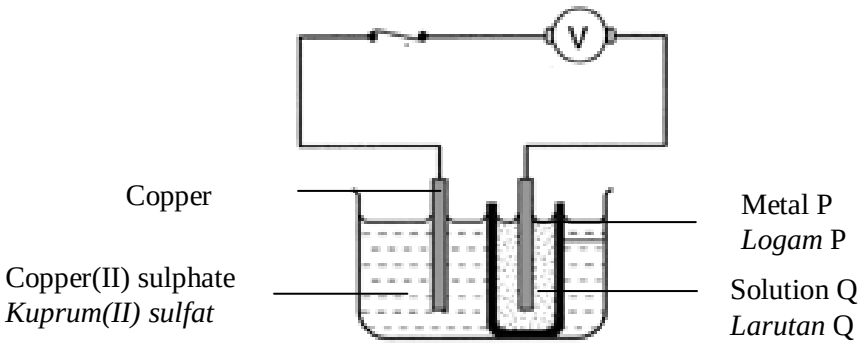


Diagram 5.1/*Rajah 5.1*

(i) State the positive terminal and the negative terminal of this cell.
Nyatakan terminal positif dan terminal negatif bagi sel ini.

(ii) Suggest a metal that is suitable as metal P and a solution that is suitable as solution Q.
Cadangkan logam yang sesuai sebagai logam P dan larutan yang sesuai sebagai logam P dan laturan yang sesuai sebagai larutan Q.

[4 Marks]

(c) Diagram 5.2 shows the apparatus set-up to investigate an electrolysis process of 1 mol dm^{-3} potassium chloride solution using carbon electrodes.
Rajah 5.2 *menunjukkan susunan radas untuk menyiasat proses elektrolisis larutan kalium klorida* 1 mol dm^{-3} *menggunakan elektrod-elektrod karbon.*

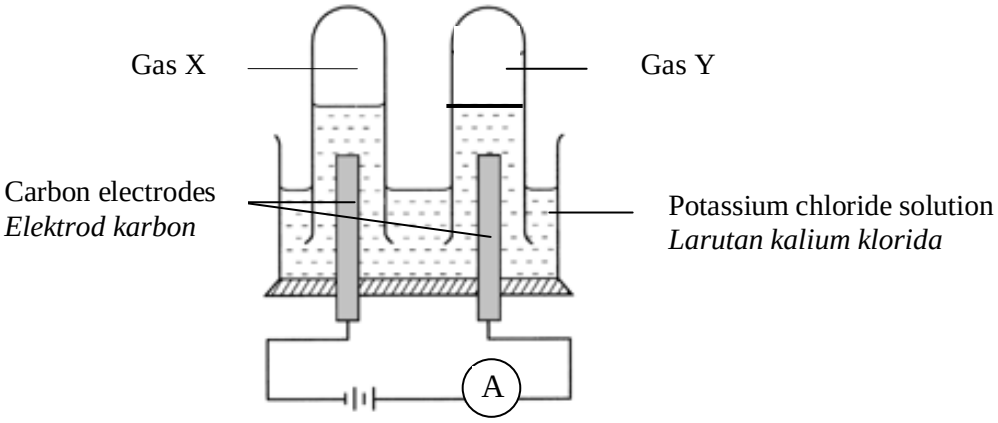


Diagram 5.2/*Rajah 5.2*

(i) State the observation at anode and cathode
Nyatakan pemerhatian di anode dan di katod.

[*2 marks*]

(ii) Name of gas X and gas Y.
Namakan gas X dan gas Y

[*2 marks*]

(iii) Explain your answer in terms of selective discharged of ion.
Write the half-equations at the anode and cathode.
Terangkan jawapan anda berdasarkan pemilihan discas ion.
Tulis persamaan setengah di anod dan di katod.

[*8 marks*]

6. Diagram 6.1 shows the apparatus set-up to investigate the electrical conductivity of substances S and R.
Rajah 6.1 menunjukkan susunan radas untuk mengkaji kekonduksian elektrik bahan S *dan* R.

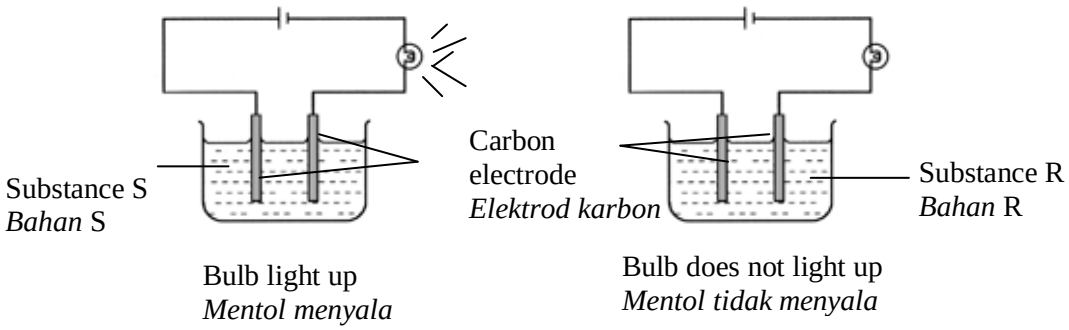


Diagram 6.1/*Rajah 6.1*

(a) Based on the observations in diagram 6.1
Berdasarkan pemerhatian dalam diagram 6.1.

(i) Give example of substance S and R.
Beri contoh bagi bahan S *amd* R

[2 marks]

(ii) Explain the observations
Terangkan pemerhatian di atas.

[3 marks]

(b) Diagram 6.2 shows the apparatus set-up for chemical cell.
Rajah 6.2 *menunjukkan susunan radas untuk satu sel kimia.*

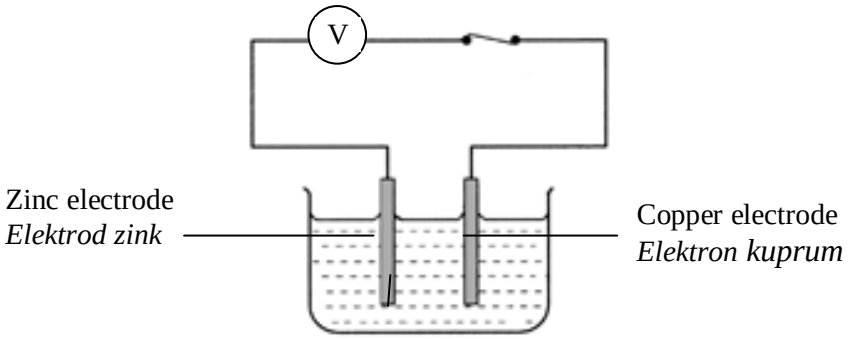


Diagram 6.2/*Rajah 6.2*

Based on Diagram 6.2
Berdasarkan Rajah 6.2

(i) Identify positive and negative terminal of the chemical cell
Kenal pasti terminal positif dan terminal negatif bagi sel kimia.

[2 marks]

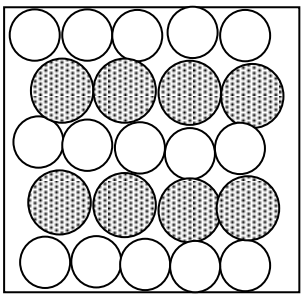
(ii) State the observation and half equation at zinc electrode.
Nyatakan pemerhatian dan persamaan setengah pada elektrod zink.

[2 marks]

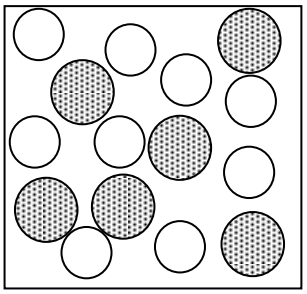
(iii) If zinc electrode is replaced with iron electrode, what will happen to the potential difference of the cell? Explain why.
Jika elektrod zink digantikan dengan elektrod ferum, apakah akan berlaku pada bacaan beza upaya sel tersebut. Terangkan mengapa.

[2 marks]

(c) Diagram 6.3 shows the arrangement of particles of a compound in two different states, A dan B.
Rajah 6.3 menunjukkan susunan zarah-zarah satu sebatian dalam dua keadaan yang berbeza, A *dan* B.



State A
Keadaan A



State B
Keadaan B

Diagram 6.3/*Rajah* 6.3

(i) The compound can conduct electricity in state B but cannot do so in state A.
Name one example of a compound with this property.
Sebatian ini boleh mengalirkan arus elektrik dalam keadaan B dan tidak boleh mengalirkan arus elektrik dalam keadaan A.

[*1 mark*]

(ii) Explain an experiment for the electrolysis of the compound you named in (c)(i).
Your explanation must include the following:
Terangkan satu eksperimen bagi elektrolisis sebatian yang anda namakan di(c)(i).
Penerangan anda haruslah merangkumi yang berikut:

- A labeled diagram showing the apparatus set-up
Rajah berlabel yang menunjukkan susunan radas

- The observation at the anode and cathode
Pemerhatian di anod dan di katod

- Half equations at both electrodes
Setengah perasmaan bagi tindak balas di anod dan di katod

- Products at the anode and cathade
Hasil di anod dan di katod

[*8 marks*]

SET 2 : ELECTROCHEMISTRY
(SECTION C)

7. (a) A student intends to electroplate iron spoon with silver metal.
Suggest a suitable electrolyte and write the half-equations at the anode and cathode.
Draw a labeled diagram to show the apparatus set-up
Seorang pelajar bercadang untuk menyadur sudu besi dengan logam argentum.
Cadangkan electrolit yang sesuai dan tuliskan persamaan setengah di anod dan di katod.

[5 marks]

(b) Table 7.1 shows the result of experiment, set I and set II, to study the effect of metal X and metal Y on displacement of copper.
Jadual 7.1 *menunjukkan kuputusan eksperimen, Set* I *dan Set* II *bagi mengkaji kesan logam X dan logam Y ke atas penyesaran kuprum.*

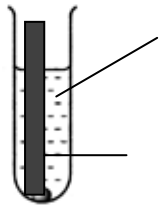
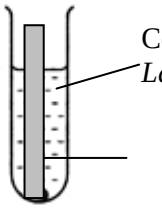
Experiment *eksperimen*	Apparatus set-up Susunan radas	Observation *Pemerhatian*
Set I	 Copper(II) sulphate solution *Larutam kuprum(II) sulfat* *Metal X* *Logam X*	Brown solid deposited *Pepejal perang dienapkan* Metal X dissolved *Logam* X *melarut* The blue color of solution fades *Warna biru larutan semakin pudar*
Set II	 Copper(II) sulphate solution *Larutan kuprum(II) sulfat* *Metal Y* *Logam* Y	No change *Tiada perubahan*

Table 7.1/*Jadual 7.1*

Based on Table 7.1, explain the difference in observation in Set I and II.

[4 marks]

(c) Diagram 7.2 shows the order P, Q, R and S in the Electrochemical Series.
Rajah 7.2 *menunjukkan susunan logam-logam P,Q,R dan S dalam Siri Elektrokimia.*

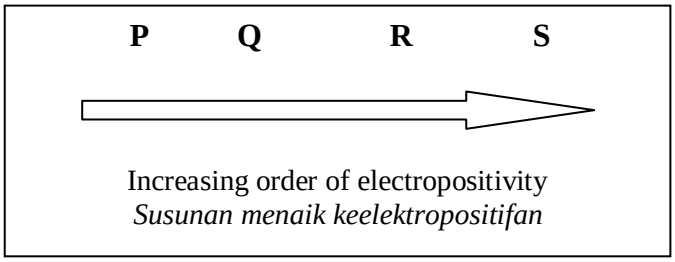


Diagram 7.2/ *Rajah* 7.2

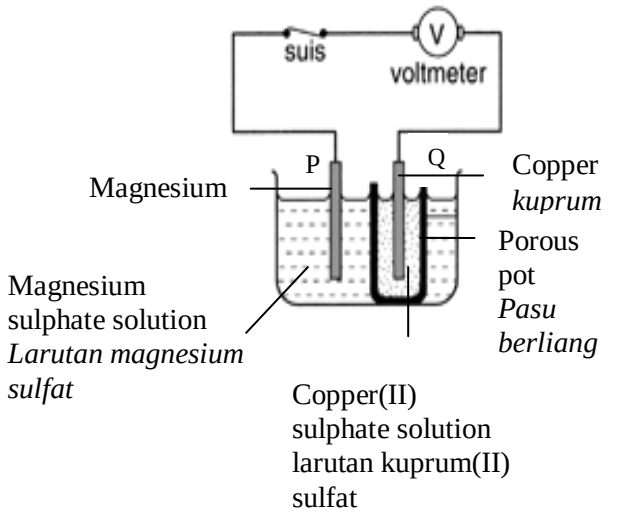
Describe an experiment to show the order of these metals in the Electrochemical Series.
Your description must include all the apparatus and material used observation and conclusion.

Huraikan satu eksperimen untuk menunjukkan susunan logam-logam ini dalam Siri Elektrokimia. Huraian anda mesti mengandungi semua alat radas dan bahan kimia yang digunakan, pemerhatian dan kesimpulan.

[*10 marks*]

SET 2 : OXIDATION AND REDUCTION
(SECTION A)

1. Diagram 1.1 shows two chemical cells. P and Q are electrodes of cell 1 while R and S are electrodes of cell 2.
Rajah 1.1 *menunjukkan dua buah sel kimia*.P *dan* Q *ialah elektrod bagi sel* 1 *manakala* R *dan* S *ialah elektrod bagi sel* 2.



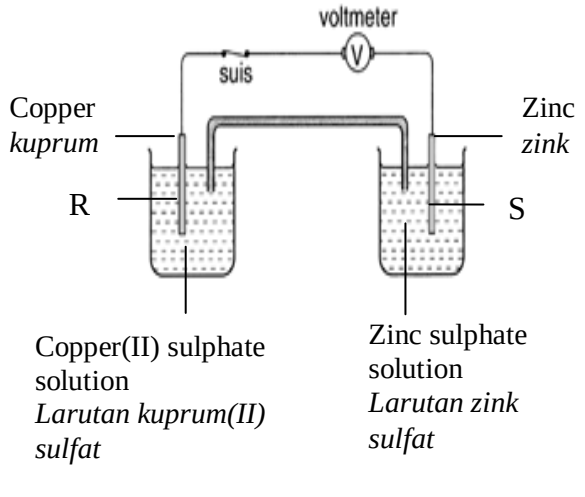


Diagram 1.1/*Rajah* 1.1

(a) What is function of porous pot?
Apakah fungsi pasu berliang?

……

[*1 mark*]

(b) State energy change that occur in cell 1 and cell 2.
Nyatakan perubahan tenaga yang berlaku dalam sel 1 *dan sel* 2.

……

[*1 mark*]

(c) In Diagram 1.1, mark positive electrode and negative electrode for cell 1 and cell 2.
Dalam Rajah 1.1, *tandakan electrod positif dan elektrod negatif bagi sel* 1 *dan sel* 2.

[*1 mark*]

(d) Based on cell 1;
Berdasarkan sel 1;

(i) Why electrons flow from P to Q?
Mengapakah elektron mengalir daripada P *ke* Q?

……

[*1 mark*]

(ii) State the colour change of solution in porous pot.
Give a reason for your answer.
Nyatakan perubahan warna larutan dalam pasu berliang.
Berikan sebab bagi jawapan anda.

……..

……

[*2 marks*]

(iii) Write half-equation for the reaction at P.
Tuliskan persamaan setengah bagi tindak balas di P.

……

[*1 mark*]

(iv) State the type of reaction occur at P.
Nyatakan jenis tindak balas yang berlaku di P.

……

[*1 mark*]

(e) Based on cell 2;
Berdasarkan sel ;

(i) State the observation at R
Nyatakan pemerhatian di R.

……

[*1 mark*]

(ii) State the substance acting as reducing agent.
Give a reason for your answer.
Nyatakan bahan yang bertindak sebagai agen penurunan.
Berikan sebab bagi jawapan anda.

……

……

[*2 marks*]

2. Diagram 2.1 show the apparatus set up used in two sets of experiment to investigate the redox reaction.
Rajah 2.1 *menunjukkan susunan radas yang digunakan dalam dua set eksperimen untuk mengkaji tindak balas redoks.*

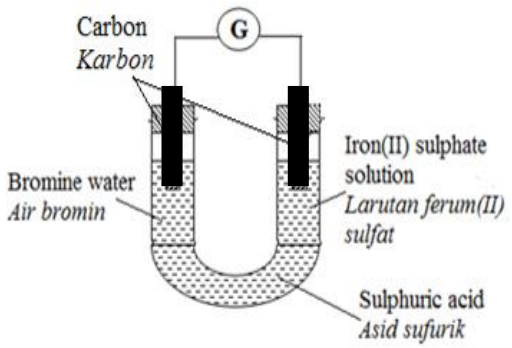
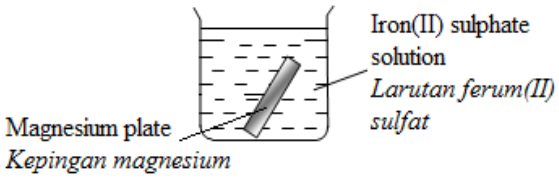
Set 1 ***Set 1***	**Set 2** ***Set 2***
	

Diagram 2.1/ *Rajah 2.1*

(a) What is meant by redox reaction?
Apakah yang dimaksudkan dengan tindak balas redoks?

.....

[*1 mark*]

(b) Based on Set 1/ *Berdasarkan Set* 1;

(i) State the colour change of iron(II) sulphate solution.
Nyatakan perubahan warna larutan ferum(II) sulfat.

……

[*1 mark*]

(ii) State the type of reaction occur to iron(II) sulphate.
Nyatakan jenis tindak balas yang berlaku kepada ferum(II)sulfat.

……..

[*1 mark*]

(iii) Write half equation for the reaction in (a)(ii).
Tuliskan persamaan setengah bagi tindak balas di(a)(ii).

……..

[*1 mark*]

(iv) State the oxidation number of bromine in bromine water.
Nyatakan nombor pengoksidaan bromin dalam air bromin.

……

[*1 mark*]

(c) Based on Set 2 ;
Berdasarkan Set 2:

(i) Which substance undergoes oxidation?
Bahan yang manakah mengalami pengoksidaan?

……..

[*1 mark*]

(ii) Write the ionic equation for the reaction occur.
Tuliskan persamaan ion bagi tindak balas yang berlaku.

……

[*1 mark*]

(iii) State the change in oxidation number of iron.
Nyatakan perubahan dalam nombor pengoksidaan bagi ferum.

……

[*1 mark*]

(d) Iron is a metal that rust easily.
Draw a labeled diagram to show how the conditions for the rusting involve the ionization of iron and the flow of electron.
Lukiskan satu gambar rajah berlabel untuk menunjukkan bagaimana syarat untuk pengaratan besi melibatkan pengionan besi dan pengaliran elektron.

[*3 marks*]

SET 2 : OXIDATION AND REDUCTION
(SECTION B)

3 (a) Table 3.1 show the equation of two reactions:
Jadual 3.1 *menunjukkan persamaan bagi dua tindak balas:*

Reaction ***Tindak balas***	**Chemical Equation** ***Persamaan Kimia***
A	$NaOH + HCl \rightarrow NaCl + H_2O$
B	$Mg + Zn(NO_3)_2 \rightarrow Mg(NO_3)_2 + Zn$

Table 3.1/*Jadual* 3.1

Determine whether each of the reactions is a redox reaction or not a redox reaction.
Explain your answer in term of oxidation number.
Tentukan sama ada setiap tindak balas tersebut merupakan tindak balas redoks atau bukan tindak balas redoks. Terangkan jawapan anda dari segi nombor pengoksidaan.

[4 *marks*]

(b) Table 3.1 shows the formulae for two oxides of copper compounds.
Jadual 3.1 *menunjukkan formula bagi dua sebatian oksida kuprum.*

Compound	**Formula**
P	CuO
Q	Cu_2O

Table 3.2/*Jadual* 3.2

(i) State the oxidation number of copper in the both compounds.
Nyatakan nombor pengoksidaan bagi kuprum dalam kedua-dua sebatian tersebut.

[2 *marks*]

(ii) Name both of the compounds based on the IUPAC nomenclature system.
Explain your answer.
Namakan kedua-dua sebatian tersebut berdasarkan sistem tatanama IUPAC.
Terangkan jawapan anda.

[4 *marks*]

(iii) Chemical equation below shows the reaction between copper(II)oxide and hydrogen gas.
Persamaan kimia di bawah menunjukkan tindak balas antara kuprum(II)*oksida dengan gas hidrogen.*

$$\mathbf{CuO + H_2 \rightarrow Cu + H_2O}$$

Based on the equation, determine:
Berdasarkan persamaan, tentukan:

- the substance that is oxidised
  bahan yang dioksidakan
- the substance that is reduced
  bahan yang diturunkan
- the oxidizing agent
  agen pengoksidaan
- the reducing agent
  agen penurunan

[4 *marks*]

(c) Diagram 3.2 shows the set up of apparatus to investigate the reactivity of metals towards oxygen.
Rajah 3.2 *menunjukkan susunan radas untuk mengkaji kereaktifan logam terhadap oksigen.*

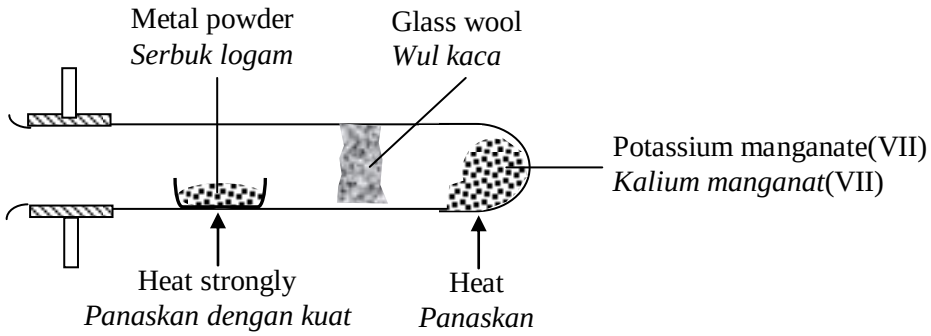


Diagram 3.2/*Rajah* 3.2

Table 3.2 show the observation when three metals; X, Y and Z are heated strongly as shown in Diagram 3.
Jadual 3.2 *menunjukkan pemerhatian apabila apabila tiga logam* X, Y *dan* Z *dipanaskan dengan kuat seperti yang ditunjukkan dalam Rajah* 7.

Metal ***Logam***	**Observation** ***Pemerhatian***
X	Burns vigorously with a bright flame. A white residue is formed. *Terbakar dengan nyalaan yang terang. Baki berwarna putih terbentuk.*
Y	Glows faintly and slowly. A black residue is formed. *Membara dengan malap dan perlahan. Baki berwarna hitam terbentuk.*
Z	Burns slowly with a bright flame. A brown residue when hot and yellow when cold is formed. *Menyala dengan perlahan. Baki berwarna perang semasa panas dan kuning apabila sejuk terbentuk.*

Table 3.2/*Jadual* 3.2

(i) Based on the observations in Table 3.2, arrange X, Y and Z in descending order of reactivity of metal towards oxygen.
Berdasarkan pemerhatian dalam Jadual 3.2, *susunkan* X, Y *dan* Z *mengikut tertib menurun kereaktifan logam terhadap oksigen.*

[1 *mark*]

(ii) Based on the information in Table 3.3, state which of the metal is copper, lead and magnesium.
Berdasarkan maklumat dalam Jadual 3.3, *nyatakan logam manakah yang merupakan kuprum, plumbum dan magnesium.*

[3 *marks*]

(iii) Write a chemical equation for the reaction between metal **X** and oxygen.
Tulis persamaan kimia bagi tindak balas antara logam **X** *dengan oksigen.*

[2 *marks*]

4. (a)

An oxidizing agent in a reaction can also become a reducing agent in another reaction.
Satu agen pengoksidaan dalam suatu tindak balas boleh juga menjadi agen penurunan dalam tindak balas yang lain.

Explain this statement based on the reactions represented by the following equations :
Terangkan pernyataan ini berdasarkan tindak balas yang ditunjukkan dalam persamaan berikut:

(i) $2Fe^{2+}(aq) + Br_2(aq) \rightarrow 2Fe^{3+}(aq) + 2Br^-(aq)$

(ii) $Fe^{2+}(aq) + Zn(s) \rightarrow Fe(s) + Zn^{2+}(aq)$

[*4 marks*]

(b) Displacement reaction between magnesium and copper(II) sulphate solution can also be classified as a redox reaction. Using half-equations, explain the above statement in terms of change in oxidation number.
Tindak balas penyesaran antara magnesium dan larutan kuprum(II) sulfat boleh juga dikelaskan sebagai satu tindak balas redoks. Menggunakan persamaan setengah, jelaskan pernyataan di atas dari segi perubahan dalam nombor pengoksidaan.

[6 *marks*]

(c) A student intends to investigate the redox reaction on the transfer of electrons at a distance. Diagram 4.1 shows the set up of apparatus used by the student.
Seorang pelajar ingin menyiasat tentang tindak balas redoks melalui pemindahan elektron pada satu jarak. Rajah 4.1 menunjukkan susunan radas yang telah digunakan oleh pelajar tersebut.

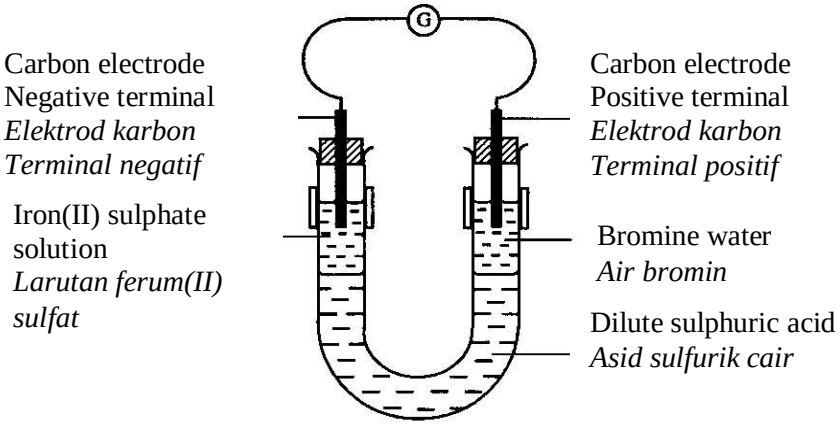


Diagram 4.1/*Rajah 4.1*

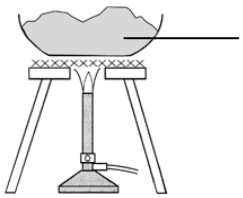
Explain the oxidation and reduction processes in terms of electron transfer that occur at the negative and positive terminals.
Write the half equation for the reaction that takes place at each terminal. State the changes that can be observed of the solutions, oxidising agent and reducing agent.

Terangkan proses pengoksidaan dan penurunan yang berlaku di terminal negatif dan terminal positif dari segi pemindahan elektron. Tuliskan setengah persamaan bagi tindak balas yang berlaku di setiap terminal. N*yatakan perubahan yang dapat diperhatikan keatas larutan,agen pengoksidaan dan agen penurunan.*

[10 *marks*]

SET 2 : OXIDATION AND REDUCTION
(SECTION C)

5. (a) Diagram 5.1 shows the apparatus set-up to investigate the redox reaction between metal P and copper(II) oxide powder
Rajah 5.1 m*enunjukkan susunan radas untuk mengkaji tindak balas redoks antara logam P dan sebuk kuprum(II) oksida*.



Mixture of metal P powder + copper(II) oxide powder
Campuran serbuk logam P + Serbuk kuprum(II)*oksida*.

Diagram 5.1/*Rajah 5.1*

Suggest metal P.
Based on your answer, explain why the reaction in diagram 5 is a redox reaction in terms of the change in oxidation number.
Cadangkan logam P .
Berdasarkan jawapan anda , terangkan mengapa tindak balas dalam Rajah 5 merupakan tindak balas redoks dari segi perubahan nombor pengoksidaan.

[4 *marks*]

(b) Table 5.1 shows the result of two experiments to study the effects of metal X dan Y on the rusting of iron.
Jadual 5.1 menunjukkan keputusan bagi dua eksperimen untuk mengkaji kesan logam X dan Y terhadap pengaratan besi.

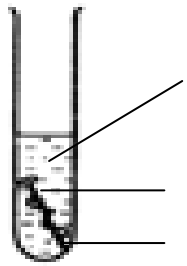
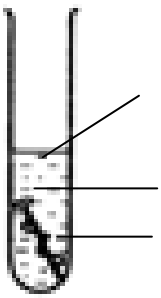
Experiment	Observation
I  Hot agar solution containing potassium hexacyanoferrate(III) and phenolphthalein *Agar panas mengandungi kalium heksasianoferat(III)dan fenolftalein* Iron nail / *paku besi* Metal X / *logam X*	Blue spots formed *Tompok biru terbentuk*
II  Hot agar solution containing kalium hexacyanoferrate(III) and phenolphthalein *Agar panas mengandungi kalium heksasianoferat(III) dan fenolftalein* Iron nail/ *paku besi* Metal Y/ *logam Y*	Pink spot formed. *Tompok merah jambu terbentuk*

Table 5.1/J*adual* 5.1

Explain the observation in experiment I and experiment II.
Terangkan pemerhatian dalam eksperimen I *dan eksperiment* II.

[6 *marks*]

(c) You are required to determine the position of carbon in the reactivity series.
Anda dikehendaki menentu kan kedudukan karbon dalam siri kereaktifan.
The chemicals supplied are
Bahan kimia yang dibekalkan ialah

- Carbon powder/*Serbuk karbon*
- Zinc oxide powder/*Serbuk zink oksida*
- Magnesium oxide powder/*Serbuk magnesium oksida*
- Copper(II)oxide powder/*Serbuk kuprum*(II) *oksida*.

Describe a laboratory experiment to determine the position of carbon in the reactivity series.
Huraikan eksperimen makmal untuk menentukan kedudukan karbon dalam siri kereaktifan.
Your description must include the following:
Huraian anda haruslah merangkumi yang berikut:

- The procedure of the experiment//*Kaedah eksperimen*
- The observation/*Pemerhatian*
- Explanation on how to determine the position of carbon in the reactivity series.
Penerangan mengenai cara menentukan kedudukan karbon dalam siri kereaktifan.

[10 *marks*]

6. (a) Diagram 6.1 shows the set-up of the apparatus of the metal displacement reaction.
Rajah 6.1 *menunjukkan susunan radas bagi tindak balas penyesaran logam.*

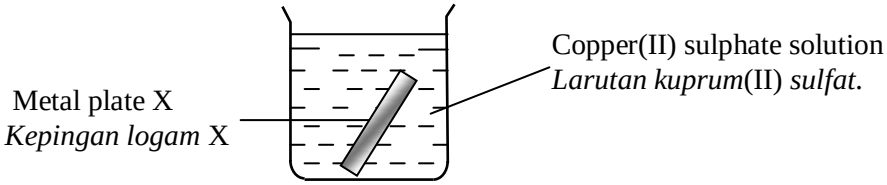


Diagram 6.1/*Rajah* 6.1

Suggest metal X.
Based on your answer, state the observation for the reaction and write the half equation for the chemical changes that take place. Identify the oxidising agent and reducing agent for the reaction.

Cadangkan logam X
Berdasarkan jawapan anda , nyatakan pemerhatian bagi tindak balas itu dan tuliskan persamaan setengah bagi perubahan yang berlaku.Kenalpasti agen pengoksidaan dan agen penurunan bagi tindak balas itu.

[6 *marks*]

(b) Using a suitable example, explain why double decomposition is not redox reaction.
Give another example of reaction which is not a redox reaction.
Dengan menggunakan contoh yang sesuai, terangkan mengapa penguraian gandadua bukanlah tindak balas redoks.
Berikan satu contoh tindak balas lain yang bukannya tindak balas redoks.

[4 *marks*]

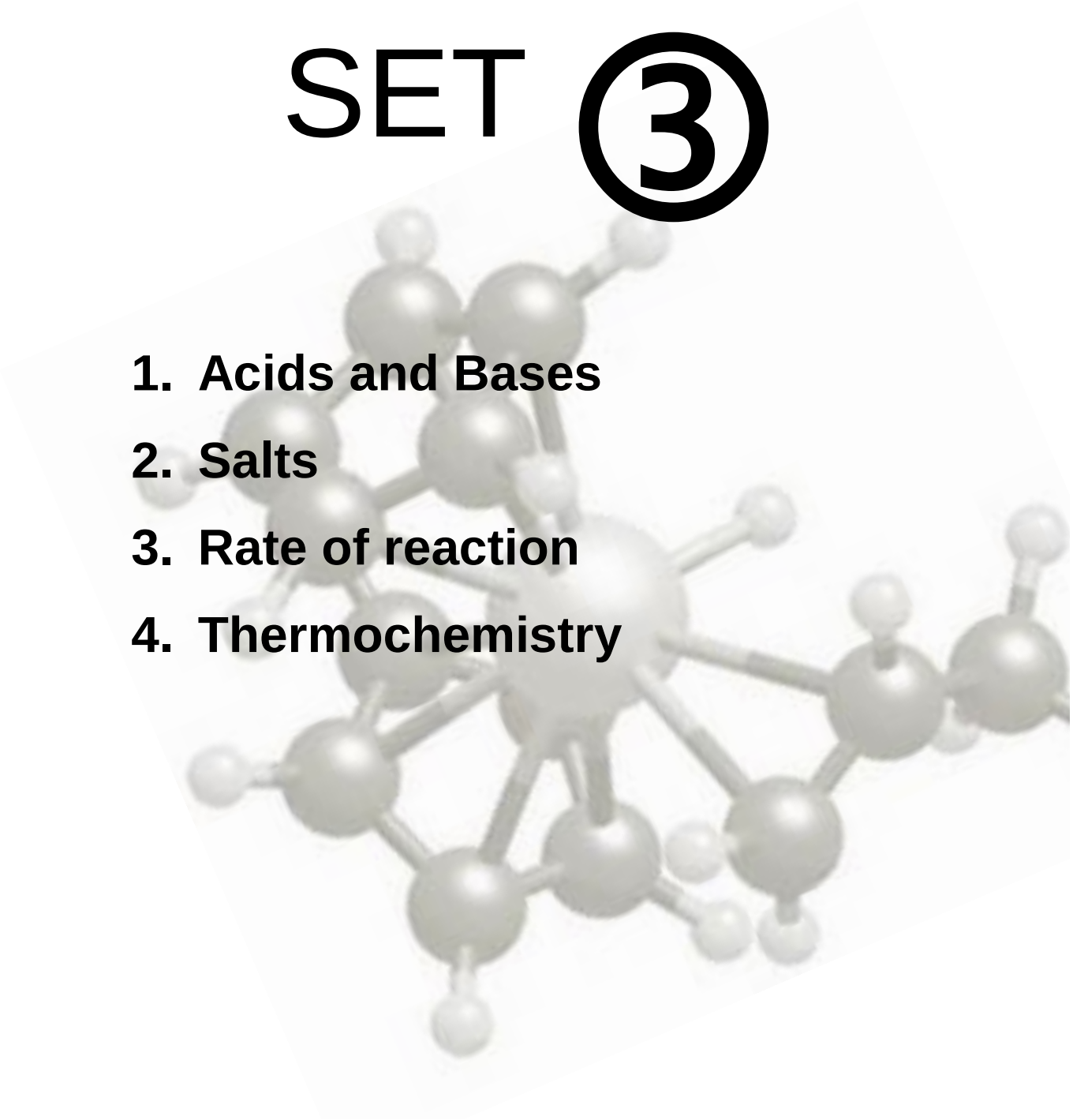
(c) The transfer of electrons takes place in many redox reactions.
With the help of a labeled diagram, describe an experiment that you can carry out to study the redox reaction through the transfer of electrons.
Predict the observation and write the equation for the oxidation and reduction.
Pemindahan elektron terlibat banyak dalam tindak balas redoks.
Dengan bantuan gambar rajah berlabel,huraikan satu eksperimen yang dapat dijalankan Untuk mengkaji tindak balas redoks melalui pemindahan elektron.
Ramalkan pemerhatian dan tuliskan persamaan bagi pengoksidaan dan penurunan.

[10 *marks*]

CHEMISTRY MODULE

http://cikguadura.wordpress.com/

SET ③



1. **Acids and Bases**
2. **Salts**
3. **Rate of reaction**
4. **Thermochemistry**

SET 3 : ACIDS, BASES AND SALT
(SECTION A)

1 Diagram 1.1 shows the apparatus set up of an experiment to study the properties of hydrogen chloride in two different solvents.
Rajah 1 *menunjukkan susunan radas eksperimen untuk mengkaji sifat-sifat hidrogen klorida dalam dua pelarut yang berlainan.*

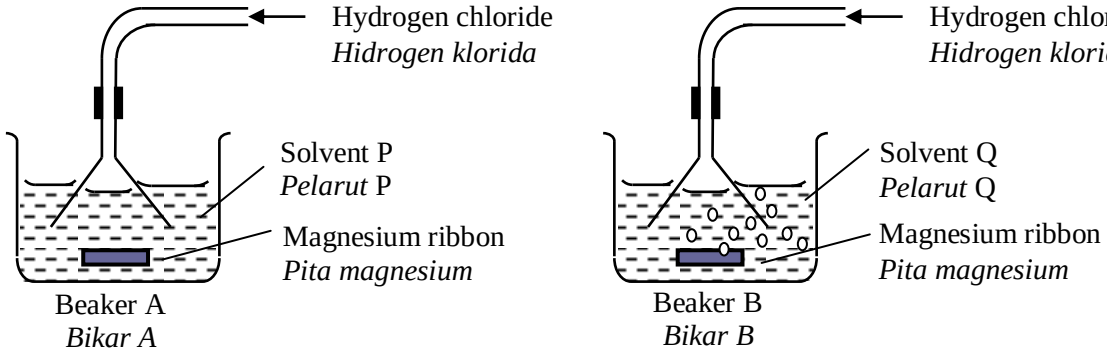


Diagram 1 / *Rajah* 1

(a) State the name of
Nyatakan nama bagi

(i) Solvent P : ……..……..……..……
Pelarut P :

(ii) Solvent Q : ……..…..
Pelarut Q :

[2 *marks*]

(b) State the type of particles of hydrogen chloride in
Nyatakan jenis zarah hidrogen klorida dalam

(i) Beaker A : .....
Bikar A :.
(ii) Beaker B : .....
Bikar B :

[2 *marks*]

(c) Explain the differences in observation between beaker A and beaker B.
Terangkan perbezaan pemerhatian antara bikar A *dan bikar* B.

.....

.....

.....

[2 *marks*]

(d) If 50 cm^3 of 0.1 mol dm^{-3} hydrogen chloride in beaker B reacts completely with magnesium ribbon,
Jika 50 cm^3 *hidrogen klorida* 0.1 mol dm^{-3} *dalam bikar* B *bertindak balas lengkap dengan pita magnesium,*

(i) Write the chemical equation to represent the reaction between hydrogen chloride in beaker B with magnesium ribbon.
Tuliskan persamaan kimia bagi mewakili tindak balas antara hidrogen klorida dalam bikar B *dengan pita magnesium.*

.....

[2 *marks*]

(ii) Calculate the mass of magnesium ribbon used.
[Relative atomic mass: Mg = 24; H = 1; Cl = 35.5]
Hitung jisim magnesium yang digunakan.
[Jisim atom relatif: Mg = 24; H = 1; C = 35.5]

[3 *marks*]

2 (a) Diagram 2.1 shows the apparatus set-up of three set of experiments to study the relationship between concentration of acid and its pH value.
Rajah 2.1 *menunjukkan susunan radas bagi tiga set eksperimen bagi mengkaji hubungan antara kepekatan asid dengan nilai* pH*nya.*

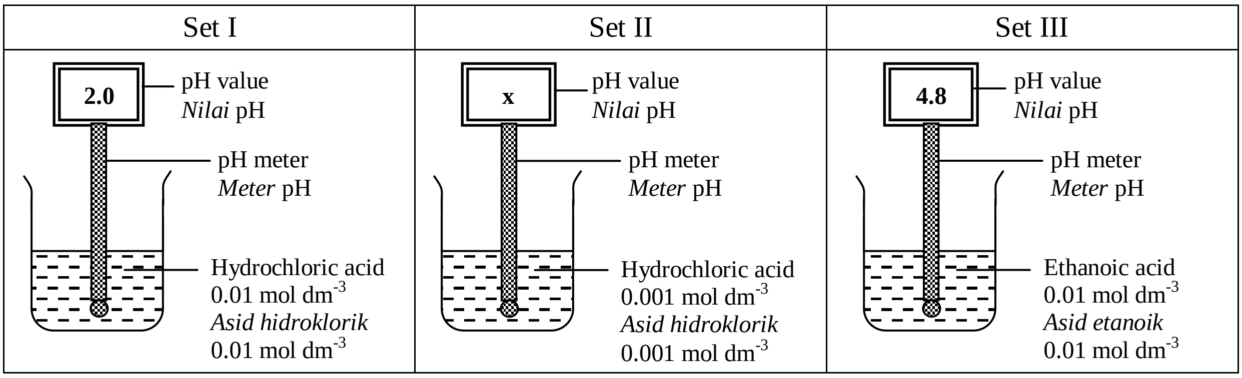


Diagram 2.1 / *Rajah* 2.1

(i) What is meant by acid?
Apakah yang dimaksudkan dengan acid?

……

[1 *mark*]

(ii) State the pH value of hydrochloric acid in Set II.
Nyatakan nilai pH *asid hidroklorik dalam Set* II.

……

[1 *mark*]

(iii) Explain your answer in (a)(ii).
Terangkan jawapan anda di (a)(ii).

……

……

……

[2 *marks*]

(iv) Explain why the pH value of ethanoic acid in Set III is higher compare to pH value of hydrochloric acid in Set I.
Terangkan mengapa nilai pH *asid etanoik dalam Set* III *adalah lebih tinggi berbanding nilai* pH *asid hidroklorik dalam Set* I.

……

……

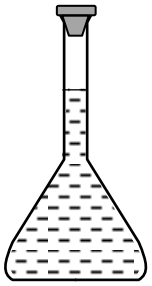
……

……

[3 *marks*]

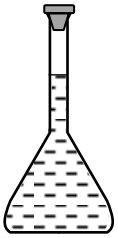
(b) Diagram 2.2 shows standard solution of sodium hydroxide in two volumetric flasks. Volumetric flask A contain 0.01 mol dm^{-3} sodium hydroxide solution and volumetric flask B contain 0.002 mol dm^{-3} sodium hydroxide solution.
Rajah 2.2 *menunjukkan larutan piawai natrium hidroksida dalam dua kelalang volumetrik. Kelalang volumetrik* A *mengandungi larutan natrium hidroksida* 0.01 mol dm^{-3} *dan kelalang volumetrik* B *mengandungi larutan natrium hidroksida* 0.002 mol dm^{-3}.

Volumetric flask A



0.01 mol dm^{-3} sodium hydroxide solution
larutan natrium hidroksida 0.01 mol dm^{-3}

Volumetric flask B



0.002 mol dm^{-3} sodium hydroxide solution
larutan natrium hidroksida 0.002 mol dm^{-3}

Diagram 2.2/*Rajah 2.2*

(i) Compare the pH value between sodium hydroxide solution in volumetric flask A and volumetric flask B. Give a reason.
Bandingkan nilai pH *antara larutan natrium hidroksida dalam kelalang volumetrik* A *dan kelalang volumetrik* B. *Berikan satu sebab.*

…….....

……

[2 *marks*]

(ii) Calculate the mass of sodium hydroxide needed to prepare 500 cm^3 of 0.01 mol dm^{-3} sodium hydroxide solution in volumetric flask A.
[Relative atomic mass: H = 1; O = 16; Na = 23]
Hitung jisim natrium hidroksida yang diperlukan untuk menyediakan 500 cm^3 *larutan natrium hidroksida* 0.01 mol dm^{-3} *dalam kelalang volumetrik* A.
[*Jisim atom relatif*: H = 1; O = 16; Na = 23]

[2 *marks*]

(iii) Sodium hydroxide solution in volumetric flask B is prepared using dilution method.
Calculate the volume of sodium hydroxide solution from volumetric flask A needed to prepare 100 cm^3 of 0.002 mol dm^{-3}sodium hydroxide solution in volumetric flask B.
Larutan natrium hidroksida dalam kelalang volumetrik B *disediakan melalui kaedah pencairan. Hitungkan isipadu larutan natrium hidroksida daripada kelalang volumetrik* A *yang diperlukan untuk menyediakan* 100 cm^3 *larutan natrium hidroksida* 0.002 mol dm^{-3}*dalam kelalang volumetrik* B.

[1 *mark*]

3 Diagram 3.1 shows the apparatus set-up for the neutralisation reaction between nitric acid and potassium hydroxide solution to prepare salt X.
Rajah 3.1 *menunjukkan susunan radas untuk tindak balas peneutralan antara asid nitrik dan larutan kalium hidroksida untuk menyediakan garam* X.

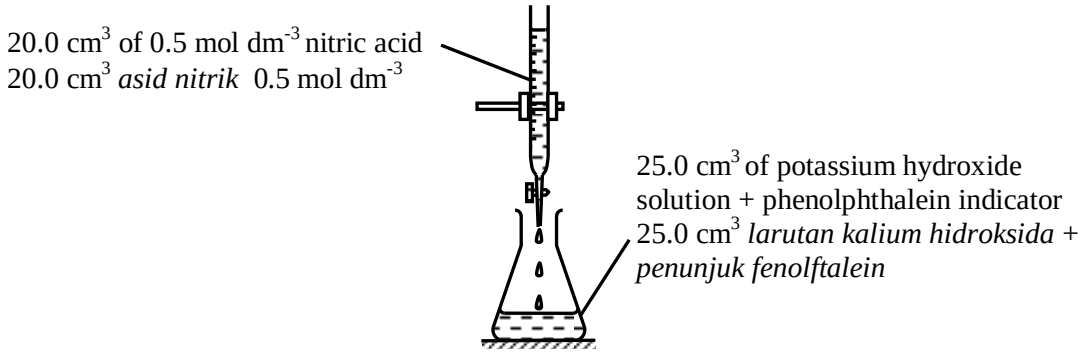


Diagram 3.1 / *Rajah* 3.1

(a) State the colour change of the solution in the conical flask at the end point.
Nyatakan perubahan warna larutan dalam kelalang kon pada takat akhir.

……

[1 *mark*]

(b) State the name of salt X.
Nyatakan nama garam X.

……

[1 *mark*]

(c) (i) Write a balanced chemical equation for the above reaction.
Tuliskan persamaan kimia seimbang bagi tindak balas di atas

.....

[1 *mark*]

(ii) Calculate the concentration of potassium hydroxide used.
Hitung kepekatan kalium hidroksida yang digunakan.

[3 *marks*]

(d) (i) The experiment is repeated with 0.5 mol dm^{-3} sulphuric acid to replace nitric acid.
What is the volume of sulphuric acid needed to neutralize completely?.
Eksperimen itu diulangi dengan menggunakan asid sulfurik 0.5 mol dm^{-3} *bagi menggantikan asid nitrik.*
Apakah isipadu asid sulfurik yang diperlukan untuk peneutralan lengkap?

……

[1 *mark*]

(ii) Explain your answer in (d) (i).
Terangkan jawapan anda dalam (d) (i).

……

……

……

……

[3 *marks*]

4 Diagram 4.1 shows the steps of preparation of salt G. Excess lead(II) oxide powder is dissolved in 50 cm^3 of 1.0 mol dm^{-3} nitric acid.
Rajah 4.1 *menunjukkan langkah-langkah bagi penyediaaan garam* G. *Serbuk plumbum*(II) *oksida berlebihan dilarutkan dalam* 50 cm^3 *asid nitrik* 1.0 mol dm^{-3}.

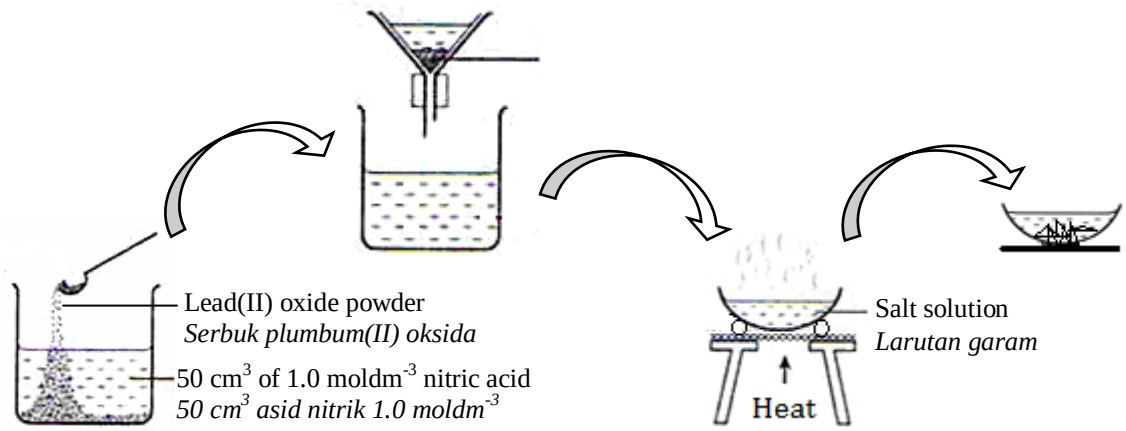


Diagram 4.1 / *Rajah 4.1*

(a) What is the meaning of salt?
Apakah maksud bagi garam?

……
[1 *mark*]

(b) Write the chemical formula of salt G formed.
Tuliskan formula kimia bagi garam G *yang terbentuk.*

……
[1 *mark*]

(c) Why is excess lead(II) oxide powder added to nitric acid?
Mengapakah serbuk plumbum(II) *oksida berlebihan ditambahkan kepada asid nitrik*?

……
[1 *mark*

(d) (i) Write the ionic equation for the reaction between lead(II) oxide and nitric acid.
Tuliskan persamaan ion bagi tindak balas antara plumbum(II) *oksida dan asid nitrik.*

……
[2 *marks*]

(ii) Calculate the mass of salt G formed.
[Molar mass of salt G = 331gmol^{-1}]
Hitungkan jisim bagi garam G *yang terbentuk.*
[*Jisim molar* garam G = 331gmol^{-1}]

[3 *marks*]

(e) Salt G formed contains nitrate ion. Describe a chemical test to verify the ion.
Garam G *yang terbentuk mengandungi ion nitrat.*
Huraikan satu ujian kimia untuk mengesahkan ion itu.

……

……

……
[2 *marks*]

5 Diagram 5 shows a flow chart for the qualitative analysis of salt W. The green colour of carbonate salt W is heated strongly to produce black colour of solid X and colourless gas Z.
Rajah 5 *menunjukkan carta alir analisis kualitatif bagi garam* W. *Garam karbonat* W *yang berwarna hijau dipanaskan dengan kuat menghasilkan pepejal* X *berwarna hitam dan gas tak berwarna Z .*

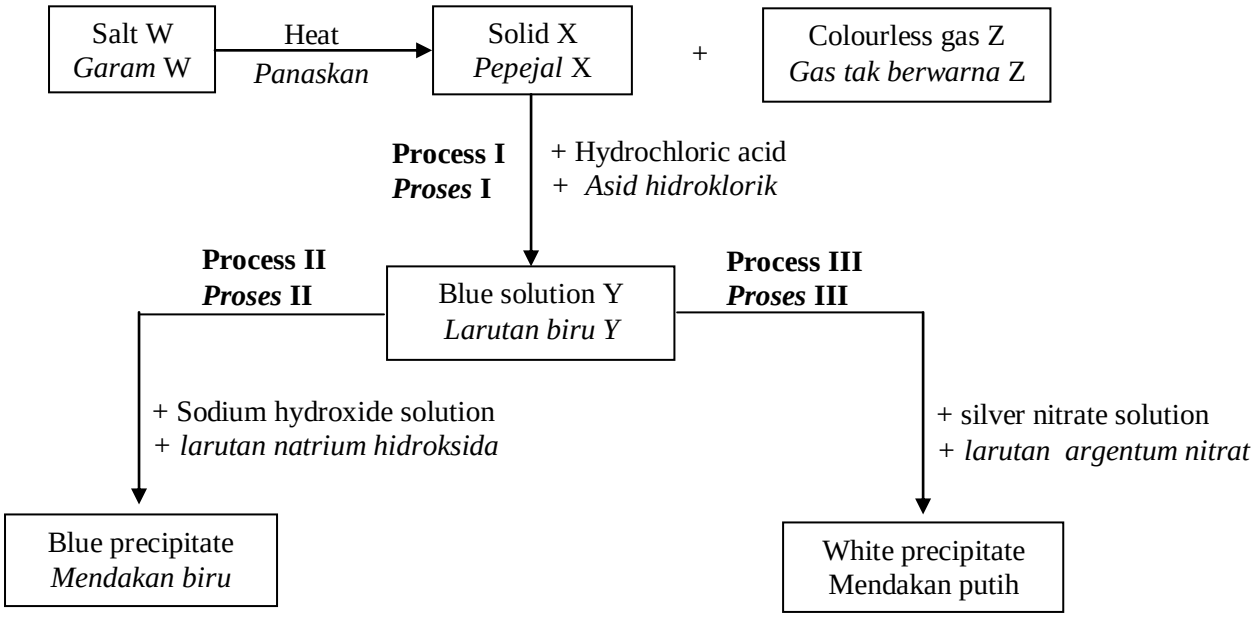


Diagram 5/*Rajah* 5

(a) Based on Diagram 5,
Berdasarkan Rajah 5,

(i) State the name of salt W and solid X.
Nyatakan nama bagi garam W *dan pepejal* X.

Salt W :.....
Garam W

Solid X :.....
Pepejal X [2 *marks*]

(ii) describe a chemical test to identify gas Z.
huraikan satu ujian kimia untuk mengenal pasti gas Z.

.....

.....
[2 *marks*]

(iii) what is the name of reaction in Process I?
apakah nama tindak balas dalam Proses I?

……..…….....
[1 *mark*]

(iv) write a balanced chemical equation for the reaction in Process I.
tuliskan persamaan kimia yang seimbang bagi tindak balas dalam Proses I.

.....
[2 *marks*]

(b) Based on the observation in Process II and Process III, state the cation and anion present in solution Y.
Berdasarkan pemerhatian dalam Proses II dan Proses III, nyatakan kation dan anion yang hadir dalam larutan Y.

Cation : .....
Kation

Anion : .....
Anion

[2 *marks*]

(c) (i) Write the ionic equation for the reaction occur in Process III.
Tuliskan persamaan ion bagi tindak balas yang berlaku dalam Proses III.

.....

[1 *mark*]

(ii) What is the name of reaction occur in Process III?
Apakah nama tindak balas yang berlaku dalam Proses III*?*

……

[1 *mark*]

6 Diagram 6.1 shows a series of reaction of copper compound.
Rajah 6.1 *menunjukkan satu siri tindak balas bagi sebatian kuprum*

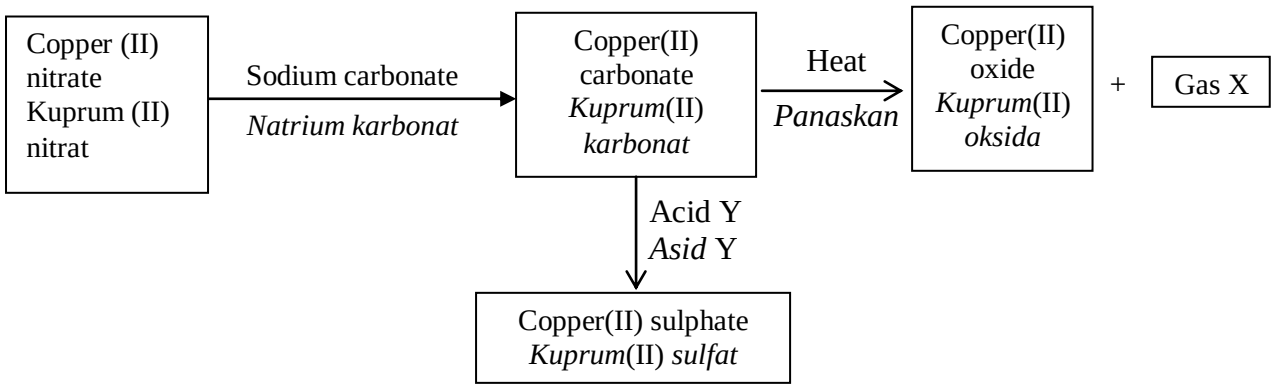


Diagram 6.1 /*Rajah 6.1*

(a) Copper(II) nitrate solution reacts with sodium carbonate solution to form copper(II) carbonate precipitate.
*Larutan kuprum(*II*) nitrat bertindak balas dengan larutan natrium karbonat membentuk mendakan kuprum(*II*) karbonat.*

(i) What is the colour of copper(II) carbonate?
Apakah warna kuprum(II) *karbonat?*

……

[1 *mark*]

(ii) State the name of the reaction.
Nyatakan nama bagi tindak balas itu.

.....

[1 *mark*]

(b) Heating of copper(II) carbonate produces copper(II) oxide and gas X.
*Pemanasan kuprum(*II*) karbonat menghasilkan kuprum(*II*) oksida dan gas* X.

(i) State the name of gas X.
Nyatakan nama bagi gas X

……..……

[1 *mark*]

(ii) Write a balanced chemical equation of the reaction.
Tuliskan persamaan kimia seimbang bagi tindak balas itu.

.....…….....…….....

[1 *mark*]

(iii) Draw a labeled diagram for the heating of copper(II) carbonate to produce copper(II) oxide and gas X. In your diagram show how gas X is tested.
*Lukiskan gambar rajah berlabel bagi pemanasan kuprum(*II*) karbonat untuk menghasilkan kuprum(*II*) oksida dan gas* X. *Dalam rajah anda tunjukkan bagaimana gas* X *diuji.*

[2 *marks*]

(c) Copper(II) carbonate reacts with acid Y to produce copper(II) sulphate.
The chemical equation is shown below.
*Kuprum(*II*) karbonat bertindak balas dengan asid* Y *menghasilkan kuprum(*II*) sulfat. Persamaan kimia itu ditunjukkan di bawah:*

$$\mathbf{CuCO_3 + Acid\ Y \rightarrow CuSO_4 + CO_2 + H_2O}$$

(i) What is acid Y?
Apakah asid Y?

……..……

[1 *mark*]

(ii) If 12.4 g copper(II) carbonate reacts completely with excess acid Y, calculate the mass of copper(II) sulphate formed.
[Relative atomic mass: C = 12, O=16 , S = 32, Cu = 64]
Jika 12.4 g *kuprum(*II*) karbonat bertindak balas lengkap dengan asid* Y *berlebihan, hitung jisim kuprum(*II*) sulfat yang terbentuk.*
[*Jisim atom relatif*: C = 12, O=16 , S = 32, Cu = 64]

3 *marks*]

(SECTION B)

7 (a) Your brother's hand is stung by wasp.
What should you apply to his hand to relieve the pain without causing further injury? Explain why.
Tangan adik anda disengat oleh tebuan.
Apakah yang harus anda sapu pada tangannya untuk mengurangkan kesakitan tanpa menyebabkan kecederaan lebih teruk? Terangkan mengapa.

[3 *marks*]

(b) A student carried out an experiment to investigate the properties of two solutions. Diagram 7.1 shows the results of the experiments
Seorang pelajar menjalankan eksperimen untuk mengkaji sifat-sifat bagi dua larutan. Rajah 7.1 *menunjukkan keputusan eksperimen itu.*

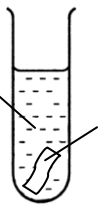
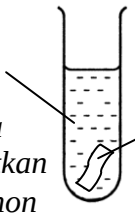
Test tube ***Tabung uji***	**X**	**Y**
Apparatus set-up *Susunan radas*	Dry ammonia gas dissolved in water *Gas ammonia kering dilarutkan dalam air*  Red litmus Paper *Kertas litmus merah*	Dry ammonia gas dissolved in propanone *Gas ammonia kering dilarutkan dalam propanon*  Red litmus Paper *Kertas litmus merah*
Observation *Pemerhatian*	The red litmus paper turned blue. *Kertas litmus merah bertukar biru*	No change *Tiada perubahan*

Diagram 7.1/ *Rajah* 7.1

Explain the difference in observation between test tube X and test tube Y.
Terangkam perbezaan pemerhatian antara tabung uji X *dan tabung uji* Y.

[6 *marks*]

(c) Table 7 shows the concentration and pH value of sulphuric acid and nitric acid.
Jadual 7 menunjukkan kepekatan dan nilai pH bagi asid sulfurik dan asid nitrik.

Acid ***Asid***	**Concentration / mol dm^{-3}** ***Kepekatan* / mol dm^{-3}**	**pH**
Sulphuric acid *Asid sulfurik*	0.005	2.0
Nitric acid *Asid nitrik*	0.005	2.3

Table 7 / *Jadual* 7

Compare the pH value between sulphuric acid and nitric acid. Explain why.
Bandingkan nilai pH *antara asid sulfurik dan asid nitrik. Terangkan mengapa.*

[4 *marks*]

(d) Diagram 7.2 shows the steps in preparation of potassium chloride salt.
Rajah 7.2 *menunjukkan langkah-langkah dalam penyediaan garam kalium klorida.*

STEP 1 /*LANGKAH* 1

Preparation of potassium hydroxide solution

14.0 g solid potassium hydroxide is dissolve in water to produce 250 cm^3 solution

Penyediaan larutan kalium hidroksida
14.0 g *pepejal kaliun hidroksida dilarutkan dalam air untuk menghasilkan* 250 cm^3 *larutan.*

STEP 2 / *LANGKAH* 2

Preparation of potassium chloride salt

25.0 cm^3 of potassium hydroxide solution neutralised 24.50 cm^3 of the hydrochloric acid.

Penyediaan garam kalium klorida

25.0 cm^3 *larutan kaliun hidroksida meneutralkan* 24.50 cm^3 *asid hidrochlorik*

Diagram 7.2 / *Rajah 7.2*

Based on the information in Diagram 7.2 calculate
[Relative atomic mass: H=1, O=16, K=39, Cl=35.5]

Berdasarkan maklumat dalam Rajah 7.2 *hitungkan*
[*Jisim atom relatif*: H=1, O=16, K=39, Cl=35.5]

(i) the concentration of potassium hydroxide solution in mol dm^{-3}.
kepekatan larutan kalium hidroksida dalam mol dm^{-3}.

[2 *marks*]

(ii) the mass of potassium chloride obtained.
jisim kalium klorida yang diperolehi.

[5 *marks]*

8 (a) Diagram 8.1 shows the names for two type of salts.
Rajah 8.1 *menunjukkan nama bagi dua jenis garam.*

- Copper(II) chloride
  Kuprum(II) *klorida*
- Lead(II) chloride
  Plumbum(II) *klorida*

Diagram 8.1/*Rajah* 8.1

(i) Based on the salt given in Diagram 8.1, write the formula of an insoluble salt.
State the name of reaction to prepare insoluble salt.
Berdasarkan garam yang diberikan dalam Rajah 8.1, *tuliskan formula garam yang tak terlarutkan.*
Nyatakan nama bagi tindak balas menyediakan garam tak terlarutkan.

[2 *marks*]

(ii) State the suitable chemicals required to produce copper(II) chloride and lead(II) chloride salts.
Nyatakan bahan-bahan kimia yang sesui untuk menyediakan garam kuprum(II) *klorida dan plumbum*(II) *klorida.*

[4 *marks*]

(b)

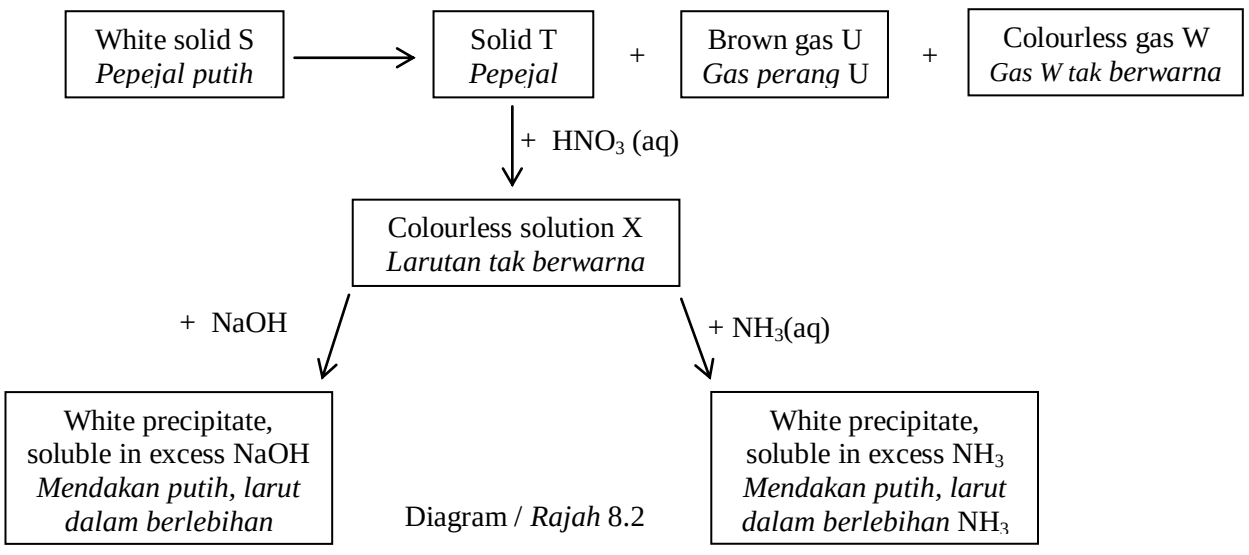


Diagram / *Rajah* 8.2

Diagram 8.2 shows reactions involving solid S. When heated, solid S decomposes to solid T, brown gas U and colourless gas W. Gas U relights glowing wooden splinter.
Rajah 8.2 *menunjukkan tindak balas yang melibatkan pepejal* S. *Bila dipanaskan, pepejal* S *terurai kepada pepejal* T, *gas perang* U dan *gas tak berwarna* U. *Gas* W *menyalakan semula kayu uji berbara.*

(i) Identify solid S, solid T, gas U and gas W.
Kenal pasti pepejal S, *pepejal* T, *gas* U *dan gas* W

[4 *marks*]

(ii) Write the chemical equation for the heating of solid S.
Tuliskan persamaan kimia untuk pemanasan pepejal S.

[2 *marks*]

(c) A student carried out an experiment to construct an ionic equation for the formation of barium sulphate. Table 8.2 shows the height of precipitate formed when 5.0 cm^3 of 0.5 mol dm^{-3} potassium sulphate solution is added with 1.0 cm^3, 2.0 cm^3, 3.0 cm^3, 4.0 cm^3, 5.0 cm^3, 6.0 cm^3, 7.0 cm^3 and 8.0 cm^3 of 0.5 mol dm^{-3} barium chloride solution respectively in eight test tubes.
Seorang pelajar telah menjalankan satu eksperimen untuk membina persamaan ion bagi pembentukan barium sulfat. Jadual 8.2 *menunjukkan tinggi mendakan yang terbentuk apabila* 5.0 cm^3 *larutan kalium sulfat* 0.5 mol dm^{-3} *ditambahkan dengan masing-masing* 1.0 cm^3, 2.0 cm^3, 3.0 cm^3, 4.0 cm^3, 5.0 cm^3, 6.0 cm^3, 7.0 cm^3 *dan* 8.0 cm^3 *larutan barium klorida dalam lapan tabung uji*.

Test tube *Tabung uji*	1	2	3	4	5	6	7	8
Volume of 0.5 mol dm^{-3} potassium sulphate solution / cm^3 *Isipadu larutan kalium sulfat* 0.5 mol dm^{-3} / cm^3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Volume of 0.5 mol dm^{-3} barium chloride solution / cm^3 *Isipadu larutan barium klorida* 0.5 mol dm^{-3} / cm^3	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Height of precipitate/ cm *Tinggi mendakan*/cm	1.2	1.4	1.6	1.8	2.0	2.0	2.0	2.0

Table 8.2 / *Jadual* 8.2

(i) Based on Table 8.2, draw a graph of the height of the precipitate against volume of 1.0 mol dm^{-3} barium chloride solution.
Berdasarkan Jadual 8, *lukiskan graf tinggi mendakan melawan isi padu larutan barium klorida* 1 mol dm^{-3}.

[3 *marks*]

(ii) On the graph that you have drawn in a(i) , mark the minimum volume of 1.0 mol dm^{-3} barium chloride solution needed to react completely with 5.0 cm^3 of 1.0 mol dm^{-3} potassium sulphate solution.
Pada kertas graf yang telah anda lukiskan di (a) (i), *tandakan isi padu minimum larutan barium klorida* 1.0 mol dm^{-3} *yang diperlukan untuk bertindak balas lengkap dengan* 5.0 cm^3 *larutan kalium sulfat* 1.0 mol dm^{-3}. [1 *mark*]

(iii) Calculate the number of mole of barium ions and number of moles of sulphate ions required for the formation of barium sulphate. Then calculate the number of moles of sulphate ions that react with 1 mole of barium ion.
Hitungkan bilangan mol ion barium dan bilangan mol ion sulfat yang diperlukan untuk pembentukan barium sulfat. Kemudian hitungkan bilangan mol ion sulfat yang bertindak balas dengan 1 mol *ion barium*

[3 *marks*]

(iv) Write the ionic equation for the formation of barium sulphate
Tuliskan persamaan ion untuk pembentukan barium klorida

[1 *mark*]

SET 3 : ACIDS, BASES AND SALT
(SECTION C)

9 (a) Diagram 9.1 shows the information of acids HX and H_2X
Rajah 9.1 *menunjukkan maklumat bagi asid* HX *dan* H_2X

- Acid HX is a monoprotic acid while H_2X is a diprotic acid.
- Both acid HX and H_2X are strong acids.

- *Asid* HX *adalah asid monoprotik manakala asid* H_2X *adalah asid diprotik*
- *Kedua-dua asid* HX *dan* H_2X *adalah asid kuat*

Diagram 9.1 / *Rajah* 9.1

Referring to the information in Diagram 9.1,
Merujuk kepada maklumat dalam Rajah 9.1,

(i) suggest suitable examples of
- diprotic acid
- monoprotic acid

cadangkan contoh yang sesuai bagi
- *asid diprotik*
- *asid monoprotik*

(ii) based on your answer in (a)(i), explain what is meant by
- diprotic acid
- monoprotic acid

berdasarkan jawapan anda di (a)(i), *terangkan apakah yang dimaksudkan dengan*
- *asid diprotik*
- *asid kuat*

[4 *marks*]

(b) Table 9.1 shows the pH value of sodium hydroxide solution and ammonia aqueous solution of the same concentration
Jadual 9.1 *menunjukkan nilai* pH *bagi larutan natrium hidroksida dan larutan berair ammonia yang berkepekatan sama.*

Alkali	Concentration / mol dm^{-3} *Kepekatan* / mol dm^{-3}	pH
Sodium hydroxide solution *Larutan natrium hidroksida*	0.1	13
Ammonia aqueous solution *Larutan berair ammonia*	0.1	10

Table 9.1 / *Jadual* 9.1

Explain why sodium hydroxide solution and ammonia aqueous solution of the same concentration have different pH value.
Terangkan mengapa larutan natrium hidroksida dan larutan berair ammonia yang berkepekatan sama mempunyai nilai pH *berbeza.*

[6 *marks*]

(c) Describe how to prepare 250 cm^3 of 1.0 mol dm^{-3} potassium hydroxide starting from solid potassium hydroxide. State the size of volumetric flask used and calculate the mass of potassium hydroxide needed.
Huraikan bagaimana menyediakan 250 cm^3 larutan kalium hidroksida 1.0 mol dm^{-3} bermula dengan pepejl kalium hidroksida. Nyatakan saiz kelalang volmetrik yang digunakan dan hitungkan jisim kalsium hidroksida yang diperlukan
[Relative atomic mass: H, 1; O, 16; K, 39] /[*Jisim atom relatif* : H, 1; O, 16; K, 39]

[10 *marks*]

10 (a) Diagram 10.1 shows a flow chart when substance C is dissolved in two different solvents, water and solvent D, and the properties of solutions formed.
Rajah 10.1 *menunjukkan carta alir apabila bahan* C *dilarutkan dalam dua pelarut berbeza, air dan pelarut* D*, dan sifat larutan yang terbentuk.*

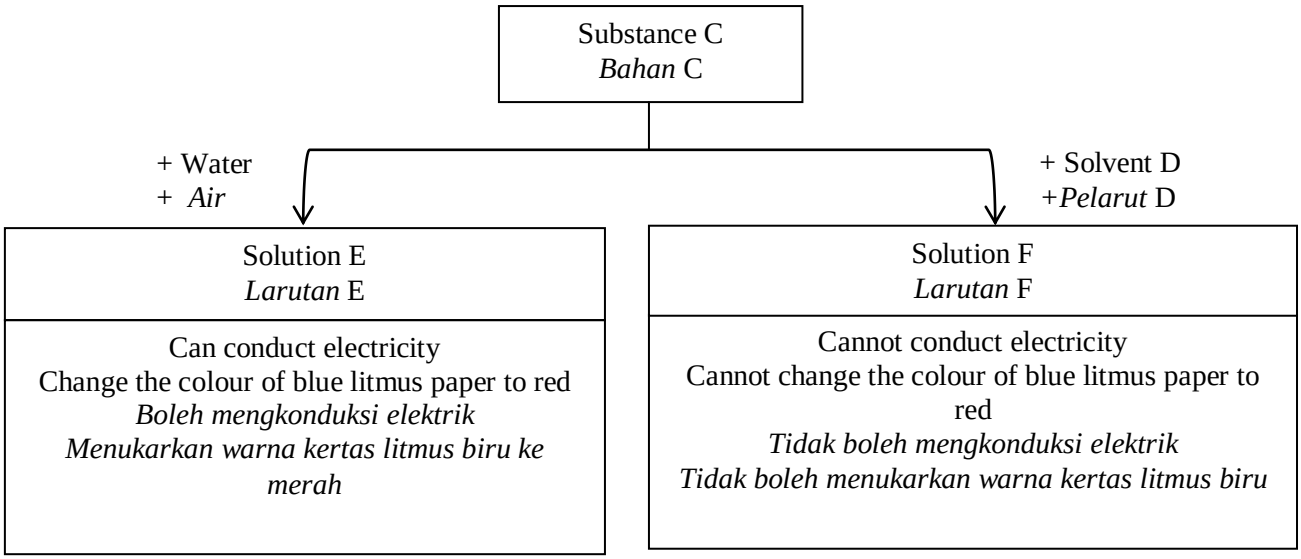


Diagram 10.1/ *Rajah 10.1*

Based on Diagram 10,
Berdasarkan Rajah 10,

(i) Suggest substance C and solvent D
Cadangkan bahan C *dan pelarut* D.

[2 *marks*]

(ii) Explain the differences in properties between solution E and solution F.
Terangkan perbezaan sifat antara larutan E *dan larutan* F.

[6 *marks*]

(b) By using all the chemical substances given below and suitable apparatus, describe a laboratory experiment to prepare dry zinc sulphate salt.
Dengan menggunakan bahan kimia yang diberikan di bawah dan alat radas yang sesuai, huraikan satu eksperimen di makmal untuk menyediakan garam zinc sulfat kering.

- zinc nitrate solution
- dilute sulphuric acid
- sodium carbonate solution

- *Larutan zink nitrat*
- *Asid sulfurik cair*
- *Larutan natrium karbonat*

In your description, include chemical equations involved.
Dalam huraian anda sertakan persamaan kimia yang terlibat.

[12 *marks*]

SET 3 : RATE OF REACTION
(SECTION A)

1. A group of students carry out two set of experiment, Set I and Set II to determine the rate of reaction between 40 cm^3 of 0.1 mol dm^{-3} hydrochloric acid with excess zinc. Table 1 shows the results for the volume of hydrogen gas collected at every 30 second.
Sekumpulan pelajar menjalankan dua set eksperimen, set I *dan* II *dalam menentukan kadar satu tindak balas antara* 40 cm^3 *asid hidroklorik* 0.1 mol dm^{-3} *dan zink yang berlebihan . Jadual* 1 *menunjukkan keputusan ekperimen pada isi padu gas hidrogen yang dikumpulkan pada setiap* 30 *saat.*

SET I :

Time / s *Masa /*s	0	30	60	90	120	150	180	210	240	270
Total volume of hydrogen gas collected *Jumlah isi padu gas hidrogen yang dikumpul* (cm^3)	0.00	7.00	13.50	19.50	24.50	30.00	34.50	39.00	42.00	42.00

SET II :

Time / s *Masa /*s	0	30	60	90	120	150	180	210	240	270
Total volume of hydrogen gas collected *Jumlah isi padu gas hidrogen yang dikumpul* (cm^3)	0.00	11.00	19.50	27.00	33.50	38.50	42.00	42.00	42.00	42.00

Table 1 [*Jadual* 1]

(a) Based on result in Set I and Set II in Table 1
Berdasarkan keputusan dalam Set I *dan* Set II *dalam Jadual* 1.

(i) State which set of the experiment has higher rate of reaction .
Nyatakan set eksperimen yang manakah menghasilkan kadar tindak balas yang tinggi

.....

[1 mark]

(ii) Draw a graph of total volume of hydrogen gas collected against time for Set I and Set II on the same axes.
Lukiskan graf jumlah isi padu gas hidrogen yang dikumpul melawan masa bagi Set I *dan* Set II *pada paksi yang sama.* [4 marks]

(b) (i) By using the graph you have drawn in (a)(ii), determine the rate of reaction at 60 seconds for Set I and Set II
Dengan menggunakan graf yang telah diplotkan di (b), *tentukan kadar tindak balaspada* 90 *saat bagi ke dua-dua set*

Set I : Set II :

[4 marks]

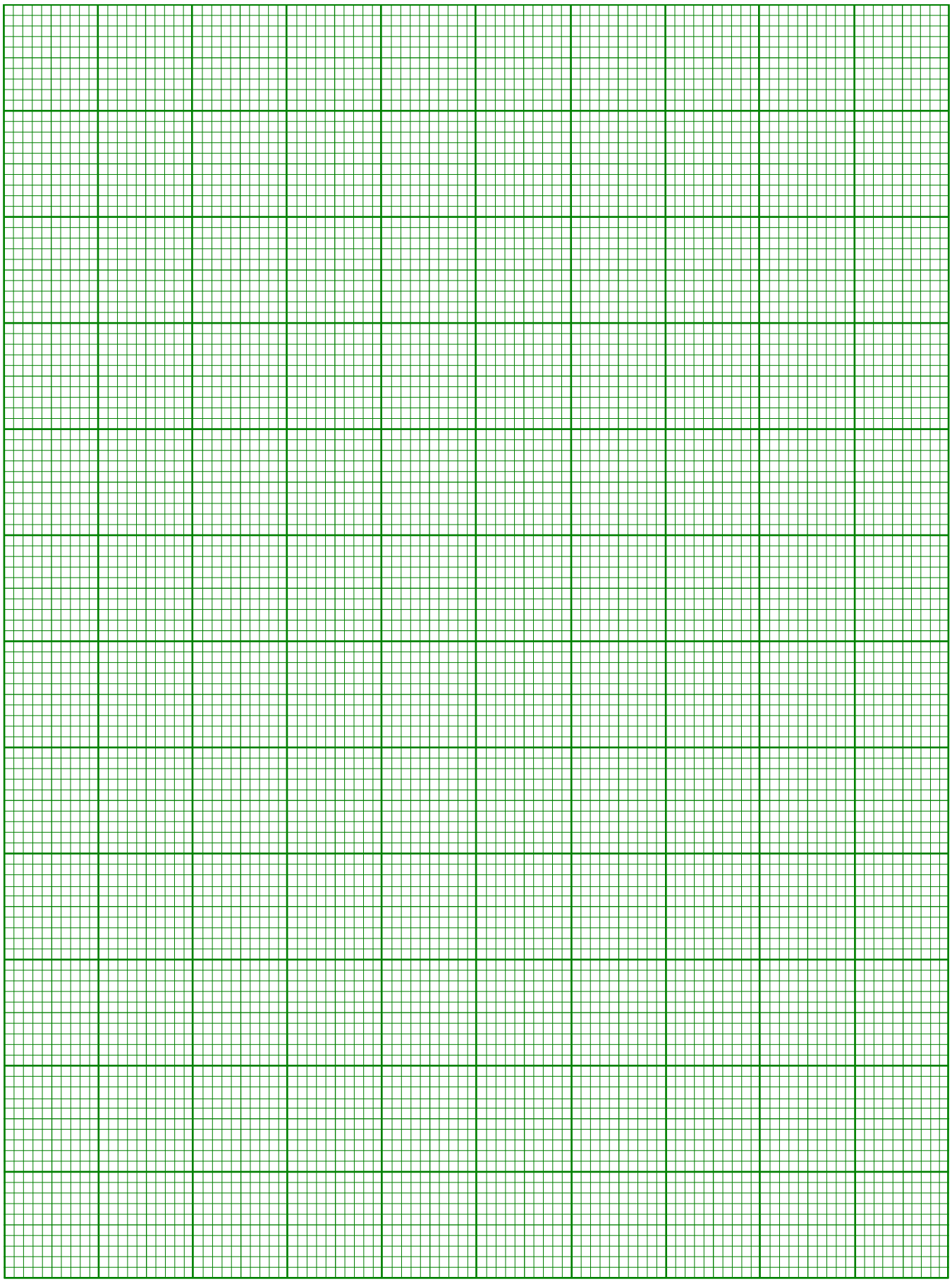
(ii) Suggest two ways to obtain curve in Set II

Cadangkan dua cara untuk mendapatkan lengkung dalam Set II

.....

.....

[2 marks]



2. A student carried out Experiment I and II to investigate the factors affecting the rate of reaction between calcium carbonate and nitric acid.
Table 2.1 shows the results of the experiment.

Seorang pelajar menjalankan Eksperimen I *dan* II *untuk mengkaji faktor-faktor yang mempengaruhi kadar tindak balas antara kalsium karbonat dan asid nitrik*.
Jadual 1 *menunjukkan keputusan eksperimen itu*.

Experiment **Eksperimen**	**I**	**II**
Reactants *Bahan tindak balas*	Excess of calcium carbonate granules and 50 cm^3 of 0.2 mol dm^{-3}nitric acid *Ketulan kalsium karbonat berlebihan dengan* 50 cm^3 *asid nitrik* 0.2 mol dm^{-3}	Excess of calcium carbonate powder and 50 cm^3 of 0.2 mol dm^{-3} nitric acid *Serbuk kalsium karbonat berlebihan dengan* 50 cm^3 *asid nitrik* 0.2 mol dm^{-3}
Time taken for the maximum volume of gas collected (minute) *Masa yang diambil untuk mengumpul isi padu maksimum gas (minit)*	10.0	5.0

Table 2.1 /*Jadual* 2.1

(a) Write the chemical equation for the reaction between calcium carbonate and nitric acid.
Tuliskan persamaan kimia bagi tindak balas antara kalsium karbonat dengan asid nitrik

.....

[2 marks]

(b) Draw the apparatus set-up to carry out this experiment.
Lukiskan gambar rajah susunan radas untuk menjalankan eksperimen ini.

[2 marks]

(c) Calculate the maximum volume of gas collected in this experiment
[Molar gas volume: 24 dm^3 mol^{-1} at room condition]
Hitungkan isi padu maksimum gas yang dikumpulkan dalam eksperimen ini.
[*Isi padu molar gas*: 24 dm^3 mol^{-1} *pada keadaan bilik*]

[3 marks]

(d) Calculate the average rate of reaction for Experiment I and Experiment II in cm^3s^{-1}.
Hitungkan kadar tindak balas purata bagi Eksperimen I *dan* II *dalam* cm^3s^{-1}.

(i) Experiment I
Eksperimen I

(ii) Experiment II
Eksperimen II

[2 *marks*]

(e) (i) Compare the rate of reaction between Experiment I and Experiment II.
Bandingkan kadar tindak balas antara Eksperimen I *and Eksperimen* II.

….....

[1 *mark*]

(ii) Explain your answer in (e)(i) based on the Collision Theory.
Terangkan jawapan anda di (e)(i) berdasarkan Teori Perlanggaran.

….....

.....

.....

.....

[3 *marks*]

SET 3 : RATE OF REACTION
(SECTION B)

3. (a) Smaller pieces of wood burn faster compare to bigger pieces of wood. Explain why .
Kayu bersaiz kecil terbakar lebih cepat berbanding kayu bersaiz besar. Terangkan mengapa

[2 marks]

(b) A student carried out two experiment to investigate the decomposition of hydrogen peroxide. Diagram 3.1 shows the apparatus set-up and observation when a glowing wooden splinter is placed at the mouth of each test tubes of both experiments.

Seorang pelajar menjalankan dua eksperimen untuk mengkaji kesan mangkin mangan(IV) *oksida ke atas kadar penguraian hidrogen peroksida. Rajah* 3.1 *menunjukkan susunan radas dan pemerhatian apabila kayu uji berbara diletakkan pada mulut setiap tabung uji di kedua-Eksperimen* I *dan Eksperimen* II.

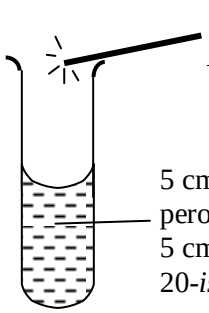
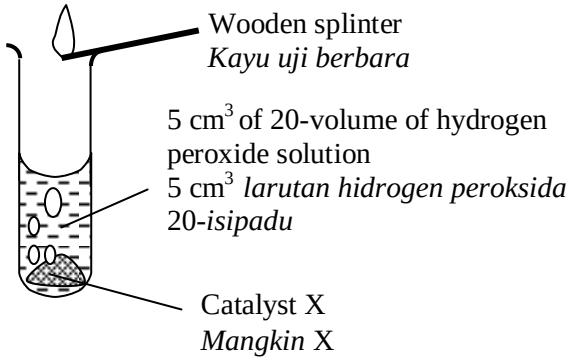
Experiment [*Eksperimen*]	Observation [*Pemerhatian*]
Experiment I *Eksperimen* I  	• The wooden splinter glows dimly and slowly. *Kayu uji berbara akan menyala malap dan perlahan.* • No effervescence occurs. *Tiada pembuakan berlaku.*
Experiment II *Eksperimen* II  	• The wooden splinter lighted brightly. *Kayu uji berbara akan menyala terang.* • Effervescence occurs. *Pembuakan berlaku.*

Diagram 3.1/ Rajah 3.1

Based on Diagram 3.1 :
Berdasarkan Rajah 3.1 :

(i) Identify which experiment has a higher rate of reaction. Give a reason to your answer
Kenal pasti eksperimen yang mempunyai mempunyai kadar tindak balas yang tinggi. Berikan alasan kepada jawapan anda

[2 marks]

(ii) Write a chemical equation to represent the decomposition of hydrogen peroxide.
Tuliskan persamaan kimia bagi penguraian hidrogen peroksida.

[2 marks]

(iii) Draw an energy profile diagram for the decomposition of hydrogen peroxide in Experiment I. Label the activation energy
Lukis satu gambar rajah profil tenaga untuk penguraian hidrogen peroksida dalam Eksperimen I. *Label tenaga pengaktifan.*

[3 marks]

(*c*) Diagram 3.2 shows Curve I and Curve II obtained from an experiment using zinc and hydrochloric acid.
Rajah 3.2 *menunjukkan Lengkung* I *dan Lengkung* II *yang diperolehi daripada suatu eksperimen apabila zink bertindak balas dengan asid hidroklorik*

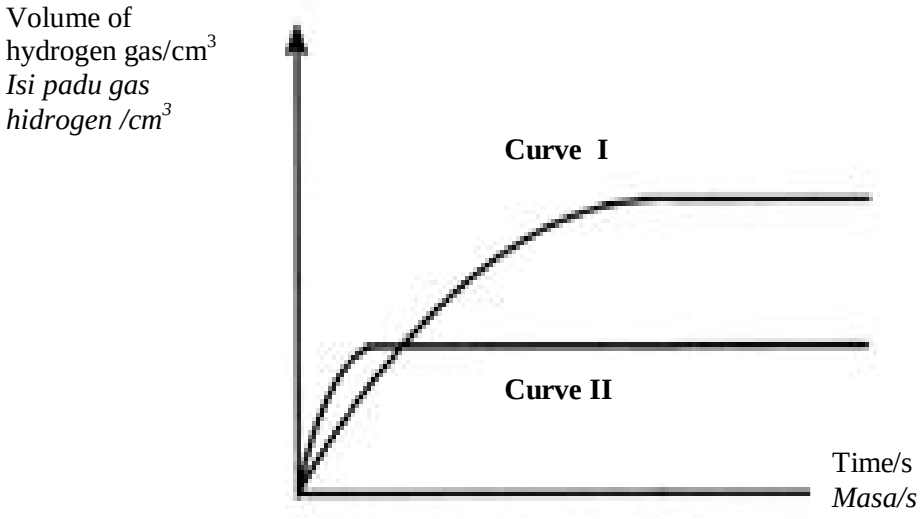


Diagram 3.2

(i) Write the chemical equation for the reaction between zinc and hydrochloric acid .
Tuliskan persamaan kimia bagi tindak balas di antara zink dan asid hidroklorik.

[2 marks]

(ii) Curve I obtained from the reaction between excess zinc powder and 50 cm^3 of 0.5 mol dm^{-3} hydrochloric acid
Lengkung I *diperolehi daripada tindak balas antara* 50 cm^3 *asid hidroklorik* 0.5 mol dm^{-3}.
Calculate the maximum volume of gas released
[Molar volume: 24 dm^3 mol^{-1} at room condition]
Kirakan isi padu maksimum gas yang terbebas.
[*Isi padu molar gas pada keadaan bilik* = 24 $dm^{-3}mol^{-1}$]

[3 marks]

(iii) Describe briefly how to obtain curve II
Huraikan dengan ringkas bagaimana mendapatkan lengkung II

[2 marks]

(iv) The experiment is repeated using excess powder and 50 cm^3 of 0.5 mol dm^{-3} sulphuric acid to replace excess zinc powder and 50 cm^3 of 0.5 mol dm^{-3}.hydrochloric acid.
Explain the rate of reaction and maximum volume of gas collected.
Eksperimen itu diulangi menggunakan serbuk zink berlebihan dan 50 cm^3 *asid hidroklorik* 0.5 mol dm^{-3} *bagi menggantikan serbuk zink berlebihan dengan 50* cm^3 *asid hidroklorik 0.5 mol* dm^{-3}. *Terangkan kadar tindak balas dan isi padu maksimum gas yang dikumpulkan.*

[4 marks]

4. (a) Food in refrigerator last longer compared to food kept in kitchen cabinet at room temperature.
Explain why?
Makanan disimpan dalam peti sejuk lebih tahan lama berbanding makanan disimpan dalam kabinet dapur pada suhu bilik. Terangkan mengapa?

[3 marks]

(b) Experiment I, II and III are carried out to investigate the factors affecting the rate of reaction between sulphuric acid and zinc.
Diagram 4 shows the results of the Experiment I, II and III
Eksperimen I, II *dan* III *dijalankan untuk mengkaji faktor-faktor yang mempengaruhi kadar tindak balas di antara asid sulfurik dan zink.*
Rajah 4 *menunjukkan keputusan bagi Eksperimen* I, II *dan* III *tersebut.*

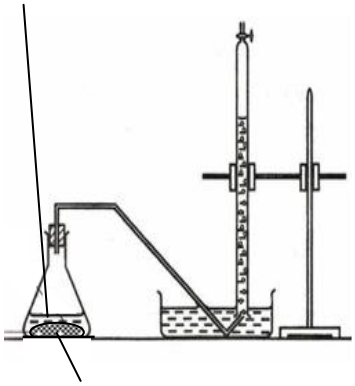
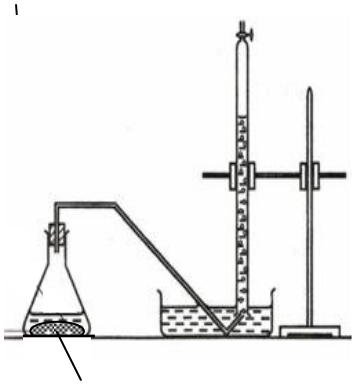
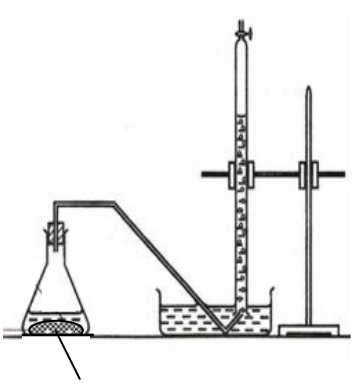
Experiment *Eksperimen*	I	II	III
Set-up of apparatus *Susunan radas*	50 cm^3 of 1.0 mol dm^{-3} sulphuric acid 50 cm^3 *asid sulfurik* 1.0 mol dm^{-3}  Zinc powder *Serbuk zink*	50 cm^3 of 1.0 mol dm^{-3} sulphuric acid 50 cm^3 *asid sulfurik* 1.0 mol dm^{-3}  Zinc granules *Ketulan zink*	50 cm^3 of 0.5 mol dm^{-3} sulphuric acid 50 cm^3 *asid sulfurik* 0.5 mol dm^{-3}  Zinc granules *Ketulan zink*
Time taken to collect maximum hydrogen gas/s *Masa yang diambil untuk mengumpul isi padu maksimum gas hidrogen/s*	80	160	240

Diagram 4/*Rajah 4*

(i) Write the chemical equation for the reaction between zinc and sulphuric acid.
Calculate the maximum volume of hydrogen gas produced in Experiment III.
[1 mol of gas occupies the volume of 24 dm^3 at room temperature and pressure]
Tuliskan persamaan kimia bagi tindak balas antara zink dengan asid sulfurik.
Hitungkan isi padu maksimum gas hidrogen yang terhasil dalam Eksperimen III.
[1 mol *gas menempati isi padu sebanyak* 24 dm^3 *pada suhu dan tekanan bilik*]

[4 marks]

(ii) Calculate the average rate of reaction for Experiment I, II and III.
Hitungkan kadar tindak balas purata bagi eksperimen I, II *dan* III.

[3 marks

(iii) Compare the rate of reaction between
Bandingkan kadar tindak balas antara

- Experiment I and Experiment II
Eksperimen I *and Experiment* II
- Experiment II and Experiment III
Eksperimen II *dan eksperimen* III

Explain your answer with reference to the Collision Theory.
Terangkan jawapan anda dengan merujuk kepada Teori Perlanggaran.

[10 marks]

SET 3 : RATE OF REACTION
(SECTION C)

5 (a) The knowledge of factors affecting the rate of reaction is applied in Haber Process.
Pengetahuan tentang faktor yang mempengaruhi kadar tindak balas diaplikasikan dalam Proses Haber.

(i) Write a chemical equation to represent the formation of ammonia gas in Haber Process.
Tuliskan persamaan kimia bagi pembentukan gas ammonia dalam Proses Haber.

[2 marks]

(ii) State two conditions that can increase the rate of reaction to produce ammonia gas.
Nyatakan dua keadaan untuk meningkatkan kadar tindak balas bagi penghasilan gas ammonia.

[2 marks]

(b) Two experiments were carried out to study a few factors that affecting on the rate of reaction between magnesium and an acid X.
Graph in Diagram 5 shows the results of Experiment I and Experiment II.
Dua eksperimen dijalankan untuk mengkaji beberapa faktor yang mempengaruhi kadar tindak balas antara magnesium dengan asid X. *Graf dalam Rajah* 5 *menunjukkan keputusan Eksperimen* I *dan Eksperimen* II.

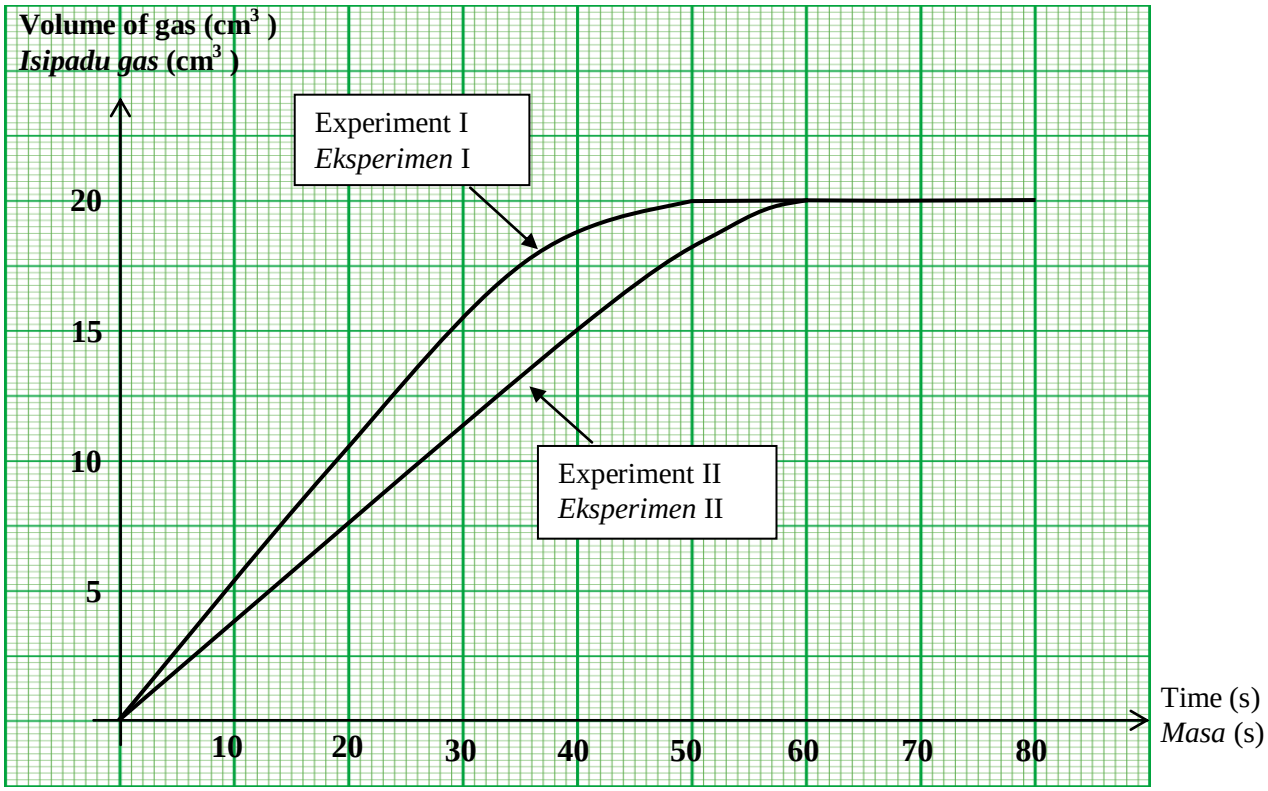


Diagram 5/*Rajah 5*

(i) State a suitable example of the acid X.
Write the chemical equation for the reaction between this acid and magnesium.
Nyatakan satu contoh asid X *yang sesuai.*
Tuliskan persamaan kimia bagi tindak balas antara asid ini dengan magnesium.

[3 *marks*]

(ii) Calculate the average rate of reaction for Experiment I and Experiment II
Hitung kadar tindak balas purata untuk Eksperimen I *dan Eksperimen* II

[2 *marks*]

(iii)Describe briefly how to carry out the experiment to obtain two curves labelled as Experiment I and Experiment II.
Huraikan secara ringkas bagaimana eksperimen dijalankan untuk mendapatkan dua lengkung berlabel Eksperimen I *dan Eksperimen* II

[6 marks]

(iv) Based on your answer in b (iii), compare the rate of reaction between Experiment I and Experiment II. Explain why there is a difference in the rate of reaction based on the Collision Theory.
Bedasarkan jawapan anda di b (iii), *bandingkan kadar tindak balas antara Eksperimen* I *and Eksperimen* II. T*erangkan mengapa terdapat perbezaan dalam kadar tindak balas berdasarkan teori perlanggaran*

[4 *marks*]

(v) Give one reason why the final volume of the gas obtained in the both experiment are same
Beri satu sebab mengapa isi padu akhir gas yang terhasil dalam ke dua-dua eksperimen adalah sama

[1 mark]

6. Table 6.1 shows the results for the volume of hydrogen gas collected when excess zinc reacts with hydrochloric acid
Jadual 6.1 *menunjukkan keputusan bagi isi padu gas hidrogen yang dikumpulkan apabila zink bertindak balas dengan asid hidroklorik*

Time / s *Masa/s*	0	30	60	90	120	150	180	210
Volume of hydrogen gas (cm^3) *Isi padu* gas hydrogen (cm^3)	0.00	14.00	24.00	30.00	34.00	35.00	36.00	36.00

Table 6.1 /*Jadual* 6.1

(a) Based on Table 6.1 /*Berdasarkan Jadual* 6.1,

(i) Calculate the rate of reaction in the first minute and in the second minute
Kirakan kadar tindak balas dalam minit pertama dan minit kedua

(ii) Based on your answer in (a)(i), compare the rate of reaction. Explain your answer
Berdasarkan jawapan anda pada (a)(i), *bandingkan kadar tindak balas.*
Terangkan jawapan anda.

(iii) Volume of hydrogen gas collected after 180 s is remains constant. Explain
Isi padu yang hydrogen yang dikumpulkan selepas 180 s *adalah malar. Terangkan*

(iv) This experiment is repeated by using copper(II) sulphate as a catalyst. Referring the Collision Theory, explain how this catalyst increases the rate of reaction.
Eksperimen ini diulang dengan menggunakan kuprum(II) *oksida sebagai mangkin.*
Merujuk pada teori perlanggaran, terangkan bagaimana mangkin dapat meningkatkan kadar tindak balas.

[7 marks]

(b) The following equation respresents the reaction between hydrogen and oxygen.
Persamaan berikut mewakili tindak bals antara hidrogen dengan oksigen.

$$2H_2 + O_2 \rightarrow 2H_2O$$

Explain how the effective collisions can produce water molecules.
Terangkan bagaimana perlanggaran berkesan dapat menghasilkan molekul air

[3 marks]

(c)

When sodium thiosulphate, $Na_2S_2O_3$ solution reacts with sulphuric acid, H_2SO_4, sodium thiosulphate solution, sulphur dioxide gas, sulphur precipitate and water molecules is formed.

Apabila larutan natrium tiosulfat , $Na_2S_2O_3$ *bertindak balas dengan asid sulfurik,* H_2SO_4 *, larutan natrium tiosulfat, gas sulfur dioksida, mendakan sulfur dan molekul air terbentuk.*

Based on the statement above, describe an experiment to investigate the effect of **temperature** or **concentration** on the rate of reaction between sodium thiosulphate, $Na_2S_2O_3$ solution and sulphuric acid, H_2SO_4.
Berdasarkan pernyataan di atas, huraikan satu eksperimen untuk mengkaji kesan suhu atau kepekatan terhadap kadar tindak balas di antara larutan natrium tiosulfat, $Na_2S_2O_3$ *dengan asid sulfurik,* H_2SO_4.

Your answer must include the following:
Jawapan anda perlu mengandungi perkara berikut:

- A list of material and apparatus
  Senarai bahan dan radas
- Procedure of the Experiment
  Prosedur eksperimen
- Conclusion
  Kesimpulan

[10 marks]

SET 3 : THERMOCHEMISTRY
(SECTION A)

1. Diagram 1 shows the apparatus set up used in experiment to determine heat of displacement of copper by zinc.
Rajah menunjukkan susunan radas yang digunakan dalam eksperimen untuk menentukan haba penyesaran kuprum oleh zink.

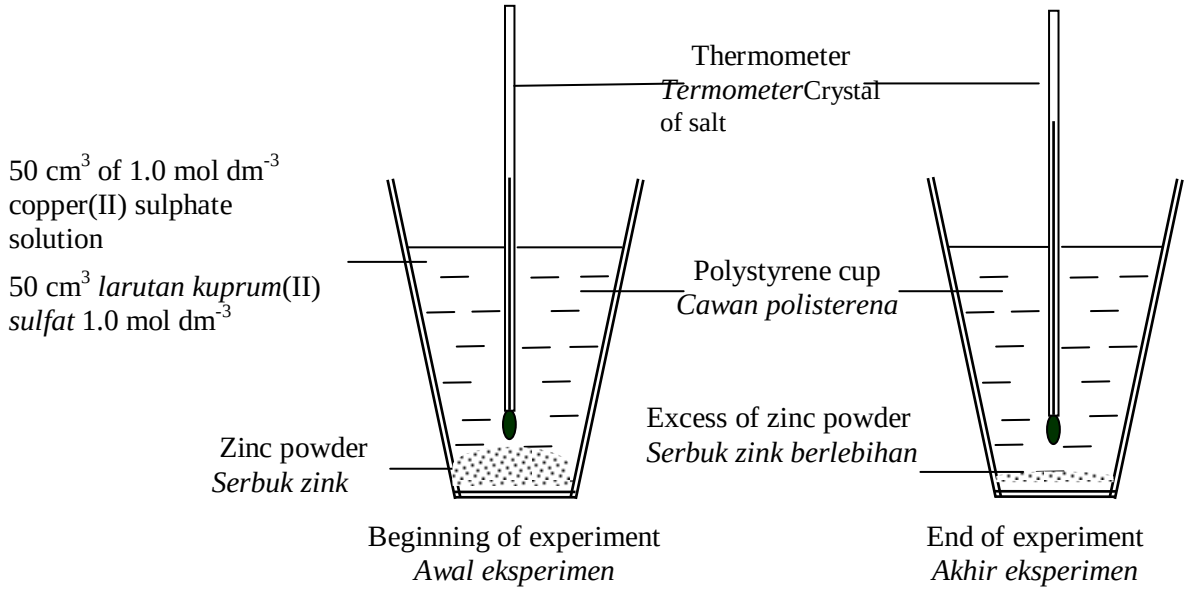


Diagram 1.1 / *Rajah* 1.1

Table 1.1 shows the results of this experiment.
Jadual 1.1 menunjukkan keputusan eksperimen ini.

Description/*Penerangan*	**Temperature (^oC)/*Suhu* (^oC)**
Initial temperature of copper(II) sulphate solution *Suhu awal larutan kuprum*(II) *sulfat*	29 .0
Highest temperature of mixture *Suhu tertinggi campuran*	35.0

Table 1.1 / *Jadual* 1.1

Based on the experiment,

(a) What is the meaning of heat of displacement?
Apakah yang dimaksudkan dengan haba penyesaran?

.....

.....

[1 *mark*]

(b) What is the colour change of copper(II) sulphate solution in this reaction ?
Apakah perubahan warna larutan kuprum(II) *sulfat dalam tindak balas ini ?*

.....

[1 *mark*]

(c) Calculate/ *Hitungkan*

(i) The heat released during the reaction/ *Haba yang dibebaskan semasa tindak balas*.
[Specific heat capacity of solution , c = 4.2 J g^{-1} ^{o} C^{-1} ; Density of solution = 1 g cm^{-3}]
[*Muatan haba tentu larutan* , c = 4.2 J g^{-1} ^{o} C^{-1} *; Ketumpatan larutan* = 1 g cm^{-3}]

[1 *mark*]

(ii) The number of moles of copper (II) sulphate solution.
Bilangan mol larutan kuprum(II) *sulfat yang bertindak balas.*

[1 *mark*]

(iii) The heat of displacement copper by zinc
Haba penyesaran kuprum oleh zink

[2 *marks*]

(d) Draw an energy level diagram for this reaction.
Lukis gambar rajah aras tenaga bagi tindak balas ini.

[3 *marks*]

(e) (i) What is the temperature change if the experiment is repeated using 50 cm^3 of 0.5 $moldm^{-3}$ copper(II) sulphate solution?
Apakah perubahan suhu jika eksperimen diulangi dengan menggunakan 50 cm^3 *larutan kuprum*(II) *sulfat* 0.5 mol dm^{-3} ?

…….....

[1 *mark*]

(ii) Explain your answer in (e)(i).
Terangkan jawapan anda (e)(i).

…….....

…….....

[2 *marks*]

2. Diagram 2.1 shows the apparatus set up to determine the heat of precipitation of silver chloride.
Rajah 2.1 menunjukkan susunan radas untuk menentukan haba pemendakan argentum klorida.

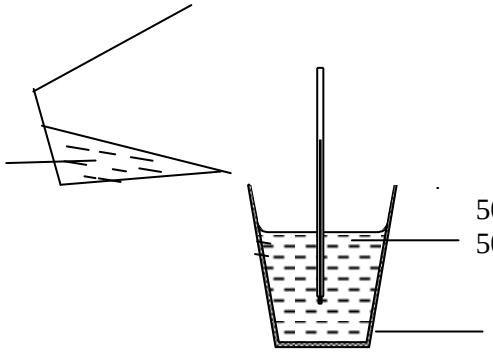


Diagram 2.1 / *Rajah* 2.1

Table 2 shows the result of the experiment.
Jadual 2 menunjukkan keputusan eksperimen ini.

Description *Penerangan*	Temperature (^{0}C) *Suhu (^{0}C)*
Initial temperature of sodium chloride solution *Suhu awal larutan natrium klorida*	27.0
Initial temperature of silver nitrate solution *Suhu awal larutan argentum nitrat*	27.0
Highest temperature of the mixture *Suhu maksimum campuran*	30.5

Table 2 / *Jadual* 2

(a) What is the meaning of heat of precipitation?
Apakah maksud haba pemendakan?

……..……..

……..……..
[1 *mark*]

(b) Why is polystyrene cup is used in this experiment?
Mengapakah bekas polisterina digunakan dalam eksperimen ini?

……..……..
[1 *mark*]

(c) Write the ionic equation for the reaction
Tuliskan persamaan ion bagi tindakbalas ini

……..……..
[1 *mark*]

(d) Calculate :
Hitung :

(i) The heat released during the reaction.
[Specific heat capacity of solution, c = 4.2 J $g^{-10}C^{-1}$; Density of solution = 1 g cm^{-3}]
Haba yang dibebaskan semasa tindak balas.
[*Muatan haba tentu bagi larutan,* c = 4.2 J $g^{-10}C^{-1}$ *;Ketumpatan larutan* = 1 g cm^{-3}]

[1 *mark*]

(ii) The number of moles of silver ions, Ag^+ in silver nitrate and chloride ions, Cl^- in sodium chloride solution
Bilangan mol ion argentum, Ag^+*dalam larutan argentum nitrat dan ion klorida* ,Cl^- *dalam larutan natrium klorida*

[2 *marks*]

(iii) The number of moles of silver chloride, AgCl formed in this experiment
Bilangan mol argentum klorida, AgCl *yang terbentuk dalam eksperimen ini.*

[1 *mark*]

(iv) The heat of precipitation.
Haba pemendakan

.

[2 *marks*]

(e) (i) Write a thermochemical equation for the reaction
Tulis persamaan termokimia untuk tindak balas itu.

……

[1 *mark*]

(ii) Draw an energy level diagram for this reaction.
Lukis gambar rajah aras tenaga bagi tindak balas ini.

[3 *marks*]

3. The combustion of an alcohol in air is represented by the equation below:
Pembakaran suatu sebatian alkohol dalam udara diwakili oleh persamaan berikut:

$$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O \quad \Delta H = -1260 \text{ kJ mol}^{-1}$$

(a) (i) State the name of the alcohol in the above equation.
Nyatakan nama bagi sebatian alkohol di dalam persamaan di atas.

……..……..……

[1 *mark*]

(ii) What is meant by '$\Delta H = -1260$ kJ mol^{-1}' in the above equation?
Apakah yang dimaksudkan dengan '$\Delta H = -1260$ kJ mol^{-1}*' dalam persamaan di atas?*

……..……..……

[1 *mark*]

(b) 200 g of water is heated by the combustion of 0.23 g of the alcohol.
200 g air dipanaskan oleh pembakaran 0.23 g alcohol tersebut.

(i) Calculate the heat released by the alcohol in the reaction.
[Relative Atomic Mass: H=1; C=12 and O=16]
Kirakan haba yang dibebaskan oleh alkohol itu dalam tindak balas.
[*Jisim atom relatif:* H=1*;* C=12 *and* O=16]

[2 *marks*]

(ii) Calculate the temperature change of water in the experiment.
[Specific heat capacity of water: 4.2 J g^{-1} ^{o}C^{-1}]
Kirakan perubahan suhu air yang dijangkakan dalam eksperimen itu.
[*Muatan haba tentu air:* 4.2 J g^{-1} ^{o}C^{-1}]

[2 *marks*]

(c) Why is the value of heat of combustion obtained is always less than the actual value?
Mengapa nilai haba pembakaran yang didapati biasanya lebih rendah daripada nilai yang sebenar?

……..……..

[1 *mark*]

(d) (i) Draw the energy level diagram for the combustion of the alcohol.

Lukis gambarajah aras tenaga untuk pembakaran alkohol tersebut.

[*3 marks*]

(ii) Draw a labeled diagram showing the apparatus set up to determine heat of combustion of the alcohol in the laboratory
Lukis gamba rajah berlabel menunjukkan susunan radas bagi menentukan haba pembakaran alcohol tersebut dalam makmal

[*2 marks*]

(e) Table 3 below shows the heat of combustion of various alcohols.
Jadual 3 *di bawah menunjukkan haba pembakaran bagi pelbagai alkohol*.

Number of carbon atoms per molecule of alcohol *Bilangan atom karbon per molekul alkohol*	Molecular formula *Formula molekul*	Name of substances *Nama sebatian*	Heat of combustion *Haba pembakaran* (kJ / mol^{-1})
1	CH_3OH	Methanol	-728
2	C_2H_5OH		-1376
3	C_3H_7OH	Propanol	-2016
4	C_4H_9OH	Butanol	

Table 3 / *Jadual* 3

(i) Predict the heat of combustion of butanol.
Ramalkan haba pembakaran bagi butanol.

.....

[1 *mark*]

(ii) Heat of combustion of propanol is higher than methanol. Explain why.
Haba pembakaran propanol lebih tinggi dari metanol. Terangkan mengapa.

……

……

……

[3 *marks*]

SET 3 : THERMOCHEMISTRY
(SECTION B)

4. (a) Diagram 4.1 and 4.2 show energy level diagrams.
Rajah 4.1 dan 4.2 menunjukkan gambar rajah aras tenaga.

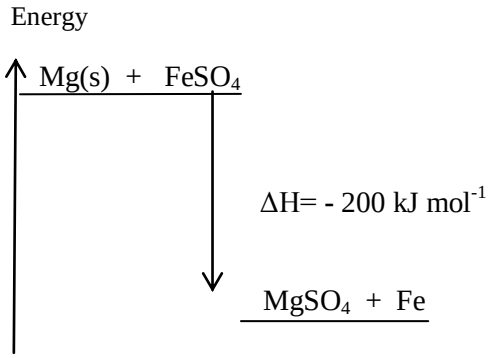


Diagram 4.1 / *Rajah* 4.1

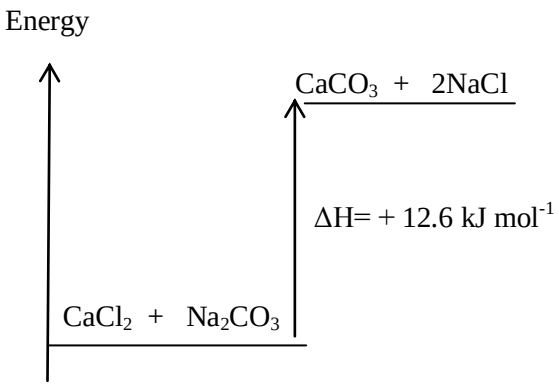


Diagram 4.2 / *Rajah* 4.2

(i) Compare both the energy level diagrams above. Your comparison should include the following
Bandingkan kedua-dua gambar rajah aras tenaga di atas. Perbandingan anda haruslah mengandungi perkara berikut.

- Change in temperature.
Perubahan suhu.
- Type of chemical reaction based on temperature change.
Jenis tindak balas kimia berdasarkan perubanan suhu.
- Total energy content of reactants and products .
Jumlah kandungan tenaga bahan dan hasil tindak balas.
- Amount of heat absorbed /realeased during breaking of bonds in the reactants and formation of bonds in the products
- *Jumlah tenaga yang diserap dan dibebaskan/diserap semasa pemecahan ikatan dalam bahan tindakbalas/hasiltindakbalas*

[6 *marks*]

(ii) Based on Diagram 4.1, calculate the change in temperature of the solution if excess magnesium powder is added to 50 cm^3 of 0.2 mol dm^{-3} iron(II) sulphate solution.
[Specific heat capacity of solution : 4.2 J g^{-1} $^oC^{-1}$]

Berdasarkan Rajah 4.1, *hitung perubahan suhu larutan jika serbuk magnesium berlebihan ditambah kepada* 50 cm^3 *larutan ferum(II) sulfat 0.2 mol* dm^{-3}.
[Muatan haba tentu larutan : 4.2 J g^{-1} $^oC^{-1}$ *]*

[3 *marks*]

(b Table 4.1 shows the result of the two experiments to determine heat of precipitation of silver chloride.
Jadual 4.1 *menunjukan keputusan dua eksperimen untuk menentukan haba pemendakan argentum klorida.*

Experiment *Eksperimen*	Reactants *Bahan tindak balas*	Temperature rise of the reaction mixture/ ^{o}C *Kenaikan suhu tindak balas campuran /* ^{o}C
I	25 cm^3 of 0.5 mol dm^{-3} silver nitrate solution + 25 cm^3 of 0.5 mol dm^{-3} **sodium chloride** solution. 25 cm^3 *larutan argentum nitrat* 0.5 mol dm^{-3} + 25 cm^3 *larutan* ***natrium klorida*** 0.5 mol dm^{-3}	3
II	25 cm^3 of 0.5 mol dm^{-3} silver nitrate solution + 25 cm^3 of 0.5 mol dm^{-3} **potassium chloride** solution. 25 cm^3 *larutan argentum nitrat* 0.5 mol dm^{-3} + 25 cm^3 *larutan kalium klorida* 0.5 mol dm^{-3}.	3

Table 4.1 / *Rajah* 4.1

Explain why the temperature rise of the reaction mixture in reaction I and II is the same.
Terangkan mengapa kenaikan suhu tindak balas campuran dalam tindak balas I *dan* II *adalah sama.*

[4 *marks*]

(c) A student carried out an experiment to determine the heat of neutralisation for the reaction between 50 cm^3 of 2.0 mol dm^{-3} hydrochloric acid and 50 cm^3 of 2.0 mol dm^{-3} sodium hydroxide solution.
Seorang pelajar telah menjalankan satu eksperimen untuk menentukan haba peneutralan bagi tindak balas antara 50 cm^3 *asid hidroklorik* 2.0 mol dm^{-3} *dengan* 50 cm^3 *larutan natrium hidroksida* 2.0 mol dm^{-3}.

The following data was obtained :
Data berikut telah diperoleh :

Initial temperature of hydrochloric acid = 30.2 ^{o}C
Suhu awal asid hidroklorik
Initial temperature of sodium hydroxide solution = 30.2 ^{o}C
Suhu awal larutan natrium hidroksida
Highest temperature of the mixture of the solutions = 42.2 ^{o}C
Suhu maksimum campuran larutan

(i) Calculate the heat of neutralisation for this reaction.
[Specific heat capacity of solution = 4.2 J g^{-1} $^{o}C^{-1}$]
Hitungkan haba peneutralan bagi tindak balas ini.
[*Muatan haba tentu larutan* = 4.2 J g^{-1} $^{o}C^{-1}$]

[4 *marks*]

(ii) If the experiment is repeated using sulphuric acid to replace hydrochloric acid and all other conditions are the same, predict the temperature change. Explain your answer.
Jika eksperimen diulang dengan menggunakan asid sulfurik untuk menggantikan asid hidroklorik tetapi semua keadaan lain adalah sama, ramalkan perubahan suhu yang dijangkakan.Terangkan jawapan anda.

[4 *marks*]

5. Table 5 shows thermochemical equations of Experiment 1 and Experiment 2.
Jadual 5 *menunjukkan persamaan termikimia bagi Eksperimen* 1 *dan Eksperimen* 2.

Experiment ***Eksperimen***	**Thermochemical Equation** ***Persamaan Termokimia***
1	$NaOH + HCl \rightarrow NaCl + H_2O \quad \Delta H = -57.3\ kJmol^{-1}$
2	$NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O \quad \Delta H = -51.5\ kJmol^{-1}$

Table 5 /*Jadual 5*

(a) Based on Table 5,
Berdasarkan Jadual 5,

(i) state the type of reaction.
nyatakan jenis tindak balas [1 *mark*]

(ii) state the differences between the total energy content of the reactants and the total energy content of products in both reactions.
nyatakan perbezaan di antara jumlah kandungan tenaga bahan tindak balas dan jumlah kandungan tenaga hasil tindak balas dalam kedua-dua tindak balas.
[1 *mark*]

(iii) explain the difference in the heat of neutralization for the reactions.
jelaskan perbezaan haba peneutralan bagi tindak balas–tindak balas. [5 *marks*]

(b) In Experiment 1, 50 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution is reacted with 50 cm^3 of 1.0 mol dm^{-3} of hydrochloric acid solution.
Di dalam Eksperimen 1, 50 cm^3 *larutan natrium hidroksida, 1.0* mol dm^{-3} *ditindak balaskan dengan* 50 cm^3 *larutan asid hidroklorik,* 1.0 $moldm^{-3}$.

(i) Calculate the heat released in the reaction.
Kirakan haba yang terbebas dari tindak balas.
[3 marks]

(ii) What is the temperature change of the reaction mixture?
Berapakah perubahan suhu campuran tindak balas?
[Specific heat capacity = 4.2 J $g^{-1}\,^0C^{-1}$, density of solution = 1 g cm^{-3}]
[*Muatan haba tentu larutan* = 4.2 J $g^{-1}\,^0C^{-1}$, *ketumpatan larutan = 1 g* cm^{-3}]
[3 *marks*]

(iii) The heat of neutralisation obtained in laboratory is less than its theoretical value. Explain.
Nilai haba peneutralan yang diperolehi di makmal adalah lebih rendah daripada nilai teorinya. Jelaskan.
[2 *marks*]

(c) Diagram 5.2 shows two energy level diagrams of different reactions.
Rajah 5.2 *menunjukkan dua gambar rajah aras tenaga bagi tindak balas berlainan.*

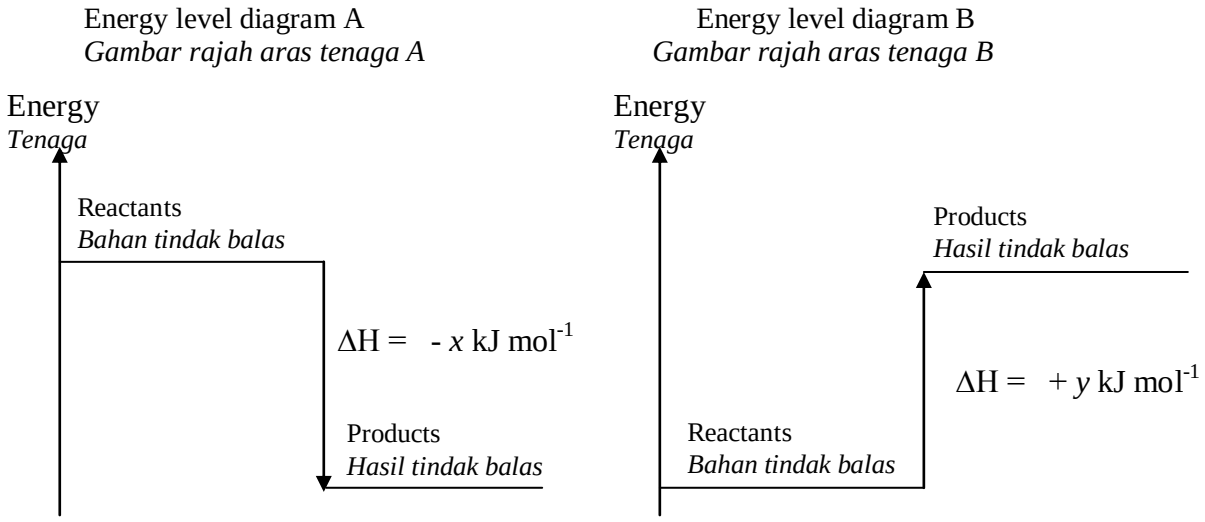


Diagram 5.2 /*Rajah 5.2*

Based on Diagram 5.2, compare the energy level diagram A and energy level diagram B.
Berdasarkan Rajah 5.2, *bandingkan gambar rajah aras tenaga* A *dan gambar rajah aras tenaga* B.
[5 marks]

SET 3 : THERMOCHEMISTRY (SECTION C)

6 (a) The thermochemical equation for the displacement of copper from copper(II) sulphate solution by zinc is bellow
Persamaan termokimia bagi penyesaran kuprum daripada larutan kuprum(II) sulfat oleh zink adalah seperti berikut :

Zn(s) + $CuSO_4$(aq) → $ZnSO_4$(aq) + Cu(s) $\Delta H = -152$ kJmol^{-1}

(i) Draw an energy level diagram for the above equation.
Lukiskan gambarajah aras tenaga bagi persamaan di atas.

[2 *marks*]

(ii) Explain the differences in energy content of reactants compare to products.
Terangkan perbezaan kandungan tenaga dalam bahan tindak balas berbanding dengan hasil tindak balas.

[2 *marks*]

(b) 50 cm^3 of 1.0 mol dm^{-3} hydrochloric acid is reacted with 50.0 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution. The change in temperature of the mixture is 7 ^{o}C.
Calculate the heat of neutralization for this reaction.

50 cm^3 *asid hidroklorik* 1.0 mol dm^{-3} *bertindak balas dengan* 50.0 cm^3 *larutan natrium hidroksida* 1.0 mol dm^{-3} . *Perubahan suhu campuran ialah 7 ^{o}C.*
Hitungkan haba peneutralan bagi tindak balas ini
[Specific heat capacity of solution = 4.2 J g^{-1} ^{o}C^{-1} ; Density of solution = 1 g cm^{-3}]
[*Muatan haba tentu larutan* = 4.2 J g^{-1} ^{O}C^{-1} *; Ketumpatan larutan*= 1 g cm^{-3}]

[4 *marks*]

(c) Table 6.1 shows the molecular formula and the heat of combustion for ethane and propane.
Jadual 6.1 *menunjukkan formula molekul dan haba pembakaran bagi etana dan propana.*

Alkane *Alkana*	**Molecular Formula** *Formula molekul*	**Heat of combustion/ kJ mol^{-1}** *Haba Pembakaran/* **kJ mol^{-1}**
Ethane *Etana*	C_2H_6	-1602
Propane *Propana*	C_3H_8	-2202

Table 6.1 /*Jadual* 6.1

Based on the information in Table 6.1, explain why there is a difference in the values of the heat of combustion between ethane and propane.
Berdasarkan maklumat dalam Jadual 9, terangkan mengapa nilai haba pembakaran bagi etana dan propana berbeza.

[3 *marks*]

(d) Describe a laboratory experiment to determine the heat of combustion of a named alcohol with a number of carbon atom per molecule less than four. In your description, include a labeled diagram and the steps involved in the calculation.
[Relative atomic mass: C =12, O =16, H = 1]
[Specific heat capacity of solution = 4.2 J g^{-1} ^{O}C^{-1} ; Density of solution = 1 g cm^{-3}]

Terangkan eksperimen makmal untuk menentukan haba pembakaran bagi alkohol yang dinamakan dengan bilangan atom karbon per molekul kurang daripada empat. Dalam penerangan anda sertakan gambar rajah berlabel dan langkah pengiraan yang terlibat.
[*Jisim atom relatif:* C =12, O =16, H = 1]
[*Muatan haba tentu larutan* = 4.2 J g^{-1} ^{O}C^{-1}*; Ketumpatan larutan = 1 g cm*$^{-3}$]

[10 *marks*]

7. (a) A student is carried out an experiment in the laboratory to determine the heat of precipitation of silver chloride, AgCl using the following chemical substances :
Seorang pelajar telah menjalankan satu eksperimen dalam makmal untuk menentukan haba pemendakan argentum klorida, AgCl *menggunakan bahan-bahan kimia berikut :*

- 25 cm^3 of 0.5 mol dm^{-3} silver nitrate solution
  25 cm^3 *larutan argentum nitrat* 0.5 mol dm^{-3}
- 25 cm^3 of 0.5 mol dm^{-3} sodium chloride solution
  25 cm^3 *larutan larutan natrium klorida* 0.5 mol dm^{-3}

Table 7.1 shows the result of the experiment:
*Jadual 7.*1 *menunjukkan keputusan eksperimen tersebut :*

Initial temperature of silver nitrate, $AgNO_3$ solution *Suhu awal larutan argentum nitrat,* $AgNO_3$	29.0 ^{o}C
Initial temperature of sodium chloride, NaCl solution *Suhu awal larutan natrium klorida,* NaCl	29.0 ^{o}C
Highest temperature of reaction mixture *Suhu tertinggi campuran tindak balas*	33.0 ^{o}C

Table 7.1 / *Jadual* 7.1

(i) Calculate the heat of precipitation of silver chloride
Hitung haba pemendakan argentum klorida.
[Specific heat capacity for all solution is 4.2 $Jg^{-1o}C^{-1}$ and the density of all solution is 1.0 g cm^{-3}]
[*Muatan haba tentu bagi semua larutan ialah* 4.2 $Jg^{-1o}C^{-1}$ *dan ketumpatan bagi semua larutan ialah* 1.0 g cm^{-3}]

(ii) Draw an energy level diagram for the reaction between silver nitrate and sodium chloride.
Lukiskan rajah aras tenaga bagi tindak balas antara argentum nitrat dan natrium klorida.

[4 *marks*]

(b) Table 7.2 shows the heat released for Experiment I, II and III for different acids that has been reacted with sodium hydroxide solution.
Jadual 7.2 *menunjukkan haba yang dibebaskan bagi tindak balas* I , II *dan* III *menggunakan asid berlainan yang ditindakbalaskan dengan larutan natrium hidroksida.*

Experiment *Eksperimen*	Chemical Equation *Persamaan kimia*	Heat of neutralisation *Haba peneutralan* (kJ mol^{-1})
I	$HCl + NaOH \rightarrow NaCl + H_2O$	57
II	$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$	54
III	$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$	57

Table 7.2 / *Jadual* 7.2

Based on Table 7.2, explain the difference in heat released between:
Berdasarkan Jadual 7.2, *terangkan perbezaan dalam haba dibebaskan antara* :

(i) Experiment I and Experiment II
Eksperimen I *dan Eksperimen* II

(ii) Experiment I and Experiment III
Eksperimen I *dan Eksperimen* III

[6 *marks*]

(c) Describe a laboratory experiment to determine the heat of displacement of metal by a more electropositive metal. In your description, include the following aspects :
Huraikan satu eksperimen makmal untuk menentukan haba penyesaran logam oleh logam yang lebih elektropositif. Dalam huraian anda, sertakan aspek-aspek berikut:

- Materials and apparatus needed
Bahan-bahan dan radas yang diperlukan
- Procedure of experiment
Prosedur eksperimen
- A table to collect data
Jadual untuk mengumpul data
- Calculation method
Kaedah penghitungan

[10 *marks*]

CHEMISTRY MODULE

http://cikguadura.wordpress.com/

SET ④

1. **Carbon Compounds**
2. **Manufactured Substancesin Industry**
3. **Chemicals for Consumers**

SET 4 : CARBON COMPOUNDS
(SECTION A)

1. Diagram 1.1 shows few series of chemical reactions of alcohol T with molecular formula C_3H_8O.
Rajah 1.1 menunjukkan satu siri tindak balas kimia bagi alcohol T dengan formula molekul C_3H_8O.

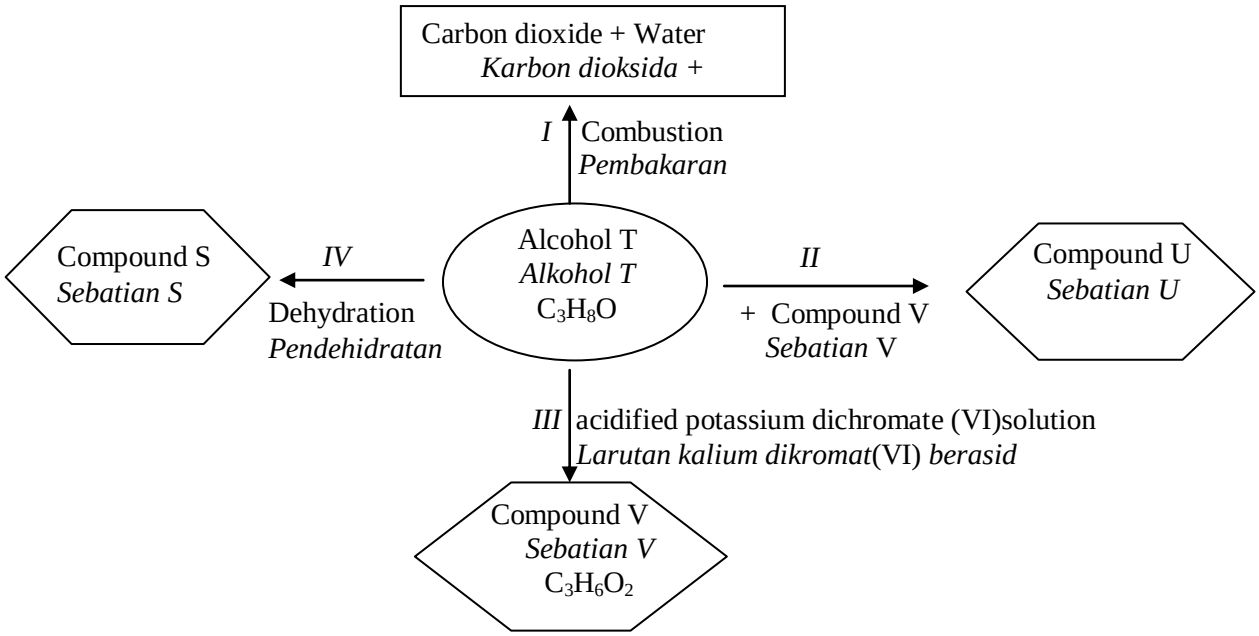


Diagram 1.1/ *Rajah 1.1*

(a) Draw the structural formula of alcohol T.
Lukiskan formula struktur bagi alkohol T

[1 *mark*]

(b) Write the chemical equation for the complete combustion of alcohol T in conversion *I*
Tuliskan persamaan kimia bagi pembakaran lengkap bagi alkohol T dalam perubahan I

…….....

[1 *mark*]

(c) Compound U is a colourless liquid.
Sebatian U ialah cecair yang tidak berwarna

(i) State a special characteristic of compound U .
Nyatakan satu ciri istimewa bagi sebatian U

……

[1 *mark*]

(ii) Name the organic compound W that is required in reaction of conversion *II*
Namakan sebatian organik W yang diperlukan dalam tindakbalas bagi perubahan II

……

[1 *mark*]

(iii) Draw the structural formula of compound U.
Lukiskan formula struktur bagi sebatian U.

[1 *mark*]

(d) (i) Name the reaction in conversion *III* to produce compound V .
Namakan tindakbalas dalam perubahan III untuk menghasilkan sebatian V.T

…….

[1 *mark*]

(ii) State an observation in the reaction of conversion *III*
Nyatakan satu pemerhatian dalam tindak balas bagi perubahan III.

…….

[1 *mark*]

(iii) Write the chemical reaction for the reaction in conversion *III*
Tuliskan persamaan kimia bagi tindak balas dalam perubahan III

…….

[1 *mark*]

(e) Write the chemical equation for the reaction in conversion *IV.*

…….

[1 *mark*]

(f) Draw a labeled diagram to show the set-up of apparatus that can be used for conversion *IV* in laboratory.
Lukiskan gambar rajah berlabel untuk menunjukkan susunan radas yang digunakan untuk perubahan IV dalam makmal.

.

[2 *marks*]

2. Diagram 2 shows a series of reactions involving compound Q with molecular formula C_2H_6O.
R*ajah 2 menunjukkan satu siri tindak balas melibatkan sebatian Q, dengan formula molekul* C_2H_6O

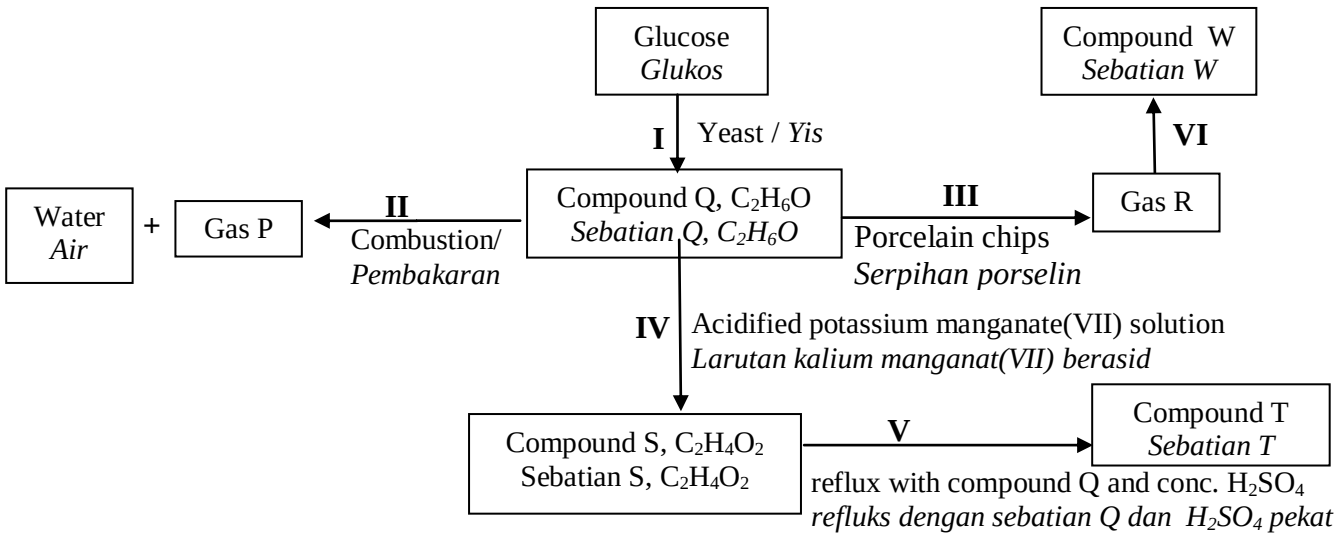


Diagram 2/ *Rajah 2*

(a) (i) State the name of reaction I.
Nyatakan nama bagi tindak balas I

……...…….

[1 *mark*]

(ii) Name of compound Q.
Namakan sebatian Q.

…….....……

[1 *mark*]

(b) Write a chemical equation for the complete combustion of compound Q in reaction II.
Tuliskan satu persamaan kimia bagi pembakaran lengkap sebatian Q dalam tindak balas II

……...……

[2 *marks*]

(c) (i) State the name of gas R that is produced in reaction III.
Nyatakan nama bagi gas R yang dihasilkan dalam tindak balas III.

……...…….

[1 *mark*]

(ii) Gas R undergoes addition polymerisation to form polymer W in reaction VI.
Draw the structural formula for polymer W.
Gas R menjalankan pempolimeran tambahan dengan membentuk polimer W dalam tindak balas VI. Lukiskan formula struktur bagi polimer W.

[1 *mark*]

(d) State the change of colour of acidified potassium manganate(VII) solution in reaction IV.
Nyatakan perubahan warna bagi larutan kalium manganat(VII) berasid dalam tindakbalas IV.

……

[1 *mark*]

(e) (i) State the name of compound T.
Nyatakan nama bagi sebatian T

……

[1 *mark*]

(ii) Write the chemical equation for reaction V
Tuliskan persamaan kimia bagi tindak balas V

……

[2 *marks*]

SET 4 : CARBON COMPOUNDS
(SECTION B)

3 (a) Table 3 shows some information about three members of a homologous series.
Jadual 3 menunjukkan maklumat bagi tiga ahli sesuatu siri homolog

Member of homologous series *Ahli siri homolog*	**Boiling point** *Takat didih* **(°C)**	**Preparation** *Penyediaan*	**Product formed when oxidized** *Hasil terbentuk bila dioksidakan*
Ethanol *Etanol*	78	$C_2H_4 + H_2O \rightarrow C_2H_5OH$	Ethanoic acid *Asid etanoik*
Propanol *Propanol*	97	$C_3H_6 + H_2O \rightarrow C_3H_7OH$	Propanoic acid *Asid propanoik*
Butanol *Butanol*	118	$C_4H_8 + H_2O \rightarrow C_4H_9OH$	Butanoic acid *Asid butanoik*

Table 3 / *Jadual 3*

Based on Table 5, state and explain five characteristics of a homologous series.
Berdasarkan Jadual 5, nyatakan dan terangkan lima ciri-ciri sesuatu siri homolog.

[10 *marks*]

(b) The following information is about an organic compound X.
Berikut adalah maklumat tentang sebatian organik X

- Empirical formula is CH_2O
  Formula empiriknya ialah CH_2O
- Relative molecular mass is 60
  Jisim Molekul Relatifnya ialah 60
- Reacts with calcium carbonate to produce a type of gas that turns lime water chalky
  Bertindak balas dengan kalsium karbonat untuk menghasilkan sejenis gas yang mengeruhkan air kapur

Based on the information given:
Berdasarkan maklumat yang diberikan

(i) Determine the molecular formula of X.
(Relative atomic mass : C = 12, H = 1, O = 16)
Tentukan formula molekul bagi X
(Jisim atom relatif : C = 12, H = 1, O = 16)

[2 *marks*]

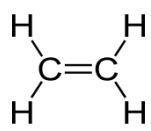
(ii) State the name of the homologous series for X and explain your answer.
Nyatakan nama bagi siri homolog bagi X dan terangkan jawapan anda.

[2 *marks*]

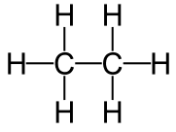
(iii) Write a balanced chemical equation for the reaction of compound X with calcium carbonate.
Tuliskan satu persamaan kimia bagi tindak balas sebatian X dengan kaslium karbonat.

[2 *marks*]

(c) Diagram 5 shows the structural formulae of hydrocarbon P and Q.
Rajah 5 menunjukkan formula struktur bagi hidrokarbon P dan Q.



Hydrocarbon P
Hydrocarbon P



Hydrocarbon Q
Hidrocarbon Q

Diagram 5/ *Rajah 5*

Compare and contrast these two hydrocarbons based on their structures.
Bezakan dan bandingkan kedua-dua hidrokarbon ini berdasarkan strukturnya.

[4 *marks*]

4. (a) A hydrocarbon M, consists of 85.7% of carbon and X% of hydrogen by mass.
[Relative atomic mass: C = 12; H = 1 , Relative molecular mass of M = 56.]
Hidrokarbon M terdiri daripada 85.7% karbon dan X % hidrogen mengikut jisim
[Jisim atom relatif : C = 12; H = 1 , Jisim molekul relatif M =56]

(i) What is the value of X?
Apakah nilai X ?

[1 *mark*]

(ii) Determine the empirical formula and molecular formula of hydrocarbon X.
Tentukan formula empirik dan formula molekul bagi hidrokarbon X.

[5 *marks*]

(iii) Draw the structural formula and name the two isomers of hydrocarbon M.
Lukiskan formula struktur bagi dua isomer untuk hidrokarbonM dan namakannya

[4 *marks*]

(iv) Compound M burns with sootier flames as compared to butane. Explain.
Sebatian M membakar dengan nyalaan yang lebih berjelaga jika dibandingkan dengan butana. Terangkan.

[3 *marks*]

(b) Natural rubber is a natural polymer.
Getah asli ialah polimer semulajadi

(i) Give another two examples of natural polymer.
Berikan dua lagi contoh polimer semulajadi

[2 *marks*]

(ii) Draw the structural formula and name the monomer of natural rubber.
Lukiskan formula struktur monomer bagi getah asli dan namakannya.

[2 *marks*]

(c) The tyres of aircrafts are made from vulcanised rubber.
Tayar kapalterbang diperbuat daripada getah tervulkan

(i) What is vulcanised rubber?
Apakah getah tervulkan?

[1 *marks*]

(ii) Explain why vulcanised rubber is more elastic than unvulcanised rubber.
Terangkan mengapa getah tervulkan adalah lebih kenyal daripada getah tak tervulkan

[2 *marks*]

5. (a) Diagram 5.1 shows the structural formula of two hydrocarbons.
Rajah 2.1 menunjukkan formula struktur bagi dua hidrokarbon

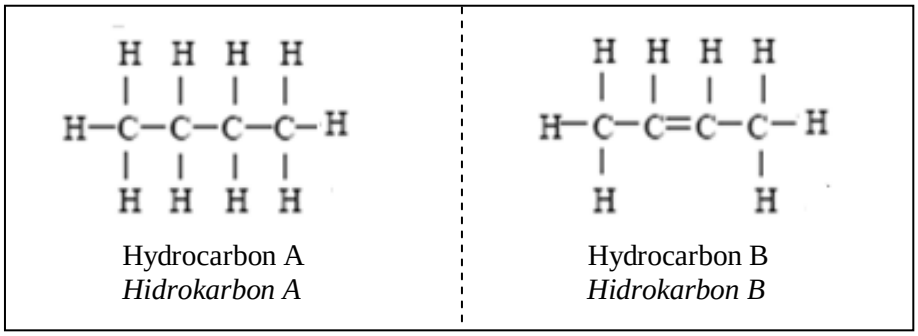


Diagram 5.1/*Rajah52.1*

(i) State the type of bond, homologous series and general formula of hydrocarbon A and B.
Nyatakan jenis ikatan, siri homolog dan formula umum bagi hidrokarbon A dan B.

[6 *marks*]

(ii) Complete combustion of hydrocarbon A produces gas C and water.
State the name of gas C and write the chemical equation for the reaction.
Pembakaran lengkap hidrokarbon A menghasilkan gas C dan air.
Nyatakan nama bagi gas C dan tuliskan persamaan kimia bagi tindak balasnya.

[3 *marks*]

(iii) Which hydrocarbon change the colour of bromine water from brown to colourless. Explain your answer.
Manakah satu hidrokarbon boleh menukarkan warna air bromin dari perang ke tak berwarna? Terangkan jawapan anda.

[3 *marks*]

(iv) Diagram 2.2 shows the burning of hydrocarbon A and B in air.
Rajah 5.2 menunjukkan pembakaran hidrokarbon A dan B dalam udara.

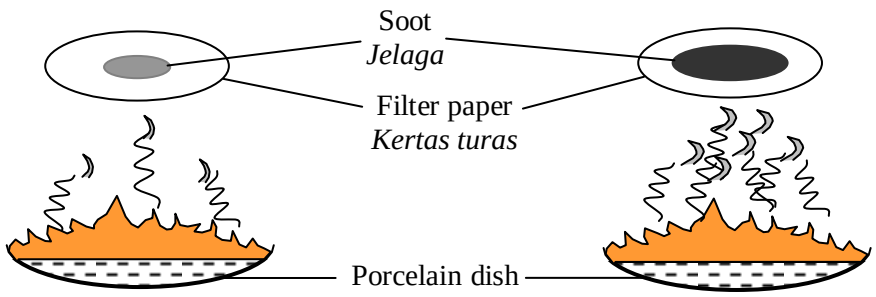


Diagram 5.2
Rajah 5.2

Compare the sootiness of hydrocarbon A and hydrocarbon B.
Explain your answer. [Given that the relative atomic mass of H = 1, C = 12]

Bandingkan kejelagaan hidrokarbon A dan B.
Terangkan jawapan anda. [Diberikan jisim molekul relative H = 1, C = 12]

[4 *marks*]

(b) Diagram 5.3 shows the reaction between carboxylic acid X and alcohol Y.
Rajah 5.3 menunjukkan tindak balas antara asid karboksilik dan alkohol Y

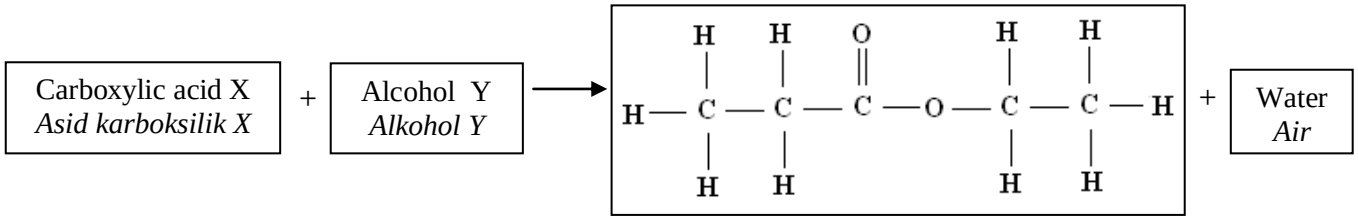


Diagram 5.3/ *Rajah 5.3*

Draw the structural formula and state the name of carboxylic acid X and alcohol Y.
Lukiskan formula struktur dan namakan asid karboksilik X dan alcohol Y.

[4 *marks*]

SET 4 : CARBON COMPOUNDS
(SECTION C)

6.(a) Table 6.1 shows the result of two sets of experiment to investigate the coagulation of latex.
Jadual 3.1 menunjukkan keputusan bagi dua set eksperimen untuk menyiasat penggumpalan getah

Set	Type of solution added Jenis larutan ditambahkan	Observation *Pemerhatian*
I	Latex + solution X *Susu getah + larutan X*	Latex coagulate very fast *Susu getah menggumpal dengan cepat*
II	Latex + solution Y *Susu getah + larutan Y*	Latex does not coagulate *Susu getah tidak menggumpal*

Table 6.1/*Jadual 6.1*

(i) Suggest one possible substance for solution X. and Y
Cadangkan satu bahan yang mungkin bagi larutan X dan Y

[2 *marks*]

(ii) Explain the process of coagulation of latex in set I
Terangkan proses penggumpalan susu getah dalam set I

[4 *marks*]

(iii) Explain why latex does not coagulate in set II
Terangkan mengapa susu getah tidak menggumpal dalam set II.

[2 *marks*]

(b) Diagram 2.1 shows how compound Q is formed from alkene W.
Rajah 2.1 menunjukkan bagaimana sebatian Q terbentuk dari alkena W.

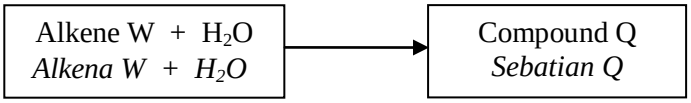


Diagram 2.1/*Rajah 2.1*

(i) Name the homologous series of compound Q.
Namakan siri homolog sebatian Q

[1 mark]

(ii) State two chemical properties of compound Q.
Nyatakan dua sifat kimia bagi sebatian Q.

[2 marks]

(iii) By using a compound Q with more than one carbon atom per molecule, describe an experiment to convert compound Q to alkene.

Your answer should consist of the following:

- Procedure of the experiment
- A labelled diagram showing the apparatus set-up
- The test to confirm the product is alkene

Dengan menggunakn sebatian Q yang mempunyai lebih daripada satu atom per molekul, huraikan satu eksperimen untuk menukarkan sebatian Q ke alkena.
Jawapan anda harus terdiri daripada yang berikut :

- *Prosedur eskperimen*
- *Gambarajah berlabel untuk menunjukkan susunan radas*
- *Ujian untuk mengesahkan hasilnya ialah alkena*

[9 marks]

7. Diagram 7.1 shows five structural formula of carbon compound.
Rajah 7.1 menunjukkan lima formula struktur bagi sebatian karbon.

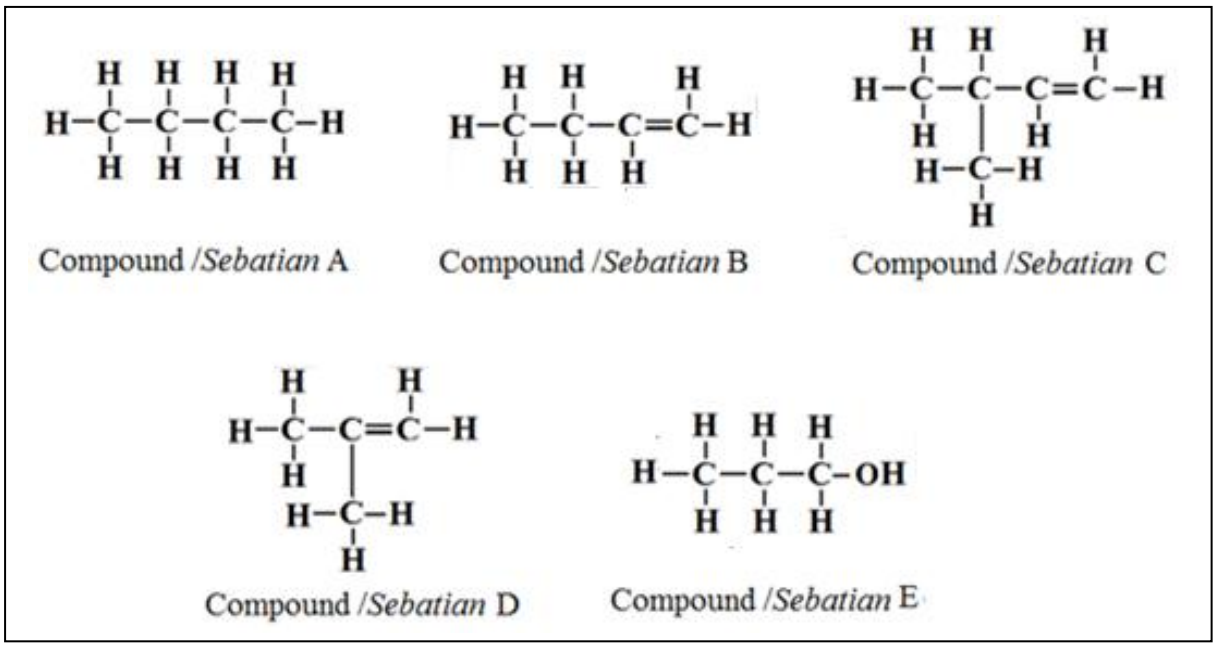


Diagram 7.1 /*Rajah 7.1*

(a) Choose any one of the compound in Diagram 7.1 , state the products formed when the compound burnt completely in excess oxygen gas.
Write the chemical equation involved.
Pilih sebarang satu sebatian dalam Rajah 7.1 , nyatakan hasil terbentuk bila sebatian dibakar dengan lengkap dalam gas oksigen berlebihan.
Tuliskan persamaan kimia yang terlibat.

[3 *marks*]

(b) State the name of two compounds in 7.1 that are isomers.
Explain your answer.
Nyatakan nama dua sebatian dalam Rajah 7.1 yang merupakan isomer.
Terangkan jawapan anda.

[3 *marks*]

(c) Describe a chemical test to differentiate between compound A and compound B.
Huraikan satu ujian kimia untuk membezakan sebatian A dan sebatian B.

[4 *marks*]

(d) Diagram 4.2 shows the reaction between compound E and carboxylic acid.
Rajah 4.2 menunjukkan tindak balas antara sebatian E dan asid karboksilik.

Compound E	**+**	**Carboxylic acid**	**→**	**ester**
Sebatian E	**+**	***Asid Karboksilik***	**→**	***ester***

Diagram 4.2/*Rajah 4.2*

(i) Give the name of a member of carboxylic acid and state the name of ester that formed when the named carboxylic acid react with compound E.
Draw the structural formula of named carboxylic acid and ester that formed.

Berikan nama bagi sebagai contoh asid karboksilik dan namakan ester terhasil bila asid karboksilik yang dinamakan bertindak balas dengan sebatian E.

[4 *marks*]

(ii) Describe an experiment to produce ester in (d) (i) in laboratory.
Huraikan satu eskperimen untuk menghasilkan ester dalam (d)(i) di makmal.

[6 *marks*]

8 (a) Diagram 8.1 shows a structural formula of butene,
Rajah 8.1 *menunjukkan formula struktur bagi butena.*

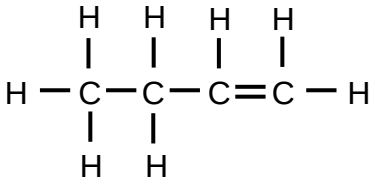


Diagram 8.1 /*Rajah 8*.1

Draw structural formulae for another two isomers of butene and name each isomer according to the IUPAC nomenclature.
Lukiskan formula struktur bagi dua lagi isomer bagi butena dan nama setiap isomernya mengikut penamaan IUPAC

[4 marks]

(b) Diagram 8.2 shows the structural formula of an ester
Rajah 8.2 menunjukkan formula struktur bagi sesuatu ester.

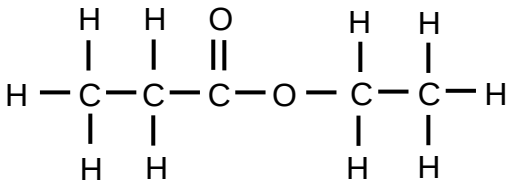


Diagram 8.2/*Rajah 8.2*

Based on diagram 85.2:
Berdasarkan rajah 8.2 :

(i) Identify the two organic chemicals needed to produce the ester above.
Tentukan dua bahan kimia organik yang diperlukan untuk menghasikan ester di atas.

[2 marks]

(ii) State three chemical properties for each organic chemicals that you stated in 8(b)(i).
Nyatakan tiga sifat kimia bagi setiap bahan kimia organik yang dinyatakan di 8 (b)(i).

[6 marks]

(c) Diagram 8..3 shows the formula of two hydrocarbons P and Q :
Rajah 8.3 menunjukkan formula bagi dua hidrokarbon P dan Q:

$CH_3(CH_2)_4CH_3$	$CH_3(CH_2)_3CH = CH_2$
P	Q

Diagram 8..3/ *Rajah 8.3.*

(i) State the name of hydrocarbons P and Q.
Nyatakan nama bagi hidrokarbon P dan Q.

(ii) Describe two chemical tests to differentiate between hydrocarbon P and Q.
Your description must include the procedure and observation
Huraikan dua ujian kimia untuk membezakan hidrokarbon P dan hidrokarbon Q.
Huraian anda mesti merangkumi prosedur dan pemerhatian.

[8 marks]

SET 4 : MANUFACTURED SUBSTANCESIN INDUSTRY
(SECTION A)

1. (a) Diagram 1 shows the manufacture of sulphuric acid, substance *L* and fertiliser *M*.
Rajah 1 menunjukkan penghasilan asid sulfurik, bahan L dan baja M.

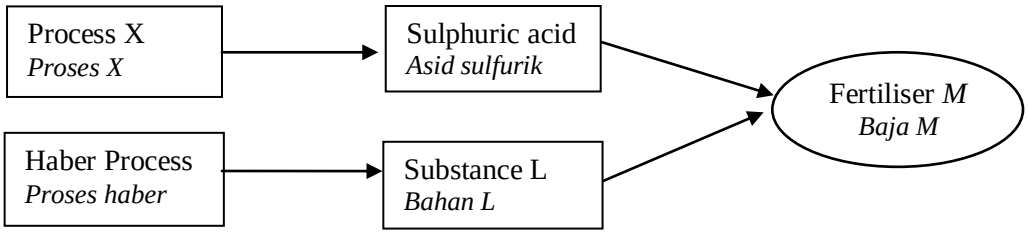


Diagram 1/ *Rajah 1*

(i) Name the process X to produce sulphuric acid.
Namakan proses X untuk menghasilkan asid sulfurik.

……..

[1 *mark*]

(ii) Sate the name of substance L.
Nyatakan nama bagi bahan L.

……..

[1 *mark*]

(iii) In process X, catalyst and high temperature are used to increase the rate of reaction.
State the catalyst and the temperature used.
Dalam proses X, mangkin dan suhu yang tinggi digunakan untuk meningkatkan kadar tindak balas.
Nyatakan mangkin dan suhu yang digunakan.

……

[1 *mark*]

(iv) What is fertiliser *M*?
Apakah baja M?

……

[1 *mark*]

(v) Write the chemical equation to produce fertiliser M.
Tulis persamaan kimia untuk penghasilan baja M.

……

[2 *marks*]

(b) Table 1 shows the manufactured substances in industries.
Jadual 1 menunjukkan bahan buatan dalam industri.

Material *Bahan*	**Substance J** *Bahan J*	**Alloy** *Aloi*	**Polymer** *Polimer*	**Glass** *Kaca*
Example *Contoh*	Reinforced concretes *Konkrit yang diperkukuhkan*	Bronze *Loyang*	Polyvinyl chloride (PVC) *Polivinil klorida (PVC)*	Borosilicate glass *Kaca borosilikat*

Table 1/ *Jadual 1*

Based on Table 1, answer the following questions.
Berdasarkan Jadual 1, jawab soalan-soalan berikut.

(i) State the name of substance J.
Nyatakan nama bagi bahan J.

……

[1 *mark*]

(ii) Draw and label the arrangement of atoms in bronze.
Lukis dan labelkan susunan atom dalam loyang.

[2 *marks*]

(iii) Write the chemical equation for the polymerisation process of polyvinyl chloride.
Tulis persamaan kimia bagi proses pempolimeran polivinil klorida.

……

[1 *mark*]

(iv) State one reason for borosilicate glass to use in laboratory glassware.
Nyatakan satu sebab kaca borosilikat digunakan untuk peralatan makmal.

……

[1 *mark*]

SET 4 : MANUFACTURED SUBSTANCESIN INDUSTRY (SECTION B)

2. (a) Sulphur dioxide, SO_2, is one of the by-products of the Contact process.
It can cause environmental pollution like acid rain.
Sulphur dioxide gas dissolves in rain water to produce sulphurous acid

(i) Write the chemical equation for the reaction between sulphur dioxide gas and rain water.

(ii) State three effects of acid rain to the environment.

Sulfur dioksida, SO_2, ialah satu daripada hasil sampingan proses Sentuh.
Ia dapat menyebabkan pencemaran alam sekitar seperti membentuk hujan asid.Gas sulfur dioksida larut dalam air hujan untuk menghasilkan asid sulfurus.
(i) Tulis persamaan kimia bagi tindak balas antara sulfur dioksida dengan air hujan.
(ii) Nyatakan tiga kesan hujan asid terhadap alam sekitar.

[4 marks]

(c) Diagram 2 shows an industry preparation of sulphuric acid by the Contact process.
Rajah 2 menunjukkan penyediaan asid sulfurik melalui proses Sentuh.

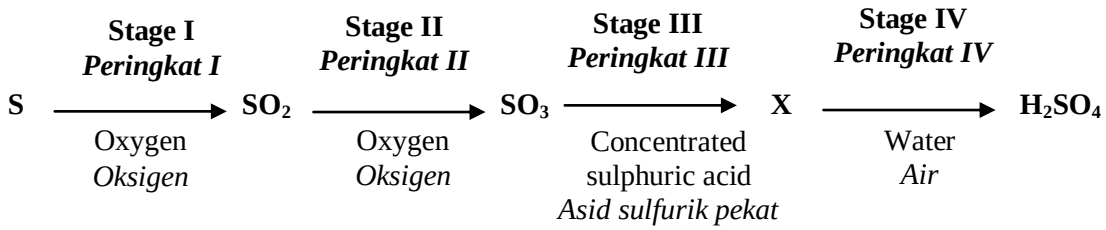


Diagram 2/ *Rajah 2*

(i) Name the compound X.
Namakan sebatian X.

(ii) Write the chemical equation of the reaction at stage II.
Tulis persamaan kimia bagi tindak balas di peringkat II.

(iii) The chemical equation below shows the reaction between sulphur and oxygen gas at stage I.
Persamaan kimia di bawa menunjukkan tindak balas antara sulfur dan gas oksigen di peringkat I.

$$S + O_2 \rightarrow SO_2$$

Given that the relative atomic mass of S = 32, O = 16 and the molar volume of any gas is 24 dm^3mol^{-1} at room temperature and pressure.
Calculate the maximum volume of sulphur dioxide gas produced if 48 g of sulphur is burnt completely in oxygen gas.
Diberikan jisim atom relatif S = 32, O = 16 dan isi padu molar sebarang gas ialah 24 dm^3mol^{-1} pada suhu dan tekanan bilik. Hitungkan isi padu maksimum gas sulfur dioksida yang terhasil jika 48g sulfur terbakar dengan lengkap dalam gas oksigen.

[6 *marks*]

(d) Brass is an alloy of copper. Pure copper is ductile and malleable whereas brass is stronger and harder than copper.
Gangsa ialah aloi kuprum. Kuprum tulen adalah mulur dan boleh ditempa sementara gangsa adalah kuat dan keras daripada kuprum.

(i) Explain why pure copper is ductile and malleable?
Terangkan mengapa kuprum mulur dan boleh ditempa?

[5 *marks*]

(ii) Name the element which is added to copper to make brass. Explain why brass is strong and harder than copper. Draw a diagram to show the arrangement of atoms in brass.
Namakan unsur yang ditambahkan kepada kuprum untuk menghasilkan gangsa. Terangkan mengapa gangsa adalah lebih kuat dan keras daripada kuprum. Lukis sebuah rajah untuk menunjukkan susunan atom dalam gangsa.

[5 *marks*]

SET 4 : MANUFACTURED SUBSTANCESIN INDUSTRY (SECTION C)

3. . Diagram 3 shows the industrial manufacture of ammonia.
Rajah 3 menunjukkan penghasilan ammonia dalam industri.

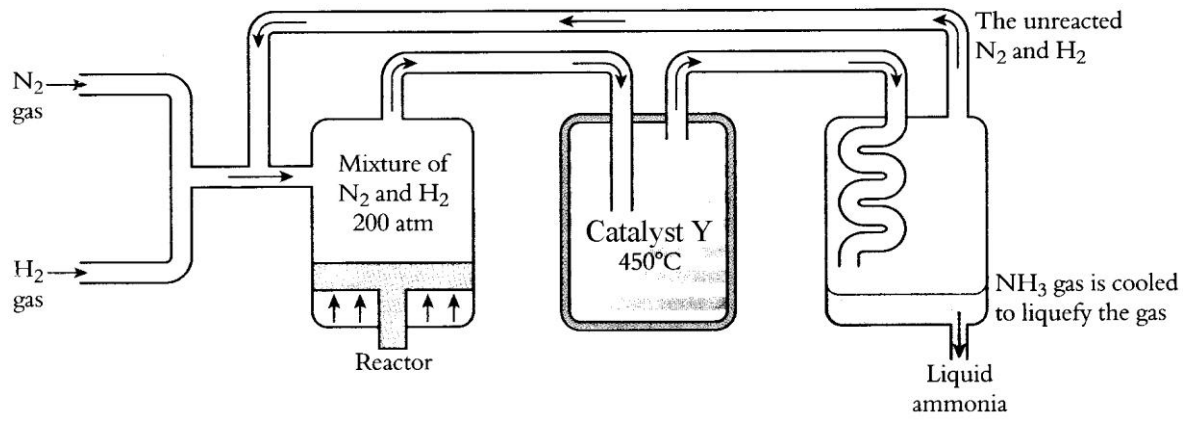


Diagram 3/ *Rajah 3*

(a) State the name of the above process, catalyst Y and write a chemical equation for the reaction between hydrogen and nitrogen.
Nyatakan nama bagi proses di atas, mangkin Y dan tulis persamaan kimia bagi tindak balas antara hidrogen dan nitrogen.

[4 *marks*]

(b) Table 3 shows the diameter of the dent formed in an experiment to compare the hardness of copper and bronze.
Jadual 3 menunjukkan diameter bagi lekuk yang terbentuk dalam suatu eksperimen untuk membandingkan kekerasan kuprum dan loyang.

Material/ *Bahan*	Diameter /cm
Copper / *kuprum*	1.0
Bronze / *loyang*	0.5

Table 3/ *Jadual 3*

Based on Table 13, draw a diagram to shows the arrangement of atoms in pure copper and bronze. Compare the hardness between copper and bronze and explain why.

Berdasarkan Jadual 13, lukis sebuah rajah untuk menunjukkan susunan atom dalam kuprum tulen dan loyang. Bandingkan kekerasan antara kuprum dan loyang dan terangkan mengapa.

[6 *marks*]

(c) The iron window frame of Encik Razali's house rusts after several years but the steel window frame of Encik Tarmizi's house does not rust.
By using suitable examples, describe a laboratory experiment to compare the resistant to rust of alloy compared to pure metal.
Include the following in your answer:

- Procedure
- Results
- Conclusion

Bingkai tingkap besi rumah Encik Razali berkarat selepas beberapa tahum tetapi bingkai tingkap keluli rumah Encik Tarmizi tidak berkarat. Dengan menggunakan contoh, huraikan suatu eksperiman makmal untuk membandingkan ketahanan karat bagi aloi berbanding dengan logam tulen.
Masukkan berikut dalam jawapan anda:

- *Prosedur*
- *Keputusan*
- *Kesimpulan*

[10 *marks*]

SET 4 : CHEMICALS FOR CONSUMERS
(SECTION A)

1. (a) Diagram 1.1 shows a label of ingredients present in a canned food.
Rajah 1 menunjukkan kandungan bahan-bahan yang terdapat dalam suatu makanan tin.

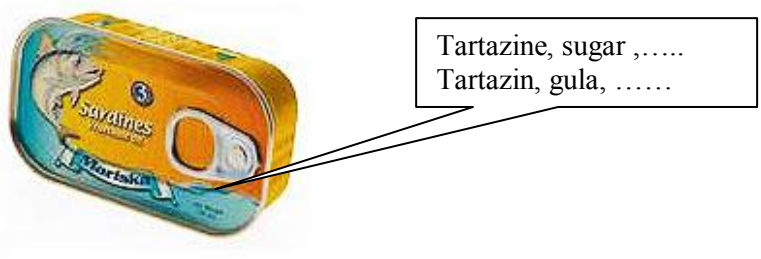


Diagram 1.1/ *Rajah 1.1*

(i) What is the function of tartazine?
Apakah fungsi tartazin?

……..
[1 *mark*]

(ii) How does sugar make the food last longer?
Bagaimana gula membolehkan maknan tahan lebih lama?

……..
[1 *mark*]

(iii) Table 1 shows the function of two types of food additives.
Jadual 1 menunjukkan fungsi dua jenis bahan tambah makanan.

Food additive *Bahan tambah makanan*	Function *Fungsi*	Type of food additive *Jenis bahan tambah makanan*
Sodium benzoate *Natrium benzoat*	Controls and inhibits the growth of microorganisms *Mengawal dan menghalang pertumbuhan mikroorganisma*	
Ethyl butanoate *Etil butanoat*	Helps to enhance the smell of food *Membantu meningkatkan bau makanan*	

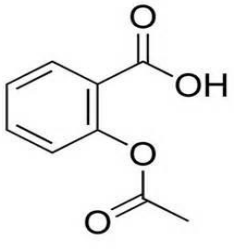
Table 1/ *Jadual 1*

Complete the table above by identify the food additives. [2 *marks*]

Lengkapkan jadual di atas dengan mengenal pasti jenis bahan tambah makanan.

(b) Diagram 1.2 shows two examples of modern medicine.
Rajah 1.2 menunjukkan dua contoh ubat moden.

Codeine
Kodeina



Aspirin
Aspirin

Diagram 1.2/ *Rajah 1.2*

(i) Name the type of medicines for codeine and aspirin is the function of analgesic medicines?
Namakan jenis ubat bagi kodeina dan aspirin.

……..……..
[1 *mark*]

(ii) What is the function of aspirin.
Apakah fungsi aspirin?

……..……..
[1 *mark*]

(c) Soap can be prepared from the reaction between oil and concentrated sodium hydroxide.
Diagram 1.3 shows the chemical equation for the reaction.
Sabun boleh disediakan daripada tindak balas antara minyak dengan larutan natrium hidroksida pekat. Rajah 1.3 menunjukkan persamaan kimia tindak balas itu.

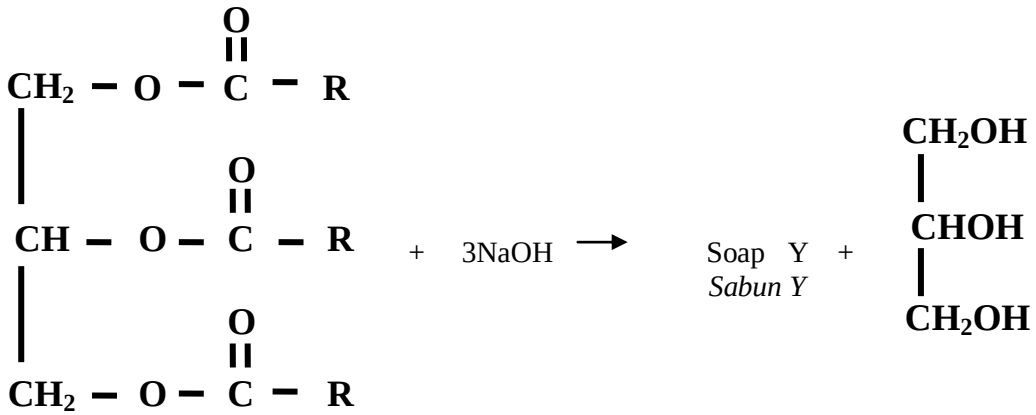


Diagram 1.3/ *Rajah 1.3*

R is a carbon chain with 15 carbon atoms.
R ialah rantai karbon dengan 15 atom karbon.

(i) Name this reaction.
Namakan tindak balas ini.

……
[1 *mark*]

(ii) Draw the structural formula for soap Y formed . On the diagram you have drawn , label the hydrophobic and hydrophilic parts of the soap
Lukis formula struktur sabun Y yang terbentuk. Pada rajah itu labelkan bahagian hidrofobik dan hidrofilik pada sabun itu.

[2 *marks*]

(iii) Why soap is not effective in hard water?
Mengapa sabun tidak berkesan dalam air liat?

……
[1 *mark]*

SET 4 : CHEMICALS FOR CONSUMERS
(SECTION B)

2 . (a) Food preservatives are substances added to food so that the food can be kept for longer periods for time. Using two suitable examples, explain how they work as preservative.
Pengawet ialah bahan yang ditambahkan kepada makanan supaya makanan dapat disimpan dalam jangka masa yang lebih panjang. Dengan menggunakan dua contoh yang sesuai, terangkan bagaimana bahan itu bertindak sebagai pengawet.

[4 marks]

(b) The following is the information about a child.
Yang berikut ialah maklumat berkaitan dengan seorang budak.

- 2 years old
  Umur 2 tahun
- High fever
  Demam panas
- Whooping cough
  Batuk kokol

(i) Can aspirin be used to treat the child? Explain why.
Bolehkah aspirin digunakan untuk merawat budak itu? Terangkan mengapa.

[2 marks]

(ii) Name two examples of modern medicine that can be used to treat the child .
Namakan dua contoh ubat moden yang boleh digunakan untuk merawat budak itu.

[2 marks]

(iii) Explain the effect if the two modern medicines stated in (b)(ii) are taken overdose or take for a long time.
Terangkan kesan jika dua ubat moden yang dinyatakan dalam (b)(ii) diambil melebihi dos atau diambil pada suatu jangka masa yang panjang.

[2 marks]

(c) Table 2 shows the food additives that are added to a certain food by two chefs.
Jadual 2 menunjukkan bahan tambah makanan yang ditambahkan kepada sebilangan makanan oleh dua orang chef.

Chef Wan	Chef Koh
Turmeric *Kunyit* Sugar, salt and spice *Gula, garam dan rempah* Garlic *Bawang putih*	Tartrazine *Tartrazin* Monosodium glutamate *Mononatrium glutamat* Ascorbic acid *Asid askorbik*

Table 2/ *Jadual 2*

Based on Table 2, categorise the food additives. Include in your answer the function of each type of food additives and the disadvantages of using any two food additives.
Berdasarkan Jadual 2, kelaskan bahan tambah makanan. Dalam jawapan anda, masukkan fungsi setiap jenis bahan tambah makanan dan keburukan menggunakan mana-mana dua bahan tambah makanan.

[10 marks]

SET 4 : CHEMICALS FOR CONSUMERS
(SECTION C)

3 (a) Table 3 shows the different types of traditional medicine and modern medicine.
Jadual 3 menunjukkan jenis ubat tradisonal dan ubat moden yang berlainan.

Traditional medicine *Ubat tradisonal*		**Modern medicine** *Ubat moden*	
Garlic	Quinine	Aspirin	Penicillin
Lemon	Aloe vera	Paracetamol	Codein
Ginseng	Tongkat Ali	Chlorpromazin	Caffeina
Bawang putih	*Kuinin*	*Aspirin*	*Penisilin*
Lemon	*Lidah buaya*	*Parasetamol*	*Kodeina*
Ginseng	*Tongkat Ali*	*Klorpromazin*	*Kafeina*

Table 3/ *Jadual 3*

(i) What are the differences between traditional medicine and modern medicine?
Apakah perbezaan antara ubat tradisonal dan ubat moden?

[2 *marks*]

(ii) Modern medicines can be classified as analgesics, antibiotics and psychotherapeutic drugs. Group the medicines in Table 3 into these three different types.
Ubat moden boleh dikelaskan sebagai analgesik, antibiotik dan psikoterapeutik. Kelaskan ubat-ubat dalam Jadual 3 kepada tiga jenis tersebut.

[5 *marks*]

(iii) State the side effects of penicillin, codeine and aspirin.
Nyatakan kesan sampingan bagi penisilin, kodeina dan aspirin.

[3 *marks*]

(b) State what is hard water and give an example of hard water.
Describe a laboratory activity to investigate the effectiveness of cleansing action of soap and detergent in hard water.
Your answer should consist of the following:

- Procedure
- Observation
- Conclusion

Nyatakan apakah air liat dan berikan satu contoh air liat.
Huraikan suatu aktiviti makmal untuk mengkaji keberkesanan tindakan pencucian sabun dan detergen dalam air liat.
Jawapan anda mesti memasukan yang berikut.

- *Prosedur*
- *Pemerhatian*
- *Kesimpulan*

[10 *marks*]

CHEMISTRY MODULE

http://cikguadura.wordpress.com/

SET ⑤

Experiment Questions

1. **Guidelines For Answering Paper 3**
2. **Paper 3 Set 1**
3. **Paper 3 Set 2**
4. **Paper 3 Set 3**
5. **Paper 3 Set 4**
6. **Paper 3 Set 5**
7. **Paper 3 Set 6**
8. **Paper 3 Set 7**

1. GUIDELINES FOR ANSWERING PAPER 3

Structure Question 1or 2 to test the mastery of 11 Scientific Skills

1. Observing
2. Classifying
3. Inferring
4. Measuring (burette , stopwatch, thermometer, voltmeter)
5. Predicting
6. Communicating(e.g construct table and draw graph)
7. Space-Time Relationship
8. Interpreting Data
9. Defining Operationally
10. Controlling Variables
11. Hypothesizing

Marks allocated for each question are as follows: 3 marks/2 marks/1 mark/0
Maximum Score : 11 X 3 = 33

Operational definition is a statement that contains:
1. what you do/procedure
2. what you see/observation

Example:
1. When acid is added into latex, **white solid** is formed.
   When acid is added into latex, **latex coagulated**.- wrong
2. When the higher the concentration sodium thiosulphate solution is added into sulphuric acid, time taken for `X~ mark to disappear from sight is shorter.
3. When iron nail is coiled with copper and immersed into jelly mixed with potassium hexacyanoferrate(III) and phenolphthalein solution, blue spot/colouration is formed.

Operational definition for	What you do	What is observed
1. Rusting of iron	When an iron nail coiled with a less electropositive metal is immersed in hot agar-agar added with potassium hexacyanoferrate (III) solution,	Blue spots are formed
2. Coagulation of latex	When acid is added to latex	White solid is formed
3. Reactivity of Group 1 elements	When a metal which is lower in Group 1 is put in a basin half filled with water	Brighter flame is formed
4. Precipitation of silver chloride	When silver nitrate solution is added to sodium chloride solution	White solid is formed
5. Voltaic cell	When two different metals are dipped into an electrolyte	The needle of the voltmeter deflects//Voltmeter shows a reading
6. An acid	When a blue litmus paper is dipped into a substance which is dissolved in water,	Blue litmus paper turns red
7. Heat of combustion	When 1 mol of fuel is burnt in excess oxygen	Temperature rises//Thermometer reading increases
8. Hardness of alloy	When a weight is dropped on a steel ball bearing taped on an alloy block	Diameter of dent formed is smaller

Hypothesis: Statement that relates the manipulated variable followed by responding variable with direction.

Example:

1. The higher temperature of the reactant the higher the rate of reaction – 3 marks

   The temperature of the reactant affects the rate of reaction – 2 marks
2. Hexenedecolourised brown bromine water but hexane does not decolourised brown bromine water.
3. When acid is added into latex, latex coagulates, when ammonia is added into latex, latex cannot coagulates
4. Question 3 (essay) Test the Mastery of Planning Experiment.

Experiment	MV	RV	Hypothesis (MV→RV)
Factor of size on Rate of reaction	Size of calcium carbonate	Rate of reaction	When size of calcium carbonate is smaller, the rate of reaction increases
Electrolysis of solution with different concentration using carbon electrodes	Concentration of hydrochloric acid solution	Product at anode	When concentrated hydrochloric is electrolysed, chlorine gas is produced at anode, but when diluted hydrochloric acid is electrolysed, oxygen gas is produced at anode.
To differentiate between hexene and hexane	Hexene and hexane	Decolourised brown bromine water	When hexene is added to bromine water, brown bromine decolorized, but when hexene is added to bromine water, brown bromine remains unchanged.
Heat of combustion of different types of alcohols	Types of alcohols	Heat of combustion	When the number of atoms per molecule alcohol increases, the heat of combustion increase
Coagulation of latex	Acid and ammonia solution	Coagulation of latex	When acid is added to latex, coagulation of latex occurs, but when ammonia solution is added to latex, coagulation of latex does not occur.

4. Question 3 (essay) Test The Mastery of Planning Experiment .
   Planning should include the following aspects:
   1. Aim of the experiment/Statement of the problem
   2. All the variables
   3. Statement of the hypothesis
   4. List of substances/material and apparatus – should be separated
   5. Procedure of the experiment
   6. Tabulation of data

   Score : (5 X 3) + 2 = 17

The question normally starts with certain situation related to daily life.
Problem statement/ aim of the experiment / hypothesis and variable can be concluded from the situation given.
State all the variables

Manipulated variable :
Responding variable :
Constant variable: list down all the fixed variables to ensure the outcome of the responding variable is related only to the manipulated variables.

Separate the substances and apparatus

- Separate the substances and apparatus
- **Apparatus** : list down the apparatus for the experiment.

Example: Rate of reaction – stop watch
Termochemistry - thermometer

Procedure :
All the steps taken in the procedure must include the apparatus used, quantity and type of substance (powder, solution, lumps … etc).
No mark is allocated for the diagram. The complete labeled diagram can help students in :

I. Writing the steps taken in the procedure
II. Listing the apparatus and materials

Tabulation of data:

- The number of columns and rows in the table is related to the manipulated and responding variables
- **Units must be written** for all the titles in each row and column of the table
- DO NOT WRITE the observation/inference/conclusion in the table.

SET 5 PAPER 3
(SET 1)

1. Table 1.1 shows the results from two experiments to investigate the properties of the oxides of aluminium when dissolved in acid and alkali.
Jadual 1.1 menunjukkan keputusan dua eksperimen untuk mengkaji sifat oksida aluminium apabila di larutkan dalam asid dan alkali.

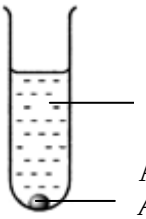
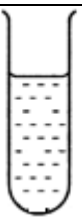
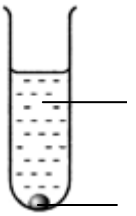
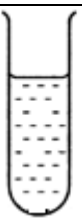
Experiment	Reaction	Observation
I	 Nitric acid *Asid nitrik* Aluminium oxide *Aluminium oksida*	
II	 Sodium hydroxide solution *Larutan natrium hidroksida* Aluminium oxide *Aluminium oksida*	

Table 1.1/ Jadual 1,1

(a) (i) Based on Table 1.1, state **one** observation.
*Berdasarkan Jadual 1.1, nyatakan **satu** pemerhatian.*

.....

[3 marks]

(ii) State the inference based on the observation.
Nyatakan inferens berdasarkan pemerhatian.

……

[3 marks]

(iii) Name the property shown by aluminium oxide.
Namakan sifat yang ditunjukkan oleh aluminium oksida.

.....

[3 marks]

(b) State one hypothesis for this experiment.
Nyatakan satu hipotesis untuk eksperimen ini.

.....

.....

[3 marks]

(c) State the variables for this experiment.
Nyatakan pembolehubah-pembolehubah untuk eksperimen ini.

(i) Manipulated variable: .....
Pembolehubah dimanipulasikan:

(ii) Responding variable: .....
Pembolehubah bergerak balas:

(iii) Fixed variable : .....
Pembolehubah ditetapkan:

[3 marks]

(d) State the operational definition for the acidic properties in this experiment.
Nyatakan definisi secara operasi untuk sifat asid dalam eksperiment ini.

.....

.....

[3 marks]

(e) Table 1.2 shows the results from an experiment to investigate the acid-base properties of sodium oxide and sulphur dioxide when dissolved in water by dipping red or blue litmus paper into the solutions.
Jadual 1.2 menunjukkan keputusan eksperimen untuk mengkaji sifat asid-bes natrium oksida dan sulphur dioksida apabila dilarutkan dalam air dengan mencelupkan kertas litmus merah atau biru ke dalam larutan terhasil.

(i) Complete Table 1.2 for the observation on the red or blue litmus paper.
Lengkapkan Jadual 1.2 untuk pemerhatian terhadap kertas litmus merah atau biru.

Experiment *Eksperimen*	Observation on the red / blue litmus paper *Pemerhatian terhadap kertas litmus merah/biru*
Sodium oxide + water *Natrium oksida + air*	
Sulphur dioxide + water *Sulphur dioksida + air*	

Table/*Jadual* 1.2 [3 marks]

(ii) Classify the following oxides into acidic oxide and basic oxide.
Kelaskan oksida berikut kepada oksida asid dan oksida bes.

- Magnesium oxide
- Phosphorous pentoxide
- Carbon dioxide
- Calcium oxide

Acidic oxide *Oksida asid*	Basic oxide *Oksida bes*

[3 marks]

2. All elements in group 17 of The Periodic Table of Element exhibit similar chemical properties but the reactivity is different.
Diagram 2 shows the set-up of apparatus for an experiment to compare the reactivity of halogen towards their reactions with iron.
Rajah 2 menunjukkan susunan radas satu eksperimen untuk membandingkan kereaktifan halogen dalam tindakbalas mereka dengan besi.
Semua unsur dalam kumpulan 17 Jadual Berkala Unsur menunjukkan sifat kimia yang sama tetapi kereaktifan yang berbeza.

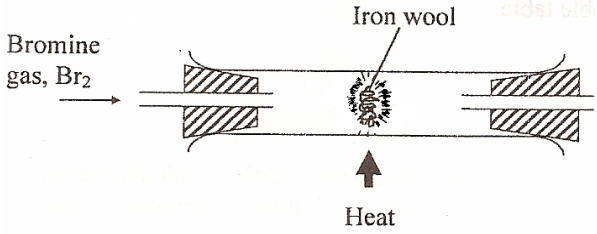
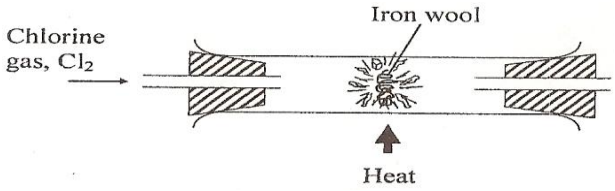
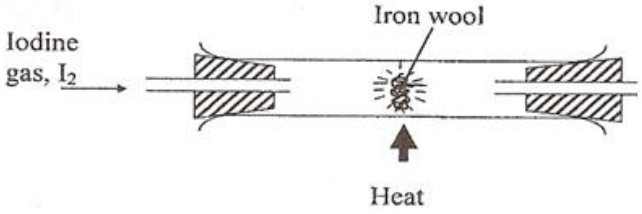
Set-up of apparatus *Susunan radas*	Observation on the iron wool *Pemerhatian keatas wul besi*
	…… A brown solid is formed *Pepejal erang terenap*
	…… A brown solid is formed *Pepejal perang terenap*
	…… A brown solid is formed *Pepejal perang terenap*

Diagram 2/ *Rajah 2*

(a) Look at the ignition or glowing in each set up of apparatus in Diagram 2.
Complete the observation for the reaction.
Perhatikan kepada nyalaan atau baraan di setiap susunan radas dalam Rajah 2. Lengkapkan pemerhatian untuk setiap tindak balas.

[3 marks]

(b) Complete the table 2 below based on the experiment.
Lengkapkan Jadual 2 berdasarkan kepada eksperimen

Name of variables *Nama Pembolehubah*	Action to be taken *Tindakan yang diambil*
(i) Manipulated Variable : Type of halogen *Pembolehubah dimanipulasi :* *Jenis hHalogen*	The way to manipulate variable: *Cara memanipulasikan pembolehubah:* ……..……..…….. ……..…….……
(ii) Responding variable : *Pembolehubah bergerak balas:* ……..……..	What to observe in the responding variable : The intensity of ignition or glowing *Apa yang diperhatikan pada pembolehubah bergerak balas:* *Keamatan nyalaan atau baraan*
(ii) Constant variable : The quantity of iron wool *Pembolehubah dimalarkan :* *Kuantiti wul besi*	The way to maintain the constant variable: *Cara mengawal pembolehubah malar :* ……. ……..……

(c) State the hypothesis for the experiment.
Nyatakan hipotesis bagi eksperimen ini..

……..……..……

……..……..……

[3 marks]

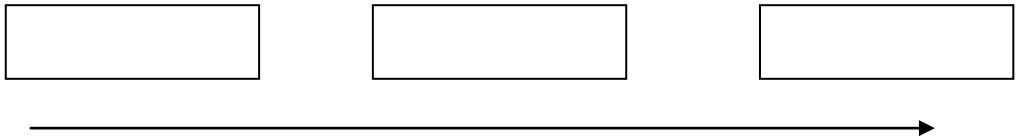
(d) Based on the observation for the reaction between bromine and iron, state the inference.
Berdasarkan pemerhatian tindak balas antara bromin dengan besi nyatakan satu inferens.

……..……..……

……..……..……

[3 marks]

(e) Arrange chlorine, bromine and iodine in ascending order of reactivity of halogen towards iron.
Susunkan klorin, bromin and iodin berdasarkan kereaktifan tindak balas terhadap besi mengikut tertib susunan menaik.



Ascending order of reactivity of halogen towards iron.
Susunan menaik kereaktifan halogen terhadap besi

[3 marks]

3. Table 3 shows the results for an experiment to construct the electrochemical series using the principle of displacement of metals.
Jadual 3 menunjukkan keputusan bagi satu eksperimen untuk membina Siri Elektrokimia menggunakan prinsip penyesaran logam.

Salt solution / Metal Strip	Magnesium nitrate	Y nitrate	Copper(II) nitrate
Magnesium	-	√	√
Y	X	-	√
Copper	X	X	-

Table 3/*Jadual* 3

X : no displacement/*tiada penyesaran*
√ : displacement occurs/*penyesaran berlaku*

(a) Based on Table 3, arrange the metals in descending order in the Electrochemical Series.
Berdasarkan Jadual 3, susunkan logam-logam tersebut secara menurun dalam Siri Elektrokimia.

.....

[3 marks]

(b) Give one example of metal Y.
Berikan satu contoh bagi logam Y.

.....

[3 marks]

(c) Give three observations when zinc strip is immersed in copper(II) sulphate solution.
Berikan tiga pemerhatian apabila kepingan zink dicelup ke dalam larutan kuprum(II) sulfat.

.....

.....

[3 marks]

4. Rusting of iron can occur naturally when iron is exposed to air and water. The rusting of iron can be affected when iron is in contact with other metals. Table 3 shows the results on the rusting of iron when zinc and copper are in contact with iron.
Pengaratan besi boleh berlaku secara semula jadi apabila terdedah kepada udara dan air. Pengaratan besi boleh dipengaruhi apabila besi bersentuhan dengan logam-logam lain. Jadual 3 menunujukkan keputusan bagi pengaratan besi apabila besi bersentuhan dengan zink dan kuprum.

Metal in contact with iron *Logam yang bersentuhan dengan besi*	Results *Keputusan*
Zinc/*Zink*	Iron does not rust/*Besi tidak berkarat*
Copper/*Kuprum*	Iron rusts/*Besi berkarat*

Table 4/*Jadual* 4

Based on the information in Table 3, plan a laboratory experiment to investigate the effect of other metals when in contact with iron on the rusting of iron.
Your planning should include the following aspects:
Berdasarkan maklumat dalam Jadual 3, rancangkan satu eksperimen makmal untuk mengkaji kesan logam lain apabila bersentuhan dengan besi terhadap pengaratan besi.
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Problem statement / *Pernyataan masalah*
(b) All the variables / *Semua pembolehubah*
(c) Hypothesis / *Hipotesis*
(d) List of materials and apparatus / *Senarai bahan dan radas*
(e) Procedure / *Prosedur*
(f) Tabulation of data / *Penjadualan data*

[17 marks]

PAPER 3 SET 2

1. Diagram 1shows the apparatus set-up to investigate the electrical conductivity of compounds in their molten state.
Rajah 1 menunjukkan susunan radas untuk mengkaji kekonduksian elektrik sebatian dalam keadaan leburan.

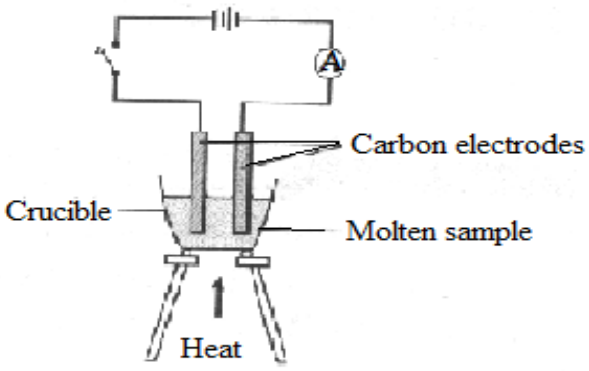


Diagram1 /*Rajah* 1

Table 1 shows the ammeter readings of three experiments on conductivity of electricity of molten naphthalene, molten lead (II) bromide and molten glucose.
Jadual 1 menunjukkan bacaan ammeter untuk tiga eksperimen kekonduksian elektrik oleh leburan naftalena, lebutan plumbum (II) bromide dan leburan glukosa.

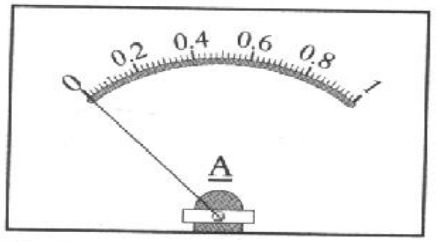
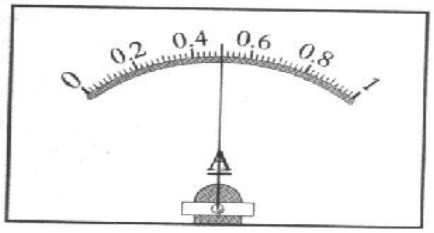
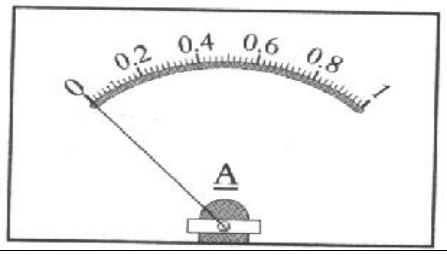
Experiment	Substances *Bahan*	Ammeter reading *Bacaan ammeter*
I	Molten naphthalene *Leburan naftalena*	
II	Molten lead(II) bromide *Leburan plumbum(II) bromida*	
III	Molten glucose *Leburan glukos*	

Table 1/Jadual 1

(a) Based on Table 1, construct a table to tabulate the ammeter readings for the three molten substances.
Berdasarkan Jadual I, konstruk satu penjadualan data untuk bacaan ammeter untuk ketiga-tiga bahan tersebut.

[3 marks]

(b) Based on the ammeter reading in (a), state one inference for this experiment.
Berdasarkan bacaan ammeter di (a), nyatakan satu inferens untuk experiment ini.

.....

[3 marks]

(c) State the type of compound formed by lead(II) bromide.
Nyatakan jenis sebatian yang dibentuk oleh plumbum(II) bromide.

.....

[3 marks]

(d) State the variables for this experiment:
Nyatakan pembolehubah untuk eksperimen ini:

(i) Manipulated variable : .....
Pembolehubah dimanipulasikan

(ii) Responding variable : .....
Pembolehubah yang bergerak balas

(iii) Fixed variable : .....
Pembolehubah dimalarkan

[3 marks]

(e) State the hypothesis for this experiment.
Nyatakan satu hipotesis untuk eksperimen ini.

.....

.....

[3 marks]

(f) State one operational definition for the conductivity of electricity in this experiment.

Nyatakan satu definisi operasi untuk kekonduksian elektrik untuk eksperimen ini.

.....

.....

[3 marks]

(g) Based on Experiment I and II, explain the difference in the ammeter reading.
Berdasarkan eksperimen I dan II, terangkan perbezaan dalam bacaan ammeter.

…….....

.....

[3 marks]

(h) Classify the following substances into substances that can conduct electricity and substances that cannot conduct electricity.
Kelaskan bahan-bahan berikut kepada bahan yang boleh mengkonduksikan elektrik dan kepada bahan yang tidak boleh mengkonduksikan elektrik.

- Glacial ethanoic acid
- Carbon rod
- tetrachloromethane
- Copper(II) sulphate solution
- Molten polyvinyl chloride (PVC)
- Copper plate

[3 marks]

2. Diagram 2.1 shows the apparatus set up to construct the ionic equation for the precipitation of silver chloride. A fixed volume of 5.0 cm^{3} of 1.0 mol dm^{-3} of sodium chloride solution is poured into each of the seven test-tubes from a burette. Then 1 cm^{3} of silver nitrate solution is added into test-tube 1, 2 cm^{3} into test tube 2, and so on until 7 cm^{3} is added into test tube 7.
3.

Rajah 2.1 menunjukkan susunan radas untuk membina persamaan ion untuk pemendakan argentum klorida. Satu isipadu tetap 5.0 cm^{3} larutan snatrium klorida dituangkan ke dalam setiap tujuh tabung uji daripada sebuah buret. Kemudian 1 cm^{3} larutan argentum nitrat di tambahkan ke dalam tabung uji 1, 2 cm^{3}dalam tabung uji 2 dan seterusnya 7 cm^{3} ditambah ke dalam tabung uji 7.

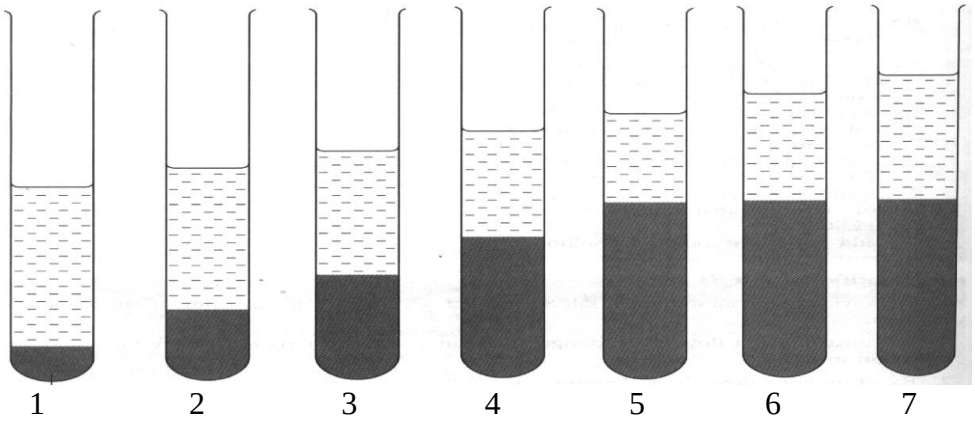


Diagram 2.1/Rajah 2.1

Table 2 shows the heights of the precipitate formed in each test tube.

Jadual 2 menunjukkan ketinggian mendakan yang terbentuk dalam tiap tabung uji.

Test-tube	1	2	3	4	5	6	7
Volume of silver nitrate(cm^3) *Isipadu argentum nitrat* (cm^3)	1.00	2.00	3.00	4.00	5.00	6.00	X
Height of precipitate (cm) *Ketinggian mendakan* (cm)	1.0	2.0	3.0	4.0	5.0	5.0	5.0

Table 2/ *Jadual 2*

(a) Diagram 2.2 shows the initial and final burette reading for test tube 7.
Rajah 2.2 menunjukkan bacaan awal dan akhir buret untuk tabung uji 7.

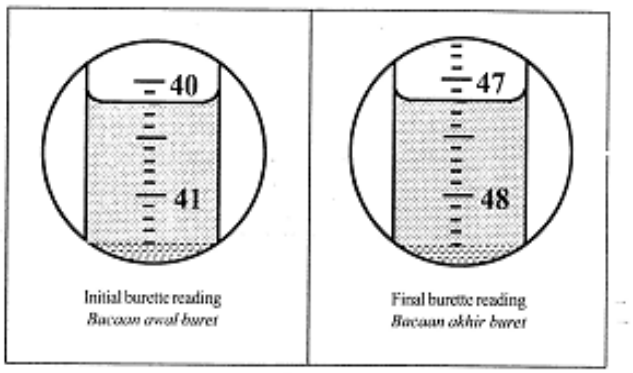


Diagram 2.1/ Rajah 2.1

Based on Diagram 2.2, determine the value X in Table 2.1.
Berdasarkan Rajah 2.2, tentukan nilai X dalam Jadual 2.1

X = final burette reading – initial burette reading
Bacaan akhir buret – bacaan awal buret

=..... - .....

= ..... [3 marks]

(b) Based on Table 2, plot a graph of height of precipitate against volume of silver nitrate solution on the graph provided.
Berdasarkan Jadual 1, plotkan graf ketinggian mendakan melawan isipadu larutan argentums nitrat yang digunakan pada kertas graf yang disediakan.

[3 marks]

(c) Determine the mole ratio of silver ion, Ag^+ and chloride ion, Cl^-.
Tentukan nisbah mol bagi ion argentum, Ag^+ dan ion klorida, Cl^-.

[3 marks]

(d) Write the ionic equation for the precipitation of silver chloride.
Tuliskan persamaan ion untuk pemendakan argentum klorida.

……..……

[3 marks]

(e) The experiment is repeated by replacing 1.0 mol dm^{-3} sodium chloride solution with 0.5 mol dm^{-3} sodium chloride solution. Sketch the graph that you will obtained on the graph in (b).
Eksperimen diulangi dengan menggantikan 1.0 mol dm^{-3} larutan natrium klorida dengan 0.5 mol dm^{-3} larutan natrium klorida. Lakarkan graf yang akan diperolehi di atas di (b).

[3 marks]

Graph (b)

(f) Classify the following salts into soluble salts and insoluble salts.
Kelaskan garam-garam berikut kepada garam yang terlarutkan dan garam tak terlarutkan

- Potassium chloride
- Nickel nitrate
- Ammonium carbonate
- Barium sulphate

[3 marks]

4. Table 1 shows the taken of two experiments for the complete reaction between excess zinc with 50 cm^3 of 0.1 mol dm^{-3} of hydrochloric acid. The reaction between zinc and hydrochloric acid will produce zinc chloride and hydrogen gas.
Jadual1 menunjukkan masa yang diambil untuk dua eksperimen bagi tindakblas lengkap antara zinc berlebihan dengan 50 cm^3 of 0.1 mol dm^{-3} asid hidroklorik. Tindak balas antara zink dan asid hidroklorik menghasilkan zink klorida dan gas hidrogen

Experiment	Reactants *Bahan Tindak balas*	Time taken for complete reaction/s *Masa untuk tindak balas lengkap/ s*
I	Zinc granules and 50 cm^3 of 0.1 mol dm^{-3} of hydrochloric acid *Ketulan zink dan 50 cm^3 of 0.1 mol dm^{-3} asid hidroklorik*	60
II	Zinc powder and 50 cm^3 of 0.1 mol dm^{-3} of hydrochloric acid *Serbuk zink dan 50 cm^3 of 0.1 mol dm^{-3} asid hidroklorik.*	40

Table 1*/ Jadual 1*

Based on the information in Table 1, plan a laboratory experiment to investigate the effect of size on the rate of reaction between an acid and a metal.
Your planning should include the following aspects.

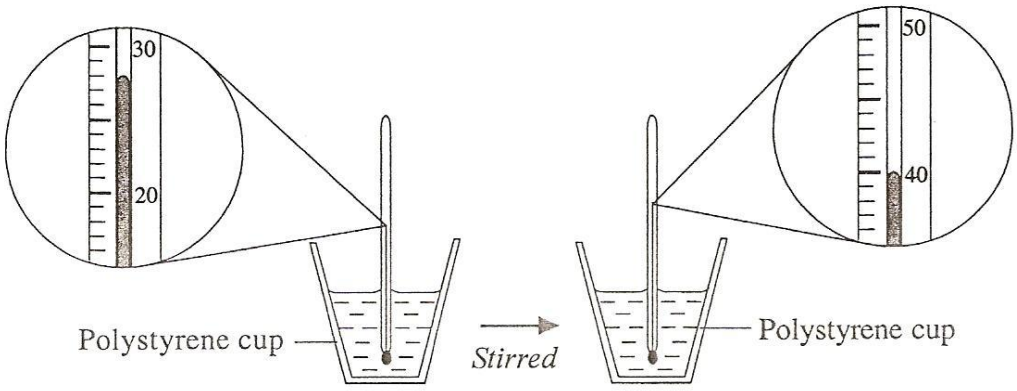
Berdasarkan maklumat dalam Jadual 1, rancang satu eksperimen makmal untuk mengkaji kesan saiz terhadap kadar tindak balas antara sejenis logam dengan asid.
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Problem statement / *Pernyataan masalah*
(b) Hypothesis / *Hipotesis*
(c) All the variables / *Semua pemboleh ubah*
(d) List of materials and apparatus / *Senarai bahan dan radas*
(e) Procedure / *Prosedur*
(f) Tabulation of data / *Penjadualan data*

[17 marks]

PAPER 3 SET 3

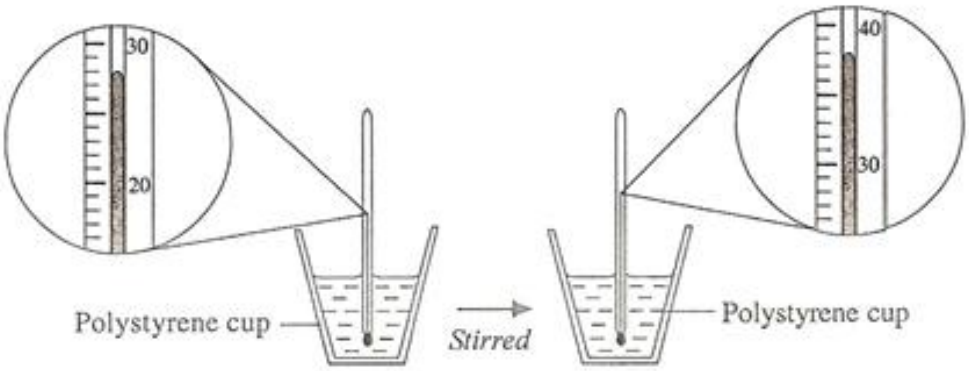
1. Diagram 1.1 shows two experiments to determine the heat of neutralization.
Rajah 1.1 menunjukkan dua eksperimen untuk menentukan haba peneutralan.



Experiment 1/*Eksperimen 1*

Reaction between 25 cm^3 of sodium hydroxide solution, NaOH 2.0 mol dm^{-3} and 25 cm^3 of hydrochloric acid, HCl 2.0 mol dm^{-3}
Tindakbalas antara 25 cm^3 larutan natrium hidroksida, NaOH 2.0 mol dm^{-3} dan 25 cm^3 asid hidroklorik, HCl 2.0 mol dm^{-3}

Initial temperature of the mixture : _____ ^oC
Suhu awal campuran :
Highest temperature of the mixture : _____ ^oC
Suhu tertinggi campuran :
Change in temperature : _____ ^oC
Perubahan suhu :



Experiment II/*Eksperimen II*

Reaction between 25 cm^3 of sodium hydroxide solution, NaOH 2.0 mol dm^{-3} and 25 cm^3 of ethanoic acid, CH_3COOH 2.0 mol dm^{-3}
Tindakbalas antara 25 cm^3 larutan natrium hidroksida, NaOH 2.0 mol dm^{-3} dan 25 cm^3 asid etanoik, CH_3COOH 2.0 mol dm^{-3}

Initial temperature of the mixture : _____ ^oC
Suhu awal campuran :
Highest temperature of the mixture : _____ ^oC
Suhu tertinggi campuran :
Change in temperature : _____ ^oC
Perubahan suhu

(a) Write the initial and the highest temperature of the mixture and the change in temperature for experiment I in Diagram 1.1.
Tulis suhu awal dan suhu tertinggi campuran serta perubahan suhu untuk eksperimen 1 dalam Rajah 1.1.

[3 marks]

(b) Construct a table that can be used to record the data from both experiments.
Bina satu jadual yang boleh digunakan untuk merekod data bagi kedua-dua eksperimen.

[3 marks]

(c) State one hypothesis for both experiments.
Nyatakan satu hipotesis bagi kedua-dua eksperimen.

……..……

……..……

[3 marks]

(d) Why must the initial temperature and the highest temperature be recorded in these experiments?
Mengapa suhu awal dan suhu tertinggi perlu direkodkan dalam eksperimen ini?

……..……

……..……

[3 marks]

(e) How can the value of the change in temperature be obtained?
Bagaimanakah nilai perubahan suhu diperolehi?

……..……

[3 marks]

(f) State three observations that you could obtain in experiment II other than change in temperature.
Nyatakan tiga pemerhatian yang boleh anda dapati dalam eksperimen II selain daripada perubahan suhu?

……..……

……..……

……..……

[3 marks]

(g) State three constant variables in this experiment.
Nyatakan tiga pembolehubah yang dimalarkan dalam eksperimen ini.

……..……

……..……

[3 marks]

(h) Calculate the value of heat of neutralization for the reactions in experiments I and II.
Hitung nilai haba peneutralan untuk tindakbalas dalam eksperimen I dan II

[3 marks]

(i) Give the operational definition for the heat of neutralization.
Berikan definisi secara operasi untuk haba peneutralan.

……..……..……

……..……..……

[3 marks]

(j) State the relationship between type of acid and value of heat of neutralization. Explain the difference.
Nyatakan hubungan antara jenis asid dan nilai haba peneutralan. Terangan perbezaannya.

……..……..……

……..……..……

[3 marks]

(k) Based on the temperatures in Experiment II, predict the change in temperature if sodium hydroxide solution replaced by ammonia solution
Berdasarkan suhu dalam eksperimen II, ramalkan perubahan suhu jika larutan natrium hidroksida digantikan dengan larutan ammonia

……..……..……

[3 marks]

(l) The experiment is repeated using methanoic acid. The values of the heat of neutralization of these acids are given in Table 1. Complete table 1 by clasifying the acids as strong acid or weak acid.
Eksperimen diulangi dengan menggunakan asid metanoik. Nilai haba peneutralan untuk semua asid diberikan dalam Jadual 1. Lengkapkan Jadual 1 dengan membuat klasifikasi asid kepada asid kuat atau asid lemah.

Name of acid Nama asid	Heat of neutralization /kJmol^{-1} Haba peneutralan /kJmol^{-1}	Type of acid Jenis asid
Ethanoic acid	- 50.3	
Hydrochloric acid	- 57.2	
Methanoic acid	- 50.5	

Table 1 */Jadual 1*

[3 marks]

2. An experiment was conducted to find out the effects of temperature on the rate of reaction. 50 cm^3 of sodium thiosulphate solution 0.05 mol dm^{-3} at 30°C was put into a 250 cm^3 conical flask. Then the conical flask was placed on an "X" sign on a piece of white paper.
10 cm^3 of hydrochloric acid 1.0 mol dm^{-3} was added to the sodium thiosulphate solution and shaken. At the same time, the stop watch was started. The stop watch was stopped as soon as the "X" sign was no longer visible. The same step of the experiment was repeated for sodium tiosulphate solution which was heated to 35°C, 40°C and 50°C.
Satu eksperimen telah dijalankan untuk mengkaji kesan suhu ke atas kadar tindakbalas. Sebuah kelalang kon 250 cm^3 yang mengandungi 50 cm^3 larutan natrium thiosulfat 0.05 mol dm^{-3} pada suhu 30°C, diletakkan di atas tanda "X", pada sehelai kertas putih.

10 cm^3 asid hidroklorik 1.0 mol dm^{-3} dicampurkan kepada larutan natrium tiosulfat tersebut dan digoncang. Pada masa yang sama, jam randik dimulakan. Jam randik dihentikan sebaik sahaja tanda "X" tidak kelihatan. Langkah eksperimen yang sama diulangi bagi larutan natrium tiosulfat yang dipanaskan sehingga suhu 35°C, 40°C, 45°C dan 50°C
Diagram 1 shows the readings of the stop watch for each of the reaction at different temperatures.
Rajah 1 menunjukkan bacaan jam randik bagi setiap tindakbalas pada suhu yang berlainan.

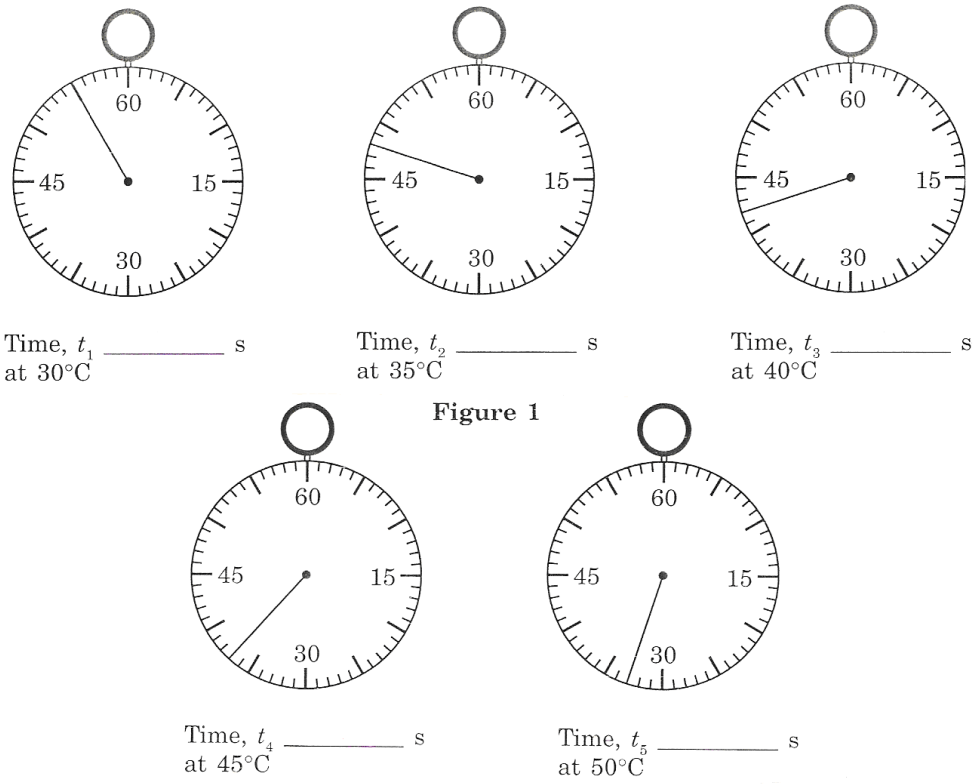


Figure 1

Diagram1 / *Rajah 1*

(a) Record the time for each reaction in the spaces provided in Figure 1.
Catatkan masa bagi setiap tindakbalas pada ruang yang disediakan dalam Rajah 1.

[3 marks]

(b) Construct a table and record temperature, time and 1/time for this experiment.
Bina satu jadual dan rekodkan suhu, masa dan 1/masa terlibat dalam eksperimen ini.

[3 marks]

(c) (i) Draw a graph of temperature against 1/time on the graph paper.
Lukiskan graf suhu melawan 1/masa pada kertas graf yang disediakan.

[3 marks]

(ii) Based on the graph in (c)(i), state the relationship between the rate of reaction and temperature.
Berdasarkan graf di (c)(i), nyatakan perhubungan antara kadar tindakbalas dengan suhu.

……..…

……..

[3 marks]

(d) Predict the time taken as soon as the sign "X" to be no longer visible if this experiment is repeated at 55^{O}C.
Ramalkan masa sebaik sahaja tanda "X" tidak boleh kelihatan jika eksperimen yang sama diulangi pada suhu $55^{O}C$.

……..……

……..……

[3 marks]

(e) (i) State the variable involved in this experiment.
Nyatakan pembolehubah yang terlibat dalam eksperimen ini.

Manipulated variable : .....
Pembolehubah dimanipulasi :

Responding variable :.....
Pembolehubah bergerakbalas

Constant variable : .....
Pembolehubah yang dimalarkan

[3 marks]

(ii) State how you would manipulate one variable while keeping the other variables constant.
Nyatakan bagaimana anda memanipulasikan satu pembolehubah manakala pembolehubah lain dimalarkan.

……..……

……..……

[3 marks]

(f) State the hypothesis for this experiment.
Nyatakan hipotesis bagi eksperimen ini.

……..……

……..……

[3 marks]

(g) From the above experiment, the student found a relationship between temperature and rate of reaction. The same situation can be applied in our daily lives, for example, keeping food that is easily spoiled in the kitchen cabinet compare to keeping food in the refrigerator.
Using your knowledge of chemistry, state the relationship between temperature and the rate at which food turns bad.
Daripada eksperimen di atas, pelajar mendapati suatu perhubungan antara suhu dengan kadar tindakbalas. Keadaan yang sama boleh diaplikasikan dalam kehidupan seharian seperti penyimpanan bahan makanan yang mudah rosak di dalam peti sejuk.
Dengan menggunakan pengetahuan kimia anda, nyatakan perhubungan antara suhu dengan kadar kerosakan makanan.

……..……

……..……
[3 marks]

Concentration of ions in the electrolytes affects the product of electrolysis of an aqueous solution.
Kepekatan ion dalam elektrolit mempengaruhi hasil dalam elektrolisis suatu larutan akueus.

3. Plan a laboratory experiment to investigate the effect of concentration of chloride ion on the selective discharge at the anode.
Rancang satu eksperimen makmal untuk mengkaji kesan kepekatan ion klorida dalam pemilihan nyahcas pada anod.

Your planning should include the following aspects :
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Statement of the problem/*Pernyataan masalah*
(b) All the variables /*Semua pembolehubah*
(c) Statement of the hypothesis /p*ernyataan hipotesis*
(d) List of substances and apparatus /*Senarai bahan dan radas*
(e) Procedure of the experiment /*Prosedur eksperimen*
(f) Tabulation of data / *Penjadualan data*

[17 marks]

4. Diagram 4 shows the conversation between two students about the electrolysis experiment.
Rajah 4 menunjukkan perbualan antara dua orang pelajar tentang eksperimen elektrolisis

I carried out an experiment of electrolysis copper (II) sulphate solution using carbon electrodes. I observed the gas bubbles are released at anode.
Saya telah menjalankan eksperimen elektrolisis larutan kuprum (II) sulfat dengan menggunakan elektrod karbon. Saya perhatikan gelembong gas dibebaskan di anod.

When I used copper as electrodes, I observed the anode become thinner.
Bila saya menggunakan kuprum sebagai elektrod, saya perhatikan anod semakin menipis

Diagram 4/ *Rajah 4*

Referring to the conversation above, plan a laboratory experiment to investigate the effect of the type of electrode to the product at anode.
Merujuk kepada perbualan di atas, rancang eksperimen makmal untuk menyiasat kesan jenis elektrod ke atas hasil di anod.
Your planning should include the following aspects :
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Statement of the problem/*Pernyataan masalah*
(b) All the variables /*Semua pembolehubah*
(b) Statement of the hypothesis /p*ernyataan hipotesis*
(c) List of substances and apparatus /*Senarai bahan dan radas*
(d) Procedure of the experiment /*Prosedur eksperimen*
(e) Tabulation of data / *Penjadualan data*

1. Diagram 1.1 shows the set-up of apparatus used in an experiment to construct the Electrochemical Series by referring to the potential difference of four pairs of metals.
Rajah 1.1 *menunjukkan susunan radas yang digunakan dalam satu eksperimen untuk membina Siri Elektrokimia dengan merujuk kepada beza keupayaan bagi empat pasangan logam.*

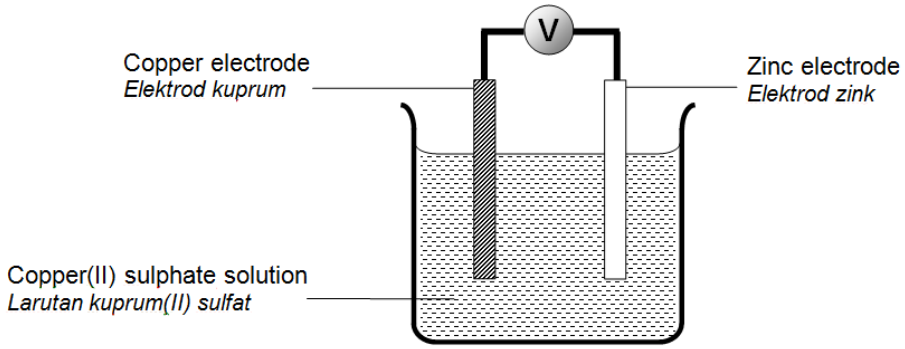


Diagram 1.1/*Rajah 1.1*

Diagram 1.2 shows the result obtained from the experiment after 30 minutes.
Rajah 1.2 *menunjukkan keputusan yang diperoleh daripada eksperimen selepas 30 minit.*

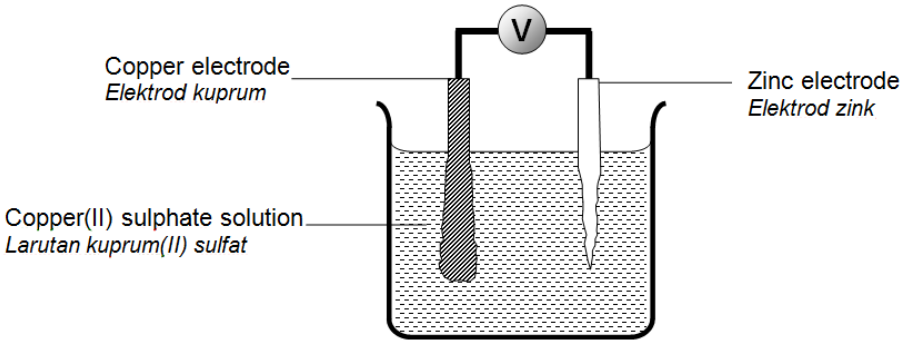


Diagram 1.2 / *Rajah 1.2*

(a) State **three** different observations and the corresponding inferences in Table 1.1.
*Nyatakan **tiga** pemerhatian yang berbeza dan inferens yang sepadan dalam Jadual* 1.1

Observation *Pemerhatian*	Inference *Inferens*

Table 1.1 / *Jadual* 1.1

[6 marks]

(b) The experiment is repeated by replacing zinc with metals P, Q and R. Copper electrode remains as the positive terminal in each of the experiments. Fresh copper (II) sulphate solution is used in each of the experiments.
Eksperimen diulangi dengan menggantikan zink dengan logam P, Q dan R. Elektrod kuprum kekal sebagai terminal positif bagi setiap eksperimen. Larutan kuprum (II) sulfat yang baru digunakan bagi setiap eksperimen.

Diagram 1.3 shows the voltmeter readings of the experiments.
Rajah 1.3 *menunjukkan bacaan voltmeter bagi semua eksperimen.*

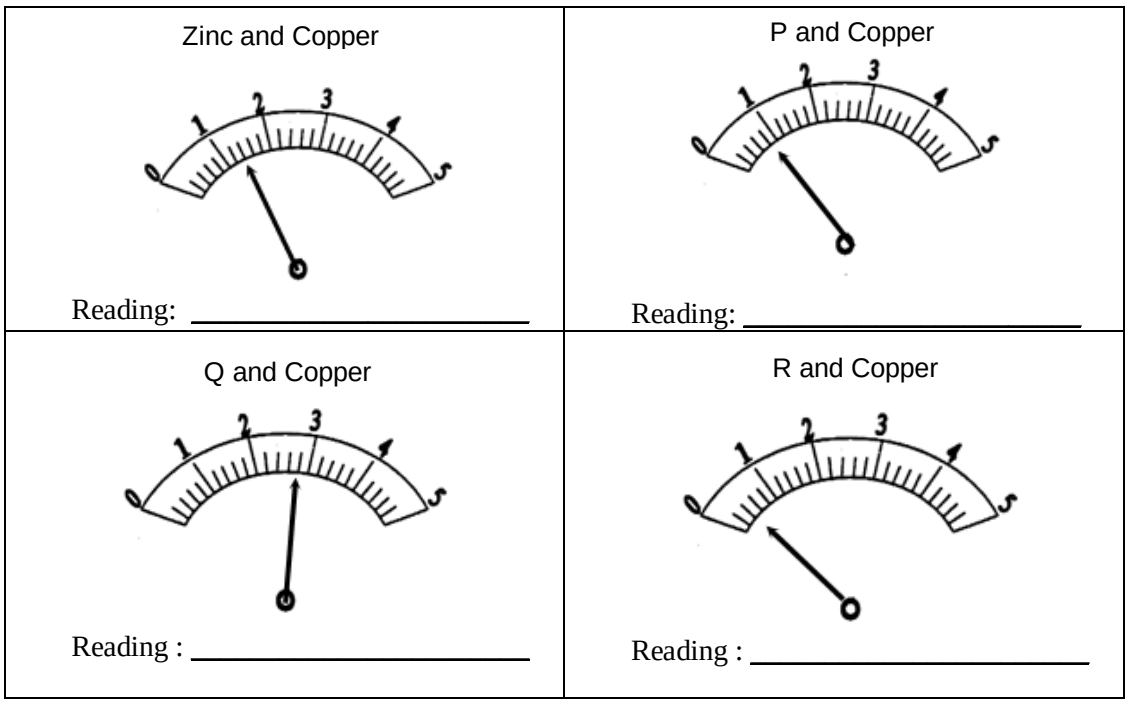


Diagram */Rajah 1.3*

Record the voltmeter readings in the spaces provided in Diagram 1.3.
Catatkan bacaan voltmeter pada ruang yang disediakan dalam Rajah 1.3.

[3 marks]

(c) Construct a table to record the voltmeter reading for four pairs of metals.
Bina satu jadual untuk merekodkan bacaan voltmeter untuk empat pasangan logam.

[3 marks]

(d) Based on the voltmeter readings and the copper electrode that acts as the positive terminal in pair of metals, arrange metals Zn, Cu, P, Q, and R in ascending order of electropositivity of metals in the electrochemical series.
Berdasarkan bacaan voltmeter dan elektrod kuprum yang bertindak sebagai terminal positif, susun keelektropositifan logam-logam Zn, Cu, P, Q dan R secara tertib menaik dalam siri elektrokimia.

……..……..……..……..……..……

[3 marks]

(e) Based on this experiment, state the:
Berdasarkan eksperimen ini, nyatakan:

(i) Manipulated variable : ……
Pemboleh ubah dimanipulasikan

(ii) Responding variable : ……
Pemboleh ubah bergerak balas

(iii) Constant variable : ……
Pemboleh ubah dimalarkan

[3 marks]

(f) State the hypothesis for the experiment.
Nyatakan hipotesis bagi eksperimen ini.

……

……

[3 marks]

(g) State the operational definition for the potential difference.
Nyatakan definisi secara operasi bagi beza upaya.

……

……

[3 marks]

(h) Classify all the ions present in copper (II) sulphate solution into cations and anions.
Kelaskan ion-ion yang terdapat di dalam larutan kuprum (II) sulfat kepada kation dan anion.

[3 marks]

(i) Predict the positive terminal and the voltage for the pair of metals P and Q.
Ramalkan terminal positif dan nilai voltan bagi pasangan logam P and logam Q

Pair of Metals *Pasangan logam*	Positive Terminal *Terminal Positif*	Voltage / V *Voltan / V*
P and Q		

[3 marks]

(j) A student carried out two experiments as shown in Diagram 1.4. In the experiments, zinc and magnesium electrodes corroded.
Seorang pelajar menjalankan dua eksperimen seperti dalam Rajah 1.4. Di dalam eksperimen-eksperimen ini, elektrod zink dan magnesium terkakis.

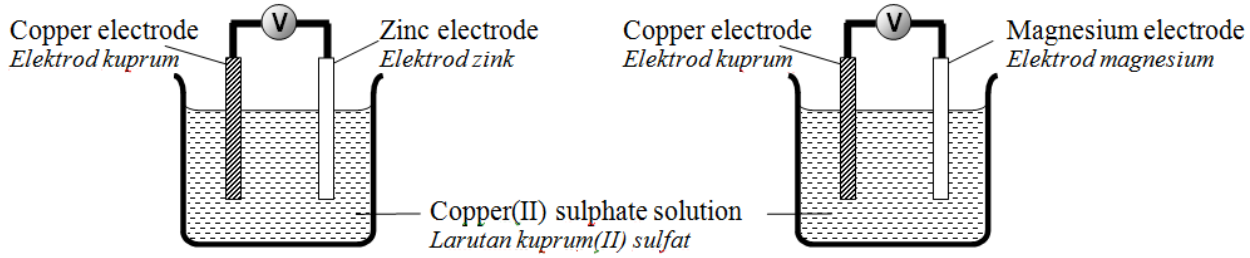


Diagram 1.4 / *Rajah 1.4*

Based on the experiments, zinc electrode takes a longer time to corrode compared to magnesium electrode. Explain why.
Berdasarkan eksperimen, elektrod zink memerlukan masa yang lebih panjang untuk terkakis berbanding dengan elektrod magnesium. Terangkan.

……

……

[3 marks]

2. The alkali metals in Group 1 of the Periodic Table of Elements can react with oxygen gas with different reactivity.
Table 1 shows the experiment and observation when Lithium, Li, Sodium, Na and Potassium, K react with Oxygen, O_2 gas.
Logam alkali dalam Kumpulan 1 Jadual Berkala Unsur boleh bertindak balas dengan gas oksigen dengan kereaktifan berbeza.
Jadual 1 menunjukkan eksperimen dan pemerhatian apabila Litium, Li, Natrium, Na dan Kalium, K bertindak balas dengan gas oksigen.

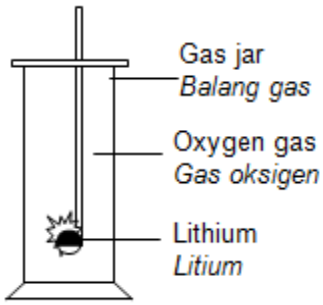
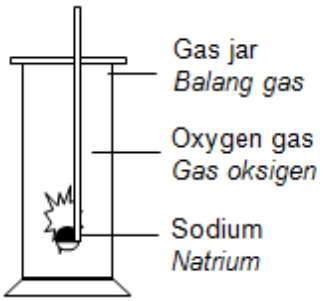
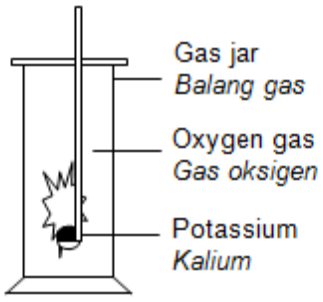
Experiment *Eksperimen*	Observation *Pemerhatian*
	Lithium burns slowly with a red flame. White fume is released. White solid is produced. *Litium terbakar perlahan-lahan dengan nyalaan merah.* *Wasap putih dibebaskan.* *Pepejal putih terhasil.*
	Sodium burns vigorously with a yellow flame. White fume is released. White solid is produced. *Natrium terbakar cergas dengan nyalaan kuning.* *Wasap putih terbebas.* *Pepejal putih terhasil.*
	Potassium burns very vigorously with a reddish-purple flame. White fume is released. White solid is produced. *Kalium terbakar sangat cergas dengan nyalaan ungu-kemerahan.* *Wasap putih terbebas.* *Pepejal putih terhasil.*

Table */Jadual 1*

(a) State the inference for the observations in Table 1.
Nyatakan inferens bagi pemerhatian-pemerhatian dalam Jadual 1.

……

……

[3 marks]

(b) Based on the experiment above:
Berdasarkan eksperimen di atas:

(i) State the method to manipulate the variable.
Nyatakan kaedah untuk memanipulasi pembolehubah.

……..

(ii) State the responding variable.
Nyatakan pembolehubah bertindak balas.

……..

(iii) State the controlled variable.
Nyatakan pembolehubah dimalarkan.

……..
[3 marks]

(c) State the hypothesis for the experiment.
Nyatakan hipotesis bagi eksperimen tersebut.

……..……..……..……
……..……..……..……
[3 *marks*]

(d) By refering to the reaction between alkali metals with oxygen, give the operational definition for the reactivity of alkali metals.
Merujuk kepada tindak balas antara logam alkali dengan oksigen, berikan definisi secara operasi bagi kereaktifan logam-logam alkali.

……..……..……..……
……..……..……..……
[3 marks]

(e) Metal X is also a member of Group 1 elements.
Alkali metal X ignites spontaneously in air with a reddish-violet flame. White fumes and a white solid are also produced.
Logam X juga adalah merupakan ahli Kumpulan 1.
Logam alkali X terbakar secara spontan di udara dengan nyalaan ungu-kemerahan. Wasap putih dan pepejal putih juga terbentuk.

(i) Predict in which period, the metal X is located in the Periodic Table of Element.
Ramalkan Kala, logam X diletakkan dalam Jadual Berkala Unsur.

…..……..……..……
[3 marks]

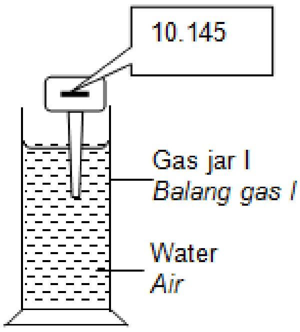
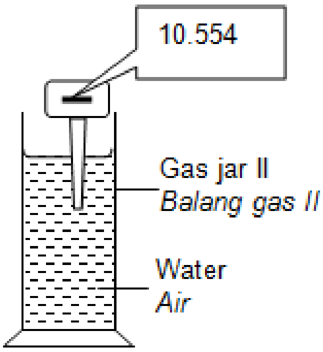
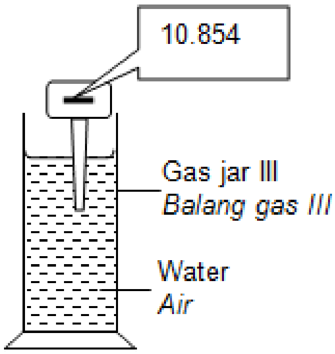
(ii) Based on the observations in Table 1 and (e) (i) , arrange lithium, sodium, potassium and metal X in ascending order of reactivity of metals towards oxygen.
Berdasarkan pemerhatian dalam Jadual 1 dan (e) (i) , susun litium, natrium, kalium dan logam alkali X mengikut tertib menaik kereaktifan logam terhadap oksigen.

……..……..……..……
[3 marks]

(f) 0.2 g of sodium will take 18 seconds to burn completely in oxygen gas.
0.5 g of sodium will take 45 seconds to burn completely in oxygen gas.
State the relationship between the mass of sodium and the time taken for the metal to burn completely in oxygen gas.
0.2 g natrium mengambil masa 18 saat untuk terbakar lengkap dalam oksigen gas.
0.5 g natrium mengambil masa 45 saat untuk terbakar lengkap dalam oksigen gas.
Nyatakan hubungan antara jisim natrium dan masa yang diambil untuk logam itu terbakar bertindak balas lengkap dalam oksigen gas.

………
[3 marks]

When the reaction in Table 1 is completed, 10 cm^3 of water is poured into the gas jar. A pH meter is dipped into the solution formed.
Table 2 shows the pH meter reading.
Apabila tindak balas dalam Jadual 1 selesai, 10 cm^3 air dituang ke dalam balang gas. Meter pH dicelup ke dalam larutan yang terbentuk.
Jadual 2 menunjukkan bacaan meter pH.

<table>
<tr>
<td> 
</td>
<td> 
</td>
<td> 
</td>
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<tr>
<td>Reading:......................
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<td>Reading:........................
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<td>Reading:........................
Bacaan</td>
</tr>
</table>

Table 2 / *Jadual 2*

(g) Record the pH meter reading to one decimal place in Table 2.
Rekod bacaan meter pH dengan satu tempat perpuluhan dalam Jadual 2.
[3 marks]

(h) Write the observations when blue litmus paper and red litmus paper are dipped into the solution formed in Gas Jar I, Gas Jar II and Gas Jar III.
Tuliskan pemerhatian apabila kertas litmus biru dan merah dicelup ke dalam larutan yang terbentuk dalam Balang Gas 1, Balang Gas II dan Balang Gas III.

Solutions *Larutan-larutan*	Red litmus paper *Kertas litmus merah*	Blue litmus paper *Kertas litmus biru*
Gas Jar I / *Balang Gas I*		
Gas Jar / *Balang Gas II*		
Gas Jar / *Balang Gas III*		

Table 1/*Jadual 1* *[3 marks]*

(i) Write the balanced chemical equations for the reaction:
Tulis persamaan kimia yang seimbang untuk tindak balas:

(i) Between alkali metal and oxygen gas (choose only one from Table 1):
Di antara logam alkali dan gas oksigen (pilih satu daripada Jadual 1):

……

(ii) Between the product formed from (i) (i) and water :
Di antara hasil yang terbentuk daripada (i) (i) dan air:

……

[3 marks]

(j) Classify the following alkaline solutions into strong alkali and weak alkali
Kelaskan larutan-larutan alkali berikut kepada alkali kuat dan alkali le

Sodium hydroxide, NaOH *Natrium hidroksida, NaOH*	Ammonia solution, NH_3 *Larutan ammonia, NH_3*
Potassium hydroxide, KOH *Kalium hidroksida, KOH*	Calcium hydroxide, $Ca(OH)_2$ *Kalsium hidroksida, $Ca(OH)_2$*

[3 marks]

3. Reaction between sodium thiosulphate, $Na_2S_2O_3$ solution and dilute sulphuric acid, H_2SO_4 will produce sodium sulphate, Na_2SO_4 , sulphur, S, sulphur dioxide, SO_2 and water, H_2O.
Tindakbalas antara larutan natrium tiosulfat, $Na_2S_2O_3$ dan asid sulfurik cair, H_2SO_4 akan menghasilkan natrium sulfat, Na_2SO_4, sulphur, S, sulphur dioksida, SO_2 dan air, H_2O

The chemical equation is:

$$\mathbf{Na_2S_2O_3 + H_2SO_4 \rightarrow Na_2SO_4 + S + SO_2 + H_2O}$$

By using the information above, plan an experiment to investigate the effect of temperature on the rate of reaction.

Your planning should include the following aspects:
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Statement of the problem / *Pernyataan masalah*
(b) All the variables / S*emua pembolehubah*
(c) Statement of the hypothesis / *Pernyataan hipotesis*
(d) List of substances and apparatus / *Senarai bahan dan radas*
(e) Procedure of the experiment /*Prosedur eksperimen*
(f) Tabulation of data /*Penjadualan data*

[17 marks]

PAPER 3 SET 5

1. An experiment is carried out to investigate the effects of concentration of ions on the selective discharge of ions at the electrodes. The set-up of apparatus of the experiment are shown in Diagram 1.
Satu eksperimen telah dijalankan untuk mengkaji kesan kepekatan ion terhadap pemilihan nyahcas ion di elektrod. Susunan radas bagi eksperimen itu ditunjukkan pada rajah 1.

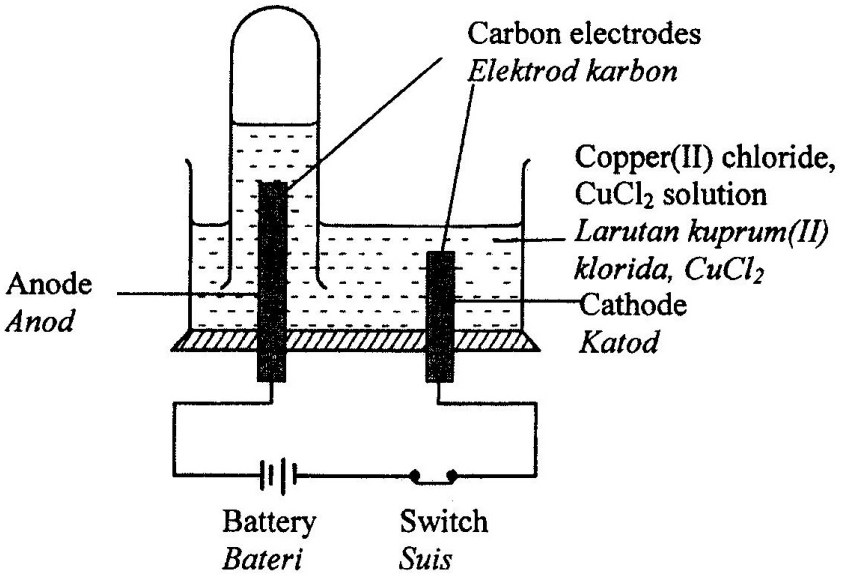
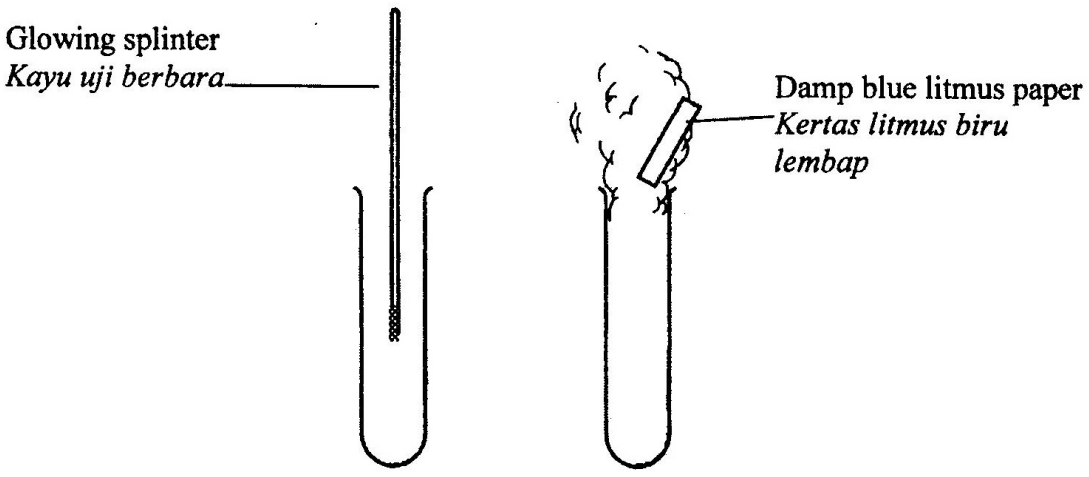


Diagram 1/*Rajah 1*

The experiment is carried out by using copper (II) chloride solutions of 1.0 mol dm^{-3} and 0.001 mol dm^{-3}. The gas collected at anode is tested with damp blue litmus paper and glowing splinter.
Eksperimen itu dijalankan dengan menggunakan larutan kuprum (II) klorida 1.0 mol dm^{-3} dan 0.001mol dm^{-3} Gas yang dikumpulkan pada anod diuji dengan kertas litmus biru yang lembap dan kayu uji berbara.



(a) Complete the Table 1 by stating the observations and related inferences in the experiment.
Lengkapkan Jadual 1 di bawah dengan menyatakan pemerhatian dan inferens yang berkaitan dalam eksperimen itu.

Electrolyte *Elektrolit*	Observations at anode *Pemerhatian di anod*
Copper (II) chloride solution of 1.0 mol dm^{-3} *Larutan kuprum (II) klorida 1.0 mol dm^{-3}*	Damp blue litmus paper: …… *Kertas litmus biru lembap :* Glowing splinter: …… *Kayu uji berbara :*
Copper (II) chloride solution of 0.001 mol dm^{-3} Larutan kuprum (II) klorida 0.001 mol dm^{-3}	Damp blue litmus paper: …… *Kertas litmus biru lembap :* Glowing splinter: …… *Kayu uji berbara :*

Table1 / *Jadual 1*

[3 marks]

(b) State the colour change of copper (II) chloride solution when experiment is carried out.
Nyatakan perubahan warna larutan kuprum (II) klorida semasa eksperimen itu dijalankan.

……

……

[3 marks]

(c) Complete Table 2 based on the experiment.
Lengkapkan Jadual 2 berdasarkan eksperimen itu.

Name of variables *Nama pembolehubah*	Action to be taken *Tindakan yang perlu diambil*
(i) Manipulated variable: *Pembolehubah dimanipulasikan:* ……	(i) The way to manipulate variable: *Cara mengubah pembolehubah dimanipulasikan :* ……
(ii) Responding variable: *Pembolehubah bergerakbalas :* ……	(ii) What to observe in the responding variable: *Apakah yang diperhatikan dalam pembolehubah bergerakbalas :* ……
(iii) Fixed variable: *Pembolehubah dimalarkan :* ……	(iii) The way to maintain the fixed variable: *Cara menetapkan pembolehubah dimalarkan* : ……

Table 2/ *Jadual 2*

[6 marks]

(d) State one hypothesis for the experiment.
Nyatakan satu hipotesis bagi eksperimen itu.

……

……

[3 marks]

(e) Classify all the ions that exist in copper (II) sulphate solution into cations and anions.
Kelaskan ion-ion yang hadir dalam larutan kuprum (II) sulfat kepada kation dan anion.

[3 marks]

2. A student carried out an experiment to determine the empirical formula of magnesium oxide.
The steps and set-up of apparatus of the experiment are shown in Diagram 1.
Seorang pelajar telah menjalankan satu eksperimen untuk menentukan formula empirik magnesium oksida.
Langkah dan susunan radas eksperimen ditunjukkan dalam rajah 1.

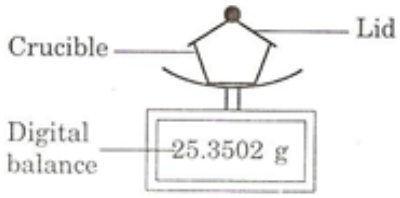
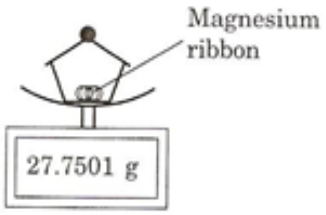
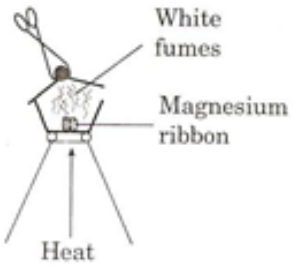
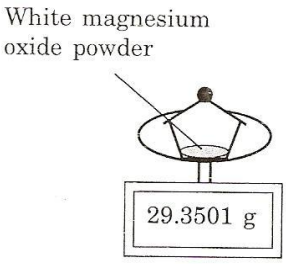
Step *Langkah*	Set-up of apparatus *Susunan radas*
1. Crucible and lid are weighed *Mangkuk pijar dan penutup ditimbang*	
2. Crucible, lid and magnesium ribbon are weighed. *Mangkuk pijar, penutup dan pita magnesium ditimbang*	
3. Magnesium ribbon is heated until the reaction is complete. *Pita magnesium dipanaskan hingga tindakbalas lengkap*	
4. Crucible, lid and magnesium oxide are weighed when cooled. *Mangkuk pijar, penutup dan magnesium oksida ditimbang setelah disejukkan*.	

Diagram 1/ *Rajah 1*

(a) Complete the following table by stating the observation and related inferences in the experiment.
Lengkapkan jadual berikut dengan menyatakan pemerhatian dan inferens yang berkaitan.

Observation *Pemerhatian*	Inferences *Inferens*
(i)	
(ii)	

[6 marks]

(b) Record the reading to two decimal places for:
Catatkan bacaan pada dua tempat perpuluhan bagi:

Description *Penerangan*	Mass / g *Jisim / g*
The crucible and lid *Mangkuk pijar dan penutup*	
The crucible, lid and magnesium ribbon *Mangkuk pijar, penutup dan pita magnesium*	
The crucible, lid and magnesium oxide when cooled *Mangkuk pijar, penutup dan magnesium oksida setelah disejukkan*	

[3 marks]

(c) (i) What is the mass of magnesium that has been used?
Berapakah jisim magnesium yang digunakan?

(ii) What is the mass of oxygen which reacted with magnesium?
Berapakah jisim oksigen yang bertindak balas dengan magnesium?

(iii) Determine the empirical formula of magnesium oxide.
Tentukan formula empirik magnesium oksida
Use the information that the relative atomic mass, Mg = 24, O = 16
Gunakan maklumat jisim atom relatif, Mg = 24, O = 16

[3 marks]

(d) Based on your answer in (c)(iii), how many moles of magnesium and oxygen atoms have reacted.
Berdasarkan jawapan di (c) (iii), berapakah bilangan mol atom magnesium dan bilangan atom oksigen yang telah bertindak balas?

……

[3 marks]

(e) The student wants to determine the empirical formula of copper (II) oxide. He used the steps and set-up of apparatus as the experiment before.
Predict whether the empirical formula of copper (II) oxide can be determined.
Explain your answer.
Pelajar tersebut ingin menentukan formula empirik kuprum (II) oksida. Beliau menggunakan langkah dan susunan radas yang digunakan dalam eksperimen sebelum itu.
Ramalkan adakah formula empirik kuprum (II) oksida dapat ditentukan. Jelaskan jawapan anda.

……

……

……

[3 marks]

(f) Below are some oxides of elements.
Dibawah adalah oksida beberapa unsur.

- Magnesium oxide
- Sulphur oxide
- Carbon dioxide
- Copper (II) oxide

Classify the oxides into two groups, those which are basic oxides and those which are acidic oxides. Put your answer in a suitable table.
Kelaskan oksida kepada dua kumpulan, iaitu kumpulan oksida bersifat bes dan kumpulan oksida bersifat asid. Jawapan anda dimasukkan ke dalam jadual yang sesuai.

[3 marks]

3. Diagram 3.1 shows how latex is obtained from the rubber tree. Rubber is used to manufacture substances for everyday life such as gloves and tires.
Rajah 3.1 menunjukkan bagaimana lateks diperolehi daripada pokok getah. Getah digunakan dalam pembuatan bahan untuk kegunaan hidup seharian seperti sarung tangan dan tayar.

Diagram 3.1/Rajah 3.1

An acid is used to coagulate latex while alkali can prevent the coagulation of latex. Based on this idea, plan a laboratory experiment to investigate the effect of acid and alkali on the coagulation of latex.
Asid digunakan untuk membekukan lateks manakala alkali boleh digunakan untuk mencegah pembekuan lateks. Berdasarkan idea ini, rancangkan satu eksperimen makmal untuk menyiasat kesan asid dan alkali terhadap pembekuan lateks.
Your planning should include the following aspects:
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Statement of the problem / *Pernyataan masalah*
(f) All the variables / *Semua pembolehubah*
(g) Statement of the hypothesis / *Pernyataan hipotesis*
(h) List of substances and apparatus /*Senarai bahan dan radas*
(i) Procedure of the experiment /*Prosedur eksperimen*
(j) Tabulation of data /*Penjadualan data*

PAPER 3 SET 6

1. Diagram 1.1 shows the apparatus set-up to carry out an experiment to compare the hardness of bronze and its pure metal, copper.
Rajah 1.1 menunjukkan gambarajah susunan radas untuk membandingkan kekerasan gangsa dengan logam tulennya, kuprum.

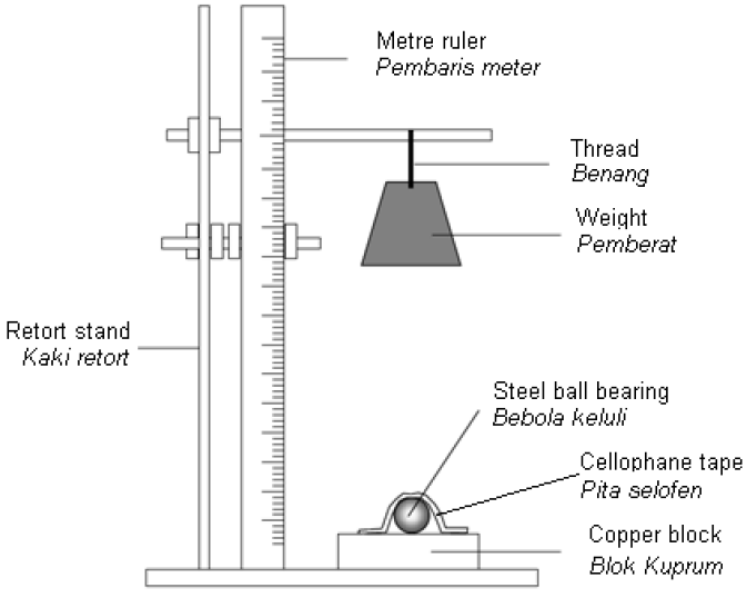


Diagram 1.1/*Rajah 1.1*

A steel ball bearing is taped onto the copper block using cellophane tape. A weight of 1 kilogram is dropped at a height of 50 cm to hit the ball bearing.
Bebola keluli dilekatkan di atas blok kuprum menggunakan peta selofen. Pemberat 1 kilogram dijatuhkan pada ketinggian 50 cm untuk menghentam bebola

Diagram 1.2 shows the shape of dents formed for the experiment.
Rajah 1.2 menunjukkan lekuk yang terbentuk bagi eksperimen itu.

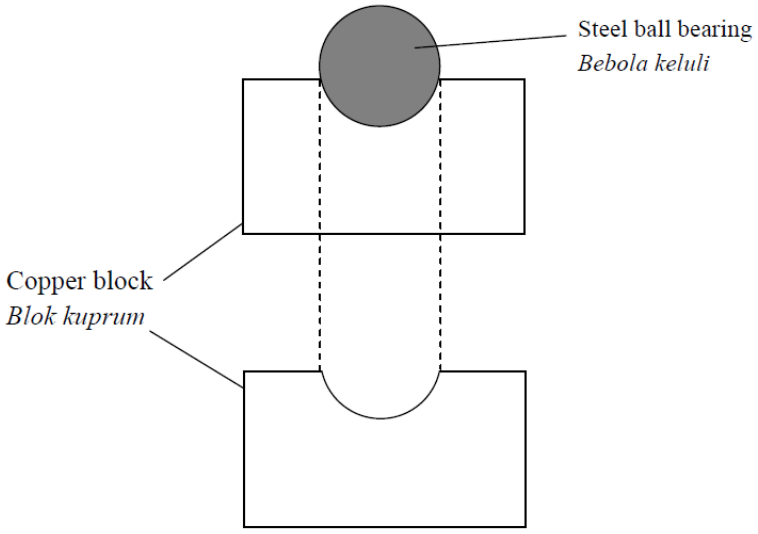


Diagram 1.2/ *Rajah 1.2*

The diameter of the dent made on the copper block is measured. The experiment is repeated by replacing copper block with bronze block.
Diameter lekuk yang terhasil di atas bongkah kuprum diukur. Eksperimen diulangi dengan menggantikan bongkah kuprum dengan bongkah gangsa.

Table 1.1 shows the view of the dents made on bronze and copper block.
Jadual 1.1 menunjukkan pandangan lekuk yang terhasil di atas bongkah gangsa dan bongkah kuprum.

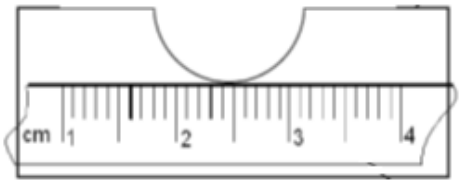
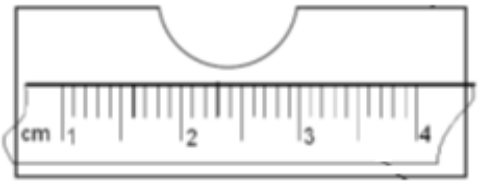
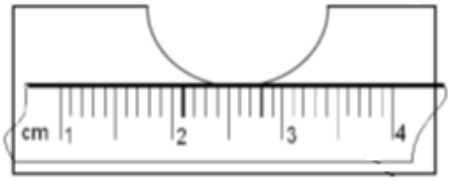
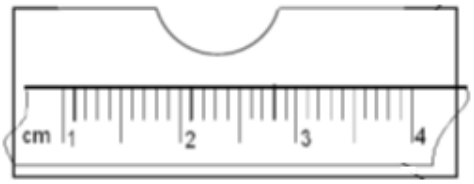
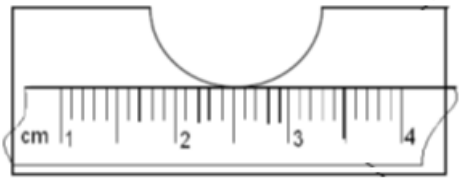
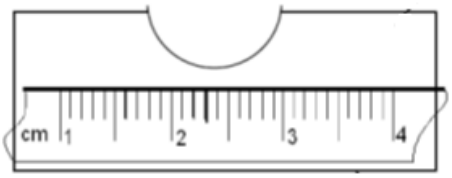
Experiment Eksperimen	Copper kuprum	Bronze Gangsa
I	 …….	 …….
II	 …….	 …….
III	 …….	 …….

Table 1.1/Jadual 1.1

(a) (i) By using the ruler given, measure the diameters of the dents made on copper and bronze blocks.
Record all the diameters of the dents in Table 1.1.
Dengan menggunakan pembaris yang diberikan, ukur diameter lekuk yang terhasil di atas bongkah kuprum dan bongkah gangsa. Catatkan semua diameter dalam Jadual 1.1

[3 marks]

(ii) Construct a table to record the diameters and the average diameter of dents on copper and bronze blocks.
Bina satu jadual untuk merekod diameter lekuk-lekuk dan purata diameter lekuk pada bongkah kuprum dan bongkah gangsa. .

[3 marks]

(b) State **one** observation that can be obtained from both experiments.
Nyatakan **satu** *pemerhatian yang dapat diperoleh daripada kedua-dua eksperimen ini.*

……..

[3 marks]

(c) Based on the average diameter of the dents on copper block and bronze block, state the inference that can be made.
Berdasarkan purata diameter lekuk di atas bongkah kuprum dan bongkah gangsa, nyatakan inferens yang boleh dibuat.

……..

……..

[3 marks]

(d) State the operational definition for the hardness of materials in the experiment
Nyatakan definisi secara operasi bagi kekerasan bahan dalam eksperimen ini.

……..

……..

[3 marks]

(e) Explain why there is difference in diameter of dents on copper and bronze blocks.
Terangkan kenapa terdapat perbenzaan dalam diameter lekuk di atas bongkah kuprum dan gangsa.

……

……

[3 marks]

(f) State the hypothesis for this experiment.
Nyatakan hipotesis untuk eksperimen ini.

……..

……..

[3 marks]

(g) Complete table below based on the experiment.
Lengkapkan Jadual di bawah berdasarkan kepada eksperimen.

Name of variables / *Nama pembolehubah*	Action to be taken / *Tindakan yang akan diambil*
(i) Manipulated variable: *Pembolehubah dimanipulasi* …….	(i)The way to manipulate variable: *Cara untuk memanipulasi pembolehubah:* …….
(ii) Responding variable: *Pembolehubah bergerak balas* …….	(ii) What to observe in the responding variable: *Apa yang diperhatikan pada pembolehubah bergerakbalas:* …….
(iii) Controlled variable: *Pembolehubah ditetapkan :* …….	(iii) The way to maintain the control variable: *Cara untuk mengekalkan pembolehubah :* …….

[6 marks]

2. Table 1.1 shows the observation in five test tubes used to investigate the effect of other metals on rusting. A mixture of jelly solution, potassium hexacyanoferrate (III), $K_3Fe(CN)_6$ solution and phenolphthalein were used as medium in each test tube.The observations were recorded after one day.
Jadual 1.1 menunjukkan pemerhatian dalam lima buah tabung uji yang digunakan untuk menyiasat kesan logam lain ke atas pengaratan. Medium yang digunakan di dalam setiap tabung uji adalah campuran larutan agar, larutan kalium heksasianoferat(III), $K_3Fe(CN)_6$ dan fenolftalein. Pemerhatian direkod selepas satu hari.

Test tube 1 *Tabung uji 1*	 Iron nail *Paku besi* Blue colour *Warna biru*
Test tube 2 *Tabung uji 2*	 Iron nail coiled with magnesium ribbon *Paku besi dililit dengan pita magnesium* High intensity of pink colour *Keamatan warna merah jambu tinggi*
Test tube 3 *Tabung uji 3*	 Iron nail coiled with copper strip *Paku besi dililit dengan kepingan kuprum* High intensity of blue colour *Keamatan warna biru tinggi*
Test tube 4 *Tabung uji 4*	 Iron nail coiled with zinc strip *Paku besi dililit dengan kepingan zink* Low intensity of pink colour *Keamatan warna merah jambu rendah*
Test tube 5 *Tabung uji 5*	 Iron nail coiled with tin strip *Paku besi dililit dengan kepingan timah* Low intensity of blue colour *Keamatan warna biru rendah*

Table 1.1/ Jaual 1.1

(a) State the observation and inference for each test tube.
Nyatakan pemerhatian dan inferens untuk setiap tabung uji.

Test tube	Observation / *Pemerhatian*	Inference / *Inferens*
1		
2		
3		
4		
5		

[6 marks]

(b) Based on this experiment, explain why there is a difference in observation between test tube 2 and 3.
Berdasarkan eksperimen ini, terangkan mengapa terdapat perbezaan pemerhatian di antara tabung uji 2 dan 3.

……..……..

……..……..
[3 marks]

(c) State the hypothesis for the experiment.
Nyatakan hipotesis bagi eksperimen ini.

……..……

……..……
[3 marks]

(d) For this experiment, state:
Bagi eksperimen ini, nyatakan

(i) The manipulated variable : ……..
Pembolehubah dimanipulasi :

(ii) The responding variable : ……..
Pembolehubah bergerakbalas :

(iii) The constant variable : ……..
Pembolehubah dimalarkan :

[3 marks]

(e) State the operational definition for the rusting of iron nail.
Nyatakan definisi secara operasi bagi pengaratan paku besi.

……

……
[3 marks]

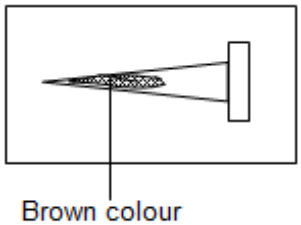
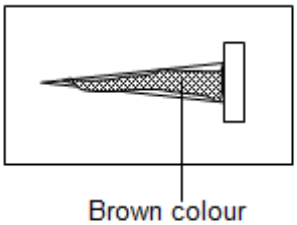
(f) Magnesium, copper, zinc and tin were used in this experiment to investigate the effect of other metals on the rusting of iron nails. Classify the metals by completing Table 1.2.
Magnesium, kuprum, zink dan timah digunakan dalam eksperimen ini untuk mengkaji kesan logam lain ke atas pengaratan paku besi. Kelaskan logam-logam dengan melengkapkan Jadual 1.2.

Metals that inhibit rusting *Logam yang melambatkan pengaratan*	Metals that speed up rusting *Logam yang mempercepatkan pengaratan*

Table 1.2/*Jadual 1.2*

[3 marks]

(g) An iron nail was placed on a moist cotton to investigate the time taken for the iron nail to rust completely. The observations are shown below.
Sebatang paku besi diletakkan di atas kapas lembap untuk mengkaji masa yang diambil untuk paku besi itu berkarat dengan lengkap. Pemerhatian adalah ditunjuk seperti di bawah.

	
After one day Selepas satu hari	After two days Selepas dua hari

(i) State the relationship between the time taken and the amount of rust formed.
Nyatakan hubungan di antara masa yang diambil dan kuantiti karat yang terbentuk.

……..……..

……..……..
[3 marks]

(ii) The iron nail will take 5 days to rust completely in the water. Predict the time taken for the iron nail to rust completely if it is placed in salt solution.
Sebatang paku besi mengambil masa 5 hari untuk berkarat dengan lengkap. Ramalkan masa yang diambil untuk paku besi itu berkarat dengan lengkap jika diletakkan dalam larutan garam.

……..
[3 marks]

(h) In another experiment, the pairs of metals in test tube 2, 3, 4 and 5 were dipped into dilute sulphuric acid, H_2SO_4 and were connected to a voltmeter. The reading of the voltmeter are shown in Diagram 1.
Dalam eksperimen yang lain, pasangan logam dalam tabung uji 2, 3, 4 dan 5 dicelupkan ke dalam asid sulfurik cair, H_2SO_4 dan disambungkan kepada voltmeter. Bacaan voltmeter ditunjukkan dalam Rajah 1.

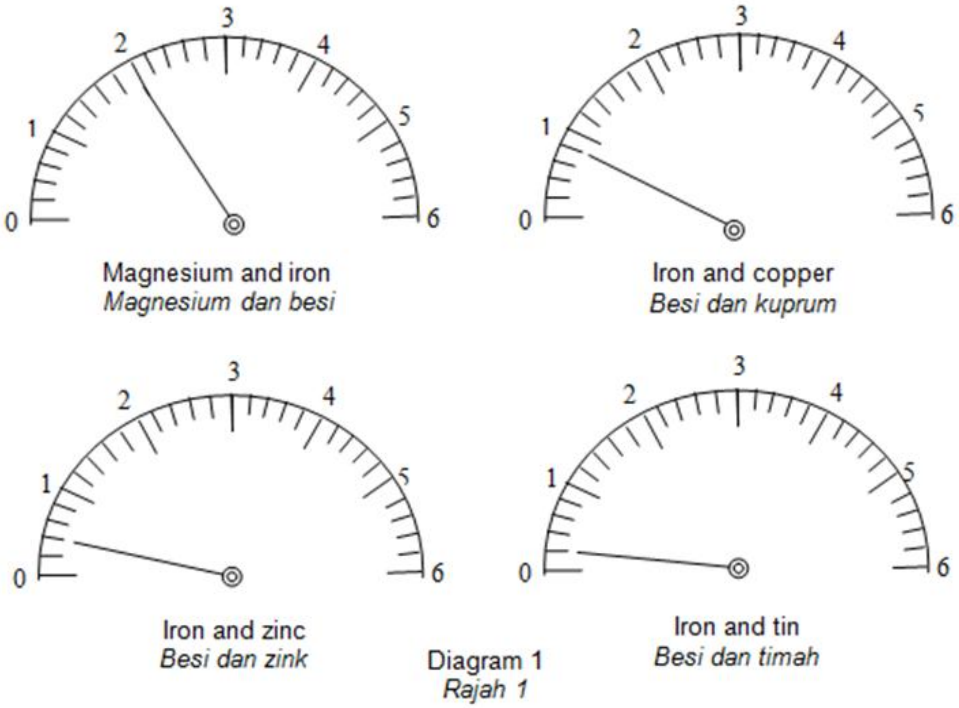


Diagram 1
Rajah 1

(i) Based on diagram 1, record the voltmeter readings in Table 1.3.

Pairs of metal *Pasangan logam*	Positive terminal *Terminal positif*	Voltmeter reading (V) *Bacaan voltmeter (V)*
Magnesium and iron *Magnesium dan besi*	Iron *Besi*	
Iron and copper *Besi dan kuprum*	Copper *Kuprum*	
Iron and zinc *Besi dan zink*	Iron *Besi*	
Iron and tin *Besi dan timah*	Tin *Timah*	

Table 1.3/ Jadual 1.3

Based Diagram 1, record ammeter reading in Table 1.3
Berdasarkan rajah 1, rekod bacaan voltmeter dalam Jadual 1.3

[3 marks]

(ii) Draw a labelled diagram to show the voltaic cell using magnesium and iron with dilute sulphuric acid as electrolyte.
Lukis gambarajah berlabel untuk menunjukkan sel voltan bagi magnesium dan besi dengan menggunakan asid sulfurik cair sebagai elektrolit.

[3 marks]

Neutralisation is a reaction between an acid and an alkali to form salt and water
Peneutralan adalah tindakbalas antara asid dan alkali untuk menghasilkan garam dan air

3. Referring to the situation above, plan a laboratory experiment to compare the heat of neutralisation between a named strong acid with sodium hydroxide solution and heat of neutralisation between a named weak acid and sodium hydroxide solution.
Berdasarkan situasi di atas, rancangkan satu eksperimen makmal untuk membandingkan haba peneutralan di antara asid kuat yang dinamakan dengan larutan natrium hidroksida dan haba peneutralan antara asid lemah yang dinamakan dengan larutan natrium hidroksida

Your planning should include the following aspects:
Perancangan anda perlu mengikut aspek berikut:

(a) Problem statement / *pernyataan masalah*
(b) All the variables / *semua pembolehubah*
(c) Statement of the hypothesis / *pernyataan hipotesis*
(d) List of substances and apparatus / *senarai bahan dan radas*
(e) Procedure of the experiment / *kaedah eksperimen*
(f) Tabulation of data / *penjadualan data*

PAPER 3 SET 7

1. A group of student carried out an experiment to determine the end-point of titration.
Diagram 1 describes the activity in this experiment.
Sekumpulan pelajar telah menjalankan satu eksperimen untuk menentukan takat akhir pentitratan.
Rajah 1 *menghuraikan aktiviti dalam eksperimen ini.*

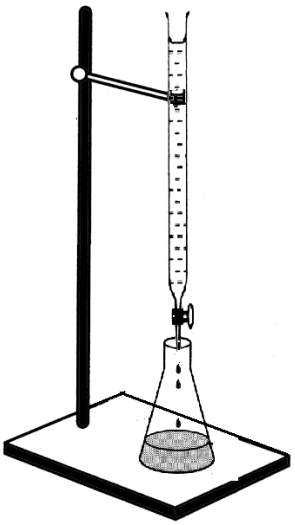
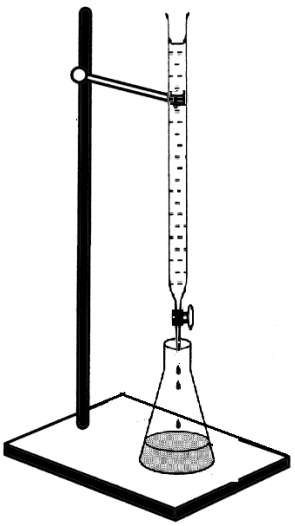
Activity I *Aktiviti* I	Titration between 25.0 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution with hydrochloric acid by using phenolphthalein as the indicator. *Pentitratan di antara* 25.0 cm^3 *larutan natrium hidroksida berkepekatan* 0.1 mol dm^{-3} *dengan asid hidroklorik dan menggunakan fenolftalein sebagai penunjuk.*  Hydrochloric acid *Asid hidroklorik* Sodium hydroxide solution + phenolphthalein indicator *Larutan natrium hidroksida + penunjuk fenolftalein*
Activity II *Aktiviti* II	Titration between 25.0 cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution with sulphuric acid by using phenolphthalein as the indicator. *Pentitratan di antara 25.0 cm^3 larutan natrium hidroksida berkepekatan 0.1 mol dm^{-3} dengan asid sulfurik dan menggunakan fenolftalein sebagai penunjuk*  Sulphuric acid *Asid sulfurik* Sodium hydroxide solution + phenolphthalein indicator *Larutan natrium hidroksida + penunjuk fenolftalein*

Diagram 1/ *Rajah 1*

Table 2 shows the reading of burette for the titration that have been conducted for Activity I.
Jadual 2 menunjukkan tiga bacaan buret bagi pentitratan yang telah dijalankan dalam Aktiviti I

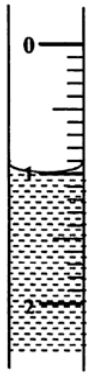
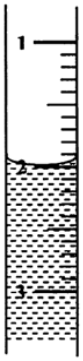
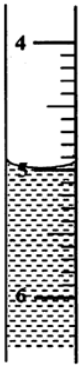
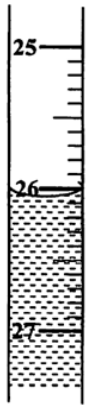
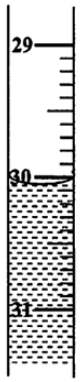
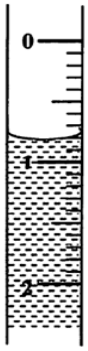
Titration number	*1*	*2*	*3*
Initial burette reading *Bacaan awal buret*	 …….	 …….	 …….
Final burette reading *Bacaan akhir buret*	 …….	 …….	 …….

Table 2/ *Jadual 2*

Table 3 shows the the reading of burette for the titration that have been conducted for Activity II.
Jadual 3 menunjukkan tiga bacaan buret bagi pentitratan yang telah dijalankan dalam Aktiviti II

Titration number	*1*	*2*	*3*
Initial burette reading *Bacaan awal buret*	 …….	 …….	 …….

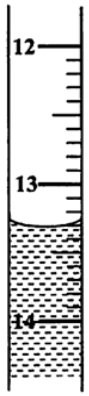
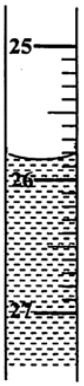
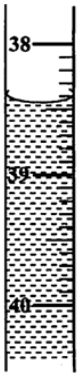
Final burette reading *Bacaan akhir buret*	 …….	 …….	 …….

Table 3/ *Jadual 3*

(a) Record the initial reading and final reading of burette for the six titration in the spaces provided in Table 2 and Table 3.
Rekod bacaan awal dan akhir buret bagi enam pentitratan di dalam ruang yang diberikan pada Jadual 2 dan Jadual 3.

[3 marks]

(b) Construct a table and record the initial burette reading, final burette reading and the volume of acid used for Activity II.
Bina satu jadual yang merekodkan bacaan awal buret, bacaan akhir buret dan isipadu asid yang telah digunakan bagi Aktiviti II.

[3 marks]

(c) Based on the data from Activity II, calculate the concentration of sulphuric acid that is used to neutralize the sodium hydroxide solution.
Berdasarkan data yang diperolehi daripada Aktiviti II, kira kepekatan asid sulfurik yang digunakan untuk meneutralkan larutan natrium hidroksida.

[3 marks]

(d) State the observation for the changes in colour of the indicator during titration in the experiment.
Nyatakan pemerhatian kepada perubahan warna penunjuk semasa pentitratan dalam eksperimen.

.....

[3 marks]

(e) Hydrochloric acid and sulphuric acid are strong acids. Based on the average volume of the acid in Activity I and Activity II in (c), what inference can be made for the basicity of acid. Give a reason for your answer.
Asid hidroklorik dan asid sulfurik adalah asid kuat. Berdasarkan kepada isipadu purata asid dalam Aktiviti I dan Aktiviti II di(c), apakah inferen yang boleh dibuat tentang kebesan asid. Berikan satu sebab bagi jawapan anda.

.....

.....

[3 marks]

(f) In Activity II, if the experiment repeated using methyl orange indicator and 25.0 cm^3 sulphuric acid 0.1 mol dm^{-3} is added to the sodium hydroxide solution , state the colour of the methyl orange indicator.
Bagi Aktiviti II, jika eksperimen diulang dengan menggunakan metil jingga dan 25.0 cm^3 asid sulfurik 0.1 mol dm^{-3} ditambahkan kepada larutan natrium hidroksida, nyatakan perubahan warna penunjuk metil jingga.

.....

[3 marks]

(g) For this experiment, state
Bagi eksperimen ini, nyatakan

(i) The manipulated variable : ……
Pembolehubah dimanipulasikan

(ii) The responding variable : ……
Pembolehubah bergerak balas

(iii) The constant variable : ……
Pembolehubah dimalarkan

[3 marks]

(h) State one hypothesis for this experiment.
Nyatakan satu hipotesis bagi eksperimen ini.

.....

[3 marks]

(i) Give the operational definition for the end-point of titration in Activity I.
Berikan definasi secara operasi takat akhir tindak balas bagi Aktiviti 1.

.....

.....

[3 marks]

(j) Classify the following acids into strong acid and weak *acid.*
Kelaskan asid berikut kepada asid kuat dan asid lemah.

Nitric acid	hydrochloric acid	Ascorbic acid	Phosphoric acid
Asid nitrik	*Asid hydrochloric*	*Asid askorbik*	*Asid fosforik*

[3 marks]

2. Diagram 2.1 shows the apparatus set up for the preparation of ester in the laboratory.
Rajah 2.1 menunjukkan susunan radas untuk penyediaan ester dalam makmal.

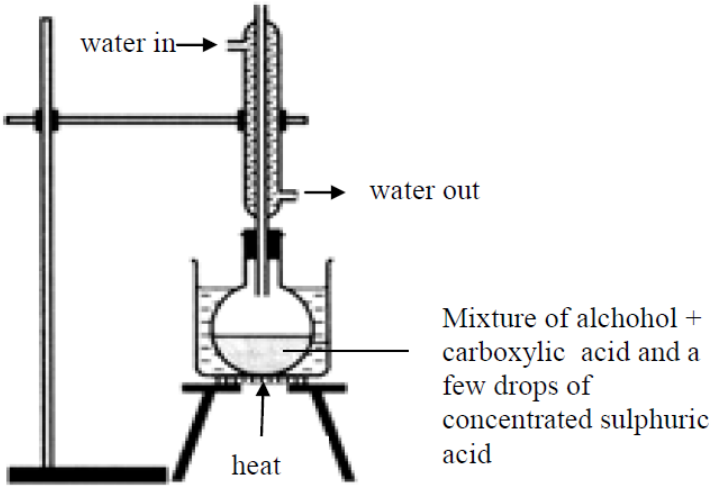


Diagram 2.1/ *Rajah 2.1*

Table 2.1 show some examples of the types of alcohol and carboxylic acid used to prepare ester.
Jadual 2.1 menunjukkan beberapa contoh jenis alcohol dan asid karboksilik yang digunakan untuk menyediakan ester

Alcohol *Alcohol*	Carboxylic acid *Asid karboksilik*	Observation *Pemerhatian*
Methanol	Ethanoic acid	Sweet pleasant smell
Ethanol	Propanoic acid	Sweet pleasant smell
propanol	Methanoic acid	Sweet pleasant smell

Table 2.1/*Jadual 2.1*

(a) State one inference for this experiment.
Nyatakan satu inferens untuk eksperimen ini.

….....

[3 marks]

(b) Construct a table to show the name of the esters formed from the alcohols and carboxylic acids provided in Table 2.1
Bina satu jadual untuk menunjukkan nama ester yang dihasilkan daripada alcohol dan asid karboksilik yang diberikan dalam Jadual 2.1

[3 marks]

(c) Propyl butanoate is an ester that is formed from the reaction between an alcohol and carboxylic acid. Name the alcohol and carboxylic acid needed to prepare the ester.
Propil butanoat ialah ester yang terhasil dari tindakbalas antara alcohol dan asid karboksilik. Namakan alcohol dan asid karboksilik yang diperlukan untuk menyediakan ester ini.

Alcohol : ……

Carboxylic acid : ……...

[3 marks]

(d) Table 2.2 shows the observation for an experiment to differentiate between alkanes and alkenes.
Jadual 2.2 menunjukkan pemerhatian untuk eksperimen membezakan alkane dan alkena.

Experiment *Eksperimen*	Hexane *Heksana*	Hexene *Heksena*
With bromine water *Dengan air bromin*	No change *Tiada perubahan*	Brown bromine decolourised *Warna perang bromin dinyahwarnakan*
With acidified potassium manganate (VII) solution *Dengan kalium manganate (VII) berasid*	No change *Tiada perubahan*	Purple solution decolourised *Larutan berwarna ungu dinyahwarnakan*

Table 2.2/ *Jadual 2.2*

(i) State the variables for this experiment:
Nyatakan semua pembolehubah untuk eksperimen ini.

Manipulated variable : ……. ……
Pembolehubah dimanipulasi :

Responding variable : ……
Pembolehubah bergerakbalas

Fixed variable : ……
Pembolehubah dimalarkan :

[3 marks]

(ii) State one hypothesis for this experiment.
Nyatakan satu hipotesis untuk eksperimen ini.

….....

….....

[3 marks]

(iii) Hexene can also be differentiated from hexane with sootiness of flame when burnt.
Predict which substance will produce more soot when burnt.
Explain your answer.
Heksena juga boleh dibezakan dari heksana dengan jelaga apabila dibakar.
Ramalkan bahan manakah akan menghasilkan lebih jelaga apabila dibakar. Terangkan jawapan anda.

….....

…….....

[3 marks]

3. Diagram 3 shows the set-up of apparatus used to investigate the cleansing action of soap and detergent on a piece of cloth stained with oil.
Rajah 3 menunjukkan susunan radas yang digunakan untuk menyiasat tindakan pembersihan sabun dan detergen pada pakaian yang dikotori minyak.

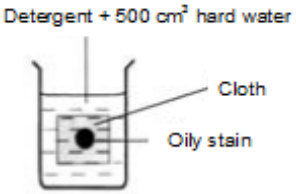
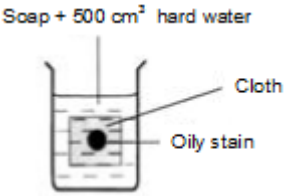
Experiment	Apparatus	Observation
I		Oil stained removed
III		Oil stained remains

Diagram 3/ *Rajah 3*

Based on the above diagram, plan one laboratory experiment to compare the effectiveness of soap and detergent in hard water.
Berdasarkan rajah di atas, rancang satu eksperimen untuk membandingkan keberkesanan sabun dan detergen dalam air liat.

Your planning should include the following aspects:
Perancangan anda perlu mengikut aspek berikut:

(a) Problem statement / *pernyataan masalah*
(b) All the variables / *semua pembolehubah*
(c) Statement of the hypothesis / *pernyataan hipotesis*
(d) List of substances and apparatus / *senarai bahan dan radas*
(e) Procedure of the experiment / *kaedah eksperimen*
(f) Tabulation of data / *penjadualan data*

[17 marks]

********** END OF MODULE **********
http://cikguadura.wordpress.com/