



**PENTAKSIRAN DIAGNOSTIK AKADEMIK
SEKOLAH BERASRAMA PENUH 2022**

PEPERIKSAAN PERCUBAAN SIJIL PELAJARAN MALAYSIA

KIMIA

4541/2

Kertas 2

Disember 2022

2 ½ jam

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

Arahan:

1. Tuliskan Nama dan Tingkatan pada ruang yang disediakan.
2. Jawab semua soalan pada *Bahagian A*. Tuliskan jawapan anda dalam ruang yang disediakan.
3. Jawab satu soalan daripada *Bahagian B*.
4. Jawab semua soalan pada *Bahagian C*.
5. Anda diminta menjawab dengan lebih terperinci untuk *Bahagian B* dan *Bahagian C*. Jawapan mestilah jelas dan logik. Persamaan, gambar rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda boleh digunakan.
6. Penggunaan kalkulator saintifik yang tidak boleh diprogramkan adalah dibenarkan.

Untuk Kegunaan Pemeriksa			
Bahagian	Soalan	Markah penuh	Markah diperoleh
A	1	5	
	2	5	
	3	6	
	4	7	
	5	8	
	6	9	
	7	10	
	8	10	
B	9	20	
	10	20	
C	11	20	
Jumlah			

NAMA : _____

TINGKATAN: _____

Kertas soalan ini mengandungi **31** halaman bercetak

Bahagian A
Section A

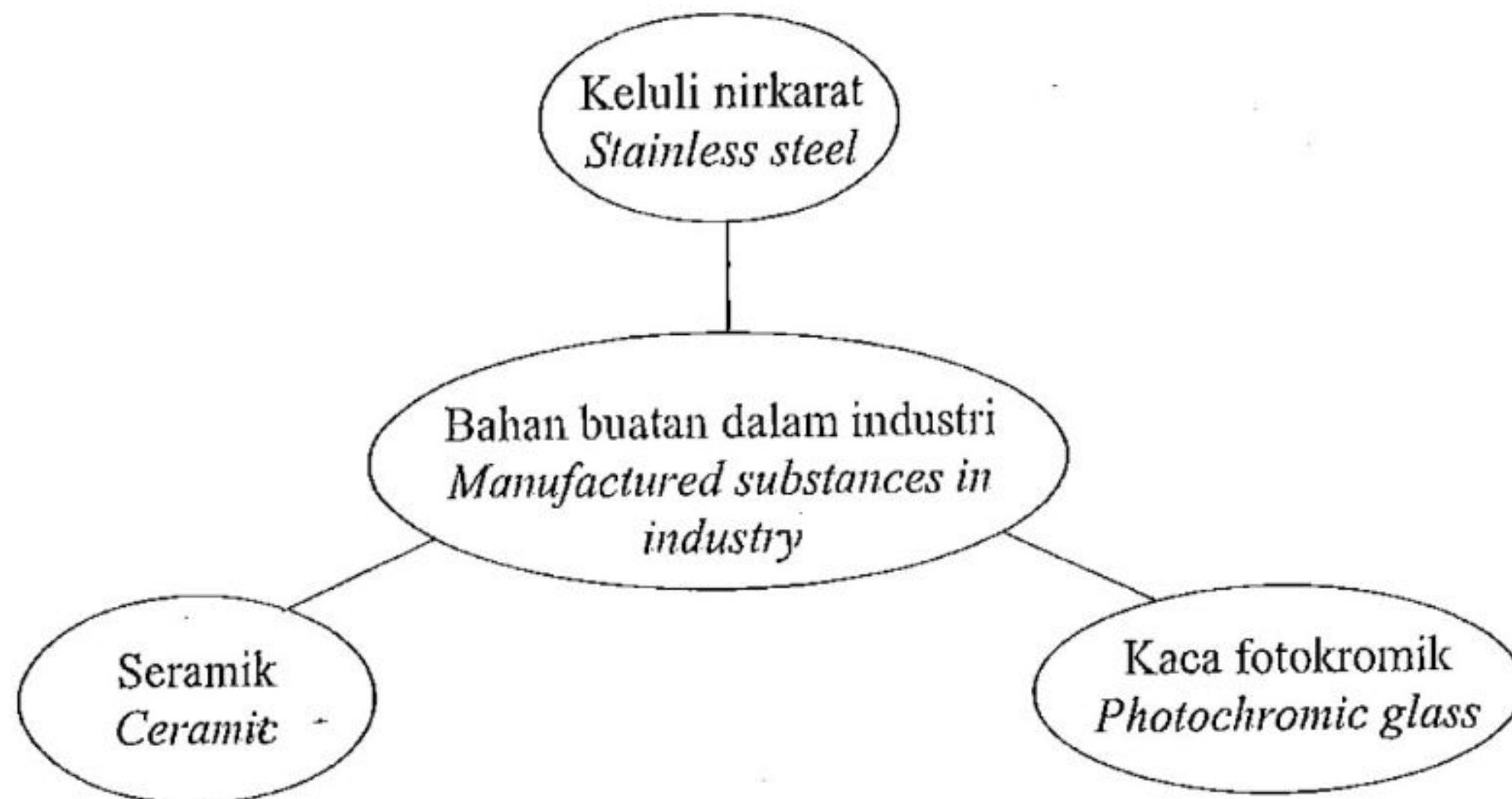
[60 markah]

[60 marks]

Jawab **semua** soalan dalam bahagian ini.

Answer all questions in this section.

- 1 Rajah 1 menunjukkan peta buih bagi contoh-contoh bahan buatan dalam industri.
Diagram 1 shows a bubble map for the examples of manufactured substances in industry.



Rajah/ Diagram 1

- (a) (i) Apakah unsur utama dalam keluli nirkarat?
What is the main element in stainless steel?

.....
[1 markah/ mark]

- (ii) Keluli nirkarat lebih keras daripada logam tulennya.
Terangkan mengapa.
Stainless steel is harder than its pure metal.
Explain why.

.....
[2 markah/ marks]

- (b) Nyatakan satu sifat istimewa kaca fotokromik.
State one special property of photochromic glass.

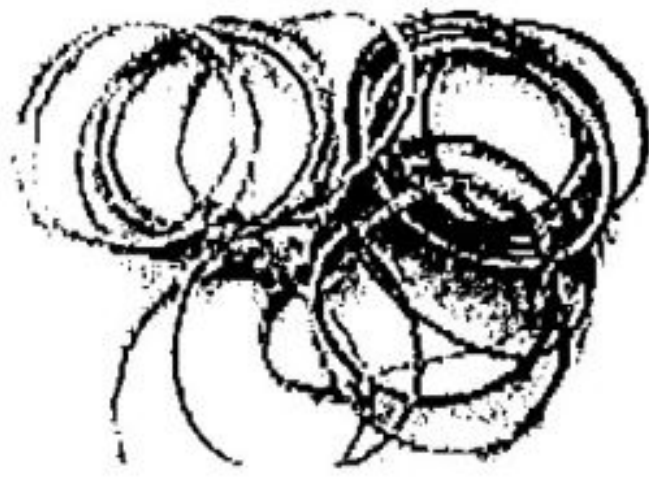
[1 markah/ mark]

- (c) Selain daripada membuat pasu, apakah kegunaan lain seramik dalam kehidupan harian?
Besides making vase, what is the other use of ceramic in daily life?

[1 markah/ mark]

- 2 Jadual 2 menunjukkan dua jenis produk yang diperbuat daripada dua jenis getah yang berbeza.

Table 2 shows two types of products made up from two different types of rubber.

Jenis getah <i>Type of rubber</i>	Produk <i>Product</i>
Getah tak tervulkan <i>Unvulcanised rubber</i>	 A
Getah tervulkan <i>Vulcanised rubber</i>	 B

Jadual/ Table 2

- (a) Getah adalah sejenis polimer.
Apakah yang dimaksudkan dengan polimer?
Rubber is a type of polymer.
What is meant by polymer?

.....
.....
[1 markah/ mark]

- (b) Nyatakan nama monomer bagi getah asli.
State the name of the monomer for natural rubber.

.....
[1 markah/ mark]

- (c) (i) Produk B lebih kuat berbanding produk A.
Terangkan jawapan anda.
Product B is stronger than product A.
Explain your answer.

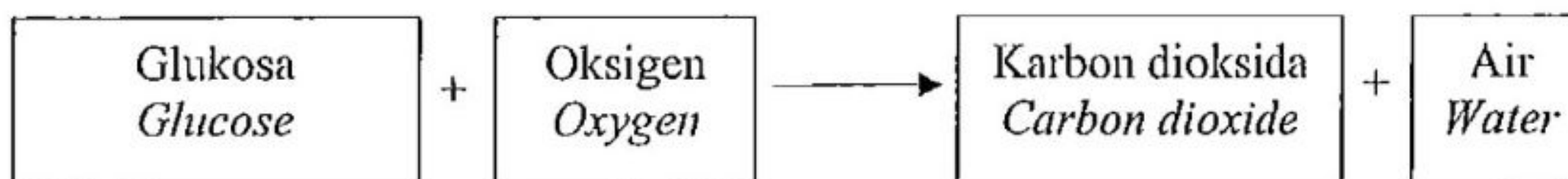
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.....
[2 markah/ marks]

- (ii) Nyatakan **satu** ciri lain produk B selain daripada di 2c(i).
*State **one** other characteristic of product B other than that in 2c(i).*

.....
[1 markah/ mark]

- 3 Rajah 3 menunjukkan persamaan bagi tindak balas respirasi sel yang berlaku dalam badan manusia.

Diagram 3 shows the equation for cellular respiration reaction that occurs in human body.



Rajah/ Diagram 3

- (a) Formula molekul bagi glukosa ialah $C_6H_{12}O_6$.

Tuliskan formula empirik bagi glukosa.

The molecular formula of glucose is $C_6H_{12}O_6$.

Write the empirical formula of glucose.

.....
[1 markah/ mark]

- (b) Berdasarkan Rajah 3,

Based on Diagram 3,

- (i) tuliskan persamaan kimia bagi mewakili tindak balas respirasi sel itu.
write the chemical equation to represent the cellular respiration reaction.

.....
[2 markah/ mark]

- (ii) hitungkan isi padu gas karbon dioksida yang terhasil pada keadaan bilik jika 360 g glukosa digunakan dalam tindak balas itu.
calculate the volume of carbon dioxide gas produced at room conditions if 360 g of glucose is used in the reaction.

[Jisim molar glukosa = 180 g mol^{-1} ;

Isi padu molar gas pada keadaan bilik = $24 \text{ dm}^3 \text{ mol}^{-1}$]

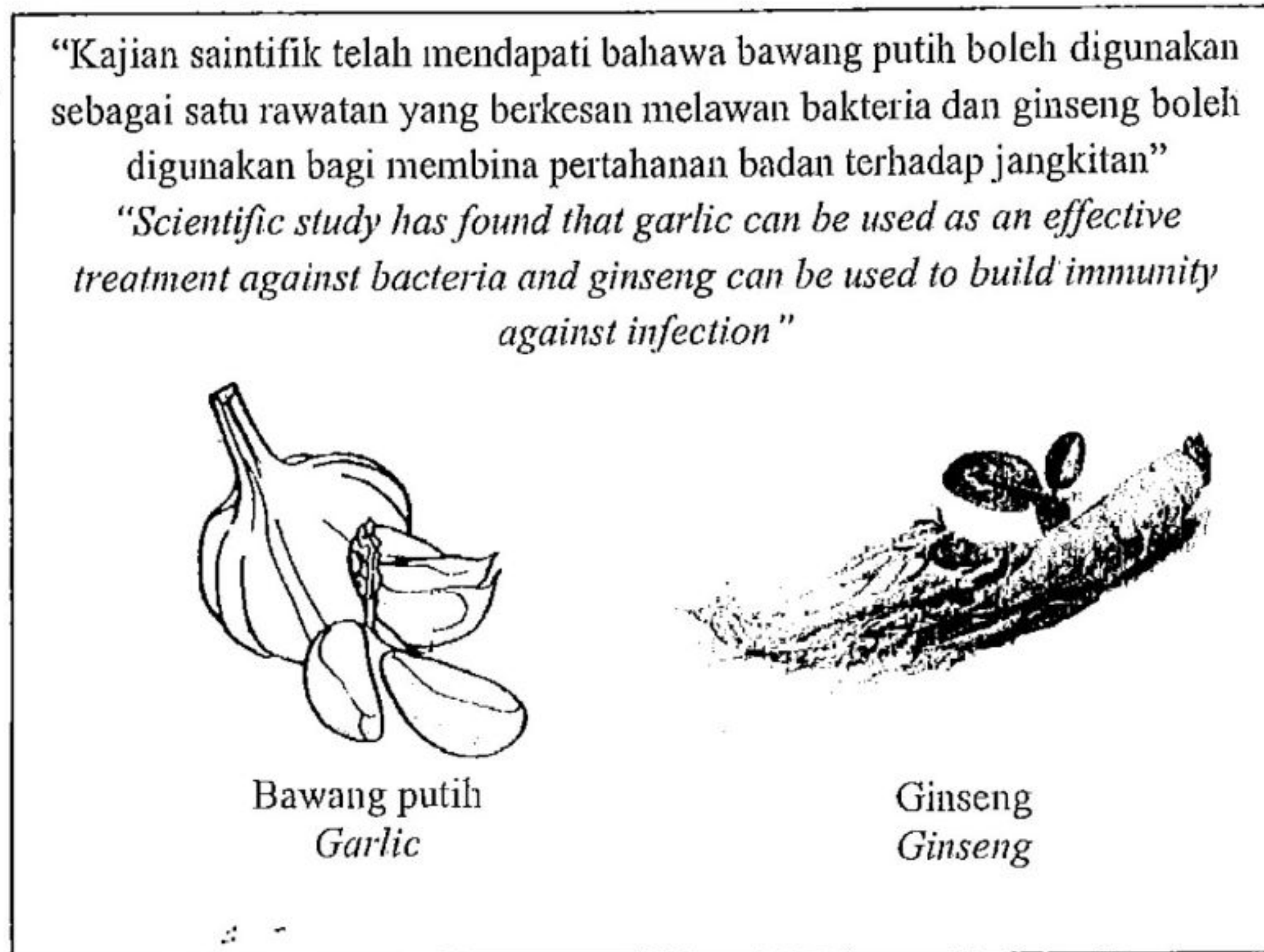
[Molar mass glucose = 180 g mol^{-1} ;

Molar volume of gas at room conditions = $24 \text{ dm}^3 \text{ mol}^{-1}$]

[3 markah/ marks]

- 4 (a) Rajah 4 menunjukkan satu pernyataan berkaitan bawang putih dan ginseng yang boleh digunakan sebagai ubat tradisional.

Diagram 4 shows a statement related to garlic and ginseng that can be used as traditional medicine.



Rajah/ Diagram 4

Berdasarkan Rajah 4,
Based on Diagram 4,

- (i) bagaimanakah cara bawang putih atau ginseng digunakan untuk merawat penyakit?
how garlic or ginseng is used to treat illness?

[1 markah/ mark]

- (ii) berikan dua kelebihan menggunakan ubat-ubat yang dinyatakan dalam Rajah 4.
give two advantages of using the medicines stated in Diagram 4.

[2 markah/ marks]

- (b) Ali adalah seorang pesakit gastrik dan dia sedang mengalami sakit kepala. Bagi meredakan sakit kepalanya, Ali telah mengambil aspirin. Malangnya, dia mengalami kesakitan dalam perut.

Ali is a gastric patient and he is having headache. In order to relieve his headache, he took aspirin. Unfortunately, he got pain in his stomach.

- (i) Terangkan mengapa beliau mengalami keadaan sedemikian.
Explain why he experiences that situation.

.....

.....

.....

[2 markah/ marks]

- (ii) Cadangkan nama ubat yang boleh menggantikan aspirin
Suggest the name of the medicine that can replace aspirin.

.....

[1 markah/ mark]

- (iii) Nyatakan kesan sampingan jika ubat yang dicadangkan di 4(b)(ii) diambil secara berlebihan
State the side effect if the medicine suggested in 4(b)(ii) is taken excessively.

.....

.....

.....

[1 markah/ mark]

- 5 Jadual 5 menunjukkan nombor proton dan nombor nukleon bagi atom V, atom W dan atom X.

Table 5 shows the proton number and nucleon number of atoms V, W and X.

Atom	Nombor proton <i>Proton number</i>	Nombor nukleon <i>Nucleon number</i>
V	6	12
W	11	23
X	17	35

Jadual/ Table 5

- (a) Apakah yang dimaksudkan dengan nombor nukleon?

What is meant by nucleon number?

.....
.....

[1 markah/ mark]

- (b) Atom Z-14 merupakan isotop kepada atom V.

Tentukan bilangan neutron dalam atom Z.

Atom Z-14 is an isotope of atom V.

Determine the number of neutrons in atom Z.

.....
[1 markah/ mark]

- (c) Unsur W dan unsur X boleh bertindak balas untuk menghasilkan pepejal putih yang mempunyai takat lebur yang tinggi.

Element W and X can react to produce a white solid that has high melting point.

- (i) Tuliskan persamaan kimia bagi tindak balas itu.

Write the chemical equation for the reaction.

.....
[2 markah/ marks]

- (ii) Hitungkan jisim pepejal yang terhasil jika 0.05 mol W terlibat dalam tindak balas itu.

Calculate the mass of solid produced if 0.05 mol of W involves in the reaction.

[2 markah/ marks]

- (d) Unsur V dan unsur X bertindak balas menghasilkan sebatian VX_4 yang mempunyai takat lebur yang rendah.

Terangkan perbezaan takat lebur bagi sebatian VX_4 dengan pepejal putih yang terbentuk dalam 5(c).

Element V and X react to produce compound VX_4 which has low melting point. Explain the difference in the melting point of compound VX_4 with the white solid produced in 5(c).

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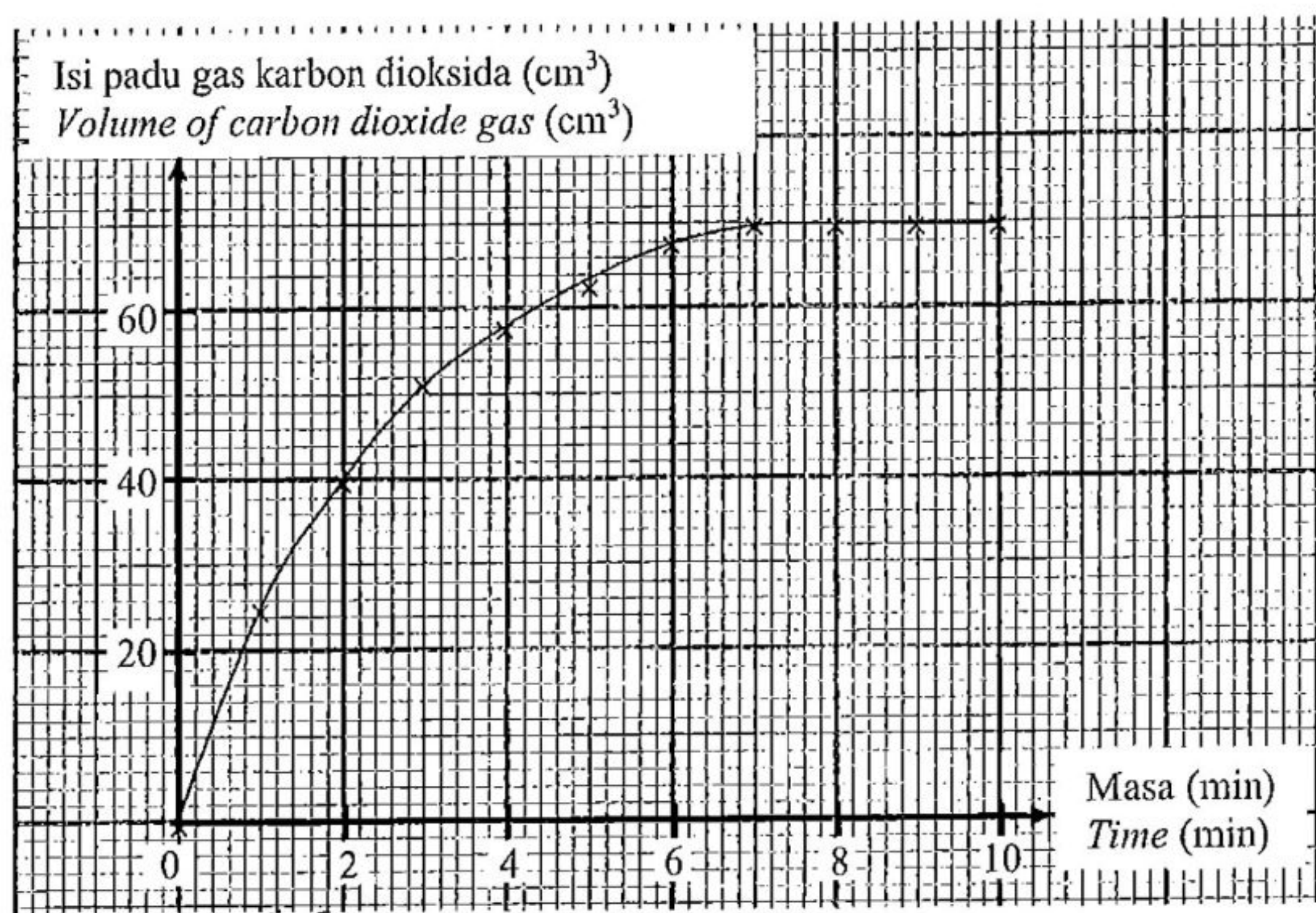
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[2 markah/marks]

- 6 Rajah 6 menunjukkan graf isi padu gas karbon dioksida melawan masa bagi tindak balas antara serbuk magnesium karbonat berlebihan dengan 50 cm^3 asid sulfurik 1.0 mol dm^{-3} .
Diagram 6 shows a graph of volume of carbon dioxide gas against time for a reaction between excess magnesium carbonate powder and 50 cm^3 of 1.0 mol dm^{-3} sulphuric acid.



Rajah/ Diagram 6

- (a) Nyatakan jenis zarah dalam magnesium karbonat.
State the type of particle in magnesium carbonate.

[1 markah/ mark]

- (b) Tuliskan persamaan kimia bagi tindak balas itu.
Write the chemical equation for the reaction.

[2 markah/ marks]

- (c) Berdasarkan Rajah 6,
Based on Diagram 6,

- (i) mengapakah lengkung pada graf mendatar selepas 7 minit?
why is the curve in the graph becomes horizontal after 7 minutes?

[1 markah/ mark]

- (ii) hitung kadar tindak balas pada minit kedua.
calculate the rate of reaction at the second minute.

[2 markah/ marks]

- (d) Jadual 6 menunjukkan maklumat bagi dua set eksperimen untuk menyiasat faktor yang mempengaruhi kadar tindak balas antara kalsium karbonat dengan asid nitrik.
Table 6 shows the information for two sets of experiment to investigate factor affecting the rate of reaction between calcium carbonate and nitric acid.

Set	Bahan tindak balas <i>Reactants</i>	Masa yang diambil untuk mengumpulkan 30 cm ³ gas karbon dioksida (s) <i>Time taken to collect 30 cm³ of carbon dioxide gas (s)</i>
I	5 g serbuk kalsium karbonat <i>5 g of calcium carbonate powder</i> + 50 cm ³ asid nitrik 1.0 mol dm ⁻³ <i>50 cm³ of 1.0 mol dm⁻³ nitric acid</i>	32
II	5 g serbuk kalsium karbonat <i>5 g of calcium carbonate powder</i> + 25 cm ³ asid nitrik 2.0 mol dm ⁻³ <i>25 cm³ of 2.0 mol dm⁻³ nitric acid</i>	20

Jadual/ Table 6

Berdasarkan maklumat dalam Jadual 6, bandingkan kadar tindak balas antara Set I dan Set II.

Terangkan jawapan anda dengan menggunakan teori perlanggaran.

Based on Table 6, compare the rate of reaction between Set I and Set II.

Explain your answer by using the collision theory.

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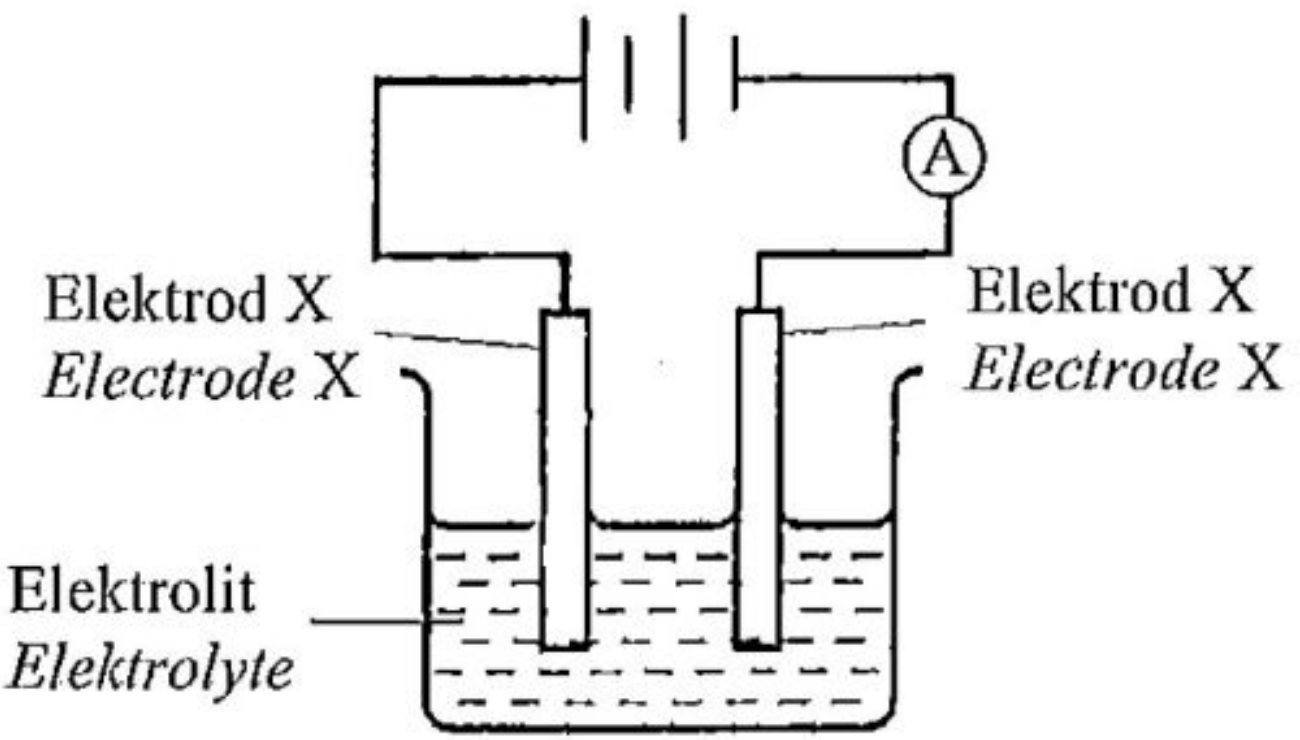
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[3 markah/ marks]

- 7 (a) Jadual 7.1 menunjukkan susunan radas dan pemerhatian bagi satu proses elektrolisis.
Table 7.1 shows the apparatus set-up and observation for the electrolysis process.

Susunan radas <i>Apparatus set-up</i>	Pemerhatian <i>Observations</i>	
	Anod <i>Anode</i>	Elektrod menipis <i>Electrode becomes thinner</i>
	Katod <i>Cathode</i>	Pepejal kelabu berkilat terdeposit <i>Shiny grey solid is deposited</i>

Jadual/ Table 7.1

- Jadual 7.2 menunjukkan nilai E^0 bagi beberapa sel setengah.
Table 7.2 shows the E^0 value for a few half-cells.

Tindak balas sel setengah <i>Half-cell equation</i>	Nilai E^0 (V) <i>E^0 value (V)</i>
$\text{Na}^+_{(\text{ak/aq})} + e \rightleftharpoons \text{Na}_{(\text{p/s})}$	- 2.71
$2\text{H}^+_{(\text{ak/aq})} + 2e \rightleftharpoons \text{H}_{2(\text{g})}$	0.00
$\text{O}_{2(\text{g})} + 2\text{H}_2\text{O}_{(\text{ce/l})} + 4e \rightleftharpoons 4\text{OH}^-_{(\text{ak/aq})}$	+0.40
$\text{Ag}^+_{(\text{ak/aq})} + e \rightleftharpoons \text{Ag}_{(\text{p/s})}$	+0.80
$\text{NO}_3^-_{(\text{ak/aq})} + 4\text{H}^+_{(\text{ak/aq})} + 3e \rightleftharpoons \text{NO}_{(\text{g})} + 2\text{H}_2\text{O}_{(\text{ce/l})}$	+0.96
$\text{Cl}_{2(\text{g})} + 2e \rightleftharpoons 2\text{Cl}^-_{(\text{ak/aq})}$	+1.36

Jadual/ Table 7.2

- (i) Nilai keupayaan elektrod piawai, E^0 bagi sesuatu elektrod dapat diukur dengan menggandingkan elektrod tersebut dengan elektrod hidrogen piawai di bawah keadaan piawai.

Nyatakan salah satu keadaan tersebut.

The value of standard electrode potential, E^0 of an electrode can be measured by pairing up the electrode to the standard hydrogen electrode under standard conditions.

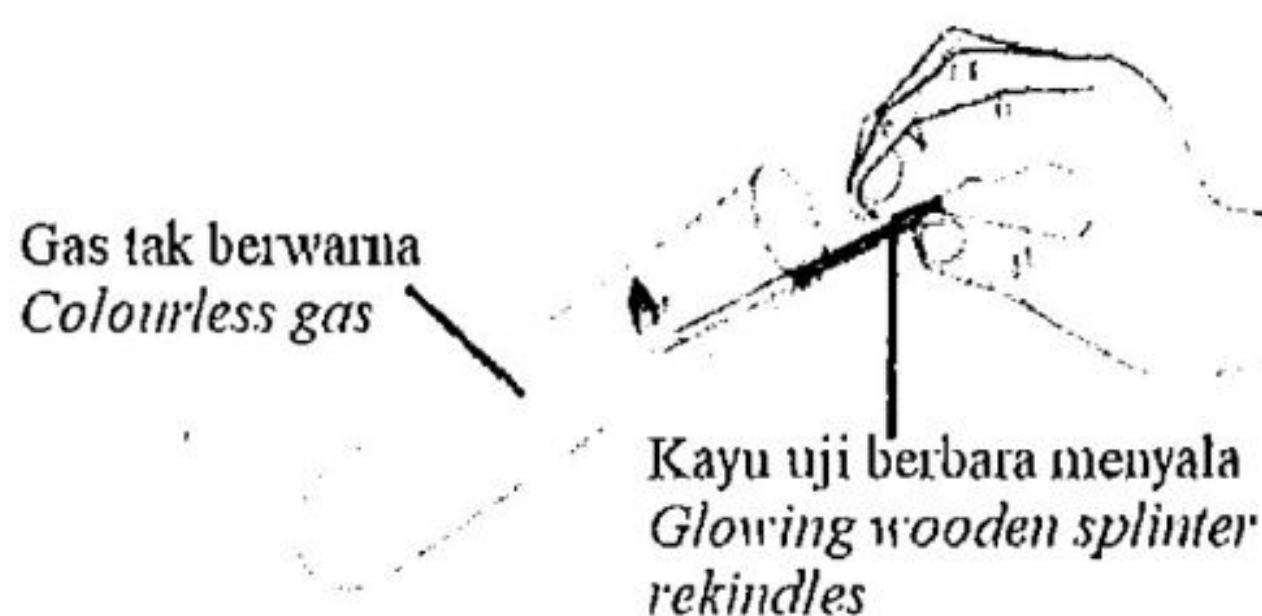
State one of the conditions.

[1 markah/ mark]

- (ii) Berdasarkan pemerhatian dalam Jadual 7.1 dan nilai E° yang diberikan dalam Jadual 7.2, apakah elektrolit yang digunakan?
Based on the observation in Table 7.1 and E° value given in Table 7.2, what is the electrolyte used?

[1 markah/ mark]

- (iii) Eksperimen dalam Jadual 7.1 diulang dengan melakukan pengubahsuaian pada susunan radas dan gas yang terhasil di anod diuji seperti yang ditunjukkan dalam Rajah 7.1.
Experiment in Table 7.1 is repeated by modifying the apparatus set-up and the gas collected at anode is tested as shown in Diagram 7.1.



Rajah/ Diagram 7.1

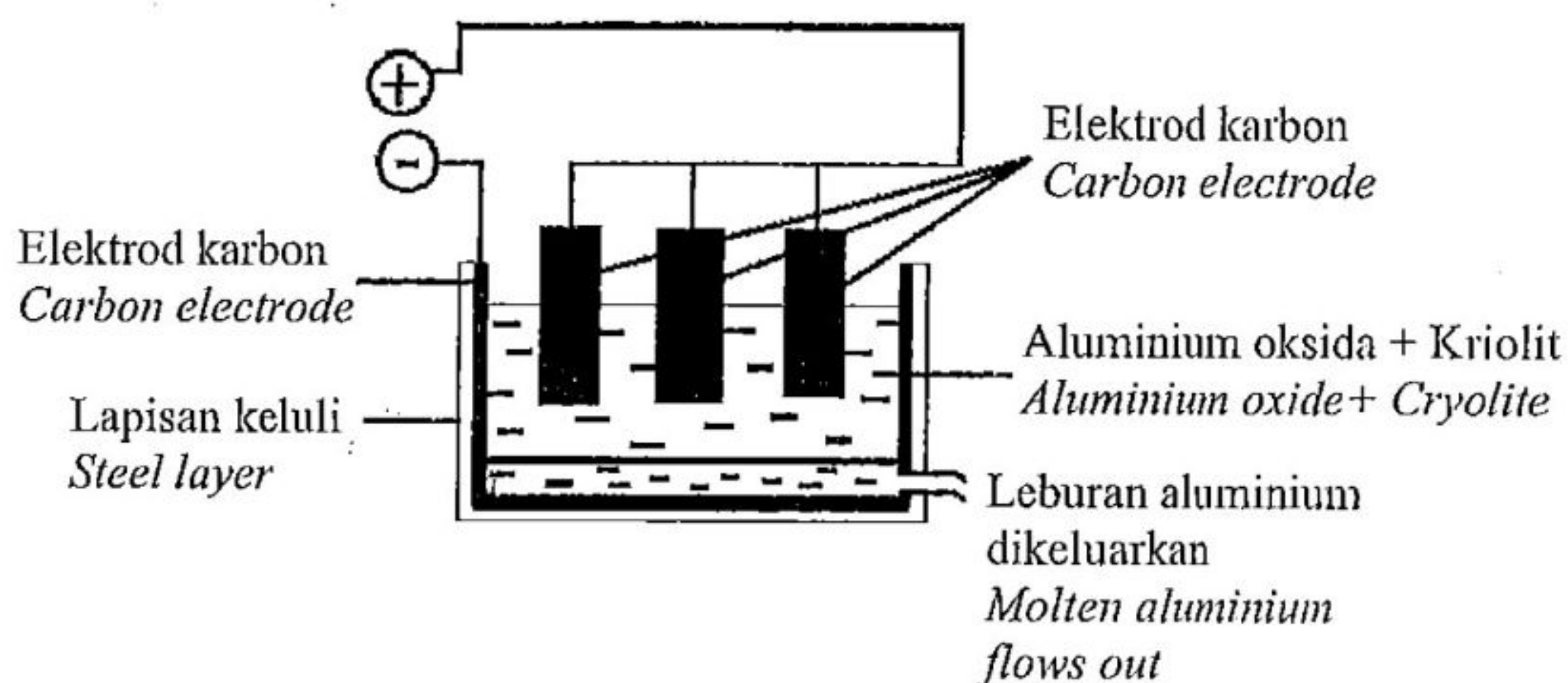
Sebagai seorang pelajar kimia, apakah pengubahsuaian yang telah dilakukan terhadap susunan radas dalam Jadual 7.1? Terangkan bagaimana gas tersebut terhasil.

As a chemistry student, what modification that has been done to the apparatus set-up in Table 7.1? Explain how the gas is produced.

[3 markah/ marks]

- (b) Rajah 7.2 menunjukkan proses pengekstrakan aluminium daripada aluminium oksida.

Diagram 7.2 shows the extraction process of aluminium from aluminium oxide.



Rajah/ Diagram 7.2

Adakah proses pengekstrakan tersebut sesuai dijalankan dalam industri? Wajarkan.

Is the extraction process suitable to be run in industry? Justify.

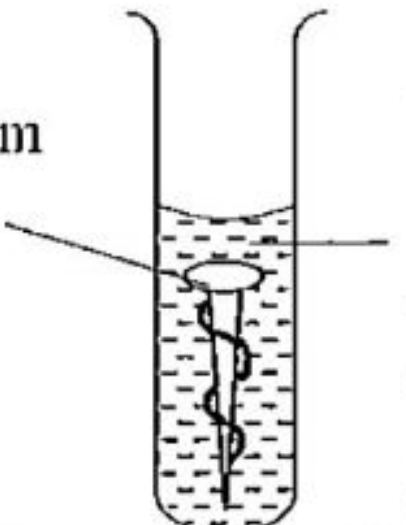
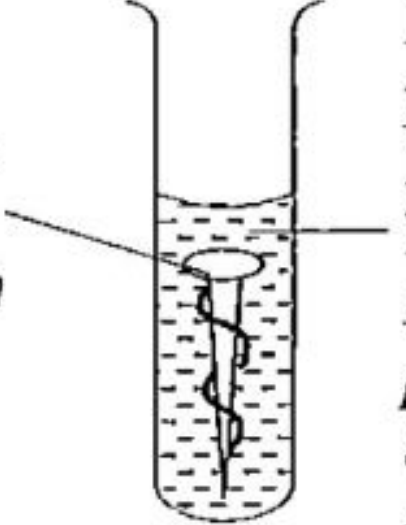
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[2 markah/ marks]

- (c) Jadual 7.3 menunjukkan susunan radas dalam satu eksperimen yang digunakan untuk mengkaji kesan logam yang berbeza ke atas pengaratan paku besi.
Table 7.3 shows the apparatus set-up in an experiment to investigate the effect of different metals on the rusting of iron nail.

Set	Susunan radas <i>Apparatus set-up</i>	Pemerhatian <i>Observation</i>
I	Paku besi dililit kuprum <i>Iron nail coiled with copper</i>  Larutan agar-agar panas + larutan kalium heksasianoferat(III) <i>Hot agar solution + potassium hexacyanoferrate(III) solution</i>	Tompok biru hadir <i>Blue spots present</i>
II	Paku besi dililit zink <i>Iron nail coiled with zinc</i>  Larutan agar-agar panas + larutan kalium heksasianoferat(III) <i>Hot agar solution + potassium hexacyanoferrate(III) solution</i>	Tiada perubahan <i>No change</i>

Jadual/ Table 7.3

Terangkan perbezaan pemerhatian dalam tabung uji bagi kedua-dua set eksperimen dalam Jadual 7.3

Explain the differences of observation in the test tubes for both sets of experiment in Table 7.3.

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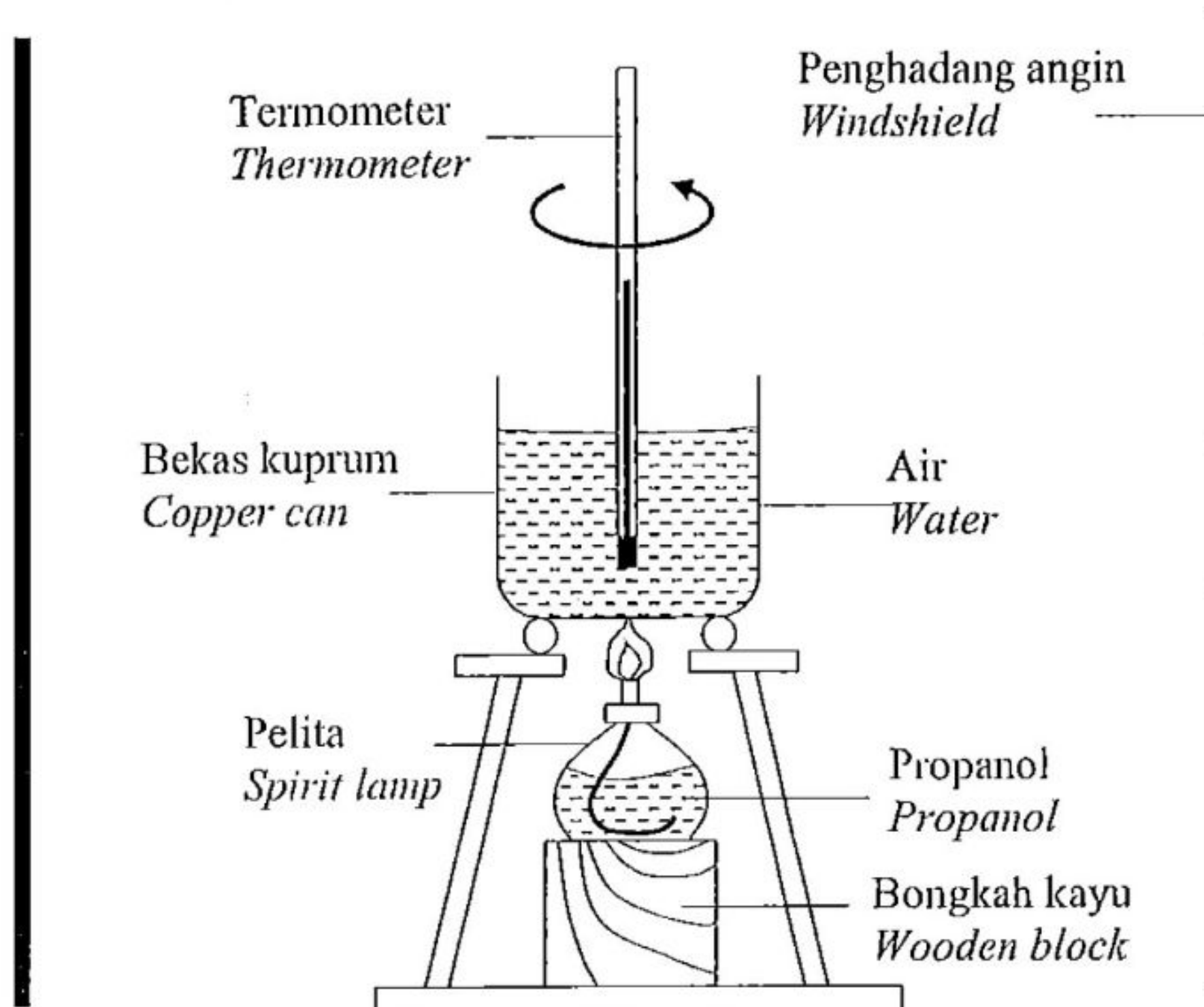
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[3 markah/ marks]

- 8 (a) Rajah 8 menunjukkan susunan radas bagi suatu eksperimen yang dijalankan untuk mengkaji haba pembakaran propanol, C_3H_7OH .
Diagram 8 shows the apparatus set-up of an experiment carried out to study the heat of combustion of propanol, C_3H_7OH .



Rajah/ Diagram 8

Dalam eksperimen ini, 200 cm^3 air dalam bekas kuprum mengalami peningkatan suhu sebanyak $30.0\text{ }^\circ\text{C}$. Jisim bagi propanol, C_3H_7OH dalam pelita berkurang sebanyak 3.0 g .

In this experiment, 200 cm^3 of water in the copper can experienced an increase in temperature by $30.0\text{ }^\circ\text{C}$. The mass of propanol, C_3H_7OH in the spirit lamp decreased by 3.0 g .

- (i) Mengapakah bekas kuprum digunakan dalam eksperimen ini?
Why is copper can used in this experiment?

[1 markah/ mark]

- (ii) Berikan sebab mengapa bahagian bawah bekas kuprum menjadi hitam setelah dipanaskan.
Give a reason why does the bottom of the copper can turn black after being heated.

[1 markah/ mark]

- (iii) Hitungkan haba pembakaran bagi propanol, C_3H_7OH .
Calculate the heat of combustion of propanol, C_3H_7OH .

[Jisim atom relatif: $H = 1$, $C = 12$, $O = 16$;

Muatan haba tentu air, $c = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$; Ketumpatan air $= 1.0 \text{ g cm}^{-3}$]

[*Relative atomic mass: $H = 1$, $C = 12$, $O = 16$; Specific heat capacity of water, $c = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$; Density of water $= 1.0 \text{ g cm}^{-3}$*]

[3 markah/ marks]

- (b) Jadual 8 menunjukkan formula molekul dan haba pembakaran bagi metanol dan etanol.

Table 8 shows the molecular formula and the heat of combustion for methanol and ethanol.

Alkohol <i>Alcohol</i>	Formula molekul <i>Molecular formula</i>	Haba pembakaran (kJ mol^{-1}) <i>Heat of combustion (kJ mol^{-1})</i>
Metanol <i>Methanol</i>	CH_3OH	-723
Etanol <i>Ethanol</i>	$\text{C}_2\text{H}_5\text{OH}$	-1360

Jadual/ Table 8

Berdasarkan maklumat dalam Jadual 8, bandingkan haba pembakaran antara metanol dan etanol. Terangkan mengapa terdapat perbezaan antara nilai haba pembakaran bagi alkohol itu.

Based on the information in Table 8, compare the heat of combustion between methanol and ethanol. Explain why there is a difference in the values of the heat of combustion between the alcohols.

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.....

.....

.....

[2 markah/ marks]

- (c) Alex mengikuti perkhemahan di hutan. Selain dari makanan dan minuman dalam tin, berikut adalah bahan dan peralatan yang dibawa bersama:

Alex went for a camping in the jungle. Besides food and canned beverage, the following materials and equipment are brought together:

- Air
Water
- Besen kecil
Small basin
- Serbuk ammonium nitrat
Ammonium nitrate powder
- Serbuk kalsium oksida
Calcium oxide powder

Alex ingin menyejukkan minuman di dalam tin. Dengan memilih bahan-bahan yang sesuai, huraikan bagaimana Alex dapat menyejukkan minuman itu?

Alex wants to cool the beverage in the can. By choosing suitable materials, describe how Alex can cool the beverage?

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.....

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.....

.....

.....

[3 markah/ marks]

Bahagian B
Section B

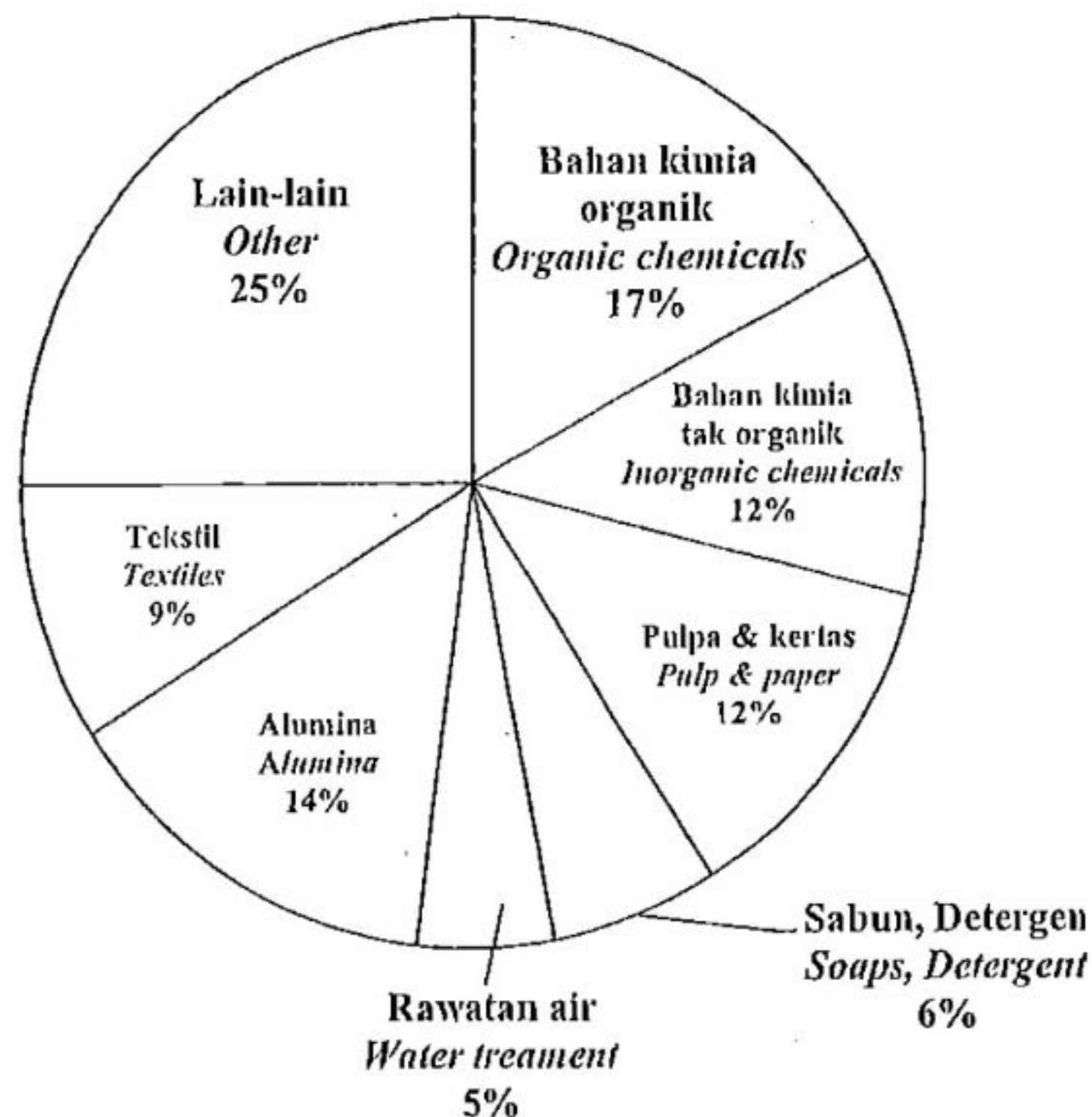
[20 markah]

[20 marks]

Jawab mana-mana **satu** soalan.

Answer any **one** question.

- 9 (a) Rajah 9.1 menunjukkan carta pai peratus penggunaan klorin dalam kehidupan seharian.
Diagram 9.1 shows the pie chart of percentage uses of chlorine in daily lives.

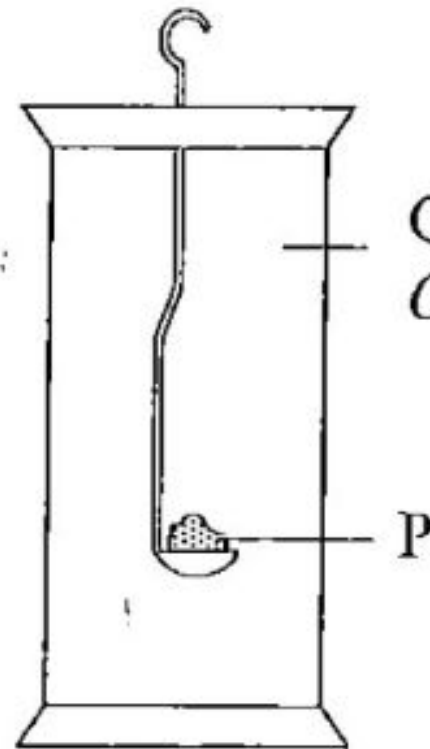
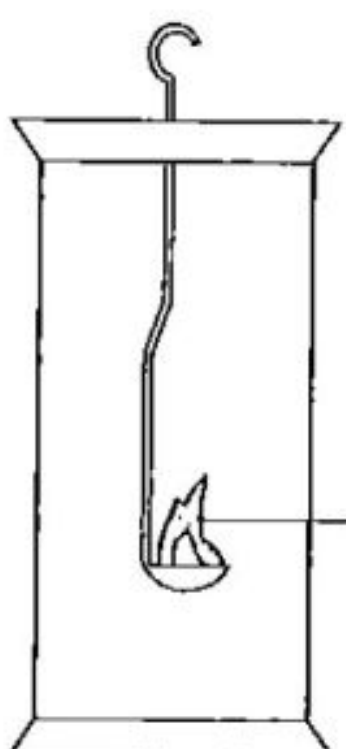
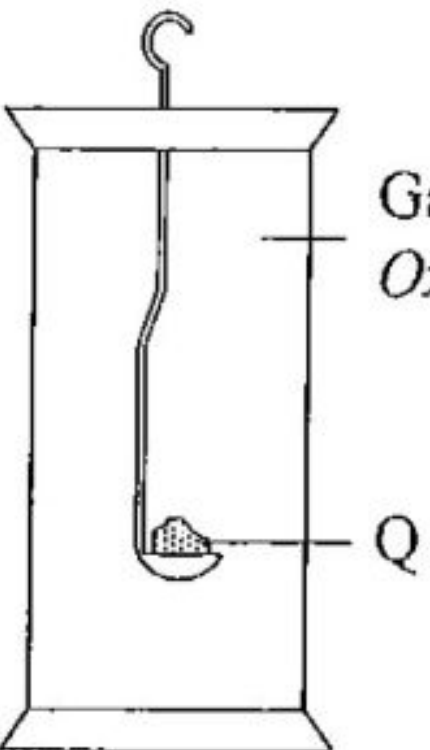
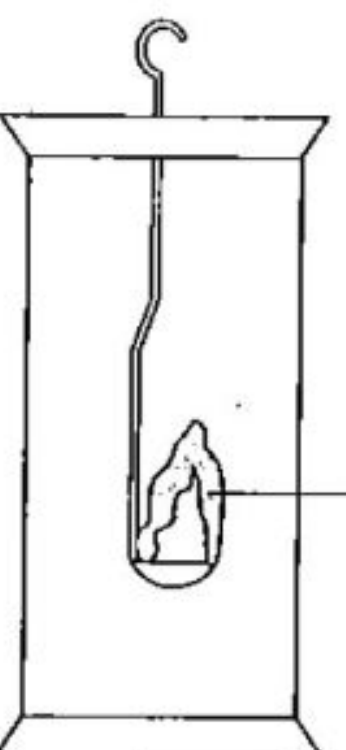


Rajah/ Diagram 9.1

- (i) Nyatakan warna dan keadaan fizik bagi unsur klorin pada suhu bilik.
State the colour and physical state of chlorine element at room temperature.
[2 markah/ marks]
- (ii) Berdasarkan Rajah 9.1, 5 % klorin digunakan dalam rawatan air untuk membasmi bakteria.
Apabila klorin bertindak balas dengan air, larutan tidak berwarna akan terhasil. Nyatakan pemerhatian apabila kertas litmus biru dicelupkan ke dalam larutan itu. Berikan sebab bagi jawapan anda. Tulis persamaan kimia bagi tindak balas.
Based on Diagram 9.1, 5 % of chlorine is used in water treatment to disinfect bacteria.
When chlorine reacts with water, colourless solution is produced. State the observation when a blue litmus paper is dipped into the solution. Give reason for your answer. Write a chemical equation of the reaction.
[4 markah/ marks]

- (b) Jadual 9.1 menunjukkan pemerhatian apabila unsur P dan unsur Q bertindak balas dengan oksigen untuk membentuk sebatian berbeza.

Table 9.1 shows the observations when elements P and Q react with oxygen gas to form different compounds.

Tindak balas <i>Reaction</i>	Susunan radas <i>Apparatus set-up</i>	Pemerhatian <i>Observation</i>
I	 Gas oksigen <i>Oxygen gas</i> P	 Nyalaan kuning <i>Yellow flame</i>
II	 Gas oksigen <i>Oxygen gas</i> Q	 Nyalaan ungu kemerahan <i>Lilac flame</i>

Jadual/ Table 9.1

- (i) Tuliskan persamaan kimia bagi tindak balas II. Hitungkan jisim sebatian yang terbentuk apabila 3.12 g unsur Q bertindak balas lengkap dengan oksigen.

Write a chemical equation for reaction II. Calculate the mass of compound formed when 3.12 g of element Q reacts completely with oxygen.

[Jisim atom relatif : O = 16, Q = 39]

[Relative atomic mass : O = 16, Q = 39]

[5 markah/ marks]

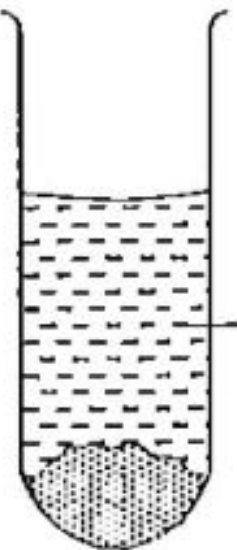
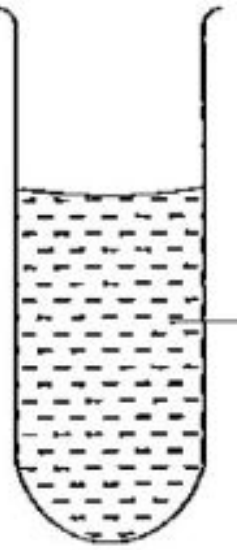
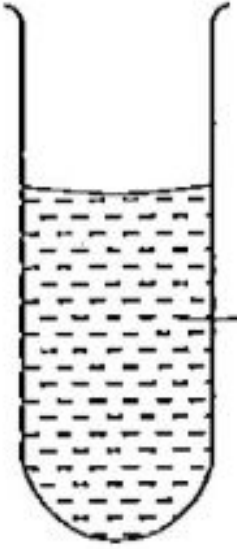
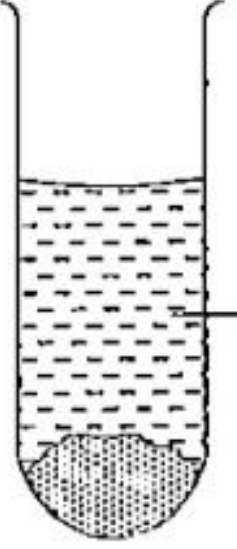
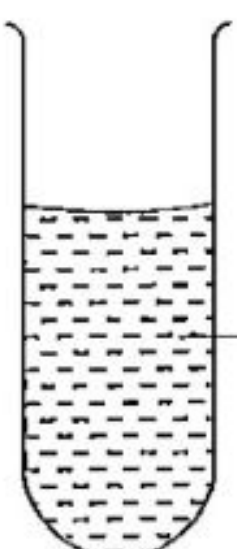
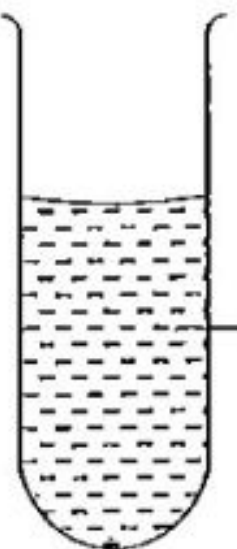
- (ii) Berdasarkan pemerhatian dalam Jadual 9.1, bandingkan kereaktifan unsur P dan unsur Q terhadap oksigen. Terangkan jawapan anda.

Based on the observation in Table 9.1, compare the reactivity of element P and Q towards oxygen. Explain your answer.

[5 markah/ marks]

- (c) Jadual 9.2 menunjukkan keputusan eksperimen bagi mengkaji sifat oksida bagi unsur X, Y dan Z yang terletak dalam Kala 3 Jadual Berkala Unsur. Pepejal oksida tersebut ditambahkan kepada asid nitrik dan larutan kalium hidroksida secara berasingan.

Table 9.2 shows the result of an experiment to investigate the properties of oxide of elements X, Y and Z that are located in Period 3 of the Periodic Table of Elements. The solid oxide of the elements is added into nitric acid and potassium hydroxide solution separately.

Oksida bagi unsur <i>Oxide of element</i>	Tindak balas dengan asid nitrik <i>Reaction with nitric acid</i>	Tindak balas dengan larutan kalium hidroksida <i>Reaction with potassium hydroxide solution</i>
Oksida X <i>Oxide of X</i>	 Tiada perubahan <i>No change</i>	 Larutan tidak berwarna <i>Colourless solution</i>
Oksida Y <i>Oxide of Y</i>	 Larutan tidak berwarna <i>Colourless solution</i>	 Tiada perubahan <i>No change</i>
Oksida Z <i>Oxide of Z</i>	 Larutan tidak berwarna <i>Colourless solution</i>	 Larutan tidak berwarna <i>Colourless solution</i>

Jadual/ Table 9.2

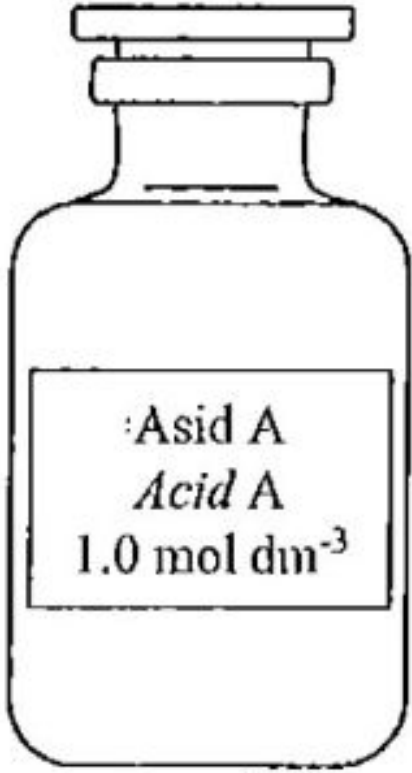
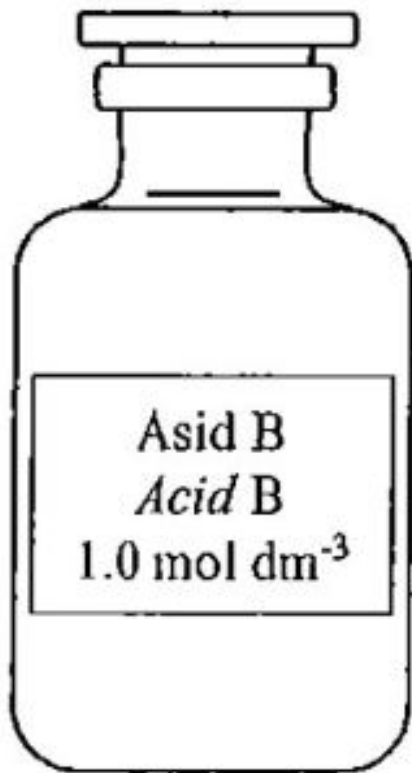
Cadangkan oksida unsur bagi X, Y dan Z. Susun unsur X, Y dan Z mengikut tertib menurun keelektronegatifan.

Suggest oxide of elements X, Y and Z. Arrange elements X, Y and Z in descending order of electronegativity.

[4 markah / marks]

- 10 (a) Jadual 10.1 menunjukkan kepekatan dan nilai pH bagi dua jenis asid dengan kebesaran yang sama.

Table 10.1 shows the concentration and pH value for two types of acid with the same basicity.

	
Nilai pH antara 3 hingga 7 <i>pH value between 3 to 7</i>	Nilai pH kurang daripada 3 <i>pH value less than 3</i>

Jadual / Table 10.1

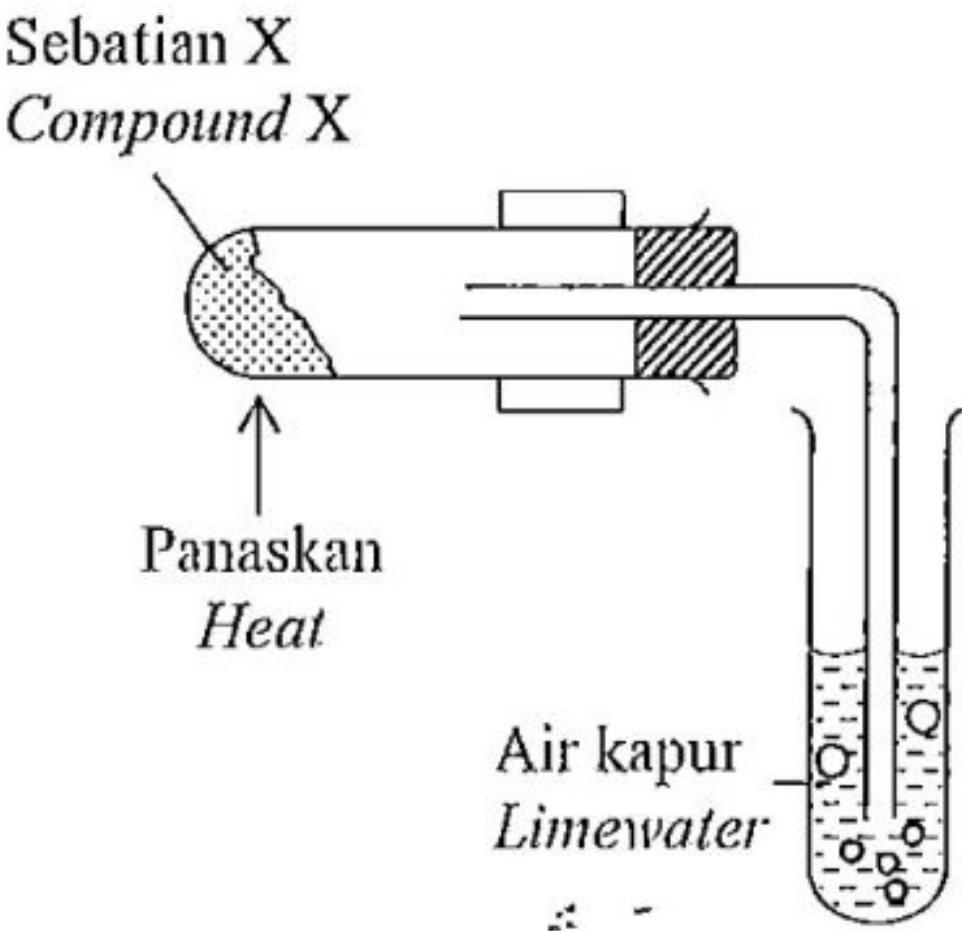
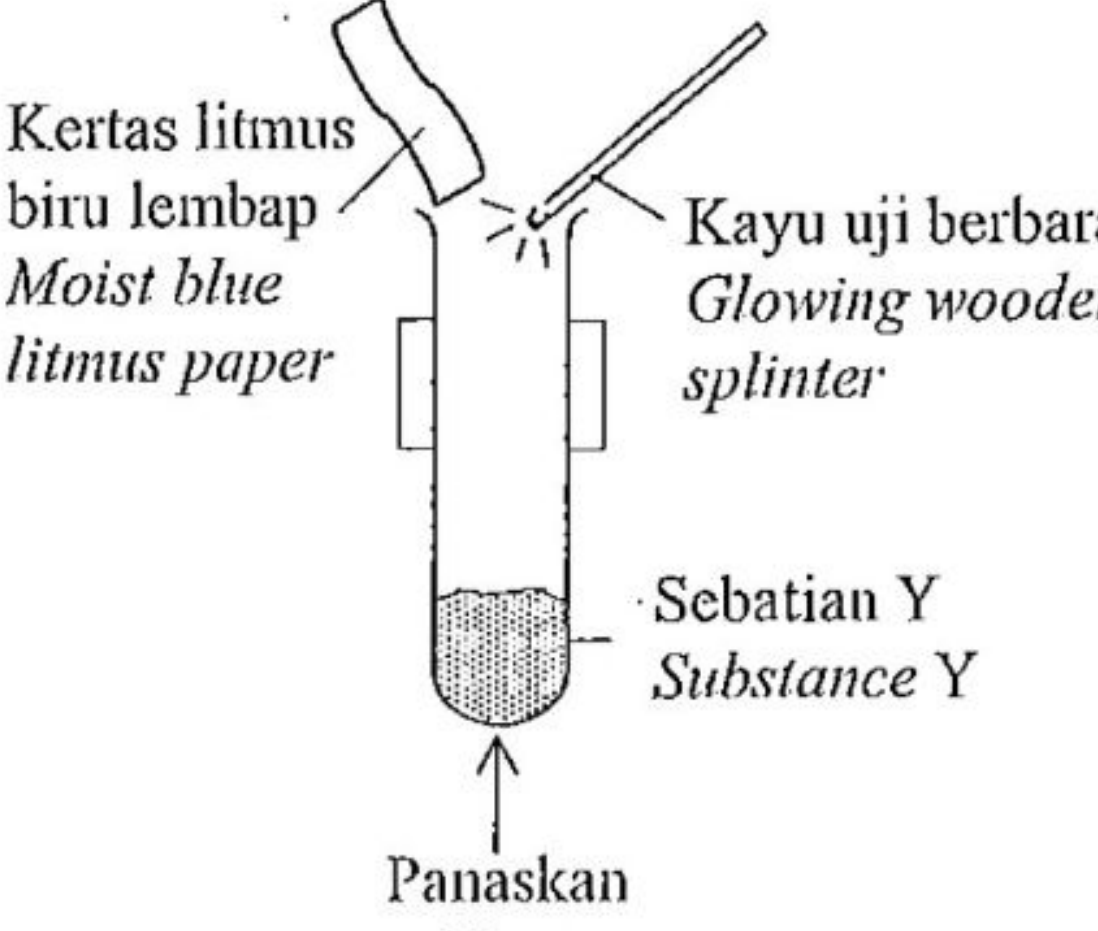
Apakah yang dimaksudkan dengan asid? Berdasarkan Jadual 10.1, cadangkan asid A dan asid B dan terangkan perbezaan nilai pH bagi kedua-dua asid.

What is meant by acid? Based on Table 10.1, suggest acid A and acid B and explain the difference in pH values of these two acids.

[6 markah/ marks]

- (b) Jadual 10.2 menunjukkan kesan pemanasan ke atas dua sebatian ion yang berbeza iaitu sebatian X dan Y. Sebatian-sebatian tersebut terdiri daripada kation yang sama. Pemanasan sebatian-sebatian tersebut menghasilkan pepejal yang berwarna kuning apabila panas dan bertukar putih apabila sejuk.

Table 10.2 shows the effect of heat on two different ionic compounds which are compound X and Y. The compounds consist of the same cation. Heating of the compounds produces yellow solid when hot and white solid when cold.

Tindak balas I <i>Reaction I</i>	Tindak balas II <i>Reaction II</i>
 Sebatian X <i>Compound X</i> Panaskan <i>Heat</i> Air kapur <i>Limewater</i>	 Kertas litmus biru lembap <i>Moist blue litmus paper</i> Kayu uji berbara <i>Glowing wooden splinter</i> Sebatian Y <i>Substance Y</i> Panaskan <i>Heat</i>
Gas tidak berwarna P terbebas <i>Colourless gas P is released</i>	Gas tidak berwarna Q dan gas berwarna perang R terbebas <i>Colourless gas Q and brown gas R are released</i>

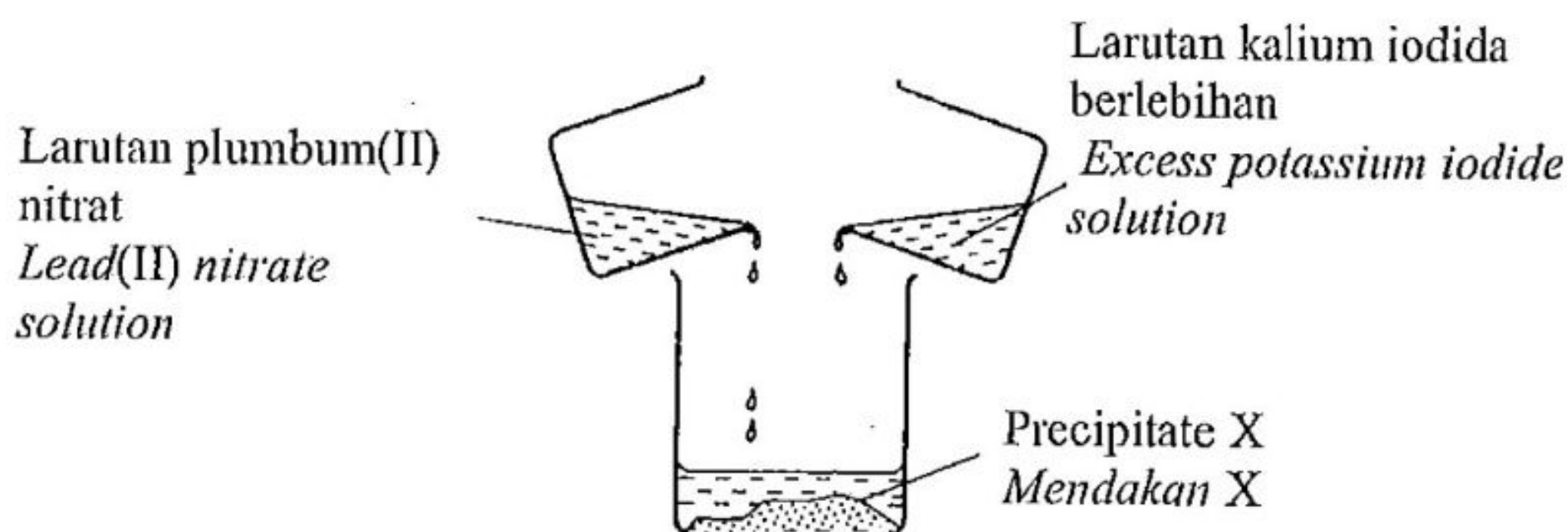
Jadual / Table 10.2

Tulis formula kimia bagi sebatian X dan sebatian Y. Nyatakan nama bagi gas P, gas Q dan gas R yang dibebaskan dalam Tindak balas I dan II. Cadangkan bahan tindak balas untuk menghasilkan sebatian X. Tulis persamaan kimia bagi Tindak balas II.

Write chemical formula for compound X and Y. State the name of gas P, Q and R released in Reaction I and II. Suggest reactants to produce compound X. Write a chemical equation for Reaction II.

[9 markah/ marks]

- (c) Rajah 10 menunjukkan susunan radas untuk menghasilkan garam tak terlarutkan.
Diagram 10 shows the apparatus set-up to produce an insoluble salt.



Rajah / Diagram 10

Namakan tindak balas bagi menghasilkan garam tak terlarutkan.

Berdasarkan Rajah 10, tuliskan persamaan ion untuk menunjukkan pembentukan mendakan X.

Jika 0.05 mol plumbum(II) nitrat bertindak balas dengan larutan kalium iodida berlebihan, hitungkan jisim mendakan X.

Name the reaction to produce insoluble salt.

Based on Diagram 10, write an ionic equation to show the formation of precipitate X.

If 0.05 mol of lead(II) nitrate reacts with excess potassium iodide solution, calculate the mass of precipitate X.

[Jisim atom relatif : I = 127, Pb = 207]

[Relative atomic mass : I = 127, Pb = 207]

[5 markah/ marks]

Bahagian C
Section C

[20 markah]

[20 marks]

Jawab **semua** soalan.

Answer **all** question.

11 Rajah 11 menunjukkan dua isomer bagi sebatian V.

Diagram 11 shows two isomers for compound V.



Rajah/ Diagram 11

(a) Berdasarkan Rajah 11,
Based on the Diagram 11,

- (i) Apakah yang dimaksudkan dengan keisomeran struktur?
What is meant by structural isomerism?

[1 markah/ mark]

- (ii) Sebatian V mempunyai tiga isomer. Lukis formula struktur yang lain bagi isomer sebatian V dan nyatakan nama isomer itu dengan menggunakan sistem penamaan IUPAC.

Compound V has three isomers. Draw another structural formula for isomer compound V and state the name of the isomer by using IUPAC nomenclature system.

[2 markah/ marks]

- (iii) Sebatian W dihasilkan melalui tindak balas penghidratan daripada sebatian V. Tulis persamaan kimia bagi tindak balas yang berlaku dan tentukan jisim sebatian W yang terhasil apabila 0.125 mol sebatian V digunakan dalam tindak balas tersebut.

Compound W is produced through hydration reaction from compound V. Write the chemical equation for the reaction that occurs and determine the mass of compound W produced when 0.125 mol of compound V is used in the reaction.

[Jisim atom relatif : H = 1, C = 12, O = 16]

[Relative atomic mass : H = 1, C = 12, O = 16]

[4 markah/ marks]

- (b) Jadual 11 menunjukkan maklumat bagi sebatian R, sebatian S dan sebatian T.
Table 11 shows the information of compounds R, S and T.

Sebatian <i>Compound</i>	Maklumat <i>Information</i>
R	• Terdiri daripada unsur karbon, hidrogen dan oksigen <i>Consists of carbon, hydrogen and oxygen elements</i> • Mempunyai 2 atom karbon <i>Has 2 carbon atoms</i> • Larut dalam air <i>Soluble in water</i> • Bertindak balas dengan asid etanoik menghasilkan ester U <i>Reacts with ethanoic acid to produce ester U</i>
S	• Terdiri daripada unsur karbon dan hidrogen sahaja <i>Consists of carbon and hydrogen elements only</i> • Mempunyai 3 atom karbon <i>Has 3 carbon atoms</i> • Tidak menyahwarnakan warna ungu larutan kalium manganat(VII) berasid. <i>Does not decolourise the purple colour of acidified potassium manganate(VII)</i>
T	• Terdiri daripada unsur karbon dan hidrogen sahaja <i>Consists of carbon and hydrogen elements only</i> • Mempunyai 3 atom karbon <i>Has 3 carbon atoms</i> • Menyahwarnakan warna ungu larutan kalium manganat(VII) berasid. <i>Decolourises the purple colour of acidified potassium manganate(VII)</i>

Jadual/ Table 11

Berdasarkan maklumat dalam Jadual 11:

Based on the information in Table 11:

- (i) Kenal pasti sebatian R, S dan T dan seterusnya terangkan perbezaan pemerhatian bagi sebatian S dan sebatian T apabila bertindak balas dengan larutan kalium manganat(VII) berasid.

Identify compounds R, S and T and then explain the difference in the observations for compounds S and T when react with acidified potassium manganate(VII) solution.

[5 markah/ marks]

- (ii) Sebatian R dapat disediakan secara tindak balas kimia melalui proses penapaian glukosa. Dengan menggunakan bahan yang sesuai yang terdapat di rumah anda, terangkan bagaimana anda dapat menyediakan sebatian R di makmal sekolah. Dalam penerangan anda, terangkan bagaimana sebatian R tulen dapat dikumpulkan.

Compound R can be prepared by a chemical reaction through a fermentation process of glucose. By using suitable materials found in your home, explain how you can prepare compound R at the school laboratory. In your description, explain how pure compound R can be collected.

[8 markah/ marks]

KERTAS SOALAN TAMAT
END OF QUESTION PAPER

Semoga cemerlang dalam SPM 2022

Dari telegram @soalanpercubaanspm

JADUAL BERKALA UNSUR

JADUAL BERKALA UNSUR			
Nombor proton			
Simbol			
Nama unsur			
Jisim atom relatif			
1	2	3	4
H Hidrogen 1	He Helium 4	Li Litium 7	Be Berilium 9
11	10	12	
Na Natrium 23	Ne Neon 20	Mg Magnesium 24	
19	18	20	
K Kalium 39	Ar Argon 40	Ca Kalsium 40	
37	36	38	
Rb Rubidium 86	Kr Kripton 84	Sr Strontium 88	
55	54	56	
Cs Sesium 133	Xe Xenon 131	Ba Barium 137	
87	86	88	
Fr Fransium 223	Rn Radon 222	Ra Radium 226	
21	20	22	23
Sc Skandium 45	Ca Kalsium 40	Ti Titanium 48	V Vanadium 51
39	38	40	41
Y Yttrium 89	Sr Strontium 88	Zr Zirkonium 91	Nb Niobium 93
57	56	72	73
La Lantanum 139	Ba Barium 137	Hf Hafnium 179	Ta Tantalum 181
89	88	104	105
Ac Aktinium 227	Ra Radium 226	Unq Unnil- kuadium 257	Unp Unnil- pentium 260
60	59	61	62
Nd Neodimium 144	Pr Praseo- dimum 141	Pm Prometium 147	Sm Samarium 150
92	91	93	94
U Uranium 238	Pa Proaktinium 231	Np Neptunium 237	Pu Plutonium 244
108	107	109	110
Os Osmium 190	Re Rhenium 186	Ir Iridium 192	Pt Platinum 195
44	43	45	46
Ru Ruthenium 101	Tc Tekneshium 98	Rh Rodium 103	Pd Paladium 106
26	25	27	28
Fe Ferum 56	Mn Mangan 55	Co Kobalt 59	Ni Nikel 59
52	51	53	54
Cr Kromium 52	V Vanadium 51	Mn Mangan 55	Fe Ferum 56
42	41	43	44
Mo Molibdenum 96	Nb Niobium 93	Tc Tekneshium 98	Ru Ruthenium 101
74	73	75	76
W Tungsten 184	Ta Tantalum 181	Re Rhenium 186	Os Osmium 190
106	105	107	108
Unh Unnilhexium 263	Unp Unnil- pentium 260	Uns Unnilseptium 262	Uno Unnilokti- um 265
266	265	266	266
Unu Unnilennium 266	Unu Unnilennium 266	Unu Unnilennium 266	Unu Unnilennium 266
101	100	101	102
Cd Kadmium 112	In Indium 115	Sn Stannum 119	Sb Antimoni 122
48	47	50	51
Cd Kadmium 112	In Indium 115	Sn Stannum 119	Sb Antimoni 122
80	79	82	83
Hg Merkuri 201	Tl Thallium 204	Pb Plumbum 207	Bi Bismut 209
201	204	207	209
Po Polonium 210	At Astatin 210	Rn Radon 222	
84	85	86	
Lu Luteetium 175	Yb Iterbium 173	Tm Tulium 169	Er Erbium 167
71	70	69	68
Lu Luteetium 175	Yb Iterbium 173	Tm Tulium 169	Er Erbium 167
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev- ium 256	Fm Fermium 253
103	102	101	100
Lr Lawrensi- um 257	No Nobelium 254	Md Mendelev-	

PERIODIC TABLE OF ELEMENT

Proton number	Symbol	Name of element	Relative atomic mass
1	H	Hydrogen	1
2	He	Helium	4
3	Li	Lithium	7
4	Be	Beryllium	9
5	B	Boron	11
6	C	Carbon	12
7	N	Nitrogen	14
8	O	Oxygen	16
9	F	Fluorine	19
10	Ne	Neon	20
11	Na	Sodium	23
12	Mg	Magnesium	24
13	Al	Aluminium	27
14	Si	Silicon	28
15	P	Phosphorus	31
16	S	Sulphur	32
17	Cl	Chlorine	35
18	Ar	Argon	40
19	K	Potassium	39
20	Ca	Calcium	40
21	Sc	Scandium	45
22	Ti	Titanium	48
23	V	Vanadium	51
24	Cr	Chromium	52
25	Mn	Manganese	55
26	Fe	Iron	56
27	Co	Cobalt	59
28	Ni	Nickel	59
29	Cu	Copper	64
30	Zn	Zinc	65
31	Ga	Gallium	70
32	Ge	Germanium	73
33	As	Arsenic	75
34	Se	Selenium	79
35	Br	Bromine	80
36	Kr	Krypton	84
37	Rb	Rubidium	86
38	Sr	Strontium	88
39	Y	Yttrium	89
40	Zr	Zirconium	91
41	Nb	Niobium	93
42	Mo	Molybdenum	96
43	Tc	Technetium	98
44	Ru	Ruthenium	101
45	Rh	Rhodium	103
46	Pd	Palladium	106
47	Ag	Silver	108
48	Cd	Cadmium	112
49	In	Indium	115
50	Sn	Tin	119
51	Sb	Antimony	122
52	Te	Tellurium	128
53	I	Iodine	127
54	Xe	Xenon	131
55	Cs	Caesium	133
56	Ba	Barium	137
57	La	Lanthanum	139
58	Ce	Cerium	140
59	Pr	Praseodymium	141
60	Nd	Neodymium	144
61	Pm	Promethium	147
62	Sm	Samarium	150
63	Eu	Europium	152
64	Gd	Gadolinium	157
65	Tb	Terbium	167
66	Dy	Dysprosium	163
67	Ho	Holmium	165
68	Er	Erbium	167
69	Tm	Thulium	169
70	Yb	Ytterbium	173
71	Lu	Lutetium	175
72	Hf	Hafnium	179
73	Ta	Tantalum	181
74	W	Tungsten	184
75	Re	Rhenium	186
76	Os	Osmium	190
77	Ir	Iridium	192
78	Pt	Platinum	195
79	Au	Gold	197
80	Hg	Mercury	201
81	Tl	Thallium	204
82	Pb	Lead	207
83	Bi	Bismuth	209
84	Po	Polonium	210
85	At	Astatine	210
86	Rn	Radon	222
87	Fr	Francium	223
88	Ra	Radium	226
89	Ac	Actinium	227
90	Th	Thorium	232
91	Pa	Protactinium	231
92	U	Uranium	238
93	Np	Neptunium	237
94	Pu	Plutonium	244
95	Am	Americium	243
96	Cm	Curium	247
97	Bk	Berkelium	247
98	Cf	Californium	249
99	Es	Einsteinium	254
100	Fm	Fermium	253
101	Md	Mendelevium	256
102	No	Nobelium	254
103	Lr	Lawrencium	257
104	Unq	Unnilquadium	257
105	Unp	Unnilpentium	260
106	Unh	Unnilhexium	263
107	Uns	Unnilseptium	262
108	Uno	Unniloctium	265
109	Une	Unnilennium	266
110	Uuh	Unnilium	269
111	Uuh	Unnilium	270
112	Uuh	Unnilium	271
113	Uuh	Unnilium	272
114	Uuh	Unnilium	273
115	Uuh	Unnilium	274
116	Uuh	Unnilium	275
117	Uuh	Unnilium	276
118	Uuh	Unnilium	277

Reference: Chang, Raymond (1991). Chemistry. McGraw-Hill, Inc.

MAKLUMAT UNTUK CALON
INFORMATION FOR CANDIDATES

1. Kertas peperiksaan ini mengandungi tiga bahagian : **Bahagian A, Bahagian B dan Bahagian C.**
This question paper consists of three sections : Section A, Section B and Section C.
2. Jawab **semua** soalan dalam **Bahagian A dan C.** Jawapan anda bagi **Bahagian A** hendaklah ditulis pada ruang yang disediakan dalam kertas peperiksaan.
Answer all questions in Section A and C. Write your answers for Section A in the spaces provided in this question paper.
3. Jawab mana-mana **satu** soalan daripada **Bahagian B.** Tulis jawapan anda bagi **Bahagian B dan Bahagian C** dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.
Answer any one question from Section B. Write your answers for Section B and Section C on the 'helaian tambahan' provided by the invigilators. You may use equations, diagrams, tables, graphs and other suitable method to explain your answer.
4. Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
The diagrams in the question are not drawn to scale unless stated.
5. Markah yang diperuntukkan bagi setiap soalan atau ceraihan soalan ditunjukkan dalam kurungan.
Marks allocated for each question or sub-part of a question are shown in brackets.
6. Tunjukkan kerja mengira. Ini membantu anda mendapatkan markah.
Show your working. It may help you to get marks.
7. Jika anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baharu.
If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.
8. Jadual Berkala Unsur disediakan di halaman 29.
The Periodic Table of Elements is provided on pages 30.
9. Anda dibenarkan menggunakan kalkulator saintifik.
You may use scientific calculator.
10. Anda dinasihatkan supaya mengambil masa 90 minit untuk menjawab soalan dalam **Bahagian A**, 30 minit untuk **Bahagian B** dan 30 minit untuk **Bahagian C.**
You are advised to spend 90 minutes to answer questions in Section A, 30 minutes for Section B and 30 minutes for Section C.
11. Ikat helaian tambahan bersama-sama kertas peperiksaan ini dan serahkan kepada pengawas peperiksaan pada akhir peperiksaan.
Tie 'helaian tambahan' together with this question paper and hand in to the invigilator at the end of the examination.

