Time: 2 hours 30 minutes

This question paper consists of three sections: **Section A**, **Section B** and **Section C**.
Kertas peperiksaan ini mengandungi tiga bahagian: **Bahagian A**, **Bahagian B** *dan* **Bahagian C**.

For Examiner's Use

Section A
Bahagian A

[60 *marks*]
[60 *markah*]

Answer **all** questions in this section.
Jawab **semua** *soalan dalam bahagian ini.*

1 Table 1 shows the nucleon number, number of neutrons and chemical formula of oxides for a few elements in Period 3 in the Periodic Table of Elements.
Jadual 1 menunjukkan nombor nukleon, bilangan neutron dan formula kimia bagi oksida untuk beberapa unsur dalam kala 3 dalam Jadual Berkala Unsur.

Element *Unsur*	**Nucleon number** *Nombor nukleon*	**Number of neutrons** *Bilangan neutron*	**Chemical formula of oxides of elements** *Formula kimia bagi oksida unsur*
Sodium *Natrium*	23	12	Na_2O
Aluminium *Aluminium*	27	14	Al_2O_3
Phosphorus *Fosforus*	31	16	P_2O_5
Sulphur *Sulfur*	32	16	SO_2
Argon *Argon*	40	22	None *Tiada*

Table 1
Jadual I

Based on Table 1;
Berdasarkan Jadual 1;

(*a*) What is the meaning of nucleon number?
Apakah maksud nombor nukleon?

.....
[1 *mark*]
[1 *markah*]

1(*a*) 1

(*b*) (i) Write the electron arrangement of phosphorus atom.
Tulis susunan elektron bagi atom fosforus.

.....
[1 *mark*]
[1 *markah*]

1(*b*)(i) 1

(ii) State the group of phosphorus in the Periodic Table of Elements.
Give **one** reason.
Nyatakan kumpulan bagi fosforus dalam Jadual Berkala Unsur.
Beri **satu** *alasan.*

.....
[2 *marks*]
[2 *markah*]

1(*b*)(ii) 2

For Examiner's Use

(c) Oxide of elements in Period 3 show acidic, basic or amphoteric properties.
Oksida bagi unsur dalam Kala 3 menunjukkan sifat berasid, berbes atau amfoterik.

Choose **one** example of oxide of element that shows
Pilih **satu** *contoh oksida bagi unsur yang menunjukkan*

Acidic property : .....
Sifat berasid

Amphoteric property : .....
Sifat amfoterik

Basic property : .....
Sifat berbes

[3 marks]
[3 markah]

1(c) 3

(d) (i) Why does argon not form an oxide compound?
Mengapakah argon tidak membentuk sebatian oksida?

.....

[1 mark]
[1 markah]

1(d)(i) 1

(ii) State **one** use of argon.
Nyatakan **satu** *kegunaan argon.*

.....

[1 mark]
[1 markah]

1(d)(ii) 1

Total A1 9

2 Diagram 1 shows the standard representation of two isotopes of carbon atoms.
Rajah 1 menunjukkan perwakilan piawai bagi dua isotop atom karbon.

$^{12}_{6}C$	$^{14}_{6}C$

Diagram 1
Rajah 1

(a) State the meaning of isotope.
Nyatakan maksud isotop.

.....

.....

[1 mark]
[1 markah]

2(a) 1

(b) Based on Diagram 1:
Berdasarkan Rajah 1:

(i) Determine the number of electrons and neutrons in the table below.
Tentukan bilangan elektron dan neutron dalam jadual di bawah.

Particle *Zarah*	$^{12}_{6}C$	$^{14}_{6}C$
Number of electron *Bilangan elektron*		
Number of neutron *Bilangan neutron*		

[2 marks]
[2 markah]

2(b)(i) 2

(ii) State **one** use of $^{14}_{6}C$ in our daily life.

Nyatakan **satu** *kegunaan* $^{14}_{6}C$ *dalam kehidupan seharian.*

.....

[1 *mark*]
[1 *markah*]

For Examiner's Use

2(*b*)(ii)

1

(*c*) P is a substance that has a melting point of 51 °C and a boiling point of 305 °C.
P *adalah satu bahan yang mempunyai takat lebur* 51 °C *dan takat didih* 305 °C.

(i) Sketch a graph of temperature against time when substance P is heated from 30 °C to 90 °C.
Lakar graf suhu melawan masa apabila bahan P *dipanaskan daripada* 30 °C *ke* 90 °C.

[2 *marks*]
[2 *markah*]

2(*c*)(i)

2

(ii) When substance P is cooled, the temperature decreases and becomes constant at one stage and then decreases again.
Apabila bahan P *disejukkan, suhu berkurangan dan menjadi malar pada satu peringkat dan kemudian berkurang semula.*

Predict the constant temperature.
Ramal suhu yang malar itu.

.....

[1 *mark*]
[1 *markah*]

2(*c*)(ii)

1

Explain why the temperature is constant at that stage.
Terangkan mengapa suhu malar pada peringkat itu.

.....

.....

.....

[2 *marks*]
[2 *markah*]

2(*c*)(ii)

2

Total A2

9

For Examiner's Use

3 Diagram 2.1 shows the apparatus set-up to investigate the products formed from the combustion of alcohol Q. Alcohol Q contains 3 carbon atoms per unit molecule.

Rajah 2.1 menunjukkan susunan radas untuk menyiasat hasil yang terbentuk daripada pembakaran alkohol Q. Alkohol Q mengandungi 3 atom karbon per unit molekul.

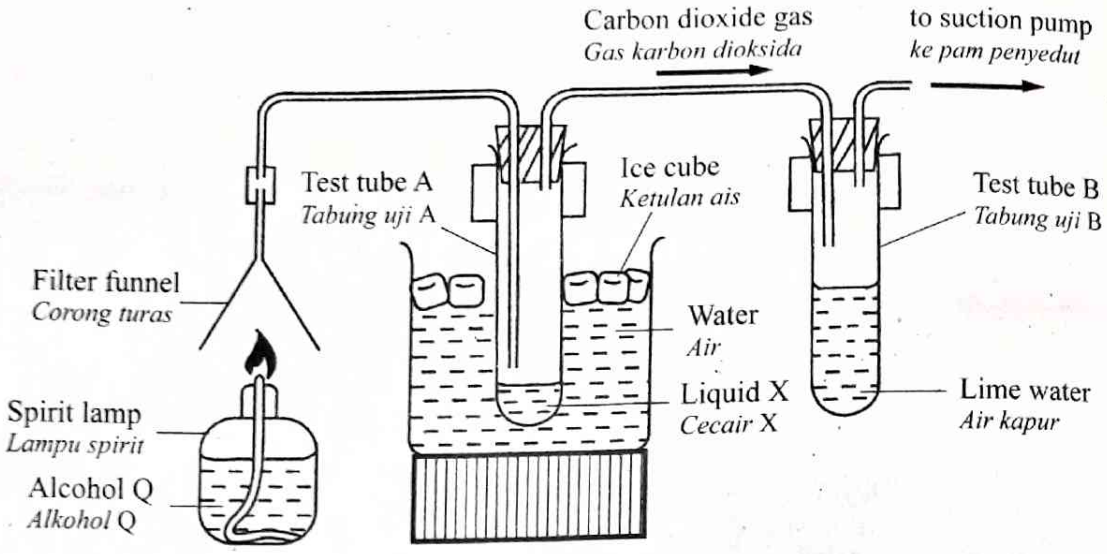


Diagram 2.1
Rajah 2.1

(*a*) (i) State the general formula of alcohol.
Nyatakan formula am bagi alkohol.

3(*a*)(i) 1

.....

[1 *mark*]
[1 *markah*]

(ii) State the molecular formula of alcohol Q used in Diagram 2.1.
Nyatakan formula molekul bagi alkohol Q yang digunakan dalam Rajah 2.1.

3(*a*)(ii) 1

.....

[1 *mark*]
[1 *markah*]

(iii) Alcohol Q is an isomer.
Draw **two** isomers of alcohol Q.
Alkohol Q adalah suatu isomer.
Lukis **dua** *isomer bagi alkohol Q.*

3(*a*)(iii) 2

[2 *marks*]
[2 *markah*]

Based on Diagram 2.1,
Berdasarkan Rajah 2.1,

(*b*) (i) Liquid X produced in test tube A changes the colour of anhydrous cobalt chloride paper from blue to pink.
Cecair X yang terhasil dalam tabung uji A menukarkan warna kertas kobalt klorida kontang daripada biru kepada merah jambu.

State the name of liquid X produced.
Nyatakan nama bagi cecair X yang terhasil.

.....

[1 mark]
[1 markah]

For Examiner's Use
3(b)(i)
1

(ii) Carbon dioxide gas produced should turn the lime water cloudy but no change is observed. Identify the mistake in the apparatus set-up.
Gas karbon dioksida yang terhasil sepatutnya mengeruhkan air kapur tetapi tiada perubahan diperhatikan.
Kenal pasti kesilapan dalam susunan radas tersebut.

.....

.....

[1 mark]
[1 markah]

3(b)(ii)
1

(c) A candy factory wants to manufacture a new pear-flavoured candy. A chemist in the factory is instructed to prepare a sample of ester with pear flavour through the esterification reaction between alcohol Q and compound R.
Diagram 2.2 shows the steps of preparation for sample of the ester in the laboratory.
Sebuah kilang gula-gula ingin mengeluarkan gula-gula baharu yang berperisa pir. Seorang ahli kimia di kilang tersebut diarahkan untuk menyediakan satu sampel ester dengan perisa pir melalui tindak balas pengesteran antara alkohol Q dan sebatian R.
Rajah menunjukkan langkah penyediaan sampel ester tersebut dalam makmal.

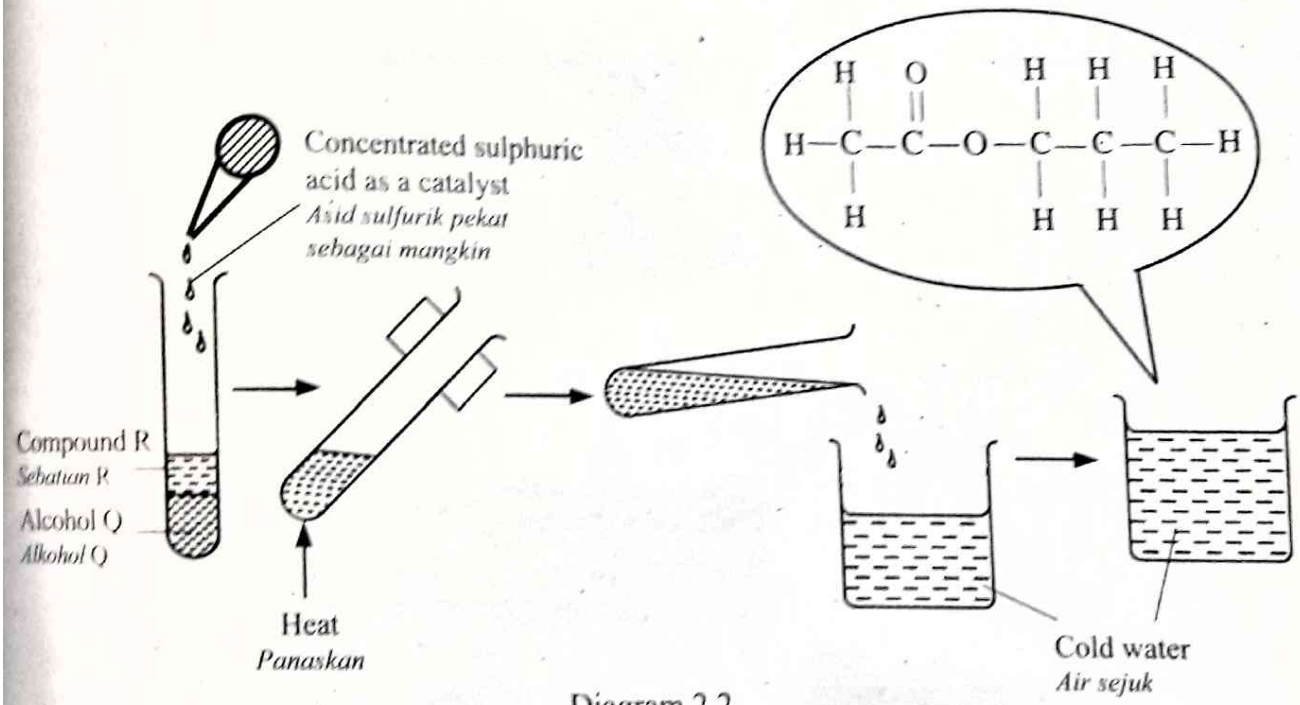


Diagram 2.2
Rajah 2.2

Based on Diagram 2.2,
Berdasarkan Rajah 2.2,

(i) By referring to the structural formula of ester, identify compound R.
Dengan merujuk kepada formula struktur ester yang diberi, kenal pasti sebatian R.

.....

[1 mark]
[1 markah]

3(c)(i)
1

For Examiner's Use

3(c)(ii) 2

(ii) Write **one** chemical equation for the esterification reaction between alcohol Q and compound R.
Tulis **satu** *persamaan kimia bagi tindak balas pengesteran antara alkohol Q dan sebatian R.*

.....

[2 *marks*]
[2 *markah*]

3(c)(iii) 1

(iii) The ester produced floats on top of the cold water to form two layers of colourless liquid. Explain why.
Ester yang terhasil terapung di atas permukaan air sejuk untuk membentuk dua lapisan cecair tak berwarna.
Terangkan mengapa.

.....

.....

[1 *mark*]
[1 *markah*]

Total A3 10

4 Diagram 3.1 shows the flow chart of two chlorine compounds, XCl_4 and YCl. These two compounds are used to determine the electrical conductivity.
Rajah 3.1 *menunjukkan carta alir bagi dua sebatian klorin,* XCl_4 *dan* YCl. *Kedua-dua sebatian ini digunakan bagi menentukan kekonduksian elektrik.*

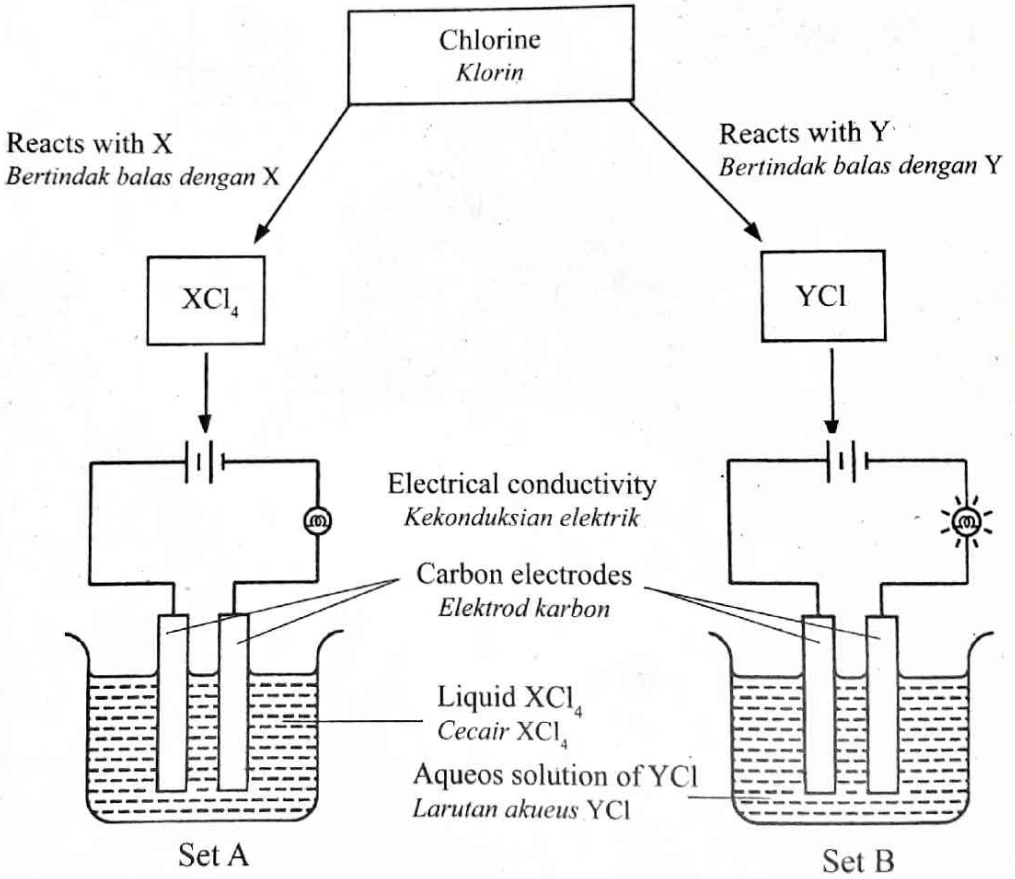


Diagram 3.1
Rajah 3.1

(*a*) (i) State the type of particles in chlorine gas.
Nyatakan jenis zarah dalam gas klorin.

4(a)(i) 1

.....

[1 *mark*]
[1 *markah*]

(ii) Name the type of bond in chlorine gas.
Namakan jenis ikatan dalam gas klorin.

.....

[1 *mark*]
[1 *markah*]

For Examiner's Use
4(*a*)(ii)
1

(*b*) Diagram 3.2 shows the electron arrangement of atom X, Y and chlorine, Cl.
Rajah 3.2 menunjukkan susunan elektron bagi atom X, Y dan klorin, Cl.

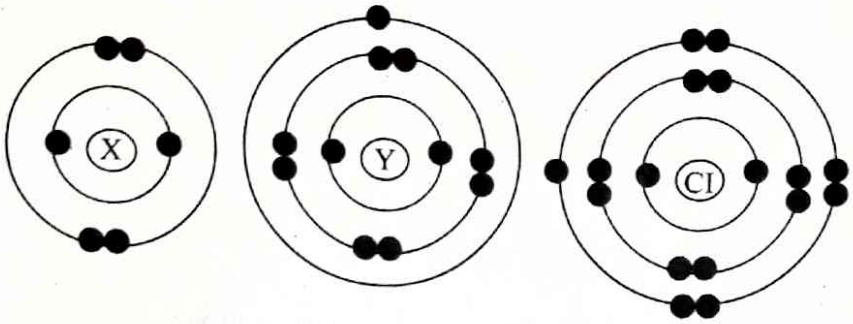


Diagram 3.2
Rajah 3.2

(i) By using atom X, Y and chlorine, Cl in Diagram 3.2, choose atoms that can form two different compounds.
Draw the electron arrangement for the compound that dissolves in water and another compound that does not dissolve in water in the space below.
Dengan menggunakan atom X, Y dan klorin, Cl dalam Rajah 3.2, pilih atom-atom yang boleh membentuk dua sebatian yang berbeza.
Lukis susunan elektron bagi sebatian itu yang larut dalam air dan satu lagi sebatian yang tidak larut dalam air dalam ruangan di bawah.

Compound that dissolves in water
Sebatian yang larut di dalam air

Compound that does not dissolve in water
Sebatian yang tidak larut di dalam air

[4 *marks*]
[4 *markah*]

4(*b*)(i)
4

For Examiner's Use

4(*b*)(ii) 1

(ii) Compare the melting point and the boiling point for both compounds **4**(*b*)(i).
Bandingkan takat lebur dan takat didih bagi kedua-dua sebatian di **4**(*b*)(i).

.....

[1 mark]
[1 markah]

4(*c*) 3

(*c*) Explain why observations in Set A and Set B in Diagram 3.1 are different.
Terangkan mengapa pemerhatian dalam Set A *dan Set* B *dalam Rajah* 3.1 *adalah berbeza.*

.....

.....

.....

[3 marks]
[3 markah]

Total A4 10

5 Industrial waste water containing heavy metal cations should be treated before being released into the river or drainage system. A sample of the industrial waste water is taken and analysed for the presence of heavy metal cations.
Diagram 4 shows the flow chart of the chemical tests for two ions that are being identified in the industrial waste water.
Air buangan industri mengandungi kation logam berat sepatutnya dirawat sebelum dilepaskan ke sungai atau sistem perparitan. Satu sampel air buangan industri diambil dan dianalisis untuk mengetahui kehadiran kation logam berat.
Rajah 4 *menunjukkan carta alir bagi ujian kimia untuk dua ion yang dikenal pasti dalam air buangan industri.*

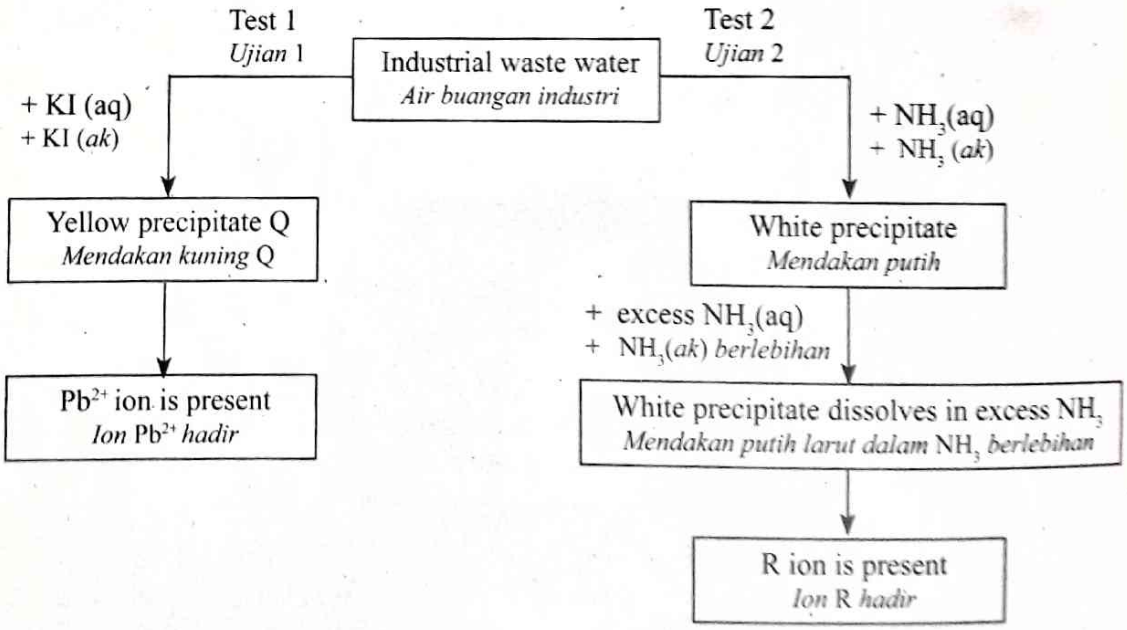


Diagram 4
Rajah 4

5(*a*) 1

(*a*) What is the meaning of cation?
Apakah maksud kation?

.....

[1 mark]
[1 markah]

(b) Based on Test 1,
Berdasarkan Ujian 1,

(i) name the yellow precipitate Q formed
namakan mendakan kuning Q yang terbentuk

.....

[1 mark]
[1 markah]

(ii) what will happen if the precipitate is heated and cooled again?
apakah yang akan berlaku sekiranya mendakan tersebut dipanaskan dan disejukkan semula?

.....

.....

[2 marks]
[2 markah]

(iii) write the ionic equation for the formation of precipitate Q
tulis persamaan ion untuk pembentukan mendakan Q

.....

[2 marks]
[2 markah]

(iv) if 0.0002 mol of potassium iodide solution is added to the industrial waste water, calculate the mass of precipitate Q formed.
sekiranya 0.0002 mol *larutan kalium iodida ditambahkan kepada air buangan industri tersebut, hitung jisim mendakan Q yang terbentuk.*
[Molar mass of Q = 461 g mol^{-1}]
[*Jisim molar* Q = 461 g mol^{-1}]

[2 marks]
[2 markah]

(c) Based on Test 2, identify R ion.
Berdasarkan Ujian 2, kenal pasti ion R.

.....

[1 mark]
[1 markah]

(d) The industrial waste water may contain Copper (II) ions. Describe briefly a chemical test to confirm the presence of Cu^{2+} ions.
Air buangan industri mungkin mengandungi ion kuprum(II). *Huraikan secara ringkas ujian kimia untuk mengesahkan kehadiran ion* Cu^{2+}.

.....

.....

[2 marks]
[2 markah]

For Examiner's Use

5(*b*)(i)	1
5(*b*)(ii)	2
5(*b*)(iii)	2
5(*b*)(iv)	2
5(*c*)	1
5(*d*)	2
Total A5	11

For Examiner's Use

6 (*a*) Table 2 shows the value of heat of neutralisation for the reaction between two different acids with sodium hydroxide solution.
Jadual 2 menunjukkan nilai haba peneutralan bagi tindak balas antara dua asid berbeza dengan larutan natrium hidroksida.

Reactants *Bahan tindak balas*	**Heat of neutralisation (kJ mol^{-1})** *Haba peneutralan* (kJ mol^{-1})
HX + NaOH	−57.3
CH_3COOH + NaOH	−55.0

Table 2
Jadual 2

(i) What is the meaning of heat of neutralisation?
Apakah maksud bagi haba peneutralan?

.....

[1 *mark*]
[1 *markah*]

6(*a*)(i) 1

(ii) Based on Table 2, suggest acid HX.
Berdasarkan Jadual 2, cadangkan asid HX.

.....

[1 *mark*]
[1 *markah*]

6(*a*)(ii) 1

(iii) Explain why there are differences in the value of heat of neutralisation.
Terangkan mengapa terdapat perbezaan nilai bagi haba peneutralan.

.....

.....

.....

[3 *marks*]
[3 *markah*]

6(*a*)(iii) 3

(*b*) A student carried out an experiment to determine the heat of combustion of ethanol. He found that 0.575 g of ethanol is used to increase the temperature of 100 cm^3 of water from 28.0 °C to 62.0 °C.
Seorang murid menjalankan satu eksperimen untuk menentukan haba pembakaran etanol. Dia mendapati 0.575 g *etanol digunakan untuk meningkatkan suhu bagi* 100 cm^3 *air daripada* 28.0 °C *kepada* 62.0 °C.

Calculate:
Hitung:

(i) The heat released from the combustion of ethanol.
[Specific heat capacity of water, c = 4.2 J g^{-1} °C^{-1}, Density of water = 1.0 g cm^{-3}]
Haba yang dibebaskan dari pembakaran ethanol.
[*Muatan haba tentu bagi air,* c = 4.2 J g^{-1} °C^{-1}, *Ketumpatan air* = 1.0 g cm^{-3}]

[1 *mark*]
[1 *markah*]

(ii) Number of mole of ethanol used.
[Molar mass of ethanol 46 g mol^{-1}]
Bilangan mol etanol yang digunakan.
[*Jisim molar bagi etanol* = 46 g mol^{-1}]

[1 *mark*]
[1 *markah*]

(iii) Heat of combustion of ethanol.
Haba pembakaran etanol.

[1 *mark*]
[1 *markah*]

(iv) Draw the apparatus set-up to carry out the experiment to investigate the heat of combustion of ethanol.
Lukis susunan radas untuk menjalankan eksperimen bagi menyiasat haba pembakaran etanol.

[3 *marks*]
[3 *markah*]

For Examiner's Use

6(*b*)(ii)	1
6(*b*)(iii)	1
6(*b*)(iv)	3
Total A6	11

Section B
***Bahagian* B**

[20 *marks*]
[20 *markah*]

Answer any **one** question from this section.
Jawab mana-mana **satu** *soalan daripada bahagian ini.*

7 (*a*) Diagram 5.1 shows HA gas is flowed into two beakers containing propanone and water respectively to study the properties of acid.
Rajah 5.1 *menunjukkan gas* HA *dialirkan ke dalam dua bikar yang masing-masing mengandungi propanon dan air untuk mengkaji sifat asid.*

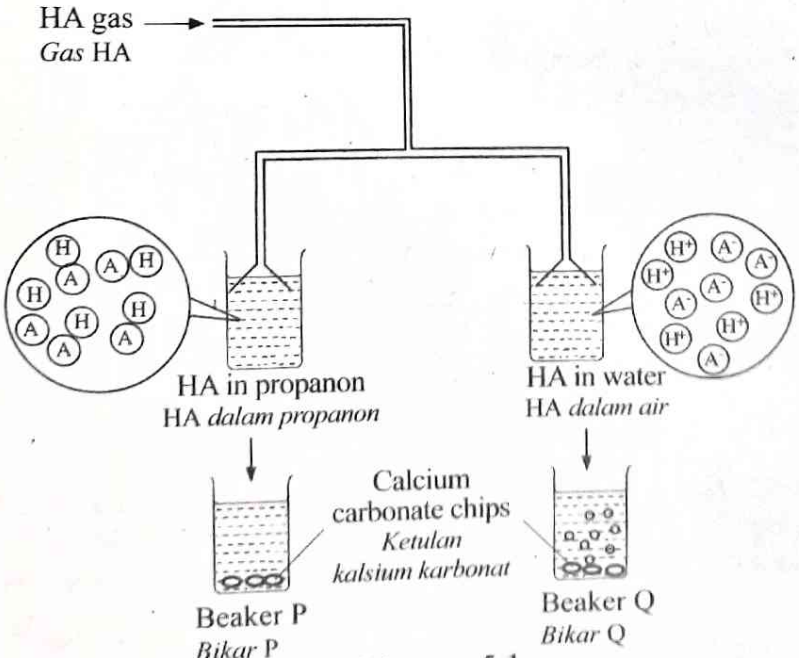


Diagram 5.1
Rajah 5.1

Based on Diagram 5.1, compare the observations in beaker P and beaker Q.
Explain your answer. [5 marks]
Berdasarkan Rajah 5.1, bandingkan pemerhatian dalam bikar P dan bikar Q.
Terangkan jawapan anda. [5 markah]

(*b*) Diagram 5.2 shows the pH value of the acids, HA and HB. Both are monoprotic acids.
Rajah 5.2 menunjukkan nilai pH bagi asid, HA dan HB. Kedua-dua asid adalah asid monoprotik.

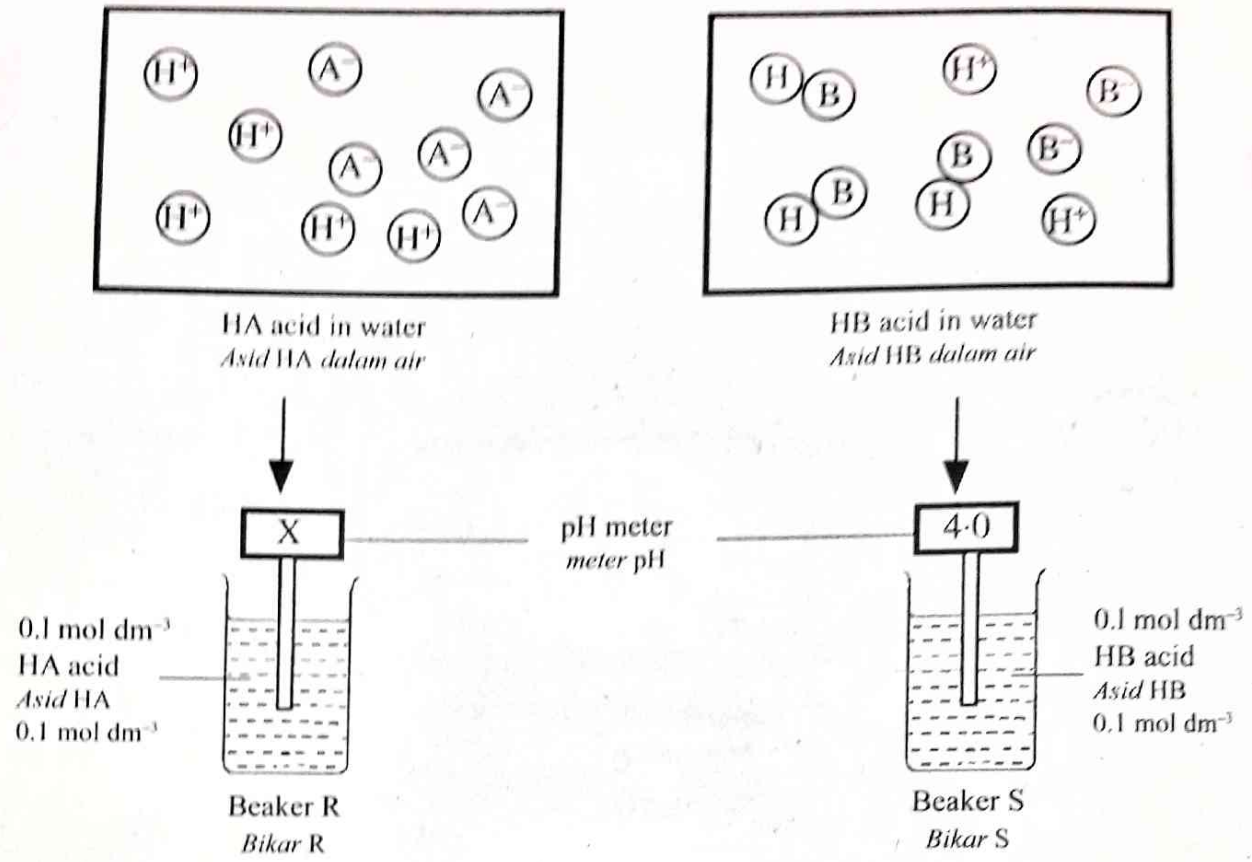


Diagram 5.2
Rajah 5.2

Suggest the names of HA acid and HB acid. Predict the value of X in Beaker R.
Explain the difference between the two acids in Beaker R and Beaker S. [5 marks]
Cadangkan nama bagi asid HA dan asid HB. Ramal nilai X dalam Bikar R.
Terangkan perbezaan antara kedua-dua asid dalam Bikar R dan Bikar S. [5 markah]

(*c*) 50 cm^3 of 0.1 mol dm^{-3} acid HA in Beaker R is pipetted out and put into a 200 cm^3 volumetric flask to prepare a standard solution. Distilled water is added into the volumetric flask until it reaches the graduation mark.
50 cm^3 asid HA 0.1 mol dm^{-3} dalam Bikar R dipipetkan dan dimasukkan ke dalam kelalang volumetrik 200 cm^3 untuk menyediakan suatu larutan piawai. Air suling ditambah ke dalam kelalang volumetrik sehingga mencapai tanda senggatan.

(i) Name the process involved and predict the pH value of HA acid in the volumetric flask.
Explain your answer. [4 marks]
Namakan proses yang terlibat dan ramal nilai pH bagi asid HA dalam kelalang volumetrik.
Terangkan jawapan anda. [4 markah]

(ii) Calculate the concentration of HA acid prepared in the volumetric flask and determine the volume of 0.05 mol dm^{-3} sodium hydroxide solution needed to neutralise 25 cm^3 of the HA acid. [6 marks]
Hitung kepekatan asid HA yang disediakan dalam kelalang volumetrik dan tentukan isi padu larutan natrium hidroksida 0.05 mol dm^{-3} yang diperlukan untuk meneutralkan 25 cm^3 asid HA itu. [6 markah]

8 (a) Diagram 6.1 shows the reaction occurred in a voltaic cell using magnesium ribbon and copper plate as electrodes.

Rajah 6.1 menunjukkan tindak balas yang berlaku dalam suatu sel voltan menggunakan pita magnesium dan kepingan kuprum sebagai elektrod.

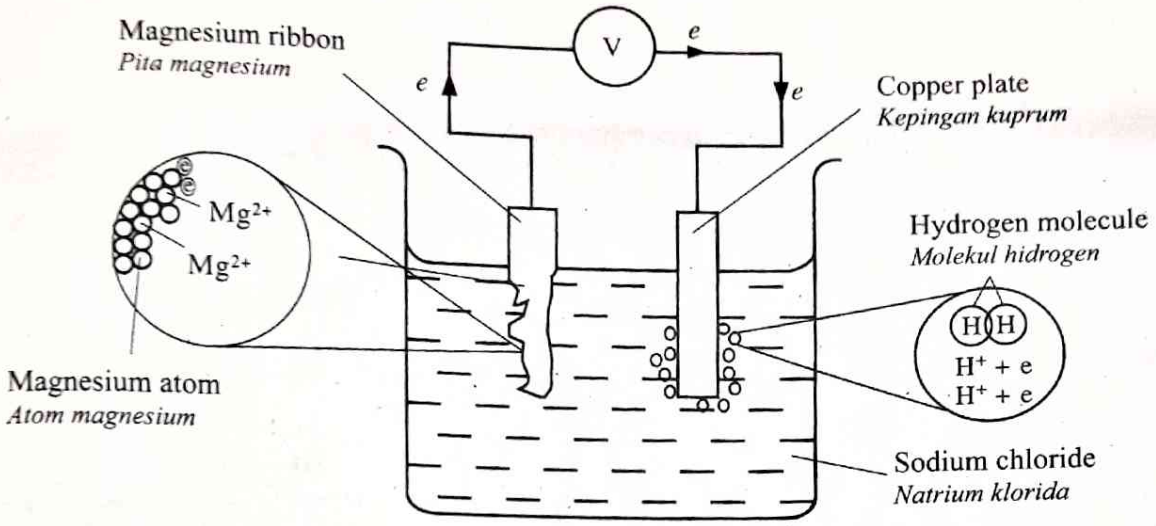


Diagram 6.1
Rajah 6.1

Based on Diagram 6.1, explain how electrical current is produced. [4 *marks*]
Berdasarkan Rajah 6.1, terangkan bagaimana arus elektrik terhasil. [4 *markah*]

(b) Bar chart in Diagram 6.2 shows the voltage of three chemical cells using different pairs of metals as electrodes.
Carta bar dalam Rajah 6.2 menunjukkan nilai voltan bagi tiga sel kimia menggunakan pasangan logam berbeza sebagai elektrod.

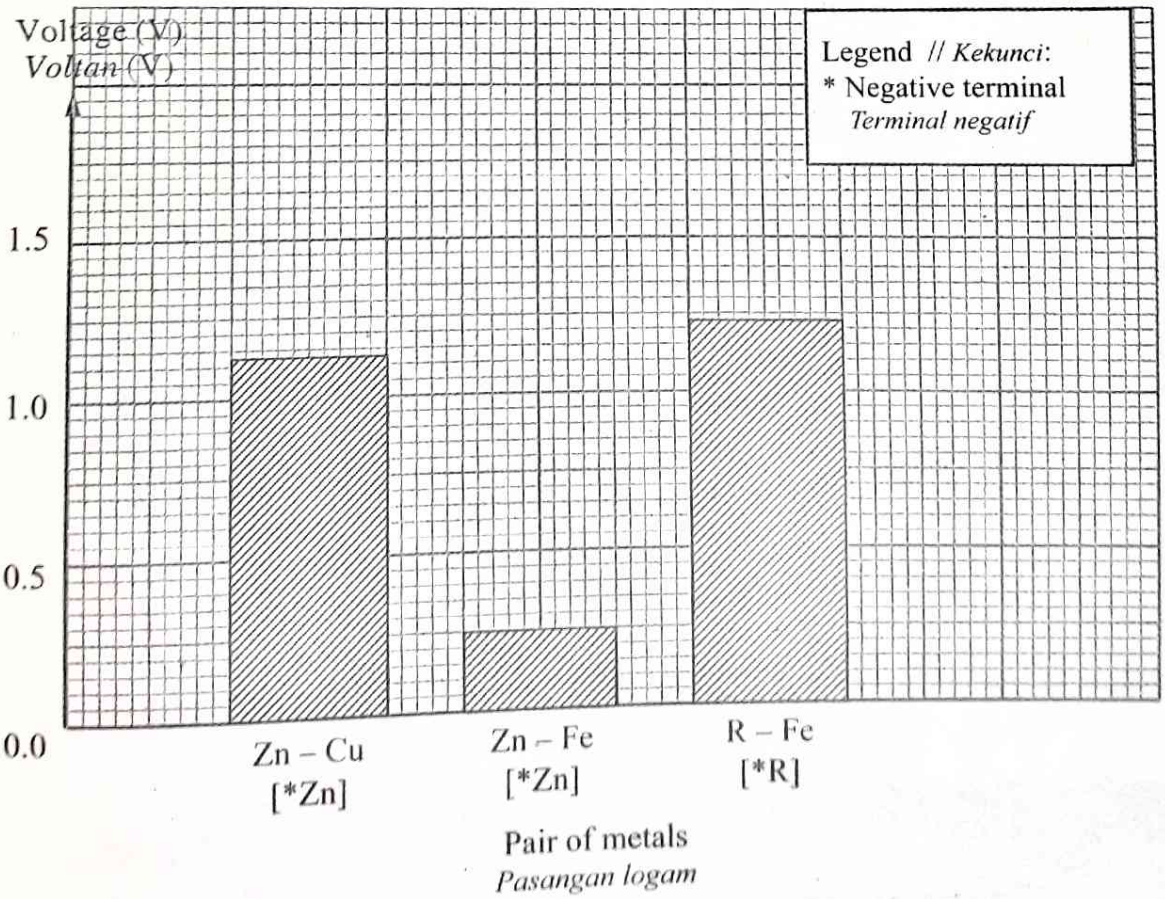


Diagram 6.2
Rajah 6.2

(i) Based on Diagram 6.2 determine,
Berdasarkan Rajah 6.2 tentukan,

- position of R in electrochemical series
  kedudukan R *dalam siri elektrokimia*
- voltage and negative terminal when R and copper are used as electrode
  nilai voltan dan terminal negatif apabila R *dan kuprum digunakan sebagai elektrod*

[3 *marks*]
[3 *markah*]

(ii)

Zinc can displace copper from copper(II) sulphate solution. *Zink boleh menyesarkan kuprum daripada larutan kuprum*(II) *sulfat.*

Give **one** reason for the above statement and write the chemical equation involved. [3 *marks*]
Berikan **satu** *alasan bagi pernyataan di atas dan tulis persamaan kimia terlibat.* [3 *markah*]

(*c*) Table 3 shows electrodes, electrolytes and observations at anode for three electrolytic cells.
Jadual 3 menunjukkan elektrod, elektrolit dan pemerhatian di anod bagi tiga sel elektrolisis.

Electrolytic cell ***Sel elektrolisis***	**Electrolyte** ***Elektrolit***	**Electrode** ***Elektrod***		**Observation at anode** ***Pemerhatian di anod***
		Cathode ***Katod***	**Anode** ***Anod***	
I	0.0001 mol dm^{-3} of copper (II) chloride solution. *Larutan kuprum* (II) *klorida* 0.0001 mol dm^{-3}	Carbon *Karbon*	Carbon *Karbon*	Colourless gas is released *Gas tidak berwarna dibebaskan*
II	1.0 mol dm^{-3} of copper (II) chloride solution *Larutan kuprum* (II) *klorida* 1.0 mol dm^{-3}	Carbon *Karbon*	Carbon *Karbon*	Greenish yellow gas is released *Gas kuning kehijauan dibebaskan*
III	0.0001 mol dm^{-3} of copper (II) chloride solution *Larutan kuprum* (II) *klorida* 0.0001 mol dm^{-3}	Copper *Kuprum*	Copper *Kuprum*	Anode becomes thinner *Anod semakin menipis*

Table 3
Jadual 3

(*c*) (i) Based on Table 3:
Berdasarkan Jadual 3:
Explain why there are differences in the observation at anode for
Terangkan mengapa terdapat perbezaan dalam pemerhatian di anod bagi

- Cell I and Cell II
  Sel I *dan Sel* II
- Cell I and Cell III
  Sel I *dan Sel* III

[8 *marks*]
[8 *markah*]

(ii) In Cell III, the blue colour of copper(II) chloride solution remains unchanged. Explain why. [2 *marks*]
Dalam Sel III, *warna biru larutan kuprum*(II) *klorida tidak berubah. Terangkan mengapa.* [2 *markah*]

Section C
Bahagian C

[20 *marks*]
[20 *markah*]

Answer any **one** question from this section.
Jawab mana-mana **satu** *soalan daripada bahagian ini.*

9 (*a*) The graph in Diagram 7.1 shows the curves of experiment I and experiment II that was carried out to study the rate of reaction.
Graf di Rajah 7.1 menunjukkan lengkung bagi eksperimen I *dan eksperimen* II *yang dijalankan bagi mengkaji kadar tindak balas.*

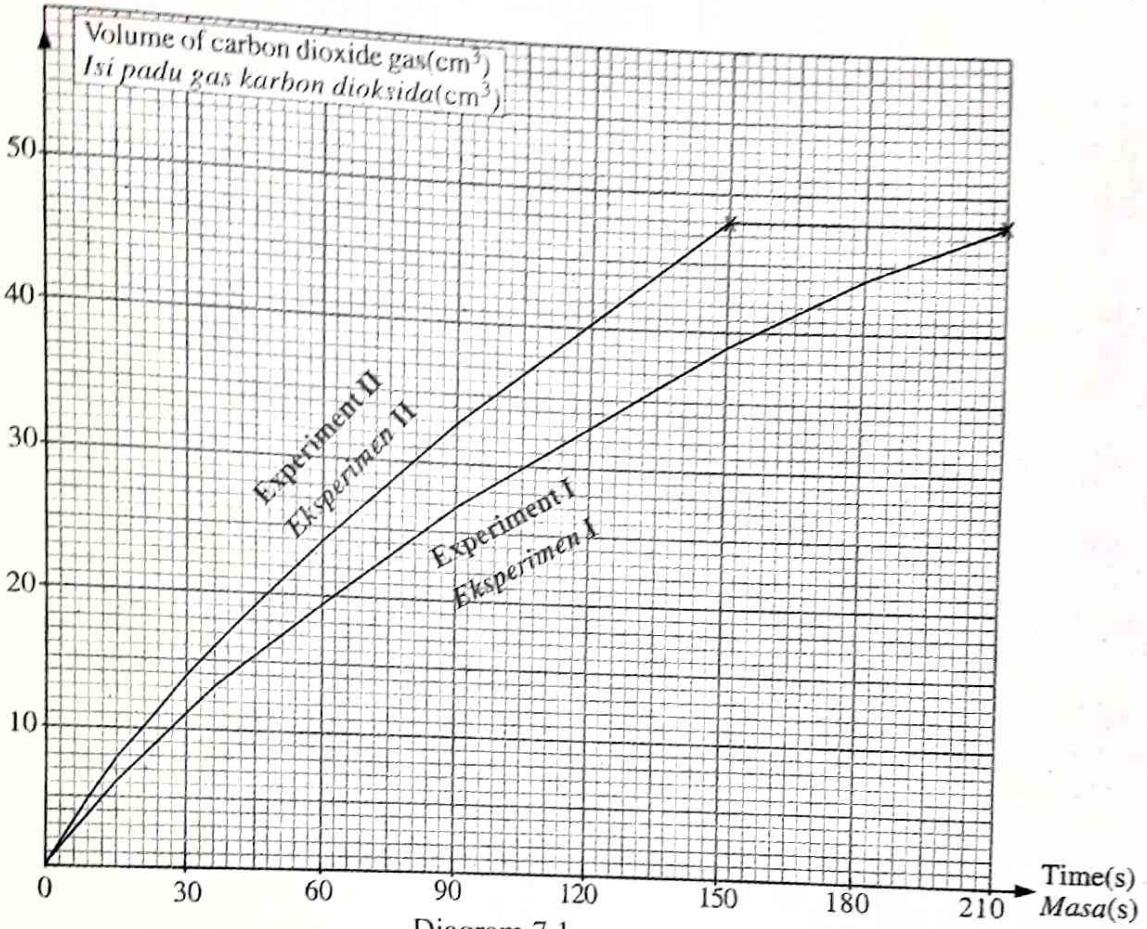


Diagram 7.1
Rajah 7.1

Based on the graph in Diagram 7.1,
Berdasarkan kepada graf di Rajah 7.1,

(i) Calculate average rate of reaction for Experiment I and Experiment II. [4 *marks*]
Hitung kadar tindak balas purata bagi Eksperimen I *dan Eksperimen* II. [4 *markah*]

(ii) Curve in Experiment I is obtained from the reaction between 5 g granulated calcium carbonate and 50 cm^3 of 1.0 mol dm^{-3} hydrochloric acid. The experiment is repeated to obtain the curve in Experiment II. Other than temperature, suggest **one** factor that can change the curve in Experiment I to the curve in Experiment II.
Based on the suggested factor, describe **one** experiment to show how you manipulate the factor in order to obtain the curve in Experiment II.
In your description include a labelled diagram. [10 *marks*]
Lengkung dalam Eksperimen I *diperoleh daripada tindak balas antara* 5 g *ketulan kalsium karbonat dan* 50 cm^3 *asid hidroklorik* 1.0 mol dm^{-3}. *Eksperimen itu diulangi untuk mendapatkan lengkung bagi Eksperimen* II. *Selain daripada suhu, cadangkan* **satu** *faktor yang boleh mengubah lengkung Eksperimen* I *kepada lengkung Eksperimen* II.
Berdasarkan faktor yang dicadangkan, huraikan **satu** *eksperimen untuk menunjukkan bagaimana anda memanipulasi faktor tersebut bagi mendapatkan lengkung Eksperimen* II.
Dalam huraian anda, sertakan gambar rajah berlabel. [10 *markah*]

(*b*) Chemical equation below shows the reaction between hydrogen gas and chlorine gas to produce hydrogen chloride gas.

Persamaan kimia di bawah menunjukkan tindak balas antara gas hidrogen dan gas klorin untuk menghasilkan gas hidrogen klorida.

$$C1_2 + H_2 \longrightarrow 2HC1$$

Set I and Set II in Diagram 7.2 show the rate of formation of hydrogen chloride gas at different temperatures.

Set I dan Set II dalam Rajah 7.2 menunjukkan kadar pembentukan gas hidrogen klorida pada suhu yang berlainan.

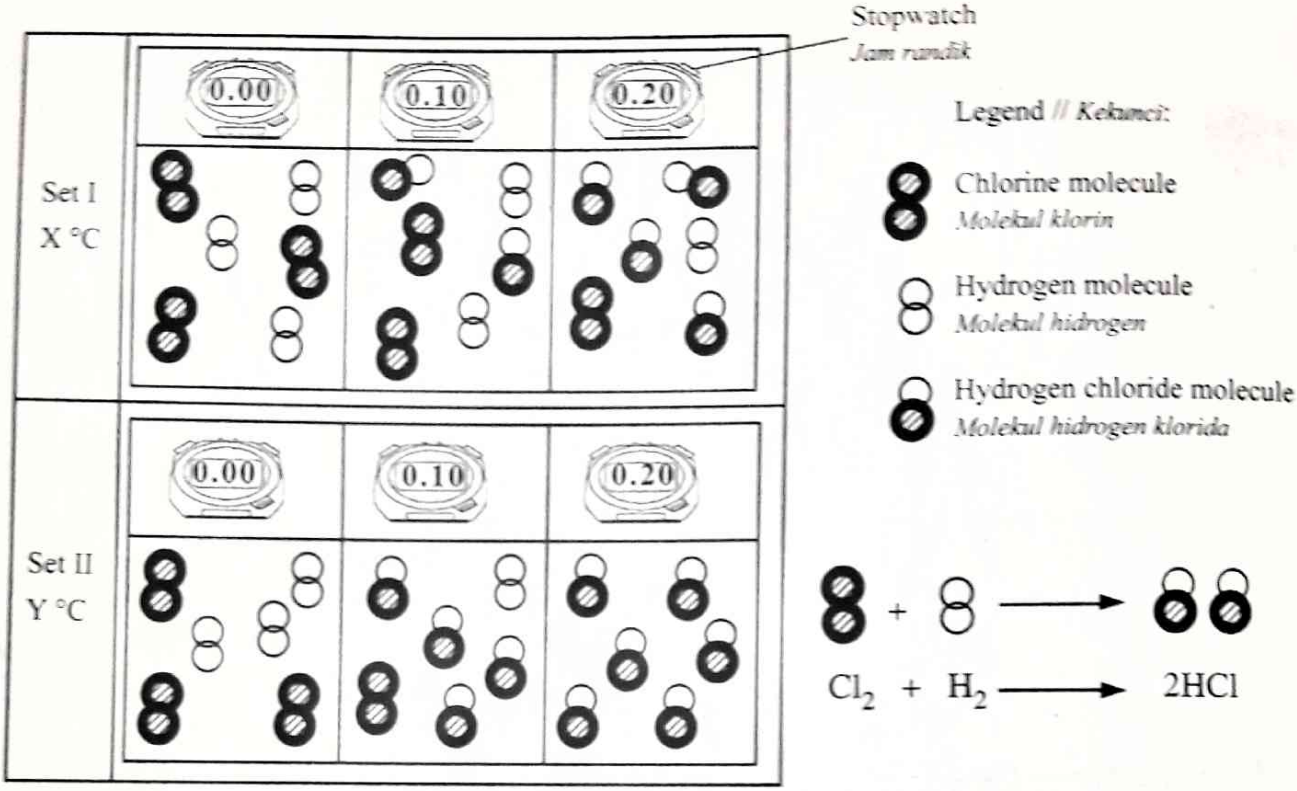


Diagram 7.2
Rajah 7.2

Based on Diagram 7.2,
Berdasarkan Rajah 7.2,

(i) if the two sets of reaction occur at temperature 30 °C and 40 °C, determine the temperature of X °C in Set I and Y °C in Set II
jika dua set tindak balas itu berlaku pada suhu 30 °C dan 40 °C, tentukan suhu X °C bagi Set I dan Y °C bagi Set II

(ii) with reference to collision theory, explain why there is a difference in the rate of formation of hydrogen chloride gas in Set I and Set II.
merujuk kepada teori perlanggaran, terangkan mengapa terdapat perbezaan dalam kadar pembentukan gas hidrogen klorida dalam Set I dan Set II.

[6 *marks*]
[6 *markah*]

10 (*a*) Table 4 shows the equation of two reactions.
Jadual 4 menunjukkan persamaan bagi dua tindak balas.

Reaction *Tindak balas*	**Chemical equation** *Persamaan kimia*
A	$Pb(NO_3)_2 + MgC1_2 \longrightarrow Mg(NO_3)_2 + PbC1_2$
B	$Pb(NO_3)_2 + Mg \longrightarrow Mg(NO_3)_2 + Pb$

Table 4
Jadual 4

Determine whether each reaction is a redox reaction or not.
Explain your answer in terms of change of oxidation number. [4 *marks*]
Tentukan sama ada setiap tindak balas tersebut merupakan tindak balas redoks atau tidak.
Terangkan jawapan anda daripada segi perubahan nombor pengoksidaan. [4 *markah*]

(*b*) Diagram 8 shows the information for reaction I and reaction II.
Rajah 8 menunjukkan maklumat bagi tindak balas I dan tindak balas II.

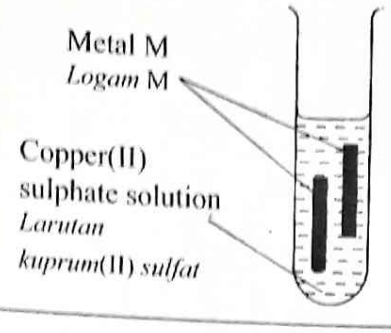
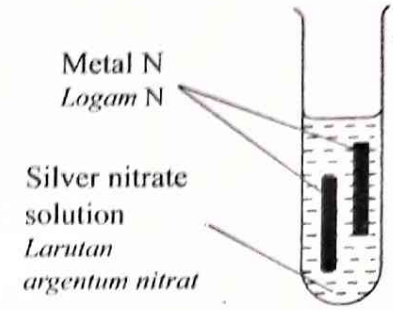
Reaction ***Tindak balas***	**Reaction I** ***Tindak balas I***	**Reaction II** ***Tindak balas II***
Set-up of apparatus *Susunan radas*		
Observation *Pemerhatian*	Blue solution turns colourless. *Larutan berwarna biru berubah menjadi tidak berwarna.*	Colourless solution turns blue. *Larutan tidak berwarna berubah menjadi biru.*

Diagram 8
Rajah 8

Based on information in Diagram 8, suggest the suitable metals for M and N. Then write the ionic equation for both reactions. [6 *marks*]
Berdasarkan maklumat dalam Rajah 8, cadangkan logam yang sesuai untuk M *dan* N. *Kemudian tulis persamaan ion bagi kedua-dua tindak balas tersebut.* [6 *markah*]

(*c*) By using solution P and solution Q, Fe^{2+} ion can be converted to Fe^{3+} ion and vice versa.
Dengan menggunakan larutan P *dan larutan* Q, *ion* Fe^{2+} *boleh ditukarkan kepada ion* Fe^{3+} *dan sebaliknya.*

Reaction 1 : Fe^{2+} + solution P ⟶ Fe^{3+}
Tindak balas 1 : Fe^{2+} + *larutan* P ⟶ Fe^{3+}

Reaction 2 : Fe^{3+} + solution Q ⟶ Fe^{2+}
Tindak balas 2 : Fe^{3+} + *larutan* Q ⟶ Fe^{2+}

Based on Reaction 1 and Reaction 2, suggest suitable substances for solution P and solution Q.
Then, by choosing either Reaction 1 or Reaction describe **one** experiment to study the transfer of electron at a distance. In your description include a labelled diagram and the ionic equation involved. [10 *marks*]
Berdasarkan Tindak balas 1 *dan Tindak balas* 2, *cadangkan bahan yang sesuai bagi larutan* P *dan larutan* Q.
Kemudian, dengan memilih sama ada Tindak balas 1 *atau Tindak balas* 2, *huraikan* **satu** *eksperimen untuk mengkaji pemindahan elektron pada suatu jarak. Dalam huraian anda, sertakan rajah berlabel dan persamaan ion yang terlibat.* [10 *markah*]

END OF QUESTION PAPER
KERTAS PEPERIKSAAN TAMAT