

Section A
Bahagian A

[60 marks]
[60 markah]

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

- 1 Diagram 1.1 shows the symbol of atoms for element P, Q, R and S
Rajah 1.1 menunjukkan symbol atom bagi unsur P, Q, R dan S

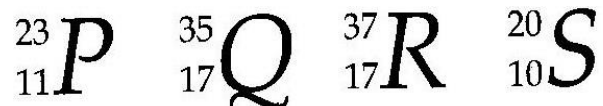


Diagram 1.1
Rajah 1.1

- (a) (i) What is the meaning of proton number ?
Apakah yang dimaksudkan dengan nombor proton?

.....
(1 mark / 1markah)

- (ii) What is the number of proton of P atom?
Berapakah bilangan proton bagi atom P ?

.....
(1 mark / 1markah)

- (iii) State the position of proton in atom Q?
Nyatakan kedudukan proton dalam atom Q?

.....
(1 mark / 1markah)

- (iv) What is the meaning of isotope?
Apakah yang dimaksudkan dengan isotop ?

.....
.....
(1 mark / 1 markah)

Which atoms are isotopes? Explain your answer
Atom-atom yang manakah adalah isotop? Terangkan jawapan anda

.....
.....
(2 marks / 2 markah)

- (b) Diagram 1.2 shows the set-up of the apparatus for an experiment to determine the empirical formula of magnesium oxide.
Rajah 1.2 menunjukkan susunan alat radas bagi eksperimen untuk menentukan formula empirik magnesium oksida.

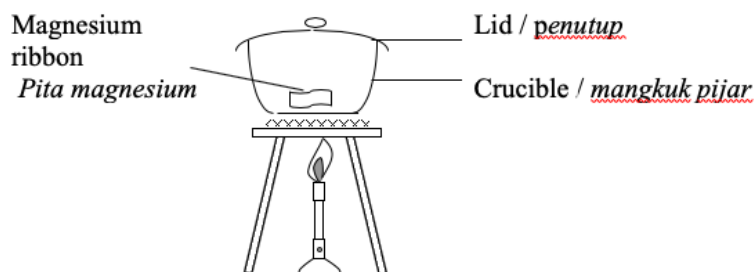


Diagram 1.2
Rajah 1.2

Result
keputusan:

$$\begin{array}{l} \text{Mass of crucible + lid} \\ \text{Jisim mangkuk pijar + penutup} \end{array} = 30.0 \text{ g}$$

$$\begin{array}{l} \text{Mass of crucible + lid + magnesium ribbon} \\ \text{Jisim mangkuk pijar + penutup + pita magnesium} \end{array} = 32.4 \text{ g}$$

$$\begin{array}{l} \text{Mass of crucible + lid + magnesium oxide} \\ \text{Jisim mangkuk pijar + penutup + magnesium oksida} \end{array} = 34.0 \text{ g}$$

[Relative atomic mass Magnesium =24, Oxygen =16]
 [Jisim atom relative Magnesium =24, Oksigen = 16]

- (b) (i) What is the meaning of empirical formula?
Apakah yang dimaksudkan dengan formula empirik?

.....

(1 mark / 1 markah)

- (ii) Based on the results above, determine the empirical formula of magnesium oxide
Dengan menggunakan keputusan di atas, tentukan formula empirik magnesium oksida.

markah)

(2 marks / 2

- 2 Diagram 2.1 shows a part of the Periodic Table of Elements. V, W, X, Y and Z are not the actual symbols of the elements.

Rajah 2.1 menunjukkan sebahagian daripada Jadual Berkala Unsur. V, W, X, Y dan Z bukan simbol sebenar unsur tersebut.

																			V
																	W		
X									Y										Z

Diagram 2.1
Rajah 2.1

Based on Diagram 2.1,
Berdasarkan Rajah 2.1,

- (a) (i) What is meant by period?
Apakah yang dimaksudkan dengan kala?

.....

[1 mark / 1 markah]

- (ii) Elements X, Y and Z are placed in period 3. Explain why.
Unsur X, Y dan Z berada pada kala 3. Terangkan mengapa.

.....

[1 mark / 1 markah]

- (iii) The atomic size of the elements decrease across period from left to right.
Explain why.
*Saiz atom bagi unsur berkurang merentasi kala dari kiri ke kanan.
Terangkan mengapa.*

.....

.....

[2 marks / 2 markah]

- (b) Diagram 2.2 shows the special characteristics of an element.
Rajah 2.2 menunjukkan ciri-ciri istimewa bagi suatu unsur.

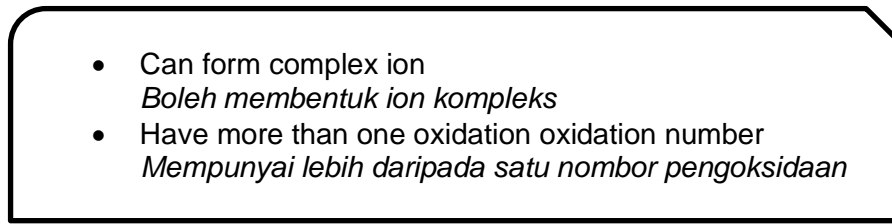


Diagram 2.2
Rajah 2.2

Which element shows the above characteristics?
Unsur manakah menunjukkan ciri-ciri di atas?

.....

[1 mark / 1 markah]

- (c) (i) Element S is located below element W in diagram 2.1.
Unsur S berada di bawah unsur W dalam Rajah 2.1

Compare the reactivity of element S and element W when react with hot iron wool.

Bandingkan kereaktifan unsur S dan unsur W apabila bertindak balas dengan wul besi yang panas.

.....

[1 mark / 1 markah]

- (ii) Explain your answer.
Terangkan jawapan anda.

.....

.....

.....

[2 marks / 2 markah]

- (d) Explain why atom V is chemically inert.
Terangkan mengapa atom V lengai secara kimia.

.....

.....

[1 mark / 1 markah]

- 3 Table 3 shows the particulars of four different types of manufactured substances in industry.
Jadual 3 menunjukkan maklumat bagi empat jenis bahan pembuatan dalam industri.

Types Jenis	Examples Contoh	Components Komponen
Glass <i>Kaca</i>	Borosilicate <i>Borosilikat</i>	Silicon dioxide, sodium oxide, calcium oxide and boron oxide <i>Silikon dioksida, natrium oksida, kalsium oksida dan boron oksida</i>
Ceramics <i>Seramik</i>	Tiles <i>Jubin</i>	Kaolinite (hydrated aluminosilicate) <i>Kaolin (aluminosilikat terhidrat)</i>
Polymer <i>Polimer</i>	Polythene <i>Polietena</i>	Ethene <i>etena</i>
Composite material <i>Bahan komposit</i>	W	Glass fibre and plastic <i>Gentian kaca dan plastik</i>

Table 3
Jadual 3

- (a) (i) State one use of borosilicate glass.
Nyatakan satu kegunaan kaca borosilikat.

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

- (ii) State one characteristic of borosilicate glass compare to the other types of glasses.
Nyatakan satu sifat kaca borosilikat berbanding jenis kaca yang lain.

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

- (iii) State one similarity and one differences between glass and ceramics.
Nyatakan satu persamaan dan satu perbezaan di antara kaca dan seramik.

.....

 [2 marks / 2 markah]

(b) Polythene is a synthetic polymer.
Polietena adalah polimer sintetik.

(i) Draw the structural formula of polythene.
Lukis formula struktur bagi polietena.

[1 mark / 1 markah]

(ii) Name the reaction to produce polymer in (b)(i).
Namakan tindak balas untuk menghasilkan polimer di (b)(i).

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

(iii) Give one disadvantage of synthetic polymer towards our environment. Explain your answer.
Nyatakan satu keburukan polimer sintetik terhadap alam sekitar. Terangkan jawapan anda.

.....
.....
.....
[2 marks / 2 markah]

(c) Composite material W can be used to make safety helmets.
Bahan komposit W digunakan untuk membuat topi keledar keselamatan.

(i) State the name of composite material W.
Nyatakan nama bahan komposit W.

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

(ii) Why is composite material W suitable to be used as safety helmets?
Mengapa bahan komposit W sesuai dijadikan topi keledar keselamatan?

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

- 4 Table 4 shows the information about acids S dan T.
Jadual 4 menunjukkan maklumat tentang asid S dan asid T.

Acid S <i>Asid S</i>	Acid T <i>Asid T</i>
pH 5	pH 1
Monoprotic acid <i>Asid monoprotik</i>	Diprotic acid <i>Asid diprotik</i>
Use in making fruit pickles <i>Digunakan dalam pembuatan jeruk buah</i>	Use in lead-acid accumulator <i>Digunakan dalam akumulator asid plumbum</i>

Table 4
Jadual 4

- (a) State the meaning of an acid.
Nyatakan maksud asid.

.....

[1 mark / 1 markah]

- (b) Based on the information in Table 2, state the name of the acid S and T.
Berdasarkan maklumat dalam Jadual 2, nyatakan nama bagi asid S dan asid T.

Acid S / *asid S* :

Acid T / *asid T* :

[2 marks / 2 markah]

- (c) Solution S and T given have same concentration but the pH values are different.
 Explain, why.
Larutan S dan T yang diberi mempunyai kepekatan yang sama tetapi mempunyai nilai pH yang berbeza. Terangkan, mengapa.

.....

[2 marks / 2 markah]

- (d) Solid copper(II) sulphate is given to prepare 250 cm³ of 1.0 mol dm⁻³ of copper(II) sulphate solution.

[Relative atomic mass: O = 16, Cu = 64, S = 32]

Pepejal kuprum(II) sulfat diberi untuk menyediakan 250 cm³ larutan kuprum(II) sulfat 1.0 mol dm⁻³.

[Jisim atom relatif: O = 16, Cu = 64, S = 32]

- (i) Describe briefly how you would prepare 250 cm³ of 1.0 mol dm⁻³ copper(II) sulphate solution.

Huraikan kaedah untuk menyediakan 250 cm³ larutan kuprum(II) sulfat 1.0 mol dm⁻³.

[3 marks / 3 markah]

- (ii) 1.0 mol dm⁻³ of copper(II) sulphate is diluted with distilled water to produce 500 cm³ of 0.5 mol dm⁻³ of concentration of the solution. Explain briefly how to prepare this solution.

Larutan kuprum(II) sulfat 1.0 mol dm⁻³ dicairkan dengan air suling untuk menghasilkan 500 cm³ larutan dengan kepekatan 0.5 mol dm⁻³. Terangkan secara ringkas bagaimana larutan ini disediakan.

[2 marks / 2 markah]

- 5 Diagram 5 shows some reactions involving compound P with the molecular formula C_3H_8O .
Rajah 5 menunjukkan beberapa tindak balas melibatkan sebatian P dengan formula molekul C_3H_8O .

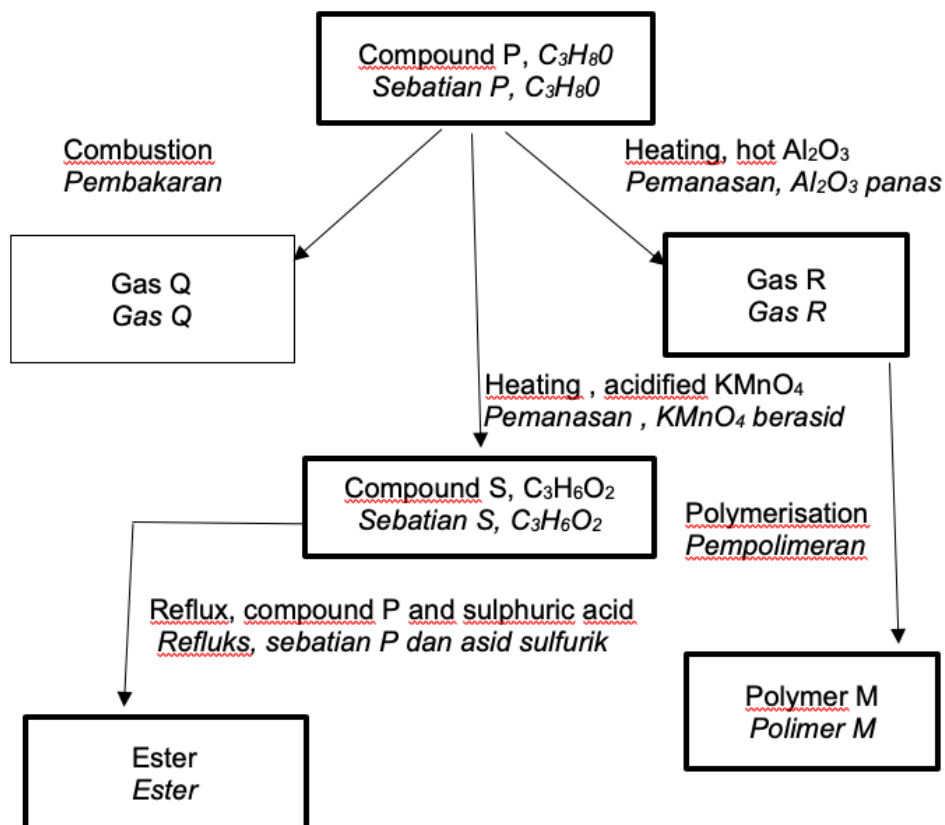


Diagram 5
Rajah 5

- (a) Name compound P
Namakan sebatian P.

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

- (b) (i) Name gas Q.
Namakan gas Q.

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

- (ii) What is the colour of the flame during combustion?
Apakah warna nyalaan semasa pembakaran?

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

- (c) State the name of the reaction of changing compound P to gas R.
Nyatakan nama tindak balas penukaran sebatian P kepada gas R.

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

- (d) Gas R changes to polymer M through polymerisation reaction.
Gas R bertukar kepada polimer M melalui tindak balas pempolimeran.

- (i) Name polymer M
Namakan polimer M.

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

- (ii) What is the type of polymerisation of R?
Apakah jenis tindak balas pempolimeran R?

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

- (e) (i) Compound P is added with acidified potassium manganate(VII) solution and it is heated to produce compound S. Name compound S.
Sebatian P ditambahkan dengan larutan kalium manganat(VII) berasid dan dipanaskan untuk menghasilkan sebatian S. Namakan sebatian S.

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

- (ii) Draw the structural formula of compound S.
Lukiskan formula struktur sebatian S.

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

- (f) (i) Write a balance chemical equation for the reaction of compound S with compound P.
Tuliskan persamaan kimia seimbang untuk tindak balas sebatian S dengan sebatian P.

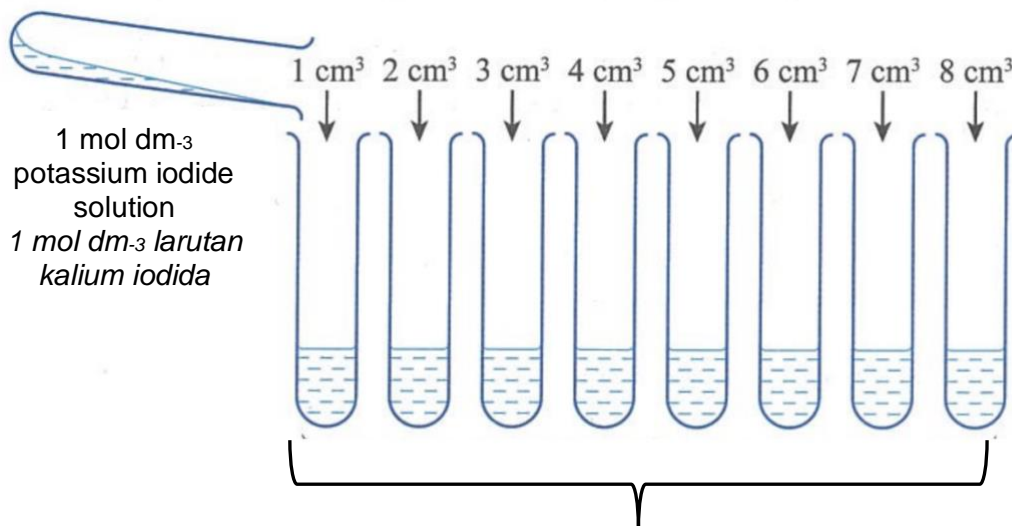
.....
[2 marks / 2 markah]

- (ii) Name the ester formed.
Namakan ester yang terbentuk.

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

6 Diagram below is the experiment carried out by Mee Ling to construct ionic equation of insoluble salt by using continuous variation method.

Rajah di bawah menunjukkan eksperimen yang telah dijalankan oleh Mee Ling untuk membina persamaan ion garam tidak larut dengan menggunakan kaedah perubahan berterusan.



5 cm³ of 0.5 mol dm⁻³ lead(II) nitrate solution
 5 cm³ daripada 0.5 mol dm⁻³ larutan plumbum(II) nitrat

Rajah 4
 Diagram 4

Based on the information above.

Berdasarkan maklumat di atas.

- (a) (i) What is meant by salt?
 Apakah yang dimaksudkan dengan garam?

.....

[1 mark / 1 markah]

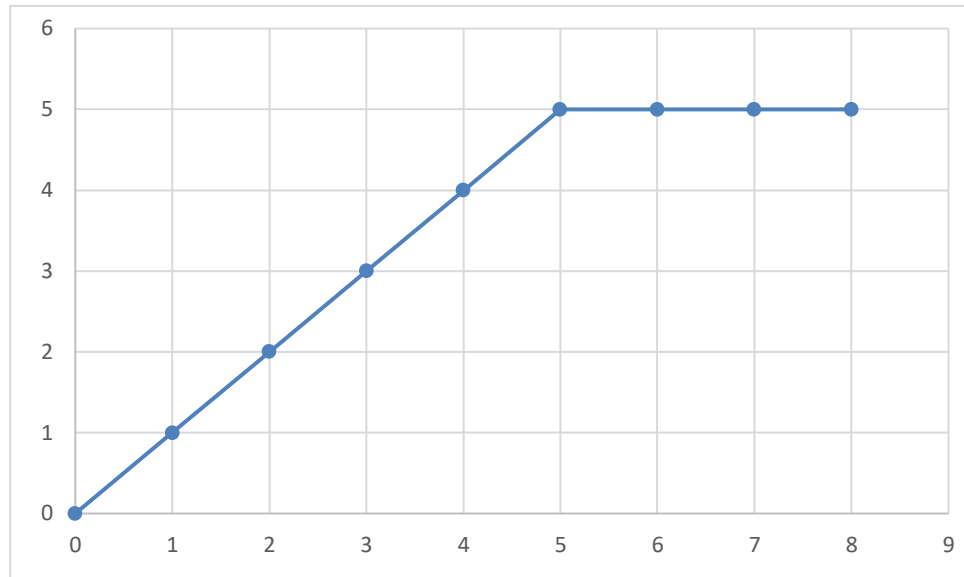
- (ii) Calculate the number of mol 5 cm³ of 0.5 mol dm⁻³ lead(II) nitrate solution.
 Kirakan bilangan mol 5 cm³ dari 0.5 mol dm⁻³ larutan plumbum(II) nitrat.

[1 mark / 1 markah]

Graph 1 shows the height of precipitate against volume of potassium iodide solution added.

Graf 1 menunjukkan ketinggian mendakan melawan isipadu larutan kalium iodida yang telah dimasukkan.

Height of precipitate (cm)
Ketinggian mendakan (cm)



Volume of 1.0 mol dm⁻³ potassium iodide solution (cm³)
Isipadu larutan 1.0 mol dm⁻³ kalium iodide (cm³)

Graph 1
Graf 1

- (iii) What is volume of potassium iodide solution needed for complete reaction with lead(II) nitrate solution?

Apakah isipadu larutan kalium iodide yang diperlukan untuk bertindak balas yang lengkap dengan larutan plumbum(II) nitrat?

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

- (iv) Calculate number of mole of potassium iodide that reacted with 0.5 mol dm^{-3} lead(II) nitrate solution. Then find number of mol iodide ion, I^- that completely reacted with 1 mol lead ion, Pb^{2+} .

Kirakan bilangan mol larutan kalium iodide yang telah bertindak balas dengan 0.5 mol dm^{-3} larutan plumbum(II) nitrat. Kemudian carikan bilangan mol ion iodide, I^- yang bertindak balas lengkap dengan 1 mol ion plumbum, Pb^{2+} .

[3 marks / 3 markah]

- (b) (i) Lead(II) nitrate solution reacts with sodium chloride solution and potassium iodide solution to produce lead(II) chloride and lead(II) iodide. State briefly the confirmatory test of nitrate ion.

Larutan plumbum(II) nitrat bertindak balas dengan larutan natrium klorida dan larutan kalium iodida untuk menghasilkan plumbum(II) klorida dan plumbum(II) iodide. Nyatakan secara ringkas ujian pengesahan ion nitrat.

.....
.....
.....

[3 marks / 3 markah]

- (ii) State the one similarities and differences of lead(II) iodide and lead(II) chloride. *Nyatakan satu persamaan dan perbezaan plumbum(II) iodide dan plumbum(II) klorida.*

.....
.....
.....

[2 marks / 2 markah]

Section B
Bahagian B

[20 marks]
[20 markah]

Answer any **one** question.
*Jawab mana-mana **satu** soalan*

- 7 Diagram 7.1 shows the energy level for the reaction between sodium hydroxide and hydrochloric acid.
Rajah 7.1 menunjukkan aras tenaga bagi tindak balas antara natrium hidroksida dan asid hidroklorik.

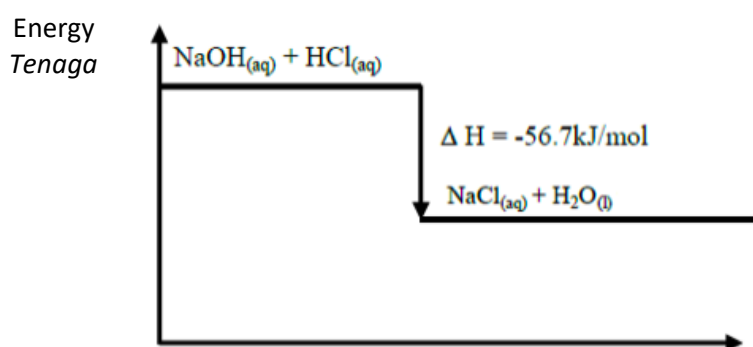


Diagram 7.1
Rajah 7.1

- (a) (i) Write two information that can be deduced from Diagram 7.1
Tulis dua maklumat yang boleh diperolehi daripada Rajah 7.1
[2 marks / 2 markah]
- (ii) If the hydrochloric acid is replaced with sulphuric acid of the same concentration, predict the heat of neutralisation for the reaction.
Explain your answer.
Jika asid hidroklorik asid digantikan dengan asid sulfurik yang sama kepekatan, ramalkan haba peneutralan bagi tindak balas itu.
Terangkan jawapan anda.
[2 marks / 2 markah]

- (b) Diagram 7.2 shows the apparatus set up to determine the heat of neutralisation between sodium hydroxide solution and hydrochloric acid.
Rajah 7.2 menunjukkan susunan radas untuk menentukan haba peneutralan antara larutan natrium hidroksida dan asid hidroklorik.

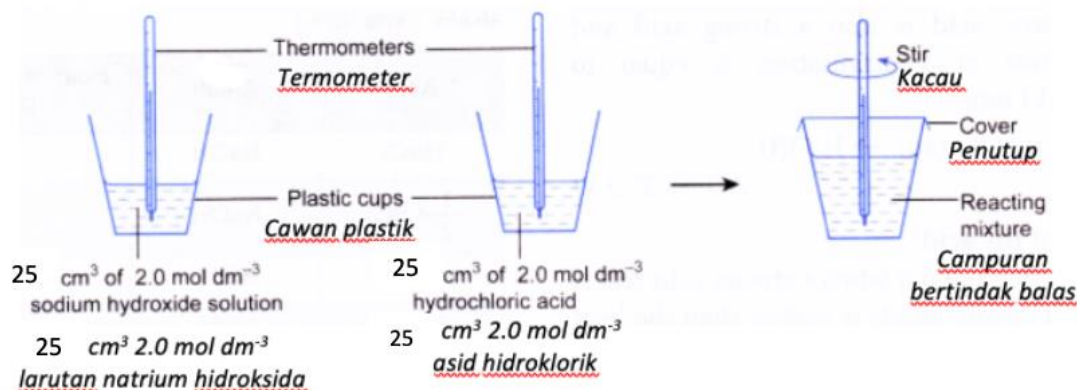


Diagram 7.2
Rajah 7.2

Table 7.1 shows the result of the experiment.
Jadual 7.1 menunjukkan keputusan eksperimen ini.

Description <i>Penerangan</i>	Temperature (°C) <i>Suhu (°C)</i>
Initial temperature of sodium hydroxide solution <i>Suhu awal larutan natrium hidroksida</i>	30.0
Initial temperature of hydrochloric acid <i>Suhu awal asid hidroklorik</i>	30.0
Highest temperature of the mixture <i>Suhu maksimum campuran</i>	36.8

Table 7.1
Jadual 7.1

Calculate the heat of neutralisation between sodium hydroxide solution and hydrochloric acid. Write the chemical equation involved.
 [Specific heat capacity of solution is $4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}$ and the density of the solution is 1.0 g cm^{-3}]
Hitung haba peneutralan antara larutan natrium hidroksida dan asid hidroklorik.
 [Muatan haba tentu larutan ialah $4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}$ dan ketumpatan larutan ialah 1.0 g cm^{-3}]

[6 marks / 6 markah]

- (c) Diagram 7.3 shows the apparatus set up to determine the heat of neutralisation between the reaction mixture using a calorimeter bomb.
Rajah 7.3 menunjukkan susunan radas untuk menentukan haba peneutralan antara campuran tindak balas menggunakan bom kalorimeter.

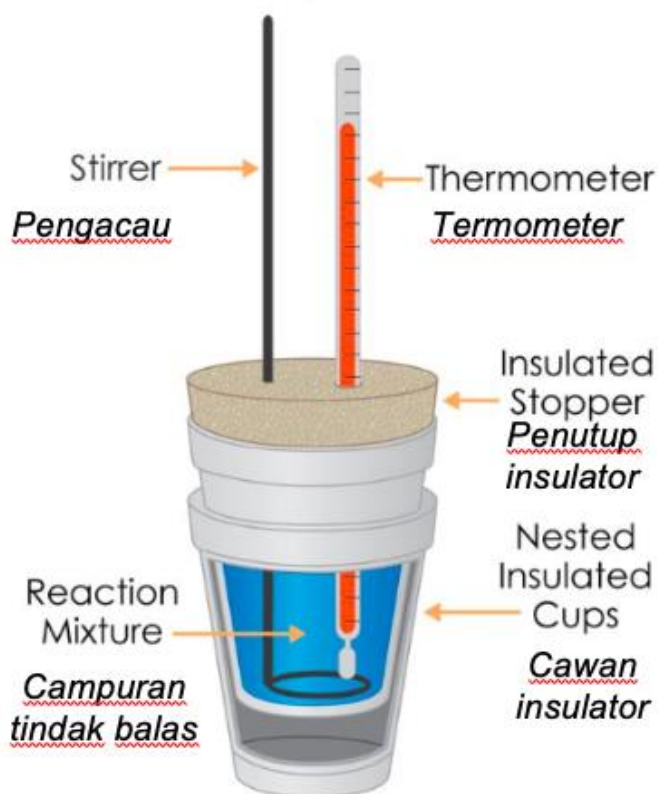


Diagram 7.3
Rajah 7.3

Table 7.2 shows the results of experiments I, II and III with different reaction mixture.
Jadual 7.2 menunjukkan keputusan eksperimen I, II dan III dengan campuran tindak balas berbeza.

Experiment <i>Eksperimen</i>	Reaction mixture <i>Campuran tindak balas</i>	Before reaction <i>Sebelum tindak balas</i>	After reaction <i>Selepas tindak balas</i>
I	25 cm ³ of 1.0 mol dm ⁻³ sodium hydroxide solution and 25 cm ³ of 1.0 mol dm ⁻³ hydrochloric acid <i>25 cm³ 1.0 mol dm⁻³ larutan natrium hidroksida dan 25 cm³ 1.0 mol dm⁻³ asid hidroklorik.</i>	Initial temperature <i>Suhu awal</i> = 30.0°C	Highest temperature of mixture <i>Suhu tertinggi campuran</i> = 33.0°C

II	25 cm ³ of 1.0 mol dm ⁻³ sodium hydroxide solution and 25 cm ³ of 1.0 mol dm ⁻³ nitric acid <i>25 cm³ 1.0 mol dm⁻³ larutan natrium hidoksida dan 25 cm³ 1.0 mol dm⁻³ asid nitrik</i>	Initial temperature <i>Suhu awal</i> = 30.0°C	Highest temperature of mixture <i>Suhu tertinggi campuran</i> = T ₁ °C
III	25 cm ³ of 1.0 mol dm ⁻³ sodium hydroxide solution and 25 cm ³ of 1.0 mol dm ⁻³ ethanoic acid. <i>25 cm³ 1.0 mol dm⁻³ larutan natrium hidoksida dan 25 cm³ 1.0 mol dm⁻³ asid etanoik.</i>	Initial temperature <i>Suhu awal</i> = 30.0°C	Highest temperature of mixture <i>Suhu tertinggi campuran</i> = T ₂ °C

Table 7.2
Jadual 7.2

- (i) By comparing,
- Experiments I and II, predict the value of T₁. Explain your answer.
 - Experiments I and III, predict the value of T₂. Explain your answer.
- Dengan membandingkan,*
- *Eksperimen I dan II, ramalkan nilai T₁. Terangkan jawapan anda.*
 - *Eksperimen I dan III, ramalkan nilai T₂. Terangkan jawapan anda.*

[6 marks / 6 markah]

- (ii) Suggest another acid that can produce the same effect as experiment III. State observation in the reaction that occurs and draw the energy level diagram for the reaction.
Cadangkan satu asid lain yang dapat memberi kesan yang sama dalam eksperimen III. Nyatakan pemerhatian dalam tindak balas yang berlaku dan lukiskan aras tenaga bagi tindak balas yang berlaku.

[4 marks / 4 markah]

- 8 Diagram 8 shows the electron arrangement for atom P, Q and R
Rajah 8 menunjukkan susunan electron bagi atom P, Q dan R

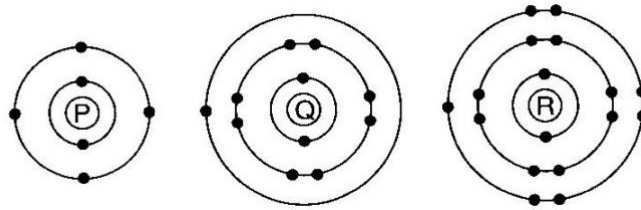


Diagram 8
Rajah 8

- (a) Atoms P and Q can form a chemical bond with atom R.
 State the type of bond formed.
Atom P dan Q boleh membentuk ikatan kimia dengan atom R.
Nyatakan jenis ikatan yang terbentuk.
- (b) Explain how the bond is formed between:
Terangkan bagaimana ikatan terbentuk antara:
- Atom P and R
Atom P dan R
 - Atom Q and R
Atom Q dan R

[10 marks / 10 markah]

- (c) State the differences of the compound formed in (b)(i) and (b)(ii) in terms of melting point and electrical conductivity. Explain the differences.
Nyatakan perbezaan sebatian yang terbentuk di (b)(i) dan (b)(ii) dari segi takat lebur. Terangkan perbezaan yang dinyatakan.

[10 marks / 10 markah]

Section C
Bahagian C

[20 marks]
[20 markah]

Answer any **one** question.
*Jawab mana-mana **satu** soalan*

- 9 (a) Khadijah could easily remove the oily stains on a handkerchief using a detergent in hard water. However, she could not remove the oily stains on the handkerchief using soap in hard water. Explain why there are differences in these observations.

Khadijah dengan mudahnya boleh menghilangkan kotoran berminyak pada sapu tangan menggunakan detergen dalam air liat. Walau bagaimanapun, dia tidak boleh menghilangkan kotoran berminyak pada sapu tangan menggunakan sabun dalam air lembut. Terangkan mengapa terdapat perbezaan dalam kedua-dua pemerhatian ini.

[4 marks / 4 markah]

- (b) A frontliner wears PPE suit during handling covid-19 patients. The PPE suit are thrown away before they return to their home. Cloths worn which exposed to the viruses are washed using detergent separately. Explain the cleansing action of detergent on the cloths.

Seorang petugas barisan hadapan memakai sut PPE sewaktu menguruskan pesakit-pesakit covid-19. Pakaian PPE tersebut akan dibuang sebelum mereka balik. Semua pakaian yang terdedah kepada virus dibasuh menggunakan detergen secara berasingan. Terangkan tindakan pembersihan detergen pada pakaian.

[6 marks / 6 markah]

- (c) You are required to prepare a type of soap. Describe a laboratory experiment to prepare the soap. Your answer should consist of the following:

- Materials
- Apparatus
- Procedure of the experiment
- Observation

Anda dikehendaki menyediakan sejenis sabun. Terangkan eksperimen di makmal untuk menyediakan sabun ini. Jawapan anda harus mengandungi perkara berikut:

- *Bahan*
- *Radas*
- *Prosedur eksperimen*
- *Pemerhatian*

[10 marks / 10 markah]

- 10 (a) Diagram 10.1 shows the changes involving iron(II) ion and iron(III) ions.
Rajah 10.1 menunjukkan perubahan yang melibatkan ion ferum(II) dan ion ferum(III).

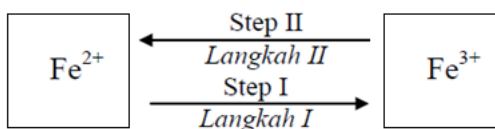


Diagram 10.1
Rajah 10.1

By referring to Diagram 10.1, suggest a suitable chemical substance to carry out the changes in Steps I and II. Your answers should include the observation for each of the step involved.

Dengan merujuk pada Rajah 10.1, cadangkan bahan kimia yang sesuai untuk melakukan perubahan pada Langkah I dan II. Jawapan anda haruslah merangkumi pemerhatian untuk setiap langkah yang terlibat.

[4 marks / 4 markah]

- (b) Diagram 10.2 shows an apparatus set-up to investigate the effect of two different metals, X and Y on the rusting of iron, Fe.

Rajah 10.2 menunjukkan susunan radas untuk mengkaji kesan dua logam berlainan, X dan Y terhadap pengurangan besi, Fe.



Diagram 10.2
Rajah 10.2

The result of this experiment after three days is shown in Table 10.
Keputusan eksperimen selepas tiga hari ditunjukkan dalam Jadual 10.

Pair of metals <i>Pasangan logam</i>	Observation <i>Pemerhatian</i>
Fe, X	Dark blue colour <i>Warna biru tua</i>
Fe, Y	No change <i>Tiada perubahan</i>

Table 10
Jadual 10

Based on Table 10, suggest the identity of metals, X and Y.
Give two reasons for each of your choices.
*Berdasarkan Jadual 10, cadangkan identiti logam X dan Y.
Berikan dua sebab bagi setiap pilihan anda.*

[6 marks / 6 markah]

(c)

More electronegative halogen can displace less electronegative halogen from its halide solution.

Halogen yang lebih elektronegatif boleh menyesarkan halogen yang kurang elektronegatif daripada larutan halidanya.

By using a suitable halogen and a halide solution, describe an experiment to verify the above statement. In your answer include:

Dengan menggunakan satu halogen dan satu larutan halida yang sesuai, huraikan satu eksperimen untuk mengesahkan pernyataan di atas. Dalam penerangan anda, hendaklah disertakan:

- Procedure / *Prosedur*
- Observation / *Pemerhatian*
- Chemical equation / *Persamaan kimia*
- Chemical test to verify the product formed
Ujian kimia untuk menentusahkan hasil tindak balas yang terbentuk

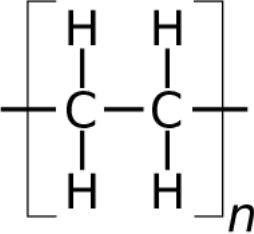
[10 marks / 10 markah]

**END OF QUESTION PAPER
KERTAS SOALAN TAMAT**

SKEMA PEMARKAHAN KERTAS 2 SET 2

No			Answer	Marks									
1	(a)	(i)	The number of protons in an atom	1									
		(ii)	11	1									
		(iii)	nucleus of atom Q	1									
		(iv)	Isotopes are atoms of same element which have same number of protons but different number of neutrons	1									
		(v)	Q and R Atom Q and atom R have same proton number but different nucleon number	1 1									
	(b)	(i)	Chemical formula that shows the simplest ratio of the number of atoms of each element in a compound	1									
		(ii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Element</th> <th>M</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>No. of mol</td> <td>$\frac{2.4}{24}$ =0.1</td> <td>$\frac{1.6}{16}$ =0.1</td> </tr> <tr> <td>Ratio</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	Element	M	O	No. of mol	$\frac{2.4}{24}$ =0.1	$\frac{1.6}{16}$ =0.1	Ratio	1	1	1
Element	M	O											
No. of mol	$\frac{2.4}{24}$ =0.1	$\frac{1.6}{16}$ =0.1											
Ratio	1	1											
			Empirical Formula: MgO	1									
			TOTAL	9									

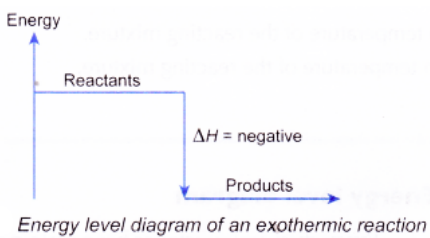
No			Mark scheme	Sub mark	Total mark
2	a	i	A horizontal rows of element in the Periodic Table.	1	1
		ii	Atoms have three shells occupied with electrons.	1	1
		iii	1. Number of proton increases / nuclei charge increase. 2. Attraction of electrona towards nucleus are stronger.	1 1	2
	b	Y // Fe		1	1
	c	i	Element W is more reactive than element S // Element W burns more brightly than element S.	1	1
		ii	1. Atomic size of atom W is smaller than atom S. 2. The strength of the nucleus to attract one electron into the outermost occupied shell becomes stronger.	1 1	2
	d	Atom V achieve a stable octet electron arrangement // Atom V has 8 valence electron.			1
				TOTAL	9

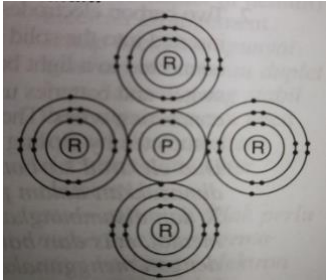
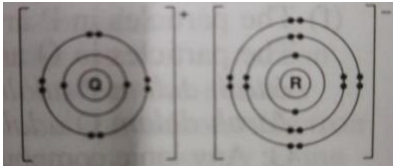
No		Mark scheme	Marks
3	(a)	(i) Laboratory glassware // Cookware // automobile headlights <i>Peralatan kaca makmal // Alatan memasak // lampu hadapan kenderaan</i>	1
		(ii) Tidak boleh retak <i>Mempunyai pekali perkembangan terma yang rendah</i>	1
		(iii) Similarity: Brittle // good heat insulator // good electrical insulator // inert to chemicals // hard <i>Persamaan: Rapuh // penebat haba yang baik // penebat elektrik yang baik // lengai kepada bahan kimia // keras</i> Different: Glass is transparent but ceramic is not // Glass can be heated until molten repeatedly but not ceramic // Glass has lower melting point than ceramic <i>Perbezaan: Kaca lutsinar tetapi seramik tidak // Kaca boleh dipanaskan sehingga melebur berulang kali tetapi tidak seramik // Kaca mempunyai takat lebur yang lebih rendah daripada seramik</i>	1 1
	(b)	(i) 	1
		(ii) Polymerisation // Addition polymerisation <i>Pempolimeran // Pempolimeran tambahan</i>	1
		(iii) Synthetic polymer is non-biodegradable. <i>Polimer sintetik adalah tidak terbiodegradasi.</i> Improper disposal of polymer wastes will block drainage system which can cause flash floods // Improper disposal of polymer wastes will become breeding ground for mosquitoes which will cause spread of disease such as dengue. // The burning of synthetic polymer will produce acidic gas and hence produce acid rain. <i>Pembuangan sisa polimer yang tidak betul akan menyekat sistem saliran yang boleh menyebabkan banjir kilat // Pembuangan sisa polimer yang tidak betul akan menjadi tempat pembiakan nyamuk yang akan menyebabkan penyebaran penyakit seperti denggi. // Pembakaran polimer sintetik akan menghasilkan gas berasid dan seterusnya menghasilkan hujan asid.</i>	1 1
	(c)	(i) Fibre glass <i>Gentian kaca</i>	1
		(ii) Light and strong <i>Ringan dan kuat</i>	1

No		Mark scheme	Sub mark	Total mark	
4	a	A chemical substance which ionises in water to produce hydrogen ion.	1	1	
	b	Acid S: Ethanoic acid Acid T: Sulphuric acid	1 1	2	
	c	S is a weak acid and T is a strong acid/ S ionises partially in water and T ionises completely in water. The higher the concentration of acid, the lower the pH value.	1 1	2	
	d	i	1. Number of moles of $\text{CuSO}_4 = \frac{250 \times 1}{1000} = 0.25 \text{ mol}$ 2. Mass of $\text{CuSO}_4 = 0.25 \times 160 = 40\text{g}$ 3. Dissolve 40 g of CuSO_4 solid into 250 cm ³ of distilled water	1 1	2
		ii	$M_1V_1 = M_2V_2$ (1) $V_1 = 0.5$ (500) $V_1 = 250 \text{ cm}^3$ Dissolve 250 cm ³ of 1.0 mol dm ⁻³ of CuSO_4 solution with 250 cm ³ of distilled water	1 1 1	3
			TOTAL	10	

5	(a)	Propanol
	(b)	(i) Carbon dioxide
		(ii) Blue
	(c)	Dehyd
	(d)	(i) Polypropene
		(ii) Addition polymerisation
	(e)	(i) Propanoic acid
		(ii) $ \begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \\ \quad \quad \\ \text{H} - \text{C} - \text{C} - \text{C} - \text{OH} \\ \quad \\ \text{H} \quad \text{H} \end{array} $
	(f)	(i) $\text{C}_2\text{H}_5\text{COOH} + \text{C}_3\text{H}_7\text{OH} \rightarrow \text{C}_2\text{H}_5\text{COOC}_3\text{H}_7 + \text{H}_2\text{O}$
		(ii) Propyl propanoate

6	(a)	Ionic compound produced when hydrogen ion from acid is replaced by metal ion or ammonium ion	1
	(b)	Mol $\text{Pb}(\text{NO}_3)_2$ $N = MV/1000$ $= 0.0025 \text{ mol}$	1
	(c)(i)	5 cm ³ With correct unit	1
	(c)(i)	Mol KI $N = MV/1000$ $= 0.005 \text{ mol}$ Number of Mol Pb^{2+} : Number of mol I- 0.0025 mol : 0.005 mol 1 mol : 2 mol So chemical formula is PbI_2	1 1
	(d)	Add dilute sulphuric acid Add iron(II) sulphate solution, slanted test tube add concentrated sulphuric slowly through the wall of test tube Brown ring formed	1 1 1
	(e)	Lead(II) iodide and lead(II) chloride is insoluble salt Colour of precipitate of lead(II) iodide is yellow, colour of precipitate lead(II) chloride is white	1 1
		Total	11

7		Marks
a(i)	The reaction between sodium hydroxide and hydrochloric acid is an exothermic reaction. Heat of neutralisation is $-56.7 \text{ kJ mol}^{-1}$ // The energy content of the reactants is higher than the energy content of the products	1 1
Jumlah		2
a	ii) The heat of neutralisation is higher than $-56.7 \text{ kJ mol}^{-1}$ // double // $-113.4 \text{ kJ mol}^{-1}$ Reason: Because sulphuric acid is a diprotic acid // 2 mol of water is formed	1 1
Jumlah		2
b	Total mass of the liquid = $(50 + 50) \text{ g} = 100 \text{ g}$ Total rise in temperature = $(36.8 - 30.0) \text{ }^\circ\text{C} = 6.8 \text{ }^\circ\text{C}$ Total amount of heat released = $mc\Delta T = 100 \times 4.2 \times 6.8 = 2856 \text{ J}$ Chemical equation: $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ Number of moles HCl / NaOH = $MV/1000 = 2(25)/1000 = 0.05 \text{ mol}$ 1 mol of HCl produces 1 mol of H_2O 0.05 mol of HCl produces 0.05 mol of H_2O 1 mol of water causes the release of 2856 J Therefore, 1 mol of water require = $2856/0.05 = 57120 \text{ J}$ Heat of neutralisation is -57120 // $-57.12 \text{ kJ mol}^{-1}$	1 1 1 1 1 1
Jumlah		6
c	i) T_1 has same temperature / 33.0°C Hydrochloric acid and nitric acid are strong monoprotic acid Hydrochloric acid and nitric acid are ionised completely in water T_2 has lower temperature than 33.0°C Ethanoic acid is weak acid compare to hydrochloric acid and nitric acid are strong acid. Ethanoic acid undergoes partial dissociation / ionisation in water while hydrochloric acid / nitric acid undergoes complete dissociation / ionisation in water	1 1 1 1 1 1
Jumlah		6
	ii) Methanoic acid // Propanoic acid (any carboxylic acid) Observation: The container that hold the mixture is hot. Energy level diagram: (1) Correct level (2) Label	1 1 1 1
		
Jumlah		4
Jumlah keseluruhan		20

8	(a)		Atom P and R form covalent bond, atom Q & R form ionic bond	1										
	(b)	(i)	Electron arrangement of atom P is 2.4 and atom R is 2.8.7	1										
			P contributes 4 valence electron to be shared											
			R contributes 1 valence electron to be shared											
			P and R achieve the stable octet electron arrangement after the sharing of electrons	1										
			Formula of compound formed is PR ₄	1										
				1										
		(ii)	Electron arrangement of atom Q is 2.8.1 and atom R is 2.8.7	1										
			Atom Q donates 1 valence electron to form Q ⁺											
			Atom R accepts 1 electron to form R ⁻											
			to achieve stable octet electron arrangement	1										
			Q ⁺ and R ⁻ are attracted by strong electrostatic force of attraction											
			Formula of the compound formed is QR	1										
				1										
			Max		8									
	(c)		Three differences between compound formed in (a)(i) and in (a)(ii)											
			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;"></th> <th style="width: 40%; text-align: center;">(a)(i)PR (covalent bond)</th> <th style="width: 40%; text-align: center;">(a)(i)QR (ionic bond)</th> </tr> </thead> <tbody> <tr> <td></td> <td style="background-color: #e0e0e0;">Low melting point</td> <td style="background-color: #e0e0e0;">High melting point</td> </tr> <tr> <td></td> <td>-less energy is needed to overcome the weak van der Waals forces/weak</td> <td>More energy is needed to overcome the strong forces electrostatic forces between the ions.</td> </tr> </tbody> </table>		(a)(i)PR (covalent bond)	(a)(i)QR (ionic bond)		Low melting point	High melting point		-less energy is needed to overcome the weak van der Waals forces/weak	More energy is needed to overcome the strong forces electrostatic forces between the ions.	1+1	
	(a)(i)PR (covalent bond)	(a)(i)QR (ionic bond)												
	Low melting point	High melting point												
	-less energy is needed to overcome the weak van der Waals forces/weak	More energy is needed to overcome the strong forces electrostatic forces between the ions.												
				1+1										
				1+1										

				intermolecular forces of attraction between molecules			
				Does not conduct electricity in any states	Can conduct electricity in molten state and aqueous solution	1+1	
				Does not contain ion / neutral molecules	Contain free moving ion	1+1	
				(state ONE any reason)			
							8
					TOTAL		20

9	(a)	<ol style="list-style-type: none"> 1. Hard water contains great amount / high concentration of magnesium ion and calcium ion. 2. In hard water, soaps will react with magnesium ion or calcium ion to form a scum. 3. When hard water reacts with detergent, it will reacts with magnesium ion or calcium ion to form soluble substances and no scum produced. 4. Formation of soap scum reduces the amount of soap available for cleaning // soap lose the cleansing ability, therefore detergent is more effective than soap in hard water.
	(b)	<ol style="list-style-type: none"> 1. Cloths immersed in water contains detergent which detergent anion consists of a hydrophobic part and a hydrophilic part. 2. Detergent reduces the surface tension of water and the cloth surface is drenched thoroughly. 3. The hydrophobic part is soluble in grease 4. The hydrophilic part soluble in water. 5. Mechanical agitation during scrubbing helps to pull the grease free and also break the grease into small droplets 6. These droplets are suspended in water forming an emulsion and rinsing will washes away the droplets and leaves the surface clean.
	(c)	<p>Materials : palm oil, 5mol^{dm}-³ sodium hydroxide solution / potassium hydroxide solution, sodium chloride powder, distilled water, filter paper</p> <p>Apparatus : beaker, measuring cylinder, spatula, glass rod, filter funnel, wire gauze, tripod stand, bunsen burner, test tube</p> <p>Procedure :</p> <ol style="list-style-type: none"> 1. Pour 10cm³ of palm oil into a beaker 2. Add 50cm³ of 5mol^{dm}-³ sodium hydroxide solution/ potassium hydroxide solution into the palm oil 3. Heat the mixture until it boils. 4. Stir the mixture with a glass rod 5. Allow the mixture to boil for 10 minutes

	<ol style="list-style-type: none">6. Remove the beaker from the heat. Add 50cm³ distilled water and three spatulafuls of sodium chloride powder into the mixture7. Boil the mixture for another 5 minutes8. Allow the mixture to cool9. Filter out the soap. Rinse the soap with a littel distilled water10. Press the soap between a few pieces of filter paper to dry it.11. Feel the soap with the fingers12. Place a small amount of the soap produced in a test tube, add water and shake. <p>Observation : The soap feels slippery. Mixture of soap and water is shaken, lather is formed</p>
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No	Mark scheme			Marks		
10	(a)	Step Langkah	Chemicals used Bahan kimia digunakan	Observation Pemerhatian		
		I	Any suitable oxidising agent // e.g : bromine water // chlorine water <i>Agen pengoksidaan yang sesuai // e.g. air bromin // air klorin</i>	Green solution turns brown // Brown bromine turns colourless // pale yellow turns colourless <i>Larutan hijau bertukar perang // warna perang bromin bertukar kepada tak berwarna</i>		1+1
		II	Any suitable reducing agent // e.g : zinc powder // magnesium powder <i>Agen penurunan yang sesuai // e.g. serbuk zink // serbuk magnesium</i>	zinc powder dissolves // brown colour of iron(III) ions becomes pale green. <i>Serbuk zink / magnesium melarut // Warna perang ion ferum(III) bertukar hijau</i>		1+1
(b)	X is copper. <i>X adalah kuprum.</i> [Alternate Answer: any other metal less electropositive than iron]. Copper is less electropositive than iron in the electrochemical series. <i>Kuprum adalah kurang elektropositif daripada ferum dalam siri elektrokimia.</i> Therefore, iron is easier to release electrons and become rusts. <i>Maka, ferum lebih mudah menderma elektron dan berkarat.</i>			1		
	Y is magnesium. <i>Y adalah magnesium.</i> [Alternate Answer: aluminium or zinc] Magnesium is more electropositive than iron in the electrochemical series. <i>Magnesium lebih elektropositif daripada ferum dalam siri elektrokimia.</i> Therefore, magnesium is easier to release electron and prevent iron from rusting. <i>Maka, magnesium lebih mudah mendermakan elektron dan menghalang ferum daripada berkarat.</i>			1		
				1		
				1		
				1		
				1		
(c)	Halogen: Bromine, Br ₂ // Chlorine, Cl ₂ Halide solution: potassium iodide, KI // potassium bromide, KBr <i>Larutan halida: Kalium iodida, KI // kalium bromida, KBr</i>			1		
	Prosedur: / <i>Procedure:</i>			1		
	1. Pour 2 cm ³ of 0.5 mol dm ⁻³ potassium iodide solution into a test tube.			1		

	<p><i>Tuang 2 cm³ larutan kalium iodida 0.5 mol dm⁻³ ke dalam tabung uji</i></p> <p>2. Add 1 cm³ of bromine water. Tambahkan 1 cm³ air bromin.</p> <p>3. Shake the test tube. <i>Goncangkan tabung uji.</i></p> <p>4. Record the observation. <i>Rekodkan pemerhatian.</i></p> <p>Observation: Colourless solution turns brown <i>Pemerhatian: Larutan tak berwarna berubah ke perang</i></p> <p>Chemical equation: $2KI + Cl_2 \rightarrow 2KCl + I_2$ <i>Persamaan kimia:</i></p> <p>Chemical test: <i>Ujian kimia:</i> Add 1 cm³ of 1,1,1-trichloroethane. Bottom layer shows purple colour. <i>Tambahkan 1 cm³ 1,1,1-trikloroetana.</i> <i>Lapisan bawah menunjukkan warna ungu.</i></p>	<p>1</p> <p>1</p> <p>1</p> <p><u>Max 3</u></p> <p>1</p> <p>1+1</p> <p>1</p> <p>1</p>