

CONFIDENTIAL

4541/2

Chemistry

Paper 2

September

2012

2 ½ hour

Name :

Index Number:

Class:



SPM TRIAL EXAMINATION 2012
MAKTAB RENDAH SAINS MARA

CHEMISTRY

Paper 2

Two hours and thirty minutes

**DO NOT OPEN THE QUESTION BOOKLET
UNTIL BEING TOLD TO DO SO**

1. Write your name and index number in the space provided.
Tuliskan nama dan angka giliran anda pada ruang yang disediakan.
2. The question booklet is bilingual
Kertas soalan ini adalah dalam dwibahasa.
3. Candidate is required to read the information on the last page.
Calon dikehendaki membaca maklumat di halaman belakang

Kod Pemeriksa			
Section	Question	Full mark	Marks
A	1	9	
	2	9	
	3	10	
	4	10	
	5	11	
	6	11	
B	7	20	
	8	20	
C	9	20	
	10	20	
TOTAL		100	

This question booklet contains 36 printed pages.

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Section A
Bahagian A

[60 marks]
 [60 markah]

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

- 1 Diagram 1 shows the apparatus set-up used to determine the melting point of substance X.
 Substance X is a white solid and an electrical insulator.
 Rajah 1 menunjukkan susunan radas bagi menentukan takat lebur bahan X.
 Bahan X adalah pepejal putih dan penebat elektrik.

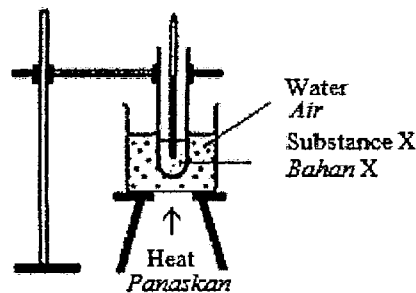
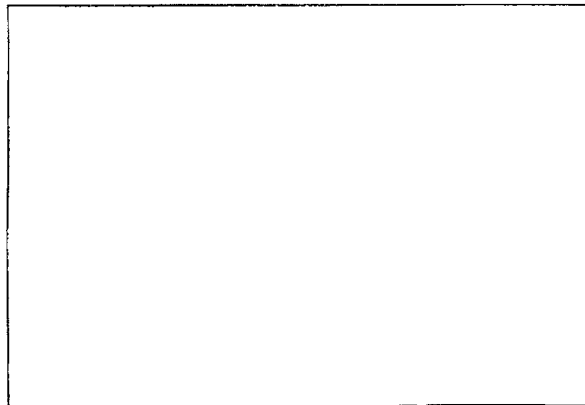


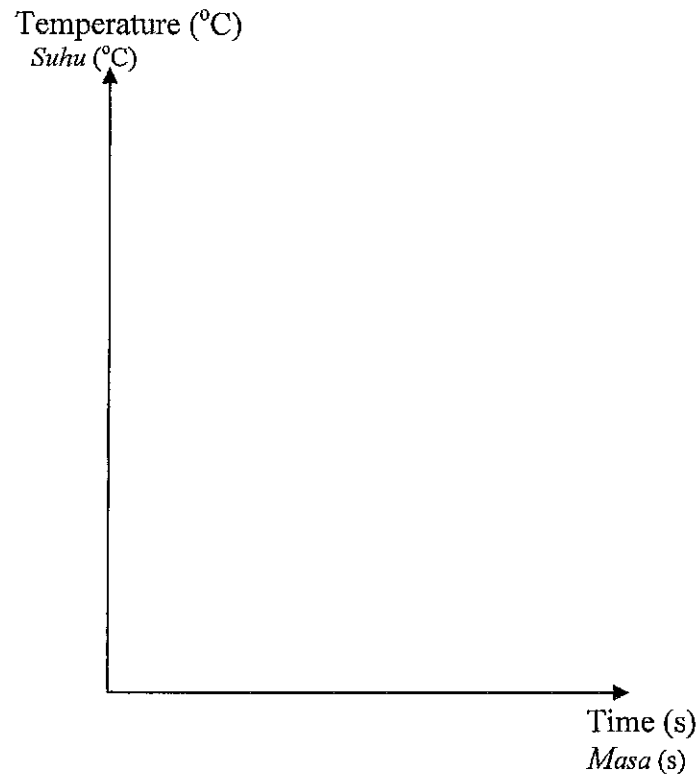
Diagram 1
 Rajah 1

- (a) Substance X melts at 61°C .
 Bahan X melebur pada 61°C .
- (i) Draw the arrangement of particles of substance X at 50°C .
 Lukiskan susunan zarah bahan X pada 50°C .



1(a)(i)	
	1

- (ii) Sketch a graph of temperature against time when substance X is heated from room temperature to 70°C on the graph below.
Lakarkan graf suhu melawan masa apabila bahan X dipanaskan dari suhu bilik ke 70°C di dalam graf di bawah.



[2 marks]
 [2 markah]

1(a)(ii)	
	2

- (iii) State the type of particles of substance X.
Nyatakan jenis zarah bahan X.

.....

[1 mark]
 [1 markah]

1(a)(iii)	
	1

- (b) Table 1 shows the proton number and nucleon number of three atoms, P, Q and R. The letters used do not represent the actual symbols of the atoms.
*Jadual 1 menunjukkan nombor proton dan nombor nukleon bagi tiga atom, P, Q dan R.
 Huruf yang digunakan tidak mewakili simbol sebenar atom-atom tersebut.*

Atom	Proton number <i>Nombor proton</i>	Nucleon number <i>Nombor nukleon</i>
P	11	23
Q	16	32
R	16	33

Table 1

Jadual 1

1(b)(i)

1

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

[1 mark]

[1 markah]

1(b)(ii)

1

- (ii) State the number of neutron of atom P.
Tentukan bilangan neutron bagi atom P.

[1 mark]

[1 markah]

1(b)(iii)

1

- (iii) Write the electron arrangement for atom Q.
Tuliskan susunan elektron bagi atom Q.

[1 mark]

[1 markah]

1(b)(iv)

2

- (iv) Which atoms are isotopes?
 State a reason for your answer
*Atom-atom manakah adalah isotop?
 Berikan satu sebab bagi jawapan anda.*

[2 marks]

[2 markah]

TOTAL A1

9

- 2 Table 2 shows the elements in Period 3 of Periodic Table of Elements.
 Jadual 2 menunjukkan unsur-unsur di dalam Kala 3 bagi Jadual Berkala Unsur.

Element	Na	Mg	Al	Si	P	S	Cl	Ar
Proton Number	11	12	13	14	15	16	17	18

Table 2
 Jadual 2

Based on Table 2, answer the following questions.
 Berdasarkan Jadual 2, jawab soalan-soalan berikut.

- (a) Which element is a halogen?
 Unsur manakah adalah halogen?

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

2(a)	
	1

- (b) State any element that form oxides that are
 Nyatakan mana-mana unsur yang membentuk oksida yang bersifat

(i) basic:
 bes

(ii) amphoteric:
 amfoterik

[2 marks]
 [2 markah]

2(b)	
	2

- (c) A piece of burning sodium is placed quickly into a gas jar containing oxygen gas.
 Secebis natrium yang terbakar dimasukkan dengan segera ke dalam balang gas berisi oksigen.

- (i) State the observation in the experiment.
 Nyatakan pemerhatian bagi eksperimen ini.

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

2(c)(i)	
	1

- (ii) State the type of the compound formed.
 Nyatakan jenis sebatian yang terbentuk.

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

2(c)(ii)	
	1

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- (iii) Draw the electron arrangement of the compound in (c)(ii).
Lukiskan gambar rajah susunan elektron bagi sebatian dalam (c)(ii).

2(c)(iii)	
	2

[2 marks]
 [2 markah]

- (d) Chlorine is more electronegative than aluminium. Explain.
Klorin lebih elektronegatif daripada aluminium. Terangkan.

2(d)	
	1

[1 mark]
 [1 markah]

- (e) Explain why Argon, Ar exists as a monoatomic gas?
Terangkan mengapa Argon, Ar wujud sebagai gas monoatom?

2(e)	
	2

[2 marks]
 [2 markah]

TOTAL A2	
	9

- 3 Diagram 3.1 shows the structural formula of compound Y.
Rajah 3.1 menunjukkan formula struktur bagi sebatian Y.

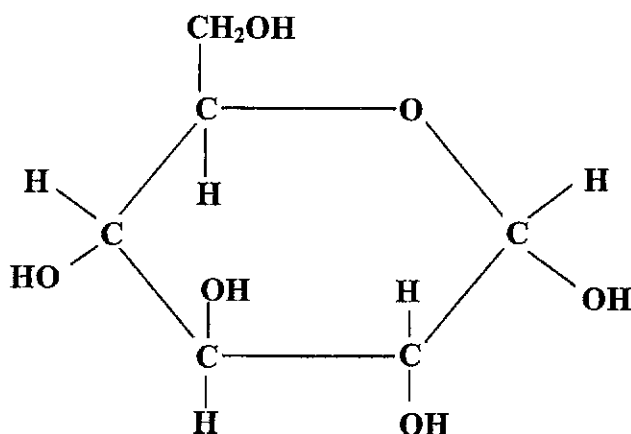


Diagram 3.1
Rajah 3.1

- (a) What is the meaning of molecular formula?
Apakah yang dimaksudkan dengan formula molekul?

.....

[1 mark]
 [1 markah]

3(a)	
	1

- (b) Write the molecular formula of compound Y.
Tuliskan formula molekul bagi sebatian Y.

.....

[1 mark]
 [1 markah]

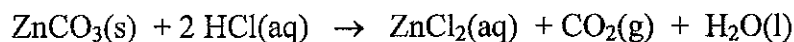
3(b)	
	1

- (c) In an experiment, 0.5 g of zinc carbonate is added into excess hydrochloric acid.

Dalam satu eksperimen, 0.5 g zink karbonat dimasukkan ke dalam asid hidroklorik berlebihan.

The following equation represents the reaction between zinc carbonate and hydrochloric acid.

Persamaan berikut mewakili tindak balas antara zink karbonat dan asid hidroklorik.



[Relative atomic mass: C=12; O=16; Cl=35.5; Zn=65]

[Jisim atom relatif: C=12; O=16; Cl=35.5; Zn=65]

- (i) Calculate the number of moles of zinc carbonate used.
Hitungkan bilangan mol zink karbonat yang digunakan.

3(c)(i)

1

[1 mark]

[1 markah]

- (ii) Calculate the maximum mass of zinc chloride produced.
Hitung jisim maksimum zink klorida yang dihasilkan.

3(c)(ii)

2

[2 marks]

[2 markah]

- (d) Diagram 3.2 shows the set-up of apparatus for an experiment to determine the empirical formula of magnesium oxide.

Rajah 3.2 menunjukkan susunan radas bagi satu eksperimen untuk menentukan formula empirik magnesium oksida.

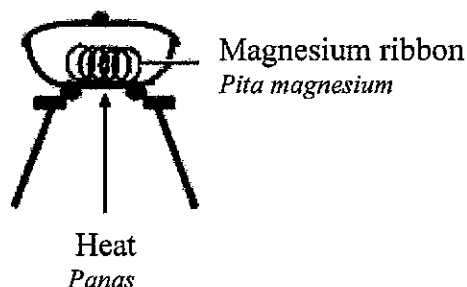


Diagram 3.2

Rajah 3.2

Description <i>Keterangan</i>	Mass (g) <i>Jisim</i>
Mass of crucible + lid <i>Jisim mangkuk pijar + penutup</i>	44.0
Mass of crucible + lid + magnesium ribbon <i>Jisim mangkuk pijar + penutup + pita magnesium</i>	46.4
Mass of crucible + lid + magnesium oxide <i>Jisim mangkuk pijar + penutup + magnesium oksida</i>	48.0

- (i) Calculate the number of mole of:
Hitungkan bilangan mol bagi:
[Relative atomic mass: Mg=24; O=16]

Magnesium :

Oxygen :

3(d)(i)

[2 marks]
[2 markah]

2

- (ii) Determine the empirical formula of magnesium oxide.
Tentukan formula empirik bagi magnesium oksida.

3(d)(ii)	
	1

[1 mark]
 [1 markah]

- (e) Can the empirical formula of copper(II) oxide be determined using this method? Explain your answer.
Bolehkah formula empirik kuprum(II) oksida ditentukan menggunakan kaedah yang sama? Terangkan jawapan anda.

.....

.....

.....

[2 marks]
 [2 markah]

3(e)	
	2

TOTAL A3	
	10

- 4 (a) Diagram 4 shows an aloe vera plant which is used as a traditional medicine.
Rajah 4 menunjukkan pokok aloe vera yang boleh digunakan sebagai ubat tradisional.



Diagram 4

Rajah 4

- (i) What illness can be cured by using aloe vera?
Apakah penyakit yang boleh diubati menggunakan aloe vera?

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

4(a)(i)	
	1

- (ii) How is aloe vera used to treat the illness in 4(a)(i)?
Bagaimanakah aloe vera digunakan untuk mengubati penyakit dalam 4(a)(i)?

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

4(a)(ii)	
	1

- (b) Penicillin and streptomycin are two examples of antibiotics.
Penisilin dan streptomisin adalah dua contoh antibiotik.

- (i) What are antibiotics?
Apakah antibiotik?

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

4(b)(i)	
	1

- (ii) State an infection which cannot be cured effectively by antibiotics.
Nyatakan jangkitan yang tidak boleh diubati dengan berkesan menggunakan antibiotik.

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

4(b)(ii)	
	1

- (iii) Give a side effect of penicillin.
Nyatakan kesan sampingan penggunaan penisilin.


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

4(b)(iii)	
	1

- (c) The following information is shown on the label of a pack of food.
Maklumat berikut ditunjukkan pada label satu bungkusan makanan.

Blue Berry Ice Cream

Ingredients / *Ramuan:*
 Non-Fat Milk, Fat, Pentyl Ethanoate,
 Ascorbic Acid, Blue Colour, Soy Lecithin,
Susu Tanpa Lemak, Lemak, Pentil Etanoat,
Asid Askorbik, Pewarna Biru, Lesitin Soya.



Expiry date : 1 November 2012
Tarikh luput

Weight of the food : 250 g
Berat makanan

Based on the information on the label, answer the following questions.
 Berdasarkan maklumat pada label tersebut, jawab soalan-soalan berikut.

- (i) Name the compound which is used as a food flavouring?
 Namakan sebatian yang digunakan sebagai bahan perisa?

4(c)(i)	
	1

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

- (ii) Suggest a non-sugar sweetener that can be added to the ingredients.
 Cadangkan pemanis tanpa gula yang boleh dicampurkan ke dalam makanan itu.

4(c)(ii)	
	1

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

- (iii) State the function of ascorbic acid.
 Nyatakan fungsi asid askorbik.

4(c)(iii)	
	1

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

- (iv) Explain why soy lecithin is added in the manufacturing of ice cream.
 Terangkan mengapa lesitin soya ditambahkan dalam pembuatan ais krim.

4(c)(iv)	
	1

.....

[2 marks]
 [2 markah]

TOTAL A4	
	10

- 5 Diagram 5 shows a series of reactions for butanol. Compound J is an unsaturated hydrocarbon.

Rajah 5 menunjukkan satu siri tindak balas bagi butanol. Sebatian J adalah satu sebatian hidrokarbon tak tepu.

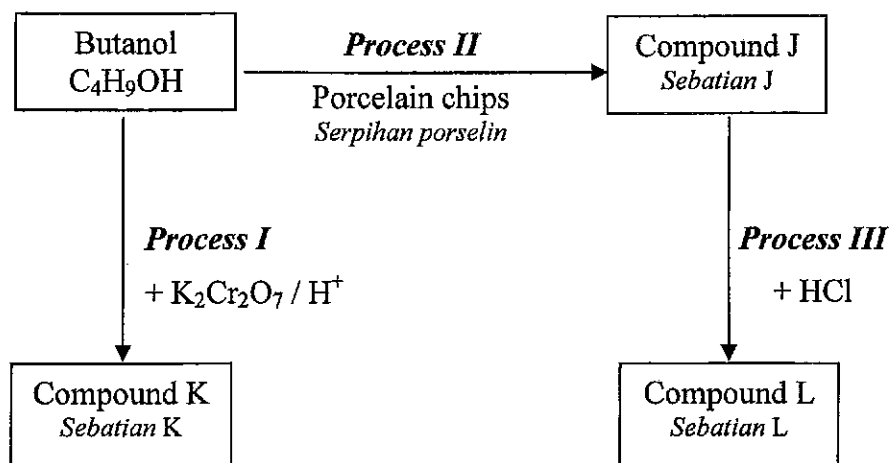


Diagram 5
Rajah 5

- (a) Name the homologous series of compound J.
Namakan siri homolog bagi sebatian J.

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

- (b) Draw the structural formulae of **two isomers** for compound J.
Lukiskan formula struktur bagi dua isomer sebatian J.

--	--

[2 marks]
[2 markah]

5(a)	
	1

5(b)	
	2

- (c) In Process I, butanol reacts with acidified potassium dichromate(VI) solution to form compound K which has a pH of 6.
Dalam Proses I, butanol bertindak balas dengan larutan kalium dikromat(VI) menghasilkan sebatian K yang mempunyai pH 6.

- (i) Name the reaction in Process I.
Namakan tindak balas bagi Proses I.

5(c)(i)	
	1

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

- (ii) State the colour change in Process I.
Nyatakan perubahan warna dalam Proses I.

5(c)(ii)	
	1

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

- (d) Butanol can react with compound K to produce a sweet smelling liquid.
 Write the chemical equation for the reaction.
Butanol boleh bertindak balas dengan sebatian K untuk menghasilkan cecair yang berbau harum. Tuliskan persamaan kimia bagi tindak balas ini.

5(d)	
	2

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

- (e) In Process III, compound J reacts with hydrogen chloride gas to produce compound L.
 Name compound L.
Dalam Proses III, sebatian J bertindak balas dengan gas hidrogen klorida menghasilkan sebatian L.
Namakan sebatian L.

5(e)	
	1

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

- (f) Draw an apparatus set-up for Process II. In your diagram show how compound J is collected.

Lukiskan susunan radas bagi Proses II. Dalam gambar rajah anda, tunjukkan bagaimana sebatian J dikumpulkan.

[3 marks]
[3 markah]

5(f)	
	3

TOTAL A5	
	11

6 Table 6 shows the heat of displacement of copper from its salt solution by zinc and magnesium.

Jadual 6 menunjukkan haba penyesaran kuprum daripada larutan garamnya oleh zink dan magnesium.

Reaction <i>Tindak balas</i>	Reactant <i>Bahan tindak balas</i>	Heat of displacement(kJ mol ⁻¹) <i>Haba penyesaran</i>
I	Zn + CuSO ₄	-210
II	Mg + CuSO ₄	-330
III	Al + CuSO ₄	

Table 6

Jadual 6

(a) What is meant by heat of displacement?

Apakah yang dimaksudkan dengan haba penyesaran?

6(a)	
	1

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

(b) Based on the heat change, name the type of reaction occurred.

Berdasarkan perubahan haba, namakan jenis tindak balas yang berlaku.

6(b)	
	1

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

(c) Draw an energy level diagram for reaction I.

Lukiskan gambar rajah aras tenaga bagi tindak balas I.

6(c)	
	2

[2 marks]
 [2 markah]

- (d) Explain the difference in heat of displacement between reactions I and II.
 Terangkan perbezaan haba penyesaran antara tindak balas I dan II.

[1 mark]
 [1 markah]

6(d)	
	1

- (e) State one precaution that needs to be taken in this experiment. Explain why.
 Nyatakan satu langkah berjaga-jaga yang perlu diambil bagi eksperimen ini.
 Terangkan mengapa.

[2 marks]
 [2 markah]

6(e)	
	2

- (f) An experiment is conducted by adding excess magnesium to 50 cm³ of 0.1 mol dm⁻³ copper(II) sulphate solution.
 Calculate the change in temperature for this reaction.
 Satu eksperimen dijalankan dengan menambahkan magnesium yang berlebihan kepada 50 cm³ larutan kuprum(II) sulfat 0.1 mol dm⁻³.
 Hitungkan perubahan suhu bagi tindak balas ini.

[Specific heat capacity of solution; $c = 4.2 \text{ Jg}^{-1} \text{ }^{\circ}\text{C}^{-1}$,

Density of solution = 1.0 g cm⁻³]

[Muatan haba tentu larutan: $c = 4.2 \text{ Jg}^{-1} \text{ }^{\circ}\text{C}^{-1}$, ketumpatan larutan = 1.0 g cm⁻³]

[3 marks]
 [3 markah]

6(f)	
	3

- (g) Predict the heat of displacement for reaction III
 Ramalkan haba penyesaran bagi tindak balas III.

[1 mark]
 [1 markah]

6(g)	
	1

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 7.1 shows the apparatus set-up to investigate the electrical conductivity of substances S and T.

Rajah 7.1 menunjukkan susunan radas untuk mengkaji kekonduksian elektrik bahan S dan T.

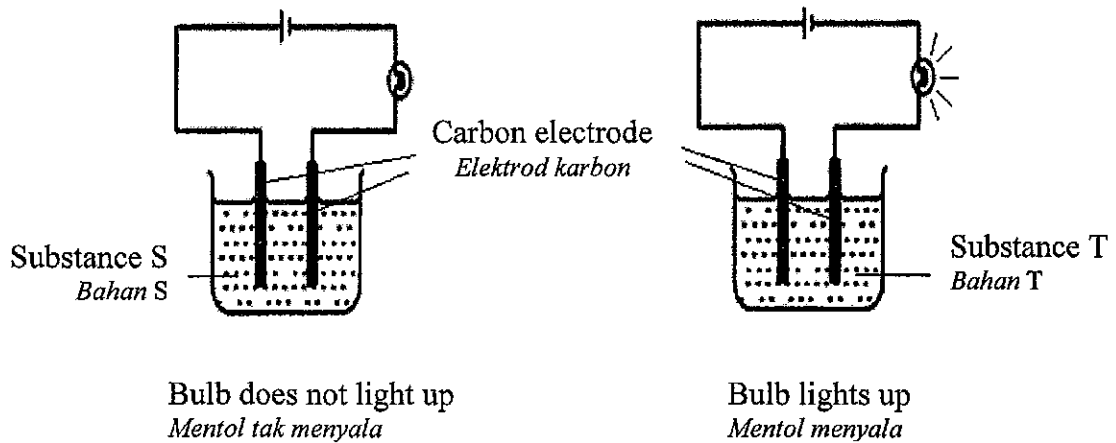


Diagram 7.1

Rajah 7.1

Based on the observations in Diagram 7.1,

Berdasarkan pemerhatian dalam Rajah 7.1,

- (i) Give example of substances S and T.

Beri contoh bagi bahan S dan T.

[2 marks]

[2 markah]

- (ii) Explain the above observations.

Terangkan pemerhatian di atas.

[3 marks]

[3 markah]

- (b) Diagram 7.2 shows the apparatus set-up for a chemical cell.
Rajah 7.2 menunjukkan susunan radas untuk satu sel kimia.

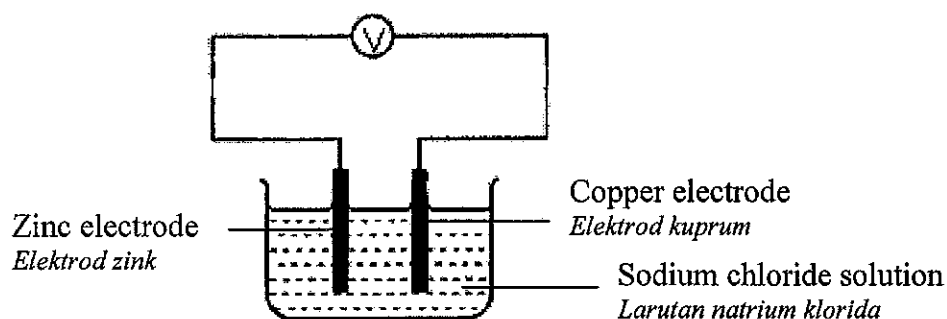


Diagram 7.2
Rajah 7.2

Based on Diagram 7.2,
Berdasarkan Rajah 7.2,

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

[2 marks]

[2 markah]

- (ii) If zinc electrode is replaced with magnesium electrode, what will happen to the potential difference of the cell? Explain why.

Jika elektrod zink digantikan dengan elektrod magnesium, apa akan berlaku kepada beza keupayaan sel tersebut. Terangkan mengapa.

[2 marks]

[2 markah]

- (c) Table 7.1 shows the observations at the anode when different concentrations of sodium chloride solution are electrolysed using carbon electrodes.

Jadual 7.1 menunjukkan pemerhatian pada anod apabila larutan natrium klorida dengan kepekatan yang berbeza dielektrolisis menggunakan elektrod karbon.

Cell Sel	Electrolyte Elektrolit	Observation at anode Pemerhatian di anod
I	1.0 mol dm ⁻³ sodium chloride solution 1.0 mol dm ⁻³ larutan natrium klorida	Yellowish green gas is released Gas hijau kekuningan dibebaskan
II	0.0001 mol dm ⁻³ sodium chloride solution 0.0001 mol dm ⁻³ larutan natrium klorida	Bubbles of colourless gas is released Gelembung gas tidak berwarna dibebaskan

Table 7.1

Jadual 7.1

- (i) Write the half equation for the reaction that occurs at the cathode for cells I and II.

Tulis persamaan setengah untuk tindak balas yang berlaku di katod bagi sel I dan II.

[2 marks]

[2 markah]

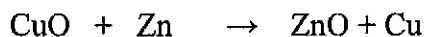
- (ii) Based on Table 7.1, explain the observations and name the product formed at the anodes for cells I and II.

Berdasarkan Jadual 7.1, terangkan pemerhatian dan namakan hasil pada anod untuk sel I dan II.

[9 marks]

[9 markah]

- 8 (a) Copper(II) oxide reacts with zinc to produce zinc oxide and copper as shown in the following equation.
Kuprum(II) oksida bertindak balas dengan zink menghasilkan zink oksida dan kuprum seperti ditunjukkan dalam persamaan berikut.



Explain why the above reaction is a redox reaction in terms of oxidation number.

Terangkan mengapa tindak balas di atas adalah tindak balas redoks dari segi perubahan nombor pengoksidaan.

[4 marks]

[4 markah]

- (b) Diagram 8 shows the reactions involved in the rusting of iron.
Rajah 8 menunjukkan tindak balas yang terlibat dalam pengurangan besi.

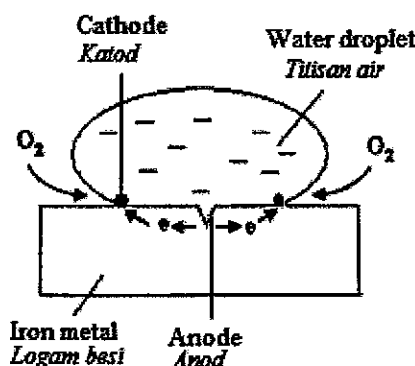


Diagram 8

Rajah 8

Based on Diagram 8,
Berdasarkan Rajah 8,

- (i) Write the half equations of oxidation and reduction reactions that occur during the rusting of iron. Identify the reducing agent and explain your answer.

Tulis persamaan setengah bagi tindak balas pengoksidaan dan penurunan yang berlaku semasa pengurangan besi. Kenal pasti agen penurunan dan terangkan jawapan anda.

[4 marks]

[4 markah]

- (ii) Iron pipes are prevented from rusting by attaching blocks of magnesium to it.
Explain how magnesium can prevent the iron pipes from rusting.
Pengurangan paip besi dicegah secara menyentuhnya dengan bongkah magnesium.

Terangkan bagaimana magnesium dapat mencegah pengurangan paip besi.

[4 marks]

[4 markah]

- (c) Table 8 shows the results of two experiments I and II for the displacement of halogens.

Jadual 8 menunjukkan keputusan dua eksperimen, I dan II bagi penyesaran halogen.

Experiment <i>Eksperimen</i>	Halogen <i>Halogen</i>	Chlorine water <i>Air klorin</i>	Bromine water <i>Air bromin</i>
	Halide solution <i>Larutan halida</i>		
I	Potassium chloride <i>Kalium klorida</i>		No reaction occurs <i>Tiada tindak balas berlaku</i>
II	Potassium bromide <i>Kalium bromida</i>	A reaction occurs <i>Tindak balas berlaku</i>	

Table 8

Jadual 8

Explain the redox reaction that occurs in experiment I and II.

In your answer, include all the half equations involved.

Terangkan tindak balas redoks yang berlaku dalam eksperimen I dan II.

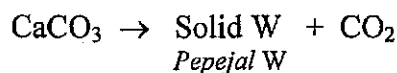
Dalam jawapan anda, masukkan semua persamaan setengah yang terlibat.

[8 marks]

[8 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) Calcium carbonate decompose as in the equation when heated.
Kalsium karbonat terurai seperti dalam persamaan apabila dipanaskan.



When 20.0 g calcium carbonate is heated, it decomposes into solid W and carbon dioxide gas. Name solid W and calculate the volume of carbon dioxide gas produced at room condition.

Apabila 20.0 g kalsium karbonat dipanaskan, ia terurai kepada pepejal W dan gas karbon dioksida. Namakan pepejal W dan hitung isipadu gas karbon dioksida yang dibebaskan pada suhu bilik.

[Relative atomic mass: Ca = 40, C = 12, O = 16, 1 mol of gas occupies 24 dm³ at room condition]

[Jisim atom relatif: Ca = 40, C = 12, O = 16, 1 mol gas menempati isipadu 24 dm³ pada suhu bilik]

[4 marks]

[4 markah]

- (b) Table 9 shows the pH values of two alkalis.
Jadual 9 menunjukkan nilai pH bagi dua alkali.

Alkali <i>Alkali</i>	Concentration of alkali / mol dm ⁻³ <i>Kepekatan alkali / mol dm⁻³</i>	pH value <i>nilai pH</i>
Potassium hydroxide solution <i>Larutan kalium hidroksida</i>	1.0	13
Ammonia solution <i>Larutan ammonia</i>	1.0	11

Table 9

Jadual 9

Explain why the pH values of both alkalis are different.

Terangkan mengapa nilai pH bagi kedua-dua alkali adalah berbeza.

[4 marks]

[4 markah]

- (c) Diagram 9 shows the apparatus set-up for the preparation of salt Y.
Rajah 9 menunjukkan susunan radas bagi penyediaan garam Y.

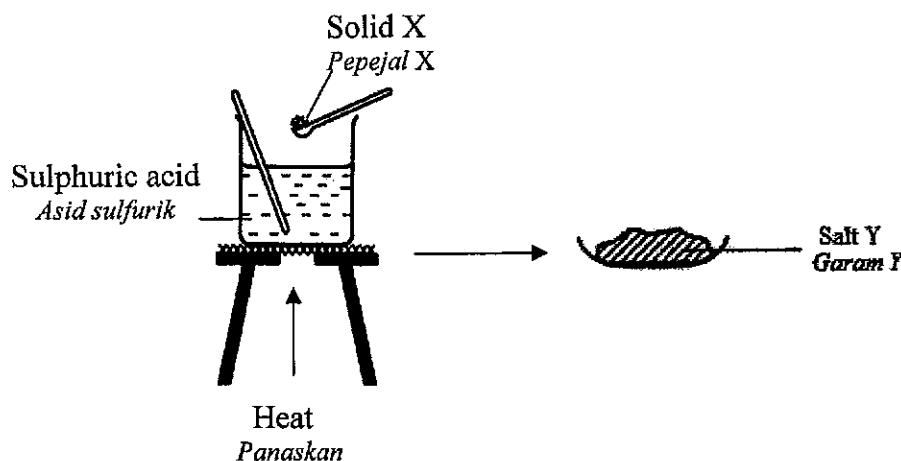


Diagram 9
Rajah 9

Salt Y is a soluble salt. Describe how to prepare a dry sample of a named salt Y in the laboratory.

Garam Y adalah garam terlarut. Huraikan bagaimana untuk menyediakan sampel garam Y kering yang dinamakan di makmal.

Your answer should include of the following:

Jawapan anda hendaklah mengandungi perkara berikut:

- Chemicals required
Bahan kimia yang diperlukan
- Procedure of the preparation
Prosedur penyediaan
- Chemical equation of the reaction
Persamaan kimia bagi tindak balas

[12 marks]

[12 markah]

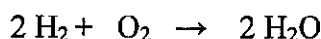
- 10 Table 10 shows the volume of gas collected when excess magnesium reacts with nitric acid.

Jadual 10 menunjukkan isipadu gas yang dikumpulkan bila magnesium berlebihan bertindak balas dengan asid nitrik.

Time/s Masa/s	0	30	60	90	120	150	180	210	240
Volume of gas/cm ³ <i>Isipadu gas/cm³</i>	0.0	3.5	5.0	6.1	6.8	7.4	8.1	8.1	8.1

Table 10
Jadual 10

- (a) Based on Table 10,
Berdasarkan Jadual 10,
- (i) Compare the rate of reaction in the first minute and in the second minute.
Explain your answer.
*Bandingkan kadar tindak balas dalam minit pertama dan minit kedua.
Terangkan jawapan anda.*
- [4 marks]
[4 markah]
- (ii) Calculate the overall rate of reaction for the above reaction.
Hitung kadar tindak balas keseluruhan bagi tindak balas di atas.
- [1 mark]
[1 markah]
- (b) The following equation represents the reaction between hydrogen and oxygen.
Persamaan berikut mewakili tindak balas antara hidrogen dan oksigen.



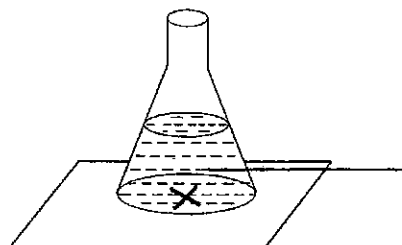
Explain how the effective collisions can produce water molecules.
Terangkan bagaimana perlanggaran berkesan dapat menghasilkan molekul air.

[3 marks]
[3 markah]

- (c) Diagram 10 shows the apparatus set-up for experiment I and II.
 In both experiments the time taken for the mark 'X' to disappear from sight is recorded.

Rajah 10 menunjukkan susunan radas untuk eksperimen I dan II.

Dalam kedua-dua eksperimen masa untuk tanda 'X' hilang dari penglihatan direkodkan.



Sodium thiosulphate solution
 + sulphuric acid
 Larutan natrium tiosulfat
 + asid sulfurik

Diagram 10

Rajah 10

Experiment <i>Eksperimen</i>	Reactants <i>Bahan-bahan tindak balas</i>	Time taken for the mark 'X' to disappear from sight / s <i>Masa untuk tanda 'X' hilang dari penglihatan / s</i>
I	50.0 cm ³ sodium thiosulphate solution + 5.0 cm ³ of 1.0 mol dm ⁻³ sulphuric acid 50.0 cm ³ larutan natrium tiosulfat + 5.0 cm ³ asid sulfurik 1.0 mol dm ⁻³	30
II	50.0 cm ³ sodium thiosulphate solution + 5.0 cm ³ of 1.0 mol dm ⁻³ sulphuric acid 50.0 cm ³ larutan natrium tiosulfat + 5.0 cm ³ asid sulfurik 1.0 mol dm ⁻³	15

Table 10

Jadual 10

- (i) Suggest two factors that can affect the time taken for the mark 'X' to disappear from sight in experiment I and II.

Cadangkan dua faktor yang boleh mempengaruhi masa untuk tanda 'X' hilang dari penglihatan dalam eksperimen I dan II.

[2 marks]

[2 markah]

- (ii) Describe how to carry out experiment I and II to investigate the effect of any one factor mentioned in (c)(i).

Huraikan bagaimana menjalankan eksperimen I dan II untuk mengkaji kesan salah satu faktor yang dinyatakan dalam (c)(i).

[10 marks]

[10 markah]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

Periodic Table of Elements

18

1	2	13	14	15	16	17	18
1 H Hydrogen 1	2 He Helium 4	5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20
3 Li Lithium 7	4 Be Beryllium 9	11 Na Sodium 23	12 Mg Magnesium 24	13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulfur 32
19 K Potassium 40	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
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
55 Cs Cesium 133	56 Ba Barium 137	57 La Lanthanum 139	72 Hf Hafnium 179	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190
87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	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 209	85 At Astatine 210	86 Rn Radon 222
			31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80
			49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127
			65 Zn Zinc 65	66 Cu Copper 64	67 Ni Nickel 59	68 Co Cobalt 59	69 Fe Iron 56
			89 Y Yttrium 89	90 Zr Zirconium 91	91 Nb Niobium 93	92 Mo Molybdenum 96	93 Tc Technetium 98
			101 Ru Ruthenium 101	102 Rh Rhodium 103	103 Pd Palladium 106	104 Ag Silver 108	105 Cd Cadmium 112
			112 In Indium 115	113 Sn Tin 119	114 Sb Antimony 122	115 Te Tellurium 128	116 I Iodine 127
			127 Al Aluminium 27	128 Si Silicon 28	129 P Phosphorus 31	130 S Sulfur 32	131 Cl Chlorine 35.5
			132 Ne Neon 20	133 F Fluorine 19	134 O Oxygen 16	135 N Nitrogen 14	136 C Carbon 12
			137 He Helium 4	138 H Hydrogen 1	139 Li Lithium 7	140 Be Beryllium 9	141 B Boron 11

Key:

10	Proton Number
Ne	Symbol
Neon	Name of element
20	Relative Atomic Mass

Name :

Class :

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4541/3

Chemistry

Paper 3

September

2012

1½ hours



**MAKTAB RENDAH SAINS MARA
SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION
2012**

CHEMISTRY**Paper 3**

One hour and thirty minutes

DO NOT OPEN THIS QUESTION BOOKLET UNTIL BEING TOLD TO DO SO

1. Write down your name and class in the space provided
Tuliskan nama dan kelas anda pada ruang yang disediakan.
2. The question booklet is bilingual.
Buku soalan ini adalah dalam dwibahasa.
3. Candidates are required to answer all questions.
Calon dikehendaki menjawab semua soalan

<i>For Examiner's Use</i>		
Question	Full Mark	Mark
1	24	
2	9	
3	17	
Total	50	

This question booklet contains 16 printed pages including the front page.

For
Examiner's
Use

1

Two experiments are conducted to investigate the effect of size of calcium carbonate on the rate of reaction between calcium carbonate and hydrochloric acid.

Dua eksperimen telah dijalankan untuk mengkaji kesan saiz kalsium karbonat terhadap kadar tindak balas antara kalsium karbonat dan asid hidroklorik.

Diagram 1.1 shows the apparatus set-up for the experiment between 2.0 g of large calcium carbonate and 50 cm³ of 0.1 mol dm⁻³ hydrochloric acid. The burette reading was recorded at 30 second intervals.

Rajah 1.1 menunjukkan susunan radas bagi eksperimen antara 2.0 g kalsium karbonat bersaiz besar dan 50 cm³ asid hidroklorik 0.1 mol dm⁻³. Bacaan buret direkodkan pada setiap 30 saat.

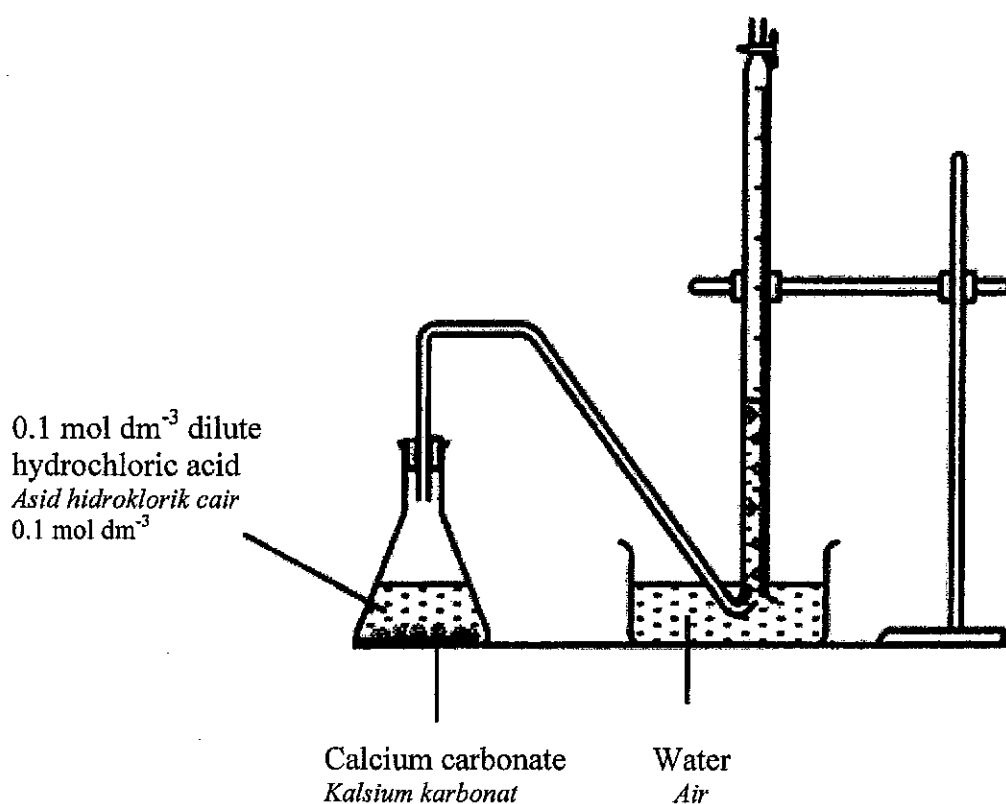


Diagram 1.1
Rajah 1.1

The experiment is repeated by using 2.0 g of small calcium carbonate to replace the large calcium carbonate.

Eksperimen ini diulangi dengan menggunakan 2.0 g kalsium karbonat bersaiz kecil menggantikan kalsium karbonat bersaiz besar.

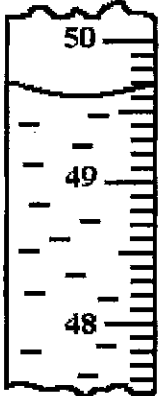
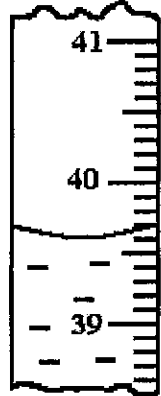
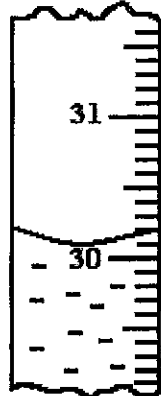
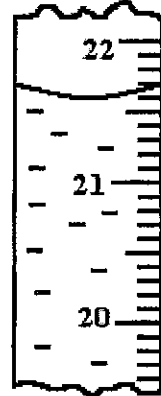
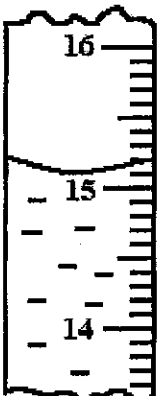
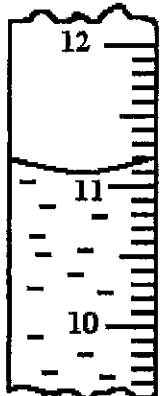
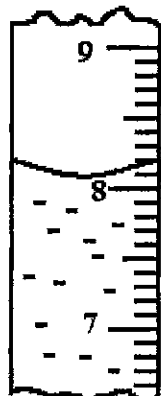
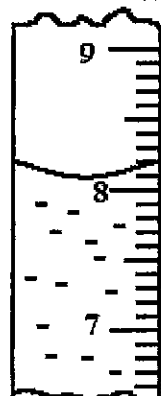
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- (a) Record the burette readings in the spaces provided in Diagram 1.2 for the experiment between the large calcium carbonate and hydrochloric acid.
 Rekod bacaan buret pada ruang yang disediakan dalam Rajah 1.2 untuk eksperimen antara kalsium karbonat bersaiz besar dengan asid hidroklorik.

[3 marks]
 [3 markah]

			
Time = 0 s Masa	Time = 30 s Masa	Time = 60 s Masa	Time = 90 s Masa
..... cm ³ cm ³ cm ³ cm ³
			
Time = 120 s Masa	Time = 150 s Masa	Time = 180 s Masa	Time = 210 s Masa
..... cm ³ cm ³ cm ³ cm ³

1(a)

Diagram 1.2
 Rajah 1.2

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- (b) (i) Construct a table showing all data which include the time, burette readings and volumes of carbon dioxide gas liberated for the experiment.
Bina satu jadual yang menunjukkan semua data yang mengandungi masa, bacaan buret dan isipadu gas karbon dioksida yang terbebas untuk eksperimen ini.

1(b)(i)

[3 marks]
[3 markah]

- (ii) Based on the data in (b)(i), state how the volume of carbon dioxide gas changes throughout the experiment when large calcium carbonate react with hydrochloric acid.
Berdasarkan data di (b)(i), nyatakan perubahan isipadu gas karbon dioksida sepanjang eksperimen apabila kalsium karbonat bersaiz besar bertindak balas dengan asid hidroklorik.

1(b)(ii)

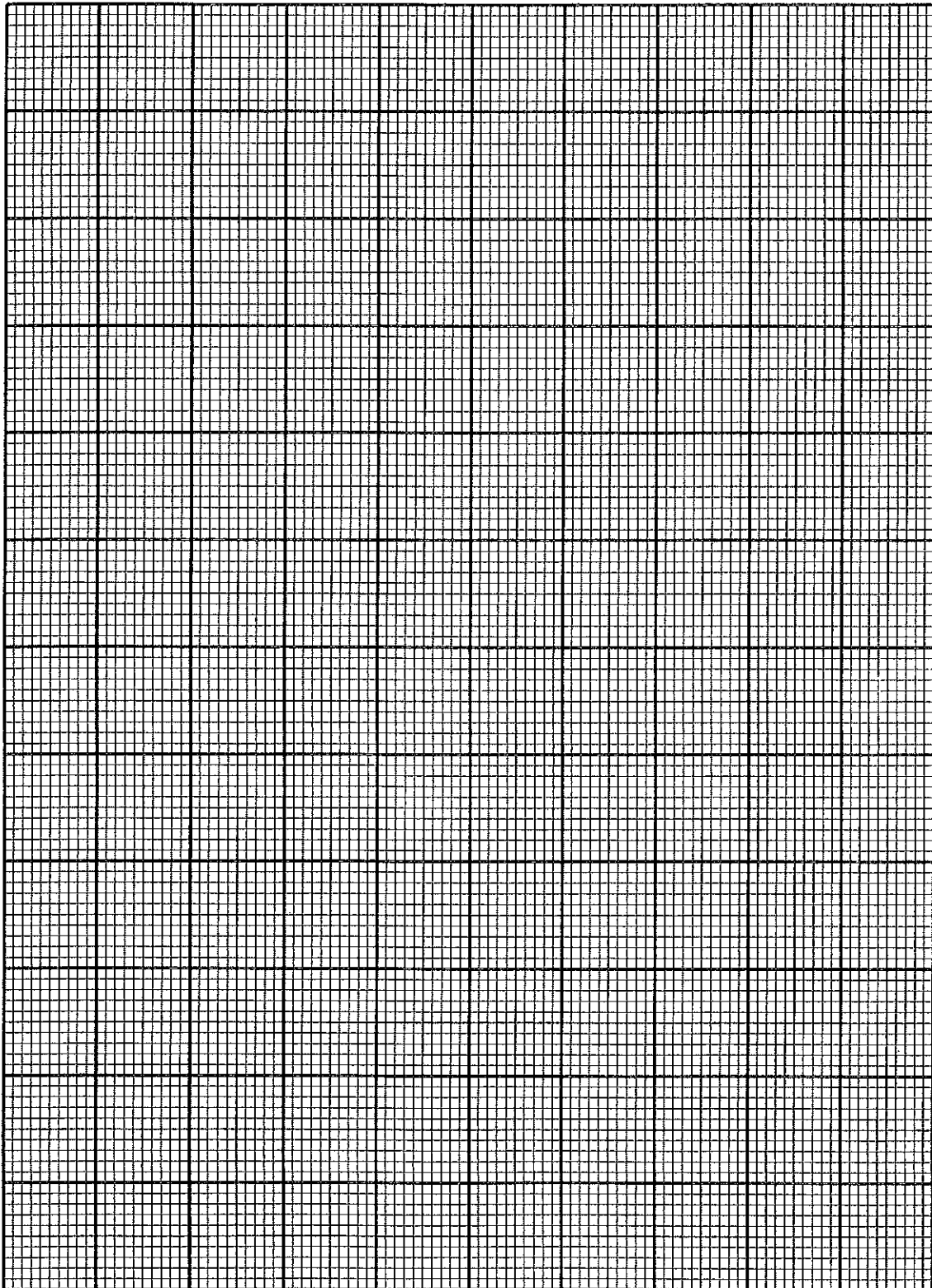
[3 marks]
[3 markah]

- (iii) Based on the data in (b)(i), plot a graph of volume of carbon dioxide gas against time.
Berdasarkan data di (b)(i), plotkan graf isipadu gas karbon dioksida melawan masa.

[3 marks]
[3 markah]

Graph of volume of carbon dioxide gas against time.
Graf isipadu gas karbon dioksida melawan masa.

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1(b)(iii)

For
Examiner's
Use

(c) For the experiment, state the:
Bagi eksperimen ini, nyatakan :

(i) Manipulated variable:
Pembolehubah dimanipulasikan:

.....

(ii) Responding variable :
Pembolehubah bergerak balas:

.....

(iii) Constant variable :
Pembolehubah dimalarkan:

.....

[3 marks]

[3 markah]

(d) State the hypothesis for the experiment.
Nyatakan hipotesis untuk eksperimen ini.

.....

.....

.....

[3 marks]

[3 markah]

(e) The experiment using small calcium carbonate takes **shorter time** to collect the maximum volume of carbon dioxide gas.
 Explain why.

Eksperimen yang menggunakan kalsium karbonat bersaiz kecil mengambil masa yang lebih pendek untuk mengumpul isipadu maksimum gas karbon dioksida.

Terangkan mengapa.

.....

.....

.....

[3 marks]

[3 markah]

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For
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- (f) Classify the following reactions into slow and fast reaction.
 Kelaskan tindak balas-tindak balas berikut kepada tindak balas lambat dan tindak balas cepat.

- * Rusting
Pengaratan
- * Double decomposition
Penguraian ganda dua
- * Combustion
Pembakaran
- * Photosynthesis
Fotosintesis

Slow reaction <i>Tindak balas lambat</i>	Fast reaction <i>Tindak balas cepat</i>

[3 marks]
[3 markah]

1(f)

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- 2 An experiment is carried out to determine the heat of combustion of methanol, CH_3OH . The apparatus set-up for the experiment is shown in Diagram 2.1.
 Satu eksperimen telah dijalankan untuk menentukan haba pembakaran bagi metanol, CH_3OH .
 Susunan radas eksperimen tersebut ditunjukkan seperti dalam Rajah 2.1.

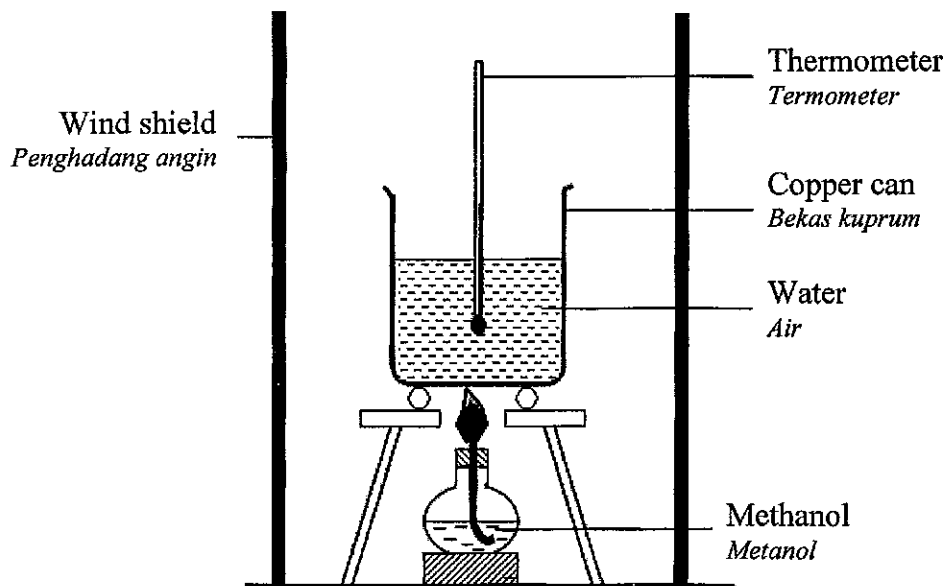


Diagram 2.1
 Rajah 2.1

The following data is recorded in Table 2
 Data berikut telah direkodkan dalam Jadual 2.

Volume of water <i>Isipadu air</i>	200 cm ³
Initial temperature of water <i>Suhu awal air</i>	30 °C
Highest temperature of water <i>Suhu tertinggi air</i>	60 °C
Initial mass of spirit lamp containing methanol <i>Jisim awal pelita spirit yang mengandungi metanol</i>	365.00 g
Final mass of spirit lamp containing methanol <i>Jisim akhir pelita spirit yang mengandungi metanol</i>	363.40 g

Table 2
 Jadual 2

- (a) State the operational definition for the heat of combustion in this experiment.

Nyatakan definisi secara operasi bagi haba pembakaran dalam eksperimen ini.

.....

.....

.....

[3 marks]
[3 markah]

2(a)

- (b) Calculate the heat of combustion of methanol.

Hitungkan haba pembakaran bagi metanol.

(Relative atomic mass H=1, C=12, O=16, Density of water = 1 g cm⁻³, specific heat capacity of water, c = 4.2 J g⁻¹ °C⁻¹)

(Jisim atom relatif H = 1, C = 12, O = 16, ketumpatan air 1 g cm⁻³, muatan haba tentu air, c = 4.2 J g⁻¹ °C⁻¹)

[3 marks]
[3 markah]

2(b)

- (c) The experiment is repeated using ethanol, C₂H₅OH.

Predict the heat of combustion of ethanol compared to methanol.

Eksperimen ini diulangi menggunakan etanol, C₂H₅OH. Ramalkan haba pembakaran bagi etanol dibandingkan dengan metanol.

.....

.....

.....

[3 marks]
[3 markah]

2(c)

3

The body of aeroplane are made of duralumin which is lighter and stronger than pure aluminium.

Badan kapal terbang diperbuat daripada duralamin yang lebih ringan dan kuat berbanding aluminium tulen

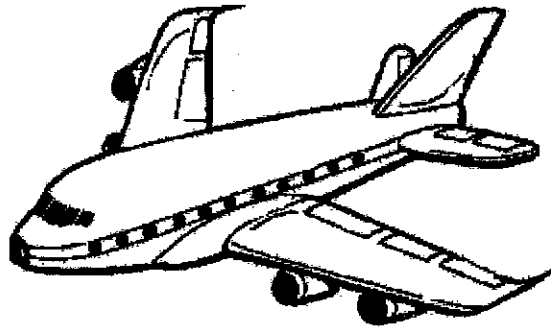


Diagram 3

Rajah 3

Referring to Diagram 3, plan a laboratory experiment to compare the hardness of a named pure metal and its alloy.

Berdasarkan Rajah 3, rancang satu eksperimen untuk membanding kekerasan logam tulen yang dinamakan dan aloinya.

Your planning should include the following aspects :

Perancangan anda hendaklah mengandungi aspek-aspek berikut :

- (a) Problem statement.
Pernyataan masalah
- (b) All the variables
Semua pembolehubah
- (c) Statement of the hypothesis
Pernyataan hipotesis
- (d) List of substances and apparatus
Senarai bahan dan radas
- (e) Procedure for the experiment
Prosedur eksperimen
- (f) Tabulation of data
Penjadualan data

[17 marks]

[17 markah]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT