NAMA:..... Tingkatan :.....

SULIT
4541/1
Chemistry
Kertas 1
Ogos
2009
2 ½ jam

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2009

CHEMISTRY

Kertas 1

Satu jam lima belas minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Kertas soalan ini mengandungi **50** soalan.

2. Jawab **semua** soalan

3. Tiap-tiap soalan diikuti oleh empat pilihan jawapan, iaitu **A, B, C** dan **D.** Bagi setiap soalan, pilih **satu jawapan sahaja.** Hitamkan jawapan anda pada kertas jawapan objektif yang disediakan.

4. Jika anda hendak menukar jawapan, padamkan tanda yang telah dibuat, kemudian hitamkan jawapan yang baru.

5. Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan

6. Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan.

Kertas soalan ini mengandungi **28** halaman bercetak

1 Diagram 1 shows the particles arrangement for the change of state of matter.
Rajah 1 *menunjukkan susunan zarah untuk perubahan keadaan jirim.*

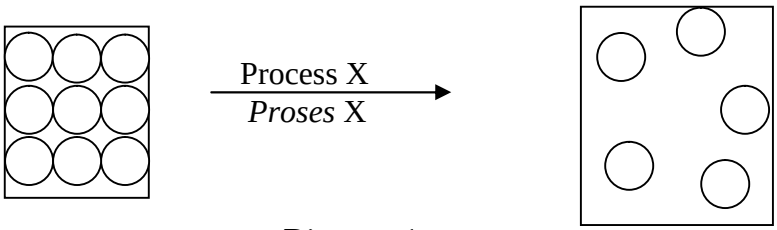


Diagram 1
Rajah 1

Which of the following is process X?
Antara berikut yang manakah proses X*?*

A Evaporation
Penyejatan

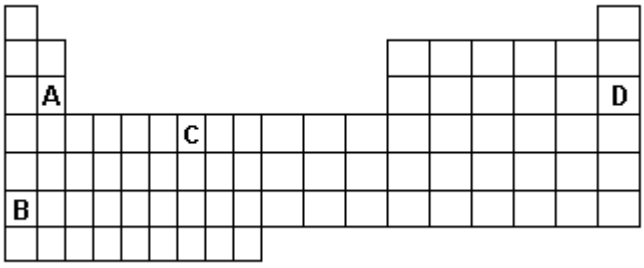
B Sublimation
Pemejalwapan

C Condensation
Kondensasi

D Boiling
Pendidihan

2 Which of the following shows an element in the Periodic Table of Elements with different oxidation numbers in its compounds?

Antara yang berikut yang manakah menunjukkan unsur dalam Jadual Berkala Unsur yang mempunyai nombor pengoksidaan yang berbeza dalam sebatian-sebatiannya?



3 Diagram 2 shows the set-up of apparatus to determine the empirical formula of magnesium oxide.

Rajah 2 menunjukkan susunan radas untuk menentukan formula empirik magnesium oksida.

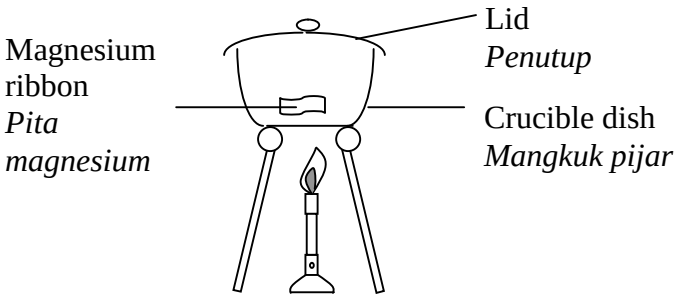


Diagram 2
Rajah 2

Which of the following statements is **true** for the lifting and closing of the lid quickly and occasionally during heating?

*Antara pernyataan berikut yang manakah **benar** bagi penutup diangkat dan ditutup dengan cepat sekali sekala semasa pemanasan?*

A To avoid the pressure in the crucible dish
Untuk mengelak tekanan dalam mangkuk pijar

B To avoid the crucible dish from cracking
Untuk mengelak mangkuk pijar dari retak

C To avoid the white fumes from escaping
Untuk mengelak wasap putih daripada terbebas keluar

D To avoid water vapour from entering the crucible dish
Untuk mengelak wap air daripada memasuki mangkuk pijar

4 Which of the following salts is insoluble in water?
Antara garam berikut yang manakah tidak larut dalam air?

A Copper(II) sulphate
Kuprum(II) sulfat

B Silver nitrate
Argentum nitrat

C Lead(II) chloride
Plumbum(II) klorida

D Potassium iodide
Kalium iodida

5 Diagram 3 shows the atomic symbol of element X.
Rajah 3 *menunjukkan simbol bagi atom unsur X.*

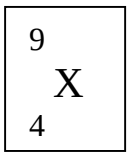


Diagram 3
Rajah 3

Which of the following is true about the sub-atomic particles of element X?
Antara berikut yang manakah benar mengenai zarah-zarah sub-atom bagi unsur X?

	Proton number ***Nombor proton***	**Nucleon number** ***Nombor nukleon***	**Electron arrangement** ***Susunan elektron***
A	4	9	2.2
B	4	9	2.7
C	9	4	2.2
D	9	4	2.7

6 A student dissolved hydrogen chloride gas into tetrachloromethane.
Which of the following statements is true of the solution obtained?

Seorang pelajar melarutkan gas hidrogen klorida ke dalam tetraklorometana.
Antara pernyataan berikut yang manakah benar bagi larutan yang terhasil?

A It does not conduct electricity
Ia tidak mengkonduksikan elektrik

B It turns dry blue litmus paper to red
Ia menukarkan kertas litmus biru kering ke merah

C There is effervescence when calcium carbonate powder is added to it
Pembuakan berlaku apabila serbuk kalsium karbonat di tambahkan ke dalam larutan tersebut

D The hydrochloric acid molecules undergo complete dissociation
Molekul asid hidroklorik mengalami penceraian lengkap

7 Diagram 4 shows the set-up of the apparatus for electrolysis.
Diagram 4 menunjukkan susunan radas bagi elektrolisis.

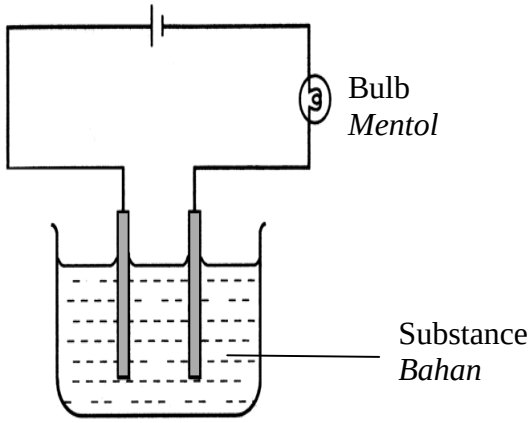


Diagram 4
Rajah 4

Which of the following substances could light up the bulb?
Antara bahan berikut yang manakah boleh menyalakan mentol?

A Propanol
Propanol

B Glucose solution
Larutan glukosa

C Glacial ethanoic acid
Asid etanoik glasial

D Sodium chloride solution
Larutan natrium klorida

8 Which of the following pairs of elements is **correct** for the type of alloy?
*Antara pasangan unsur berikut yang manakah **betul** untuk jenis aloi*?

	Main Element ***Unsur utama***	**Element added** ***Unsur yang ditambah***	**Type of alloy** ***Jenis aloi***
A	Copper *Kuprum*	Zinc *Zink*	Brass *Loyang*
B	Copper *Kuprum*	Iron *Ferum*	Bronze *Gangsa*
C	Tin *Stanum*	Carbon *Karbon*	Pewter *Pewter*
D	Iron *Ferum*	Tin *Stanum*	Steel *Keluli*

9 The following equation shows the reaction between calcium carbonate , $CaCO_3$ and hydrochloric acid, HCl :

Persamaan berikut menunjukkan tindak balas antara kalsium karbonat, $CaCO_3$ *dan asid hidroklorik,* HCl :

$$CaCO_{3(aq)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2\,(g)} + H_2O_{(l)}$$

Which of the following is the suitable method to determine the rate of reaction?
Antara berikut yang manakah kaedah yang sesuai untuk menentukan kadar tindak itu?

A Change in the temperature of the solution with time
Perubahan dalam suhu bagi larutan dengan masa

B Change in the volume of carbon dioxide gas with time
Perubahan isi padu gas karbon dioksida dengan masa

C Change in the mass of water with time
Perubahan jisim air dengan masa

D Change in the concentration of hydrochloric acid with time
Perubahan kepekatan asid hidroklorik dengan masa

10 The following chemical equation shows a reaction for ethanol.
Persamaan kimia berikut menunjukkan satu tindak balas bagi etanol.

$$C_2H_5OH(l) \rightarrow C_2H_4(g) + H_2O(l)$$

What is the name of the reaction?
Apakah nama bagi tindak balas itu?

A Oxidation
Pengoksidaan

B Reduction
Penurunan

C Dehydration
Pendehidratan

D Fermentation
Penapaian

11 Which of the following is a reduction process?
Antara yang berikut yang manakah proses penurunan?

A A copper(II) ion gains two electrons
Ion kuprum(II) menerima dua elektron

B Hydrogen sulphide loses its hydrogen
Hidrogen sulfida kehilangan hidrogen

C Iron(II) ion converted to iron(III) ion
Ion ferum(II) bertukar kepada ion ferum(III)

D A magnesium atom loses two electrons
Satu atom magnesium kehilangan dua elektron

12 Which of the following is true when ammonium nitrate dissolves in water in a test tube, the test tube becomes cold?
Antara berikut yang manakah betul apabila ammonium nitrat dilarutkan ke dalam air dalam sebuah tabung uji, tabung uji menjadi sejuk?

A The ions move slower.
Ion bergerak perlahan.

B Water absorbs heat energy.
Air menyerap tenaga haba.

C Heat energy is lost to the surroundings.
Haba hilang ke persekitaran.

D Heat energy is absorbed from the surroundings.
Tenaga haba diserapdaripada persekitaran.

13 Which of the following characteristics shows that salt is used as food preservative.?
Antara cir-ciri berikut yang manakah menunjukkan bahawa garam digunakan sebagai pengawet makanan?

A Presence of chlorine
Kehadiran klorin

B Saltiness
Rasa masin

C Dehydrating property
Bersifat pengontang

D Toxicity
Bertoksid

14 Diagram 5 shows the symbol for atom Y.
Rajah 5 *menunjukkan simbol bagi satu atom* Y.

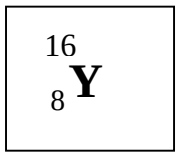
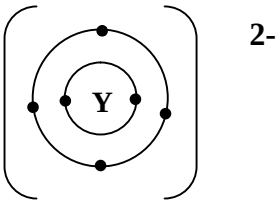


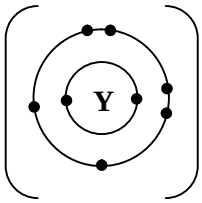
Diagram 5
Rajah 5

Which of the following represents the electron arrangement for ion Y^{2-} ?
Antara berikut yang manakah menunjukkan susunan elektron ion Y^{2-} ?

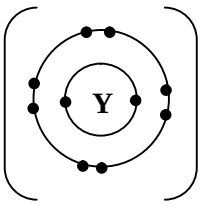
A



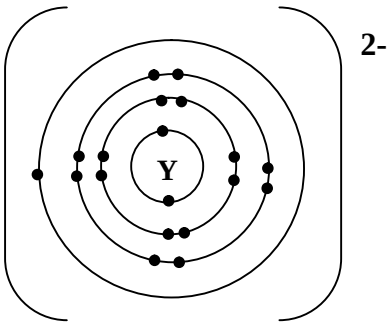
B



C



D



15 Table 1 shows the mass of elements M and O in an oxide of M, and the relative atomic mass of elements M and O.
Jadual 1 *menunjukkan jisim unsur M dan O yang terdapat dalam oksida M, dan jisim atom relatif bagi unsur M dan O.*

Element ***Unsur***	M	O
Mass/ g *Jisim/ g*	1.62	1.44
Relative atomic mass *Jisim atom relatif*	27	16

Table 1
Jadual 1

Which of the following formulae is the empirical formula for the oxide of M?
Antara berikut yang manakah adalah formula empirik bagi oksida M?

A MO

B MO_2

C M_2O

D M_2O_3

16 The electron arrangements of atoms of elements P and Q are 2.4 and 2.6 respectively. Which of the following statements is **true** about the compound formed between P and Q?

Susunan elektron bagi atom unsur P *dan* Q *masing-masing adalah* 2.4 *dan* 2.6.
Antara pernyataaan yang berikut yang manakah ***benar*** *tentang sebatian yang terbentuk antara sebatian* P *dan* Q?

A Each atom Q receives an electron from one atom P
Setiap atom Q *menerima satu elektron dari atom* P

B Each atom P receives four electrons from one atom Q
Setiap atom P *menerima empat elektron dari atom* Q

C Each atom P combines with two atoms Q by sharing of electrons
Setiap atom P *bergabung dengan dua atom* Q *melalui perkongsian elektron*

D Each atom P combines with one atom Q by transfer of electrons
Setiap atom P *bergabung dengan satu atom* Q *melalui pemindahan elektron*

17 The chemical equation below shows a reaction between chlorine and iron.
Which of the following is the formula of the product?
Persamaan kimia di bawah menunjukkan suatu tindak balas antara klorin dengan besi.
Antara berikut yang manakah formula hasil tindak balas itu?

$$Cl_2(g) + Fe(s) \rightarrow \boxed{\quad}$$

A FeO

B Fe_2O_3

C $FeCl_2$

D $FeCl_3$

18 Diagram 6 shows the electrolysis of 1.0 mol dm^{-3} potassium iodide solution.
Rajah 6 *menunjukkan elektrolisis bagi larutan kalium iodida* 1.0 mol dm^{-3}.

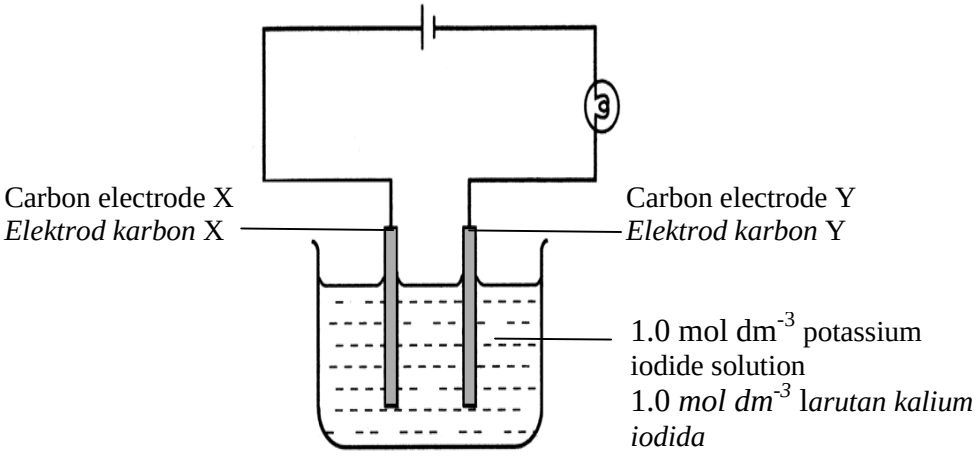


Diagram 6
Rajah 6

Which of the following are the products formed at the carbon electrodes X and Y?
Antara berikut yang manakah hasil yang terbentuk pada elektrod karbon X *dan* Y?

	Carbon electrode X ***Elektrod karbon* X**	**Carbon electrode Y** ***Elektrod karbon* Y**
A	Oxygen *Oksigen*	Hydrogen *Hidrogen*
B	Iodine *Iodin*	Hydrogen *Hidrogen*
C	Hydrogen *Hidrogen*	Oxygen *Oksigen*
D	Iodine *Iodin*	Potassium *Kalium*

19 Table 2 shows the concentration and pH value of hydrochloric acid and ethanoic acid
Jadual 2 menunjukkan kepekatan dan nilai pH bagi asid hidroklorik dan asid etanoik

Type of acid ***Jenis asid***	**Concentration / mol dm^{-3}** ***Kepekatan* / mol dm^{-3}**	**pH value** ***nilai pH***
Hydrochloric ric acid *Asid hidroklorik*	0.1	1
Ethanoic acid *Asid etanoik*	0.1	4

Table 2
Jadual 2

Which of the following statements are **true** about both acids?
*Antara pernyataan berikut yang manakah **benar** tentang kedua-dua asid*?

I Hydrochloric acid is a stronger acid compared to ethanoic acid.
Asid hidroklorik adalah asid lebih kuat berbanding asid etanoik.

II Concentration of hydrogen ions is higher in hydrochloric acid compared with ethanoic acid.
Kepekatan ion hydrogen lebih tinggi dalam asid hidroklorik berbanding dengan asid etanoik.

III The degree of dissociation of hydrochloric acid in water is higher than ethanoic acid.
Darjah penceraian asid hidroklorik dalam air lebih tinggi berbanding asid etanoik.

IV Both acids can neutralized an alkali to produce salt and water
Kedua-dua asid dapat meneutralkan alkali untuk menghasilkan garam dan air

A I and III

B III and IV

C I, II and III

D I, II, III and IV

20 Diagram 7 shows the set up of the apparatus for the action of heat on substance W. After a few minutes lime water turns cloudy.
Rajah 7 menunjukkan susunan radas bagi kesan haba ke atas bahan W. Selepas beberapa minit air kapur menjadi keruh.

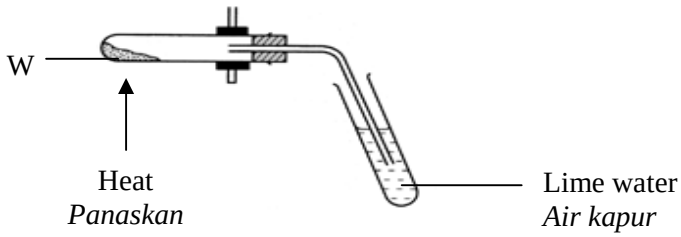


Diagram 7
Rajah 7

Which of the following salts could be W?
Antara garam-garam berikut yang manakah mungkin W?

I Lead(II) nitrate
Plumbum(II) nitrat

II Zinc carbonate
Zink karbonat

III Copper(II) carbonate
Kuprum(II) *karbonat*

IV Potassium carbonate
Kalium karbonat

A I and IV

B II and III

C I, II and III

D II, III and IV

21 A substance has the following properties:
Suatu bahan mempunyai ciri-ciri berikut:

- Hard and opaque
  Keras dan tak lutcahaya
- Good insulator of heat and electricity
  Penebat haba dan elektrik yang baik
- Inert towards chemicals
  Lengai terhadap bahan kimia

Which of following substances has the above properties?
Antara bahan-bahan berikut yang manakah mempunyai ciri-ciri seperti di atas?

A Ceramics
Seramik

B Glass
Kaca

C Metal
Logam

D Polymer
Polimer

22 The following equation shows the redox reaction between copper and silver nitrate solution.
Persamaan berikut menunjukkan tindak balas redok antara kuprum dengan larutan argentum nitrat.

$$Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$$

Which of the following statements is **true** about this reaction?
*Antara pernyataan berikut yang manakah **benar** mengenai tindak balas ini?*

A Silver ion is oxidised
Ion argentum dioksidakan

B Copper is the oxidising agent
Kuprum adalah agen pengoksidaan

C The oxidation number of copper increases
Nombor pengoksidaan bagi kuprum bertambah

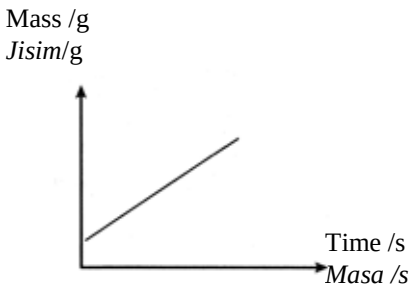
D The oxidation number of nitrogen decreases
Nombor pengoksidaan bagi nitrogen berkurang

23 The following equation shows the reaction between excess zinc powder and dilute nitric acid:
Persamaan berikut menunjukkan tindak balas antara serbuk zink berlebihan dengan asid nitrik:

$$Zn\ (s) + 2HNO_3\ (aq) \rightarrow Zn(NO_3)_2\ (aq) + H_2\ (g)$$

Which of the following graphs represents the mass of zinc against time?
Antara graf berikut yang manakah mewakili jisim zink melawan masa?

A



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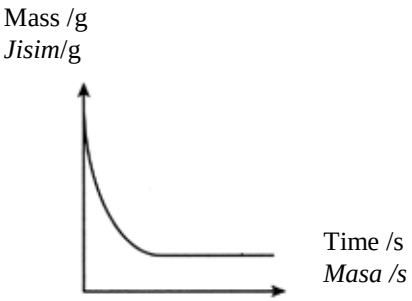
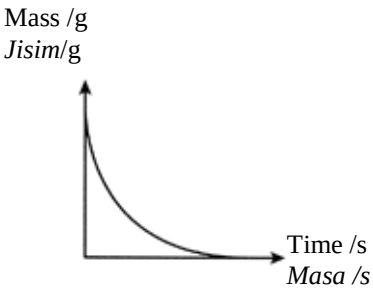
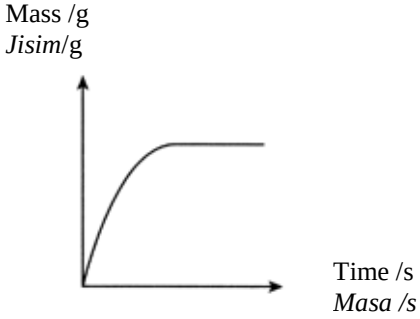


C



D

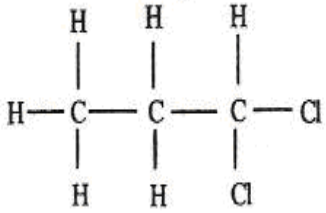


24 The following equation represents the reaction between propene and chlorine.
Persamaan berikut mewakili tindak balas antara propena dan klorin.

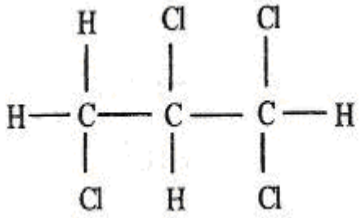
$$\text{Propene} + Cl_2 \rightarrow Z$$

Which of the following is the structural formula for Z?
Antara berikut yang manakah adalah formula struktur bagi Z?

A



B



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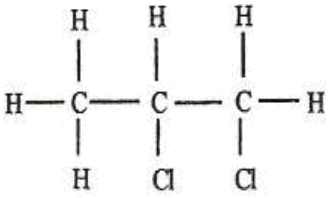
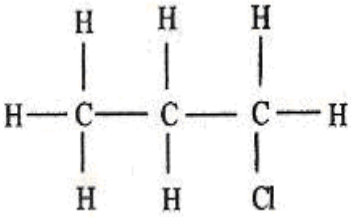


D



25 Table 3 shows the reactants and heat of neutralization of the reaction between sodium hydroxide solution with methanoic acid and hydrochloric acid.
Jadual 3 menunjukkan bahan tindak balas dan haba peneutralan bagi tindak balas antara larutan natrium hidroksida dengan asid metanoik dan asid hidroklorik.

Reactants ***Bahan tindak balas***	**Heat of neutralization/ kJ mol^{-1}** ***Haba peneutralan/ kJ mol^{-1}***
Methanoic acid and sodium hydroxide solution *Asid metanoik dan larutan natrium hidroksida*	- 54.0
Hydrochloric acid and sodium hydroxide solution *Asid hidroklorik dan larutan natrium hidroksida*	-57.0

Table 3
Jadual 3

Which of the following statements is **true**?
*Antara pernyataan berikut yang manakah **benar**?*

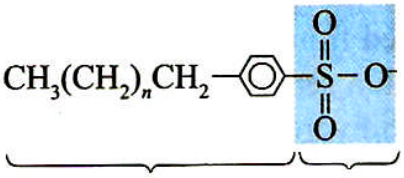
A Methanoic acid partially dissociates in water
Asid metanoik tercerai separa di dalam air

B Methanoic acid releases energy to the surrounding
Asid metanoik membebaskan tenaga ke persekitaran

C Methanoic acid produces H^+ ions which can be replaced by Na^+ ions
Asid metanoik menghasilkan ion H^+ *yang boleh menggantikan ion* Na^+

D Methanoic acid absorbed some of the heat energy released to complete its dissociation in water
Asid metanoik menyerap sebahagian daripada tenaga yang dibebaskan untuk melengkapkan penceraiannya dalam air

26 Diagram 8 shows the structure of a detergent ion.
Rajah 8 *menunjukkan struktur bagi satu ion detergen.*



Part X *Bahagian X* Part Y *Bahagian Y*

Diagram 8
Rajah 8

Which of the following statements explains the diagram?
Antara pernyataan berikut yang manakah menerangkan rajah tersebut?

A Parts X and Y are soluble in water
Bahagian X dan bahagian Y larut dalam air

B Parts X and Y are soluble in grease
Bahagian X dan bahagian Y larut dalam gris

C Part X is soluble in grease and part Y is soluble in water
Bahagian X larut dalam gris tetapi bahagian Y larut dalam air

D Part X is soluble in water and part Y is soluble in grease
Bahagian X larut dalam air tetapi bahagian Y larut dalam gris

27 The electron arrangement of atom Z is 2.8.1
Which of the following is the number of protons and electrons of Z^+ ion?

Susunan elektron atom Z *ialah* 2.8.1
Antara berikut yang manakah bilangan proton dan elektron bagi ion Z^+?

	Number of proton ***Bilangan proton***	**Number of electron** ***Bilangan elektron***
A	10	11
B	11	11
C	11	10
D	10	12

28 Diagram 9 shows the symbols for elements X and Y.
Rajah 9 *menunjukkan simbol bagi unsur* X *dan* Y.

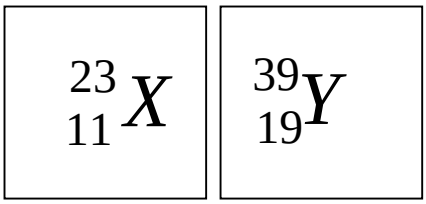


Diagram 9
Rajah 9

Which of the following is true about elements X and Y?
Antara berikut yang manakah adalah benar bagi unsur X *dan* Y?

A Element X is less reactive than element Y
Unsur X adalah kurang reaktif daripada unsur Y

B Both elements X and Y are monoatomic gas
Kedua-dua unsur X dan Y adalah gas monoatom

C Both elements X and Y are non metal
Kedua-dua unsur X dan Y adalah bukan logam

D Element X reacts with element Y to form an ionic compound
Unsur X bertindak balas dengan unsur Y untuk membentuk sebatian ion.

29 10 g of metal oxide with a formula of MO can be completely reduced to 8 g of metal M. What is the relative atomic mass of M?
10 g *oksida logam dengan formula* MO *boleh diturunkan kepada* 8 g *logam* M.
Apakah jisim atom relatif bagi M?

[Relative atomic mass: O = 16]
[*Jisim atom relatif* : O = 16]

A 32
B 40
C 64
D 80

30 Diagram 10 shows the electron arrangement of a compound formed between atoms X and Y.
Rajah 10 *menunjukkan susunan elektron bagi sebatian yang terbentuk antara atom* X *and* Y.

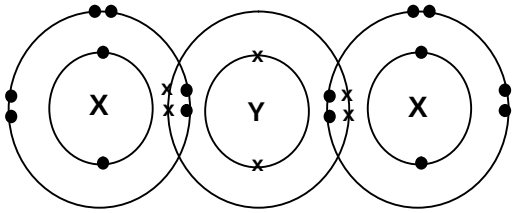


Diagram 10
Rajah 10

Which of the following statements is **true** about the compound?
Antara pernyataan berikut yang manakah ***benar*** *tentang sebatian tersebut*?

A It is an ionic compound
Sebatian itu adalah sebatian ionik

B The compound is formed by covalent bonds
Sebatian itu terbentuk melalui ikatan kovalen

C The compound has a high boiling point
Sebatian itu mempunyai takat didih yang tinggi

D The compound is formed by electron transfer
Sebatian itu terbentuk melalui pemindahan elektron

31 What is the volume of 2.0 mol dm^{-3} potassium hydroxide solution is needed to prepare 500 cm^3 of 0.1 mol dm^{-3} potassium hydroxide solution.
Berapakah isipadu larutan kalium hidroksida 2.0 mol dm^{-3} *yang diperlukan untuk menyediakan* 500 cm^3 *larutan kalium hidroksida* 0.1 mol dm^{-3}.

A 25 cm^3
B 50 cm^3
C 100 cm^3
D 500 cm^3

32 Diagram 11 shows the electrolysis of copper(II) nitrate solution using copper as electrodes.
Rajah 11 *menunjukkan elektrolisis bagi larutan kuprum*(II) *nitrat dengan menggunakan elektrod-elektrod kuprum..*

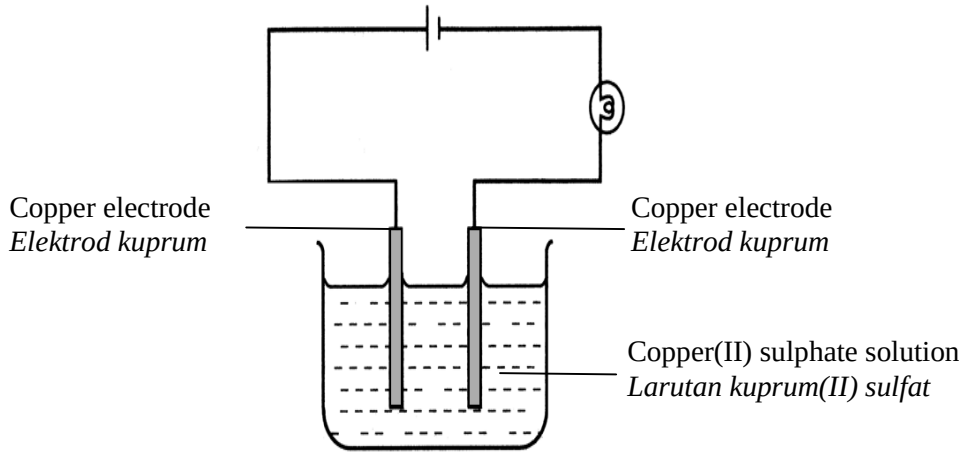


Diagram 11
Rajah 11

Which of the following half equations represents the reactions at the anode and cathode?
Antara setengah persamaan berikut yang manakah mewakili tindak balas di anod dan katod?

	Anode ***Anod***	**Cathode** ***Katod***
A	$4OH^- \rightarrow 2H_2O + O_2 + 4e$	$2H^+ + 2e \rightarrow H_2$
B	$Cu \rightarrow Cu^{2+} + 2e$	$Cu^{2+} + 2e \rightarrow Cu$
C	$4OH^- \rightarrow 2H_2O + O_2 + 4e$	$Cu^{2+} + 2e \rightarrow Cu$
D	$Cu \rightarrow Cu^{2+} + 2e$	$2H^+ + 2e \rightarrow H_2$

33 Which of the following substances can be used to differentiate between sodium sulphate solution and sodium chloride solution?
Antara bahan berikut yang manakah boleh digunakan untuk membezakan larutan natrium sulfat dan larutan natrium klorida?

A Dilute nitric acid
Asid nitrik cair

B Barium nitrate solution
Larutan barium nitrat

C Potassium iodide solution
Larutan kalium iodida

D Magnesium nitrate solution
Larutan magnesium nitrat

34 Diagram 12 shows an energy profile diagram. E_a is the activation energy for the decomposition of hydrogen peroxide.
Rajah 12 menunjukkan suatu gambar rajah profil tenaga. E_a bagi penguraian hidrogen peroksida.

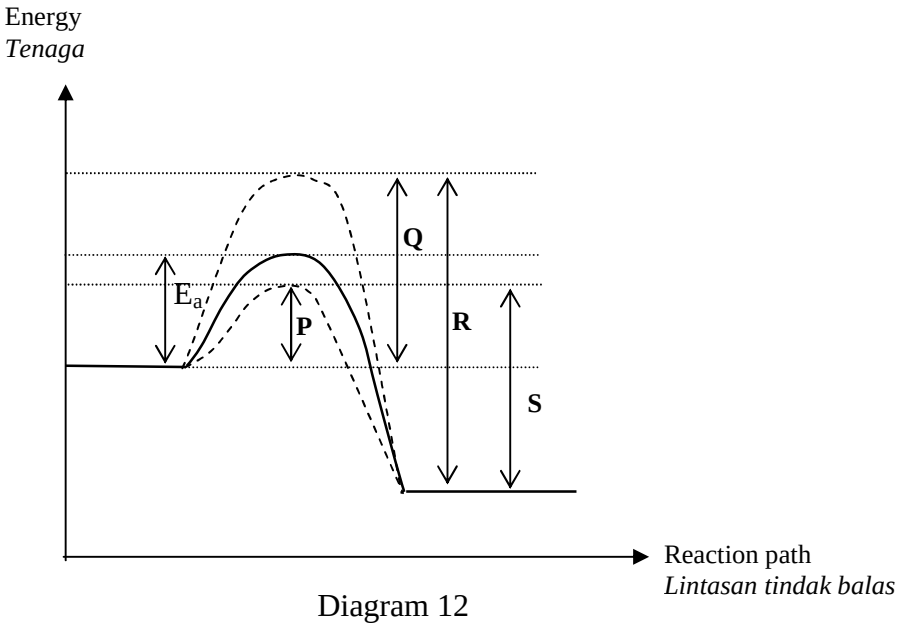


Diagram 12
Rajah 12

Which of the following is the activation energy for the dissociation of hydrogen peroxide when manganese(IV) oxide is added?
*Antara berikut yang manakah tenaga pengaktifan bagi penguraian hydrogen peroksida apabila mangan(*IV*) oksida ditambahkan*?

A P
B Q
C R
D S

35 Diagram 13 shows the structural formula of pent-1-ene.
Rajah 13 *menunjukkan formula struktur bagi pent*-1-*ena*.

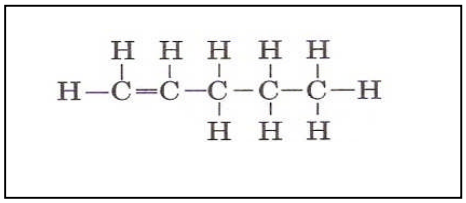
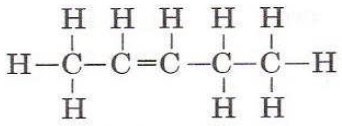


Diagram 13
Rajah 13

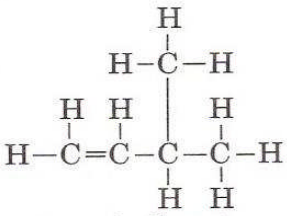
Which of the following are the structural formulae and names for the isomers of pent-1-ene?
Antara berikut yang manakah adalah formula struktur dan nama isomer bagi pent-1-*ena?*

I



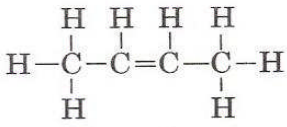
Pent-2-ene

II



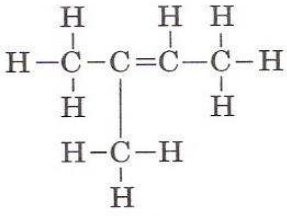
3-methylbut-1-ene

III



Pent-3-ene

IV



2-methylbut-2-ene

A I and IV

B II and III

C I, II and IV

D I, II, III and IV

36 In an experiment 50 cm^3 1.0 mol $dm^{-3}$of dilute nitric acid solution is mixed with 50 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution in a polystyrene cup. The temperature of the mixture increased by 14^0C. What is the heat released in the experiment?
[Specific heat capacity of the solution is 4.2 $Jg^{-1o}C^{-1}$]

Dalam satu eksperimen 50 cm^3 *larutan asid nitrik* 1.0 mol dm^{-3} *dicampur dengan* 50 cm^3 *larutan natrium hidroksida* 1.0 mol dm^{-3} *di dalam cawan polistirena. Suhu campuran itu bertambah sebanyak* 14^oC. *Berapakah haba yang dibebaskan dalam eksperimen itu?*
[*Muatan haba tentu larutan ialah* 4.2 $Jg^{-1o}C^{-1}$]

A 1470 J
B 2940 J
C 4410 J
D 5880 J

37 Which of the following fertilizers is the most suitable to increase soil fertility?
[Relative molecular mass: $NaNO_3$ = 85, NH_4NO_3= 80, $(NH_4)_2SO_4$ = 132, $(NH_4)_3PO_4$ = 149, Relative atomic mass: N=14]

Antara baja berikut yang manakah paling sesuai untuk meningkatkan kesuburan tanah?
[*Jisim molekul relatif*: $NaNO_3$ = 85, NH_4NO_3= 80, $(NH_4)_2SO_4$ = 132, $(NH_4)_3PO_4$ = 149, *Jisim atom relatif*: N=14]

A $NaNO_3$
B NH_4NO_3
C $(NH_4)_2SO_4$
D $(NH_4)_3PO_4$

38 Which of the following equations represent a redox reaction?
Antara persamaan beriku, yang manakah mewakili tindak balas redok?

I $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$
II $2HCl + Zn \rightarrow ZnCl_2 + H_2$
III $Ag^+ + Cl^- \rightarrow AgCl$
IV $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$

A I and II

B II and IV

C I and III

D III and IV

39 The following equation shows the decomposition of carbonate M when heated strongly.
Persamaan berikut menunjukkan penguraian garam karbonat M apabila dipanaskan dengan kuat.

$$MCO_3 \rightarrow MO + CO_2$$

What is the mass of MCO_3 needed to produce 8.0 g of MO?
Apakah jisim MCO_3 *yang diperlukan untuk menghasilkan* 8.0 g MO?

[Relative atomic mass: C = 12, O = 16, M = 64]
[*Jisim atom relatif* : C = 12, O = 16, M = 64]

A 3.7 g

B 6.2 g

C 8.0 g

D 12.4 g

40 A patient is experiencing depression and has difficulty in sleeping. Which of the following medicine is suitable for treating this patient?
Seorang pesakit menghadapi kemurungan dan kesusahan untuk tidur. Antara ubat berikut, yang manakah sesuai bagi merawat pesakit tersebut?

A Codeine
Kodeina

B Barbiturate
Barbiturat

C Paracetamol
Parasetamol

D Streptomysin
Streptomisin

41 The nucleon number of X is 40 and X^{2+} ion has 18 electrons.
What is the number of neutrons of X^{2+} ion?

Nombor nukleon X ialah 40 dan ion X^{2+} mempunyai 18 elektron.
Berapakah bilangan neutron bagi ion X^{2+} ?

A 18

B 20

C 22

D 40

42 The following chemical equation shows the reaction between sodium and oxygen.
Persamaan kimia berikut menunjukkan tindak balas antara natrium dengan oksigen.

$$\mathbf{n}Na(s) + O_2(g) \rightarrow \mathbf{m}\boxed{\quad}$$

What are the values of n, m and the formula in the box?
Apakah nilai bagi n, m dan formula dalam kotak?

	n	m	Formula
A	4	2	Na_2O
B	2	2	Na_2O
C	2	2	NaO_2
D	2	4	NaO

43 Diagram 14 shows the ionic formulae of elements A and B.
Rajah 14 *menunjukkan formula ion bagi unsur* A *dan* B.

$\boxed{A^{3+}}$ $\boxed{B^{2-}}$

Diagram 14
Rajah 14

Which of the following ionic equations represents the reaction between the ions?
Antara persamaan ion berikut yang manakah mewakili tindak balas antara ion-ion tersebut?

A $A^{3+} + B^{2-} \rightarrow A_2B_3$

B $2A + 3B \rightarrow A_2B_3$

C $2A^{3+} + 3B^{2-} \rightarrow A_2B_3$

D $3A^{3+} + 2B^{2-} \rightarrow A_2B_3$

44 The following equation shows the reaction between sulphuric acid and potassium hydroxide.
Persamaan berikut menunjukkan tindak balas antara asid sulfurik dan kalium hidroksida.

$$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2\ H_2O$$

What is the volume of 0.5 mol dm^{-3} potassium hydroxide solution which can neutralize 50.0 cm^3 of 0.5 mol dm^{-3} sulphuric acid?
Berapakah isipadu larutan kalium hidroksida 0.5 mol dm^{-3} *yang boleh meneutralkan 50.0* cm^3 *asid sulfurik* 0.5 mol dm^{-3}?

A 25.0 cm^3
B 50.0 cm^3
C 75.0 cm^3
D 100.0 cm^3

45 Table 4 shows the information of three chemical cells.
Jadual 4 *menunjukkan maklumat tentang tiga sel kimia*.

Chemical cell ***Sel kimia***	**Pair of metal electrodes** ***Pasangan elektrod logam***	**Voltage /V** ***Voltan /V***	**Negative terminal** ***Terminal negatif***
I	Q, P	0.7	Q
II	R, Q	2.7	Q
III	R, S	1.1	S

Table 4
Jadual 4

Which of the following is the arrangement in ascending order of these metals in the electrochemical series?
Antara yang berikut, yang manakah susunan secara menaik bagi logam-logam ini dalam siri elektrokimia?

A R, P, S, Q
B Q, P, S, R
C S, R, P, Q
D R, S, P, Q

46 The following chemical equation shows the reaction between potassium iodide solution and lead(II) nitrate solution:
Persamaan kimia berikut menunjukkan tindak balas antara larutan kalium iodida dan larutan plumbum(II) *nitrat*:

$$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$$

Calculate the maximum mass of precipitate formed when excess potassium iodide solution is added to 50 cm^3 of 0.2 mol dm^{-3} lead(II) nitrate solution.
[Relative atomic mass: Pb = 207, I = 127, K = 39, N =14, O =16]

Hitungkan jisim maksimum mendakan yang terbentuk apabila larutan kalium iodida berlebihan ditambah ke dalam 50 cm^3 *larutan plumbum*(II) *nitrat* 0.2 mol dm^{-3}.
[*Jisim atom relatif*: Pb = 207, I = 127, K = 39, N =14, O =16]

A 1.01 g
B 2.02 g
C 4.61 g
D 9.22 g

47 Excess calcium carbonate powder reacts with 50 cm^3 of 0.1 mol dm^{-3} hydrochloric acid to produce carbon dioxide gas.
Which of the following acids will produce a highest rate of reaction?

Kalsium karbonat berlebihan bertindak balas dengan 50 cm^3 *asid hidroklorik* 0.1 *mol* dm^{-3} *bagi menghasilkan gas karbon dioksida.*
Antara asid berikut yang manakah akan menghasilkan kadar tindak balas yang paling tinggi?

A 50 cm^3 of 0.2 mol dm^{-3} sulphuric acid
50 cm^3 *sulfurik asid* 0.2 mol dm^{-3}

B 50 cm^3 of 0.2 mol dm^{-3} ethanoic acid
50 cm^3 *asid etanoik asid* 0.2 mol dm^{-3}

C 50 cm^3 of 0.2 mol dm^{-3} carbonic acid
50 cm^3 *asid karbonik* 0.2 mol dm^{-3}

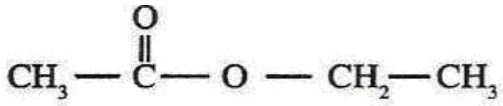
D 50 cm^3 of 0.2 mol dm^{-3} nitric acid
50 cm^3 *asid nitrik* 0.2 mol dm^{-3}

48

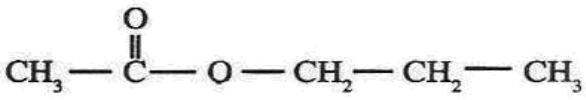
Ethanoic acid + propanol	→	Compound X + Water
Asid etanoik + propanol	→	*Sebatian* X + *Air*

What is the structural formula of compound X?
Apakah formula struktur bagi sebatian X?

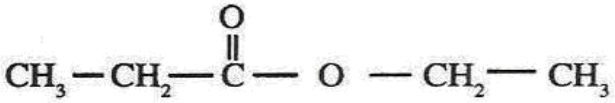
A



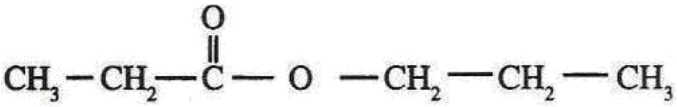
B



C



D



49 Which of the following reactions needs a catalyst for the production of sulphuric acid by the Contact Process?
Antara tindak balas berikut yang manakah memerlukan mangkin untuk penghasilan asid sulfurik melalui Proses Sentuh?

A $S + O_2 \rightarrow SO_2$

B $2SO_2 + O_2 \rightarrow 2SO_3$

C $SO_3 + H_2S_2O_7 \rightarrow H_2S_2O_7$

D $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

50 Diagram 15 shows a method to prevent the corrosion of underground steel tank by sacrificial protection.
Rajah 15 *menunjukkan satu cara mencegah kakisan tangki keluli di bawah tanah secara perlindungan korban.*

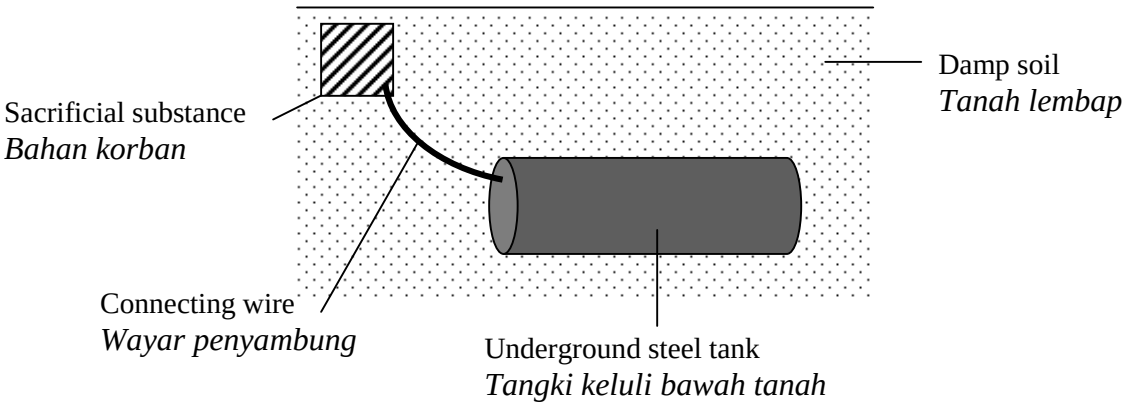


Diagram 15
Rajah 15

Which of the following elements is the most suitable as the sacrificial substance?
Antara unsur berikut yang manakah paling sesuai sebagai bahan korban?

A Carbon
Karbon

B Copper
Kuprum

C Iron
Ferum

D Magnesium
Magnesium

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

Nama :..... Tingkatan :.....

SULIT
4541/2
Chemistry
Kertas 2
Ogos
2009
2 ½ jam

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2009

CHEMISTRY

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tuliskan nama dan tingkatan pada ruang yang disediakan.*
2. *Jawab **semua** soalan daripada **Bahagian A**. Tuliskan jawapan anda dalam ruang yang disediakan*
3. *Jawab **satu** soalan daripada **Bahagian B** dan **satu** soalan daripada **Bahagian C**. Jawapan kepada **Bahagian B** dan **Bahagian C** hendaklah ditulis pada kertas tulis.*
4. *Anda diminta menjawab dengan lebih terperinci untuk Bahagian B dan Bahagian C. Jawapan mestilah jelas dan logik. Persamaan, gambar rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda boleh digunakan.*
5. *Anda hendaklah menyerahkan kertas tulis dan kertas tambahan, jika digunakan bersama-sama dengan kertas soalan.*
6. *Penggunaan kalkulator saintifik yang tidak boleh diprogramkan adalah dibenarkan.*

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

Kertas soalan ini mengandungi **20** halaman bercetak

Section A
[60 *marks*]
Answer **all** *questions.*

1 Diagram 1 shows the apparatus set-up for preparing soap.
Rajah 1 menunjukkan susunan radas bagi penyediaan sabun.

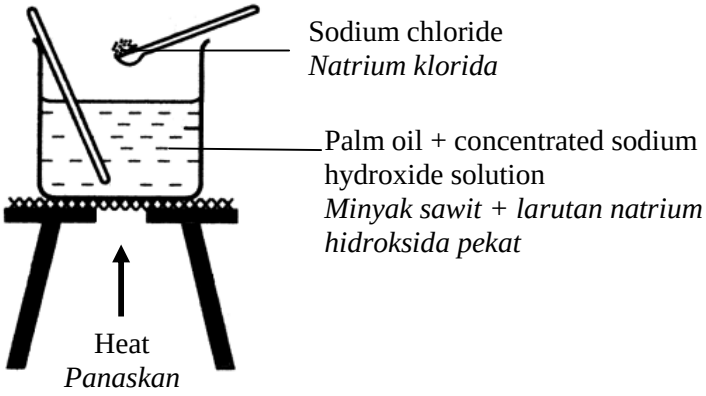


Diagram 1
Rajah 1

(a) (i) State the name of the process to prepare soap.
Nyatakan nama bagi proses untuk menyediakan sabun.

……..…….....
[1 mark]

(ii) What is the homologous series of palm oil?
Apakah siri homolog bagi minyak sawit?

.....…….
[1 mark]

(iii) Why is sodium chloride added to the mixture?
Mengapakah natrium klorida ditambah kepada campuran itu?

…….
[1 mark]

(iv) Suggest another solution which can replace sodium hydroxide
Cadangkan satu larutan lain yang boleh menggantikan natrium hidroksida.

…….
[1 mark]

(b) The cleansing action of a detergent is more effective than soap in hard water
Tindakan pencucian detergen adalah lebih berkesan daripada sabun dalam air liat.

(i) What is hard water?
Apakah air liat?

…….
[1 mark]

(ii) Explain why detergent is more effective than soap in hard water.
Terangkan mengapa detergen adalah lebih berkesan daripada sabun dalam air liat.

…...…….

…...…….
[2 marks]

(c) Sodium benzoate, ascorbic acid and monosodium glutamate are examples of food additives.
Natrium benzoat, asid askorbik dan mononatrium glutamat adalah contoh- contoh bahan tambah makanan.

(i) Complete the table below:
Lengkapkan jadual di bawah:

Type of food additive ***Jenis bahan tambah makanan***	**Example** ***Contoh***	**Function** ***Fungsi***
Preservatives *Pengawet*	Sodium benzoate in tomato sauce *Natrium benzoat di dalam sos tomato*	…… ……
…….	Ascorbic acid in fruit juice *Asid askorbik di dalam jus buah*	To preserve the colour of fruit juice *Mengekalkan warna jus buah*

[2 marks]

(ii) Monosodium glutamate is a permitted flavouring. What is the effect of monosodium glutamate to a person who is sensitive to it?
Mononatrium glutamat adalah perisa makanan yang dibenarkan. Apakah kesan mononatrium glutamat kepada orang yang sensitif dengannya?

…….
[1 mark]

2 (a) Diagram 2.1 shows the symbol for elements V, W, X and Y.
Rajah 2.1 menunjukkan simbol-simbol bagi unsur-unsur V, W, X dan Y.

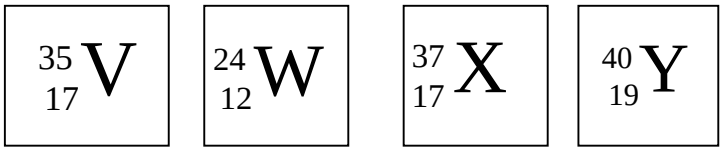


Diagram 2.1
Rajah 2.1

(i) State the name of the three subatomic particles in an atom.
Nyatakan nama bagi tiga zarah subatom dalam suatu atom.

.....

[1 mark]

(ii) Draw the electron arrangement of an ion of element X.
Lukiskan susunan elektron bagi satu ion bagi unsur X.

[1 mark]

(iii) Which of the atoms above are isotopes of an element? Explain your answer.
Yang manakah atom-atom di atas adalah isotop bagi suatu unsur? Terangkan jawapan anda.

.....

.....

[2 marks]

(iv) State the position of element Y in the Periodic Table of Elements.
Nyatakan kedudukan unsur Y dalam Jadual Berkala Unsur.

.....

[1 mark]

(v) What is the number of neutrons in atom V?
Berapakah bilangan neutron dalam atom V?

.....

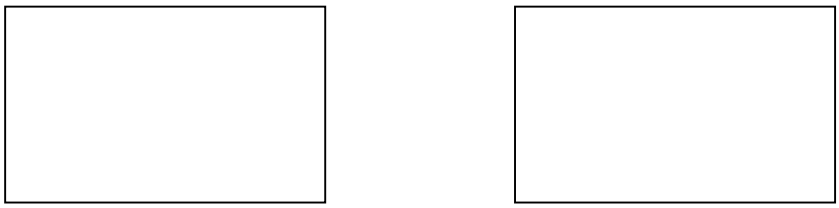
[1 mark]

(b) Table 2 shows the melting point and boiling point of substances P, Q, R and S.
Jadual 2 menunjukkan takat lebur dan takat didih bagi bahan P, Q, R dan S.

Substance	Melting point (^oC)	Boiling point (^oC)
P	–42	–10
Q	65	110
R	–8	54
S	200	450

Table 2
Jadual 2

(i) Draw the arrangement of particles of substances Q and R at room temperature.
Lukis susunan zarah-zarah bagi bahan Q dan R pada suhu bilik.



Substance Q
Bahan Q

Substance R
Bahan R

[2 marks]

(ii) Diagram 2.2 shows the cooling graph of liquid Q.
Rajah 2.2 menunjukkan graf penyejukan bagi cecair Q.

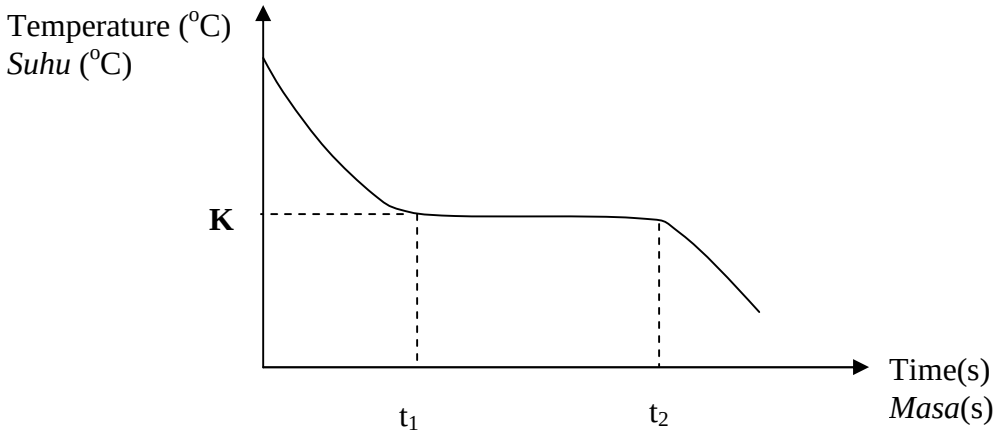


Diagram 2.2
Rajah 2.2

State the value of K **.**
Give reason why the temperature remains constant at K^oC from t_1 to t_2.
Nyatakan nilai K.
Beri sebab mengapa suhu tidak berubah pada K^oC dari t_1 hingga t_2

……

……

[2 marks]

3 Diagram 3 shows the apparatus set-up to determine the empirical formula of oxide metal M.
Rajah 3 menunjukkan susunan radas untuk menentukan formula empirik bagi oksida logam M.

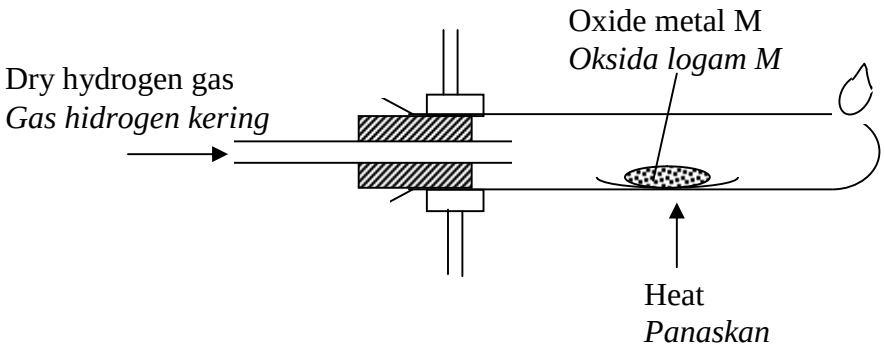


Diagram 3
Rajah 3

(a) (i) State the name of two reactants to prepare hydrogen gas in the laboratory.
Nyatakan nama dua bahan tindak balas untuk menyediakan gas hidrogen dalam makmal.

.....

[1 *mark*]

(ii) Write the chemical equation for the reaction in (a)(i).
Tuliskan persamaan kimia bagi tindak balas di (a)(i).

.....

[1 *mark*]

(b) State one precaution that must be taken when carrying out the experiment.
Nyatakan satu langkah berjaga-jaga yang mesti diambil semasa menjalankan eksperimen itu.

.....

[1 *mark*]

(c) Table 3 shows the results of the experiment:
Jadual 3 menunjukkan keputusan eksperimen itu:

Mass of combustion tube + asbestos paper *Jisim tiub pembakaran + kertas asbestos*	36.50 g
Mass of combustion tube + asbestos paper + M oxide *Jisim tiub pembakaran + kertas asbestos + oksida M*	37.30 g
Mass of combustion tube + asbestos paper + M *Jisim tiub pembakaran + kertas asbestos* + M	37.14 g

Table 3
Jadual 3

(i) Based on the results in Table 3, determine the empirical formula of M oxide.
Berdasarkan keputusan dalam Jadual 3, tentukan formula empirik bagi oksida M.
[Relative atomic mass ; O=16, M=64]
[Jisim atom relatif ; O=16, M=64]

[3 *marks*]

(ii) Write the chemical equation for the reaction between M oxide and hydrogen gas
Tulis persamaan kimia bagi tindak balas antara oksida M dengan gas hidrogen.

.....

[1 *mark*]

(d) (i) The empirical formula of magnesium oxide cannot be determined by the above method. Explain why.
Formula empirik bagi magnesium oksida tidak boleh ditentukan melalui kaedah di atas. Terangkan menagapa..

.....

[1 *mark*]

(ii) Draw a suitable set up of apparatus for the experiment to determine the empirical formula of magnesium oxide.
Lukiskan susunan radas yang sesuai untuk eksperimen bagi menentukan formula empirik magnesium oksida.

[2 *marks*]

4 Diagram 4 shows Experiments I and II in the preparation of a salt.
Rajah 4 menunjukkan Eksperimen 1 dan II dalam penyediaan garam.

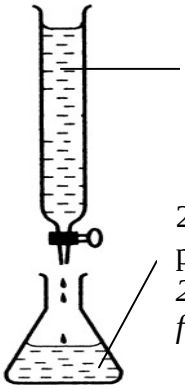
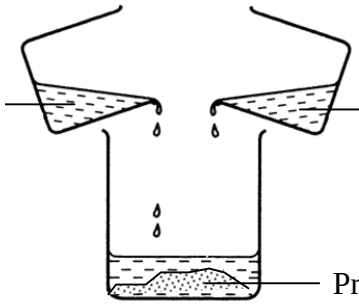
Experiment *Eksperimen*	**Method** *Kaedah*
I	 0.1 mol dm^{-3} hydrochloric acid *0.1 mol dm^{-3} asid hidroklorik* 25.0 cm^3 of 0.2 mol dm^{-3} sodium hydroxide + phenolphthalein *25.0 cm^3 natrium hidroksida 0.2 mol dm^{-3} + fenolftalein*
II	10 cm^3 of 1.0 mol dm^{-3} lead(II) nitrate solution *10 cm^3 larutan plumbum(II) nitrat* 1.0 *mol dm^{-3}*  Excess potassium iodide solution *Larutan kalium iodida berlebihan* Precipitate X *Mendakan X*

Diagram 4
Rajah 4

(a) Based on Experiment I:
Berdasarkan Eksperimen I :

(i) State the name for the reaction.
Nyatakan nama bagi tindak balas itu.

.....
[1 mark]

(ii) Write the chemical equation for the reaction that occurs in the conical flask.
Tuliskan persamaan kimia bagi tindakbalas yang berlaku di dalam kelalang kon.

.....
[1 mark]

(iii) State the colour change in the conical flask at the end point.
Nyatakan perubahan warna di dalam kelalang kon pada takat akhir.

.....
[1 mark]

(iv) Calculate the volume of hydrochloric acid used to neutralise the sodium hydroxide solution.
Hitungkan isi padu asid hidroklorik yang digunakan untuk meneutralkan larutan natrium hidroksida.

[2 marks]

(b) Based on Experiment II:
Berdasarkan Eksperimen II :

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

.....
[1 mark]

(ii) State the name of precipitate X.
Nyatakan nama bagi mendakan X.

.....
[1 mark]

(iii) Write the ionic equation for the reaction.
Tuliskan persamaan ion bagi tindak balas itu.

.....
[1 mark]

(iv) Calculate the maximum mass of precipitate X formed.
[Relative atomic mass ; Pb=207, I=127]
Hitungkan jisim maksimum mendakan X yang terbentuk.
[Jisim atom relatif ; Pb=207, I=127]

[2 marks]

5 Diagram 5 shows a series of changes on alcohol J with a molecular formula C_3H_8O.
Rajah 5 menunjukkan siri penukaran alkohol J dengan formula molekul C_3H_8O.

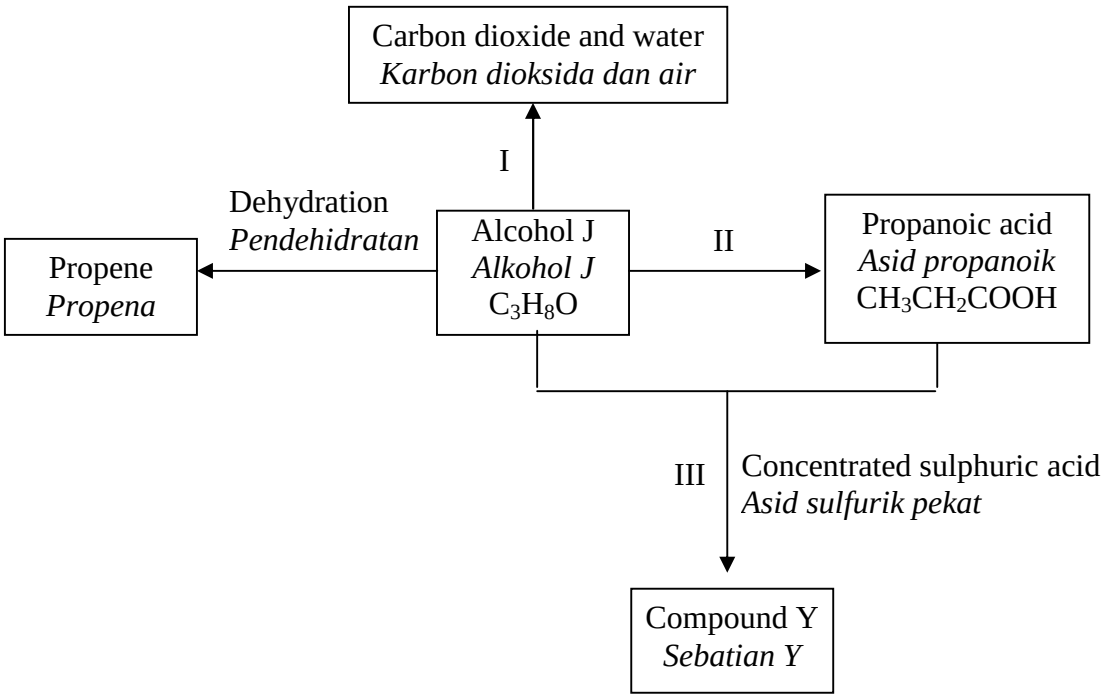


Diagram 5
Rajah 5

(a) Write the chemical equation for the reaction in process I.
Tuliskan persamaan kimia di dalam proses I.

.....

[1 *mark*]

(b) Alcohol J can be converted into propanoic acid through process II.
Alkohol J boleh ditukarkan kepada asid propanoik melalui proses II.

(i) State the name of process II.
Nyatakan nama proses II.

.....

[1 *mark*]

(ii) Describe briefly the method to prepare propanoic acid from alcohol J.
Huraikan secara ringkas kaedah menyediakan asid propanoik dari alkohol J.

.....

.....

.....

[2 *marks*]

(iii) Draw the structural formula for all the isomers of alcohol J.
Lukiskan formula struktur semua isomer bagi alkohol J .

[2 *marks*]

(c) Compound Y is produced from the reaction between alcohol J and propanoic acid through process III.
Sebatian Y dihasilkan dari tindak balas antara alkohol J dan asid propanoik melalui proses III.

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

.....

[1 *mark*]

(ii) State a special characteristic for compound Y.
Nyatakan sifat istimewa bagi sebatian Y.

.....

[1 *mark*]

(d) Propene can be converted to propane by the hydrogenation process.
Desribe briefly one chemical test to differentiate between propene and propane
Propena boleh ditukarkan kepada propana melalui proses penghidrogenan.
Huraikan secara ringkas satu ujian kimia untuk membezakan antara propena dan propana.

.....

.....

.....

[2 *marks*]

6 (a) Diagram 6.1 shows the apparatus set-up of an experiment to investigate the transfer of electrons at a distance.
Rajah 6.1 menunjukkan susunan radas eksperimen untuk mengkaji pemindahan elektron pada suatu jarak.

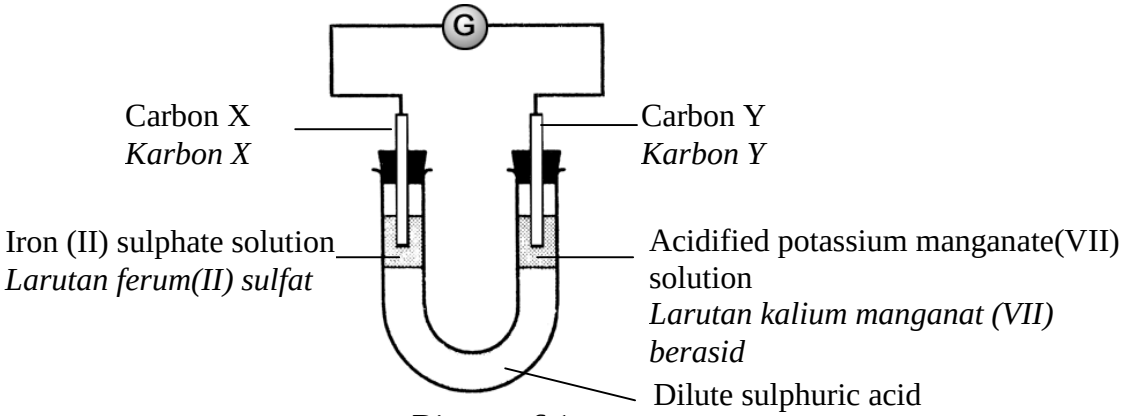


Diagram 6.1
Rajah 6.1

(i) State the name of the oxidizing agent in this reaction.
Nyatakan nama agen pengoksidaan dalam tindak balas ini.

……...
[1 mark]

(ii) Referring to the reaction that takes place at carbon X :
Merujuk pada tindak balas yang berlaku di karbon X :

Write the half equation for the reaction.
Tuliskan persamaan setengah untuk tindak balas itu.

……
[1 mark]

State one observation that occurred.
Nyatakan satu pemerhatian yang berlaku.

……
[1 mark]

(iii) Show the direction of the electron flow in Diagram 6.1
Tunjukkan arah pengaliran elektron dalam Rajah 6.1 [1 mark]

(iv) Referring to the reaction that takes place at carbon Y, calculate the oxidation number of manganese in MnO_4^-
Merujuk pada tindak balas yang berlaku pada karbon Y, hitungkan no pengoksidaan bagi mangan dalam MnO_4^-

[2 marks]

(b) Diagram 6.2 shows the apparatus set-up to investigate the displacement of halogen from its halide solution. Chlorine water was added to a test tube containing a potassium iodide solution and organic solvent, 1,1,1-trichloroethane.
Rajah 6.2 menunjukkan susunan radas untuk mengkaji penyesaran halogen daripada larutan halidanya. Air klorin ditambah ke dalam tabung uji yang mengandungi larutan kalium iodida dan pelarut organik 1,1,1-trikloroetana.

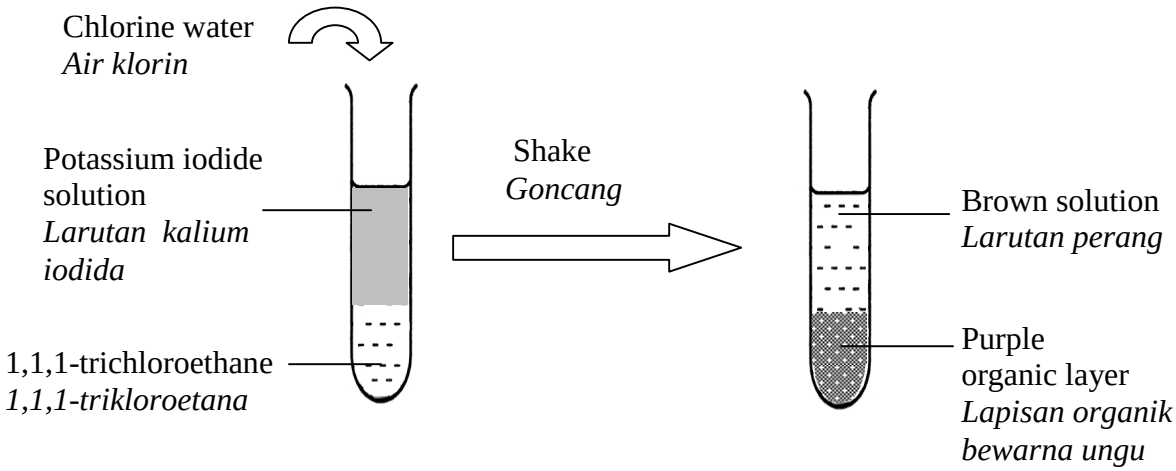


Diagram 6.2
Rajah 6.2

(i) Write the ionic equation for the reaction.
Tuliskan persamaan ion bagi tindak balas itu.

.....
[1 mark]

(ii) What is the function of chlorine water?
Apakah fungsi air klorin?

.....
[1 mark]

(iii) State the change of oxidation number for iodine.
Nyatakan perubahan nombor pengoksidaan bagi iodin.

.....
[1 mark]

(iv) State the name of another reagent that can replace chlorine water.
Nyatakan nama satu bahan uji lain yang boleh menggantikan air klorin.

.....
[1 mark]

Section B
[20 *marks*]
Answer any **one** *question.*

7 (a) (i) What is meant by alloy? [2 marks]
Apakah maksud aloi?

(ii) List two aims of alloying. [3 marks]
Senaraikan dua tujuan pengaloian.

(c) Diagram 7 shows the apparatus set-up to investigate the hardness of copper and bronze.
Rajah 7 menunjukkan susunan radas untuk mengkaji kekerasan kuprum dan gangsa.

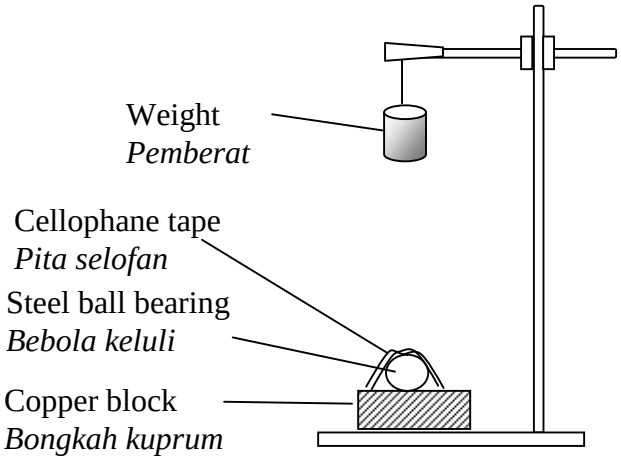


Diagram 7
Rajah 7

A steel ball bearing is taped onto the copper block using cellophane tape. A weight of 1 kilogram is dropped at a height of 50 cm to hit the ball bearing. The diameter of the dent made on the copper block is measured. The experiment is repeated by replacing copper block with bronze block. Table 7 shows the results of the experiment.
Satu bebola keluli dilekatkan pada bongkah kuprum dengan menggunakan pita selofan. Pemberat 1 kg dijatuhkan dari tinggi 50 cm ke atas bebola keluli. Diameter lekuk yang terhasil pada bongkah gangsa diukur. Eksperimen itu diulangi dengan menggantikan bongkah kuprum dengan bongkah gangsa. Jadual 7 menunjukkan keputusan eksperimen itu.

Type of block ***Jenis bongkah***	**Diameter of dent (cm)** ***Diameter lekuk (cm)***
Copper	0.5
Bronze	0.2

Table 7
Jadual 7

(i) Based on the results of the experiment, compare the hardness between copper and bronze.
Berdasarkan keputusan eksperimen, bandingkan kekerasan di antara kuprum dengan gangsa.

[1 mark]

(ii) Explain the difference in hardness between copper and bronze.
Terangkan perbezaan kekerasan kuprum dan gangsa.

[5 marks]

(iii) Draw a labelled diagram to show the arrangement of atoms in copper and bronze.
Lukiskan rajah berlabel untuk menunjukkan susunan atom dalam kuprum dan gangsa.

[3 marks]

(c) Sulphuric acid, H_2SO_4 is manufactured in industry through Contact Process.
This process consists of the following stages:
Sulfurik asid, H_2SO_4 adalah dihasilkan dalam industri melalui Proses Sentuh.
Proses ini terdiri daripada peringkat-peringkat berikut:

Stage 1 *Peringkat 1*	Molten sulphur is burnt in dry air to produce sulphur dioxide. *Leburan sulfur dibakar dalam udara kering untuk menghasilkan sulfur dioksida.* $S + O_2 \rightarrow SO_2$
Stage 2 *Peringkat 2*	Sulphur dioxide and excess oxygen gas are passed over vanadium (V) oxide catalyst at 450°C to produce sulphur trioxide. *Sulfur dioksida dan gas oksigen gas berlebihan dialirkan ke atas vanadium(V) oksida pada 450°C untuk menghasilkan sulfur trioksida.* $2SO_2 + O_2 \rightleftharpoons 2SO_3$
Stage 3 *Peringkat 3*	Sulphur trioxide $\xrightarrow{\text{Step } I}$ Oleum $\xrightarrow{\text{Step } II}$ Dilute sulphuric acid *Sulfur trioksida* $\xrightarrow{\text{Langkah } I}$ *Oleum* $\xrightarrow{\text{Langkah } II}$ *Asid sulfurik cair*

(i) Describe Step I and Step II in Stage 3.
Huraikan Langkah I dan Langkah II dalam Peringkat 3.

[2 marks]

(ii) Write the chemical equation for Step I and Step II in (c)(i).
Tuliskan persamaan kimia untuk Langkah I dan Langkah II dalam c(i).

[2 marks]

(iii) 48 g of sulphur is burnt completely in oxygen gas in Stage 1.
Calculate the maximum volume of sulphur dioxide gas produced.
[Relative atomic mass ; S = 32, O = 16; molar volume of any gas is 24 $dm^3\ mol^{-1}$ at room temperature and pressure]
48 g sulfur dibakar dengan lengkap dalam gas oksigen dalam Peringkat 1.
Hitungkan isi padu maksimum bagi sulfur dioksida yang terhasil.
[Jisim atom relatif ; S = 32, O=16; isi padu molar bagi sebarang gas ialah 24 $dm^3\ mol^{-1}$ pada suhu dan tekanan bilik]

[2 marks]

8 Diagram 8 shows the electron arrangement of a compound formed between element Q and element R.
Rajah 8 menunjukkan susunan elektron bagi sebatian yang terbentuk antara unsur Q dan unsur R.

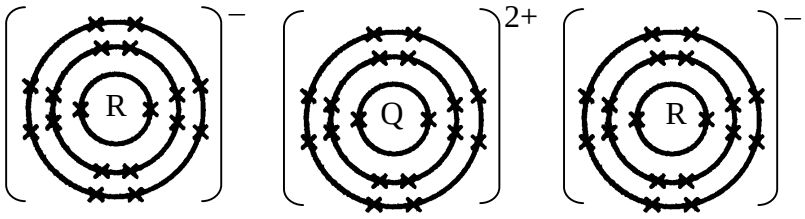


Diagram 8
Rajah 8

(a) Explain the position of R in the Periodic Table of Elements.
Terangkan kedudukan R di dalam Jadual Berkala Unsur.

[4 marks]

(b) Based on Diagram 8, explain how the compound is formed.
Berdasarkan Rajah 8, terangkan bagaimana sebatian itu terbentuk.

[7 marks]

(c) Element R can also react with carbon, C to form a compound.
Unsur R juga bertindak balas dengan karbon, C untuk membentuk suatu sebatian.

(i) Write the formula of the compound formed.
Tuliskan formula bagi sebatian yang terbentuk.

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

[3 marks]

(d) The compounds formed in (b) and (c) have different physical properties.
Explain the differences between the two compounds based on:

- Melting point
- Electrical conductivity

Sebatian yang terbentuk dalam (b) *dan* (c) *mempunyai sifat fizik yang berlainan.*
Terangkan perbezaan di antara kedua-dua sebatian berdasarkan kepada:

- *Takat lebur*
- *Kekoduksian elektrik*

[6 marks]

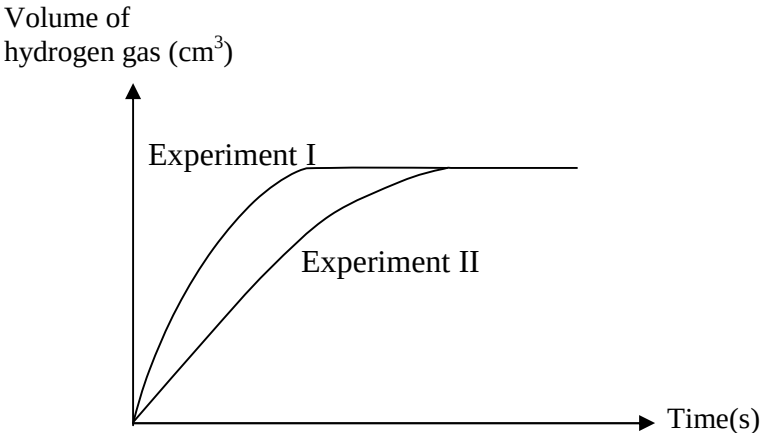
Section C
[20 *marks*]
Answer any **one** *question.*

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

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

(ii) Describe three methods that can increase the rate of reaction to produce ammonia gas.
Huraikan tiga kaedah untuk meningkatkan kadar tindak balas bagi penghasilan gas ammonia. [3 marks]

(b) Graph 9 shows the results of Experiment I and Experiment II to investigate the factor of catalyst in the reaction of zinc and hydrochloric acid.
Graf 9 menunjukkan keputusan bagi Eksperimen I dan Eksperimen II untuk mengkaji faktor mangkin dalam tindak balas antara zink dan asid hidroklorik.



Graph 9
Graf 9

(i) Which experiment used catalyst? State the name of the catalyst used.

Eksperimen yang manakah menggunakan mangkin? Nyatakan nama bagi mangkin yang digunakan.

[2 marks]

(ii) The reaction between zinc and hydrochloric acid releases energy.
Draw an energy profile diagram for both reactions in Experiment I and Experiment II. Label E_a for the activation energy without a catalyst and E'_a for the activation energy with a catalyst.
Tindak balas antara zink dengan asid hidroklorik membebaskan tenaga. Lukiskan satu gambar rajah profil tenaga bagi kedua-dua tindak balas dalam Eksperimen I dan Eksperimen II. Labelkan E_a bagi tenaga pengaktian tanpa mangkin dan E'_a bagi tenaga pengaktifan dengan mangkin.

[4 marks]

(iii) Explain the difference in the rate of reaction between Experiment I and Experiment II based on the collision theory.
Terangkan perbezaan dalam kadar tindakbalas antara Eksperimen I dan Eksperimen II berdasarkan teori perlanggaran.

[4 marks]

(c) Table 9 shows three experiments that were carried out to investigate the effect of concentration on the rate of reaction.
Jadual 9 menunjukkan tiga eksperimen yang telah dijalankan untuk mengkaji kesan kepekatan ke atas kadar tindak balas.

Experiment *Eksperimen*	**Reactants** *Bahan tindak balas*
I	Excess of calcium carbonate powder + 40 cm^3 of 0.5 mol dm^{-3} hydrochloric acid. *Serbuk kalsium karbonat berlebihan + 40 cm^3 0.5 mol dm^{-3} asid hidroklorik*
II	Excess of calcium carbonate powder + 20 cm^3 of 1.0 mol dm^{-3} hydrochloric acid. *Serbuk kalsium karbonat berlebihan + 20 cm^3 1.0 mol dm^{-3} asid hidroklorik*
III	Excess of calcium carbonate powder + 20 cm^3 of 1.0 mol dm^{-3} sulphuric acid. *Serbuk kalsium karbonat berlebihan + 20 cm^3 1.0 mol dm^{-3} asid sulfurik*

Table 9
Jadual 9

Sketch a graph to show the volume of carbon dioxide gas released against time taken for the three experiments on the same axis.
Lakarkan satu graf untuk menunjukkan isi padu gas karbon dioksida melawan masa yang diambil untuk ketiga-tiga eksperimen itu pada paksi yang sama. [3 marks]

Compare the volume of gas released between Experiment I and II and between Experiment II and III. Explain why.
Bandingkan isi padu gas yang terbebas antara Eksperimen I dan II dan antara Eksperimen II dan III . Terangkan mengapa. [3 marks]

10 (a) Diagram 10 show the energy level of Reaction I and Reaction II.
Rajah 10 menunjukkan aras tenaga bagi Tindak balas I dan Tindak balas II.

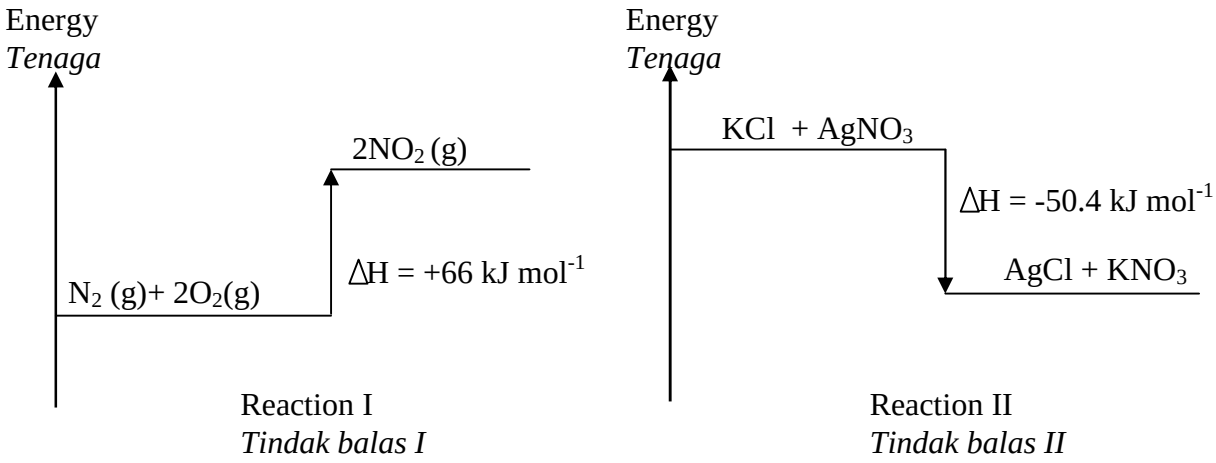


Diagram 10
Rajah 10

Based on Diagram 10, compare the energy level diagram between Reaction I and Reaction II.
Berdasarkan Rajah 10, bandingkan gambar rajah aras tenaga antara Tindak balas I dan Tindak balas II.

[3 marks]

(b) Table 10 shows the molecular formula and the heat of combustion for propanol and butanol.
Jadual 10 menunjukkan formula molekul dan haba pembakaran bagi propanol dan butanol

Alcohol ***Alkohol***	**Molecular Formula** ***Formula molekul***	**Heat of combustion/ kJ mol^{-1}** ***Haba Pembakaran/ kJ mol^{-1}***
Propanol *Propanol*	C_3H_7OH	-2100
Butanol *Butanol*	C_4H_9 OH	-2877

Table 10
Jadual 10

Based on the information in Table 10, compare the heat of combustion between propanol and butanol. Explain why there is a difference in the values of the heat of combustion between propanol and butanol.
Berdasarkan maklumat dalam Jadual 10, bandingkan haba pembakaran di antara propanol dan butanol. Terangkan mengapa nilai haba pembakaran bagi propanol dan butanol berbeza.

[3 marks]

(c) By using a named example of an alcohol, describe a laboratory experiment to determine the heat of combustion.
In your description, include a labeled diagram and the calculations involved.
[Relative atomic mass: C =12, O =16, H = 1]
[Specific heat capacity of solution = 4.2 J g^{-1} $^{O}C^{-1}$; Density of solution = 1 g cm^{-3}]

Dengan menggunakan satu contoh alkohol yang dinamakan, huraikan satu eksperimen makmal untuk menentukan haba pembakaran.
Dalam penerangan anda sertakan gambar rajah berlabel dan langkah pengiraan yang terlibat.
[Jisim atom relatif: C =12, O =16, H = 1]
[Muatan haba tentu larutan = 4.2 J g^{-1} $^{O}C^{-1}$; Ketumpatan larutan = 1 g cm^{-3}]

[10 marks]

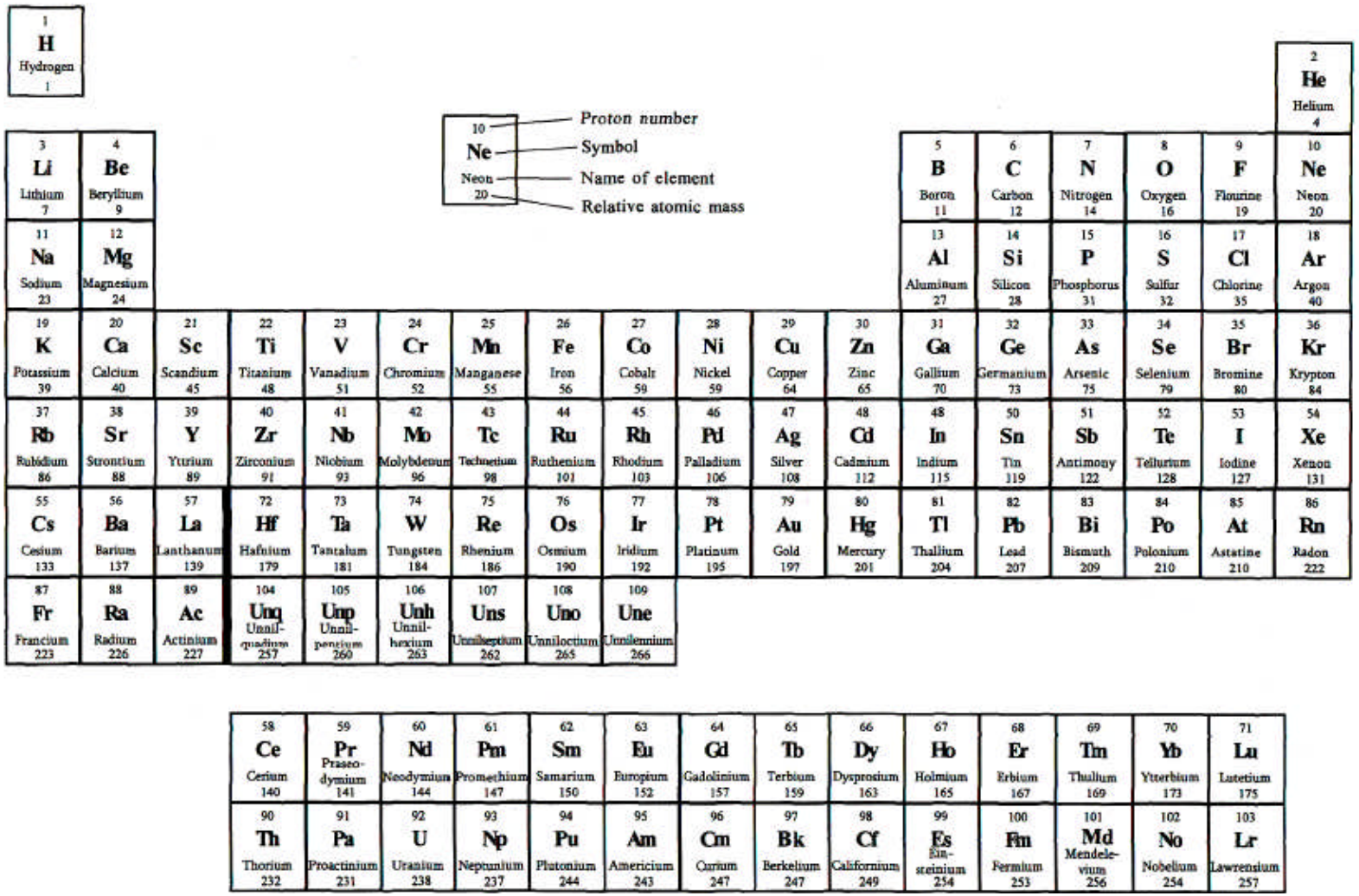
(d) In an experiment to determine the heat of displacement, excess zinc is added to 100 cm^3 of 0.5 mol dm^{-3} silver nitrate solution. Calculate the temperature change if the heat of displacement is –105 $kJmol^{-1}$.
[Specific heat capacity of the solution = 4.2 J g^{-1} $^{o}C^{-1}$;
Density of the solution = 1 g cm^{-3}]

Dalam eksperimen untuk menentukan haba penyesaran, zink berlebihan ditambahkan kepada 100 cm^3 0.5 mol dm^{-3} larutan argentum nitrat. Hitungkan perubahan suhu jika haba penyesaran dalam eksperimen itu ialah -105 kJ mol^{-1}.
[Muatan haba tentu larutan = 4.2 J g^{-1} $^{O}C^{-1}$;
Ketumpatan larutan= 1 g cm^{-3}]

[4 marks]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

THE PERIODIC TABLE OF ELEMENTS



Nama : ……... Tingkatan : .....…...……

SULIT
4541/3
Chemistry
Kertas 3
Ogos
2009
1 ½ jam

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2009

CHEMISTRY
Kertas 3

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tuliskan nama dan tingkatan pada ruang yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa.*
3. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*

Untuk Kegunaan Pemeriksa		
Soalan	**Markah Penuh**	**Markah Diperoleh**
1	33	
2	17	
JUMLAH	50	

Kertas soalan ini mengandungi 9 halaman bercetak

For Examiner's Use

1 Diagram 1.1 shows the set-up of apparatus used in an experiment to determine the position of different metals in the electrochemical series by measuring the voltage of different pairs of metals.

The experiment is repeated by replacing metal M with metals N, P and Q and salt solution of M with the respective salt solutions of N, P and Q. The copper electrode is the positve terminal in all the experiments.

Rajah 1.1 menunjukkan susunan radas yang digunakan dalam satu eksperimen untuk menentukan kedudukan logam yang berlainan dalam siri elektrokimia dengan mengukur voltan pasangan logam yang berlainan.

Eksperimen diulang dengan menggantikan logam M dengan logam N, P dan Q dan larutan garam M dengan larutan garam N, P dan Q yang sepadan. Elektrod kuprum adalah terminal positif bagi semua eksperimen.

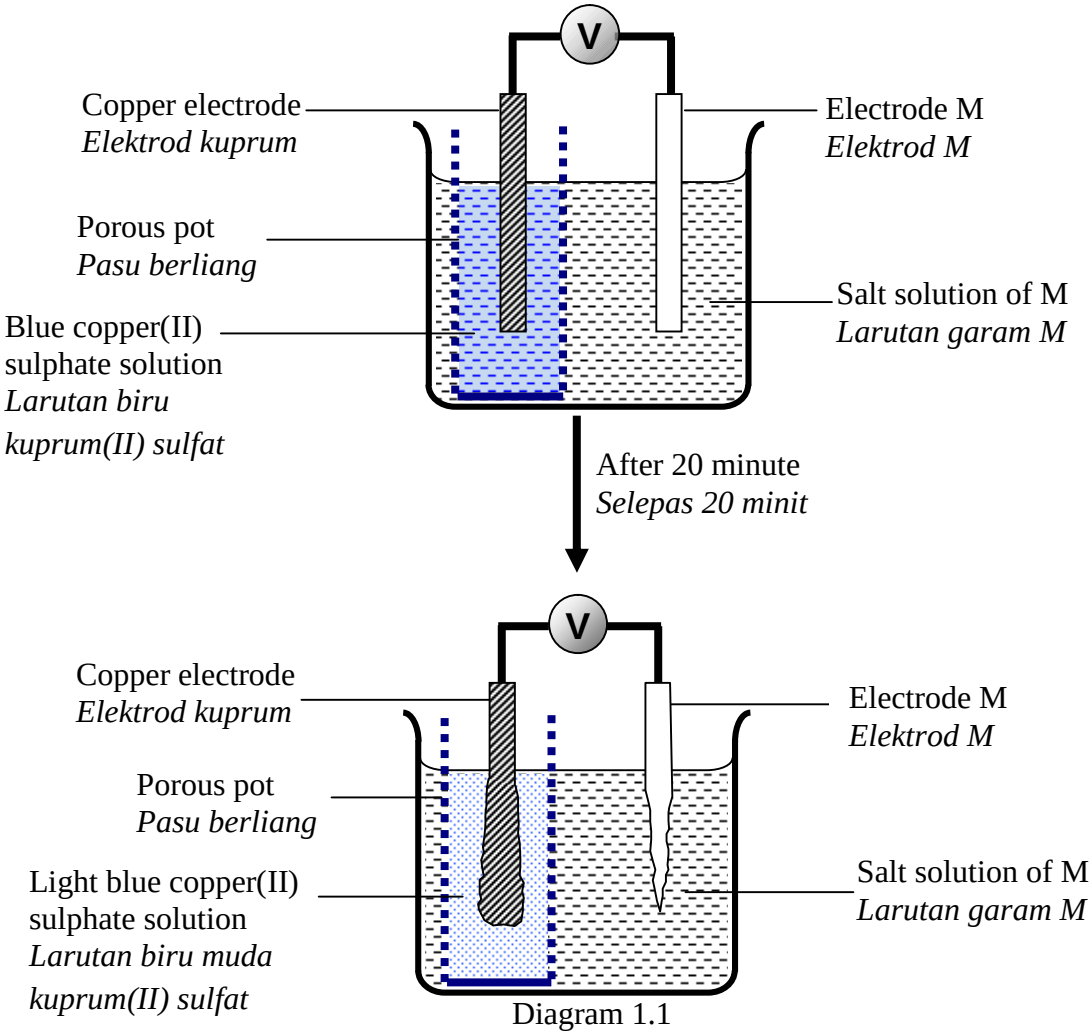


Diagram 1.1
Rajah 1.1

For Examiner's Use

Diagram 1.2 shows the voltmeter readings of all the experiments.
Rajah 1.2 menunjukkan bacaan voltmeter bagi semua eksperimen.

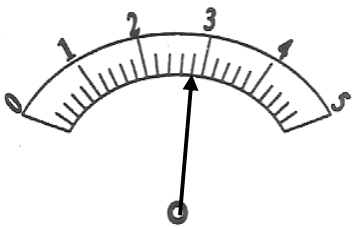
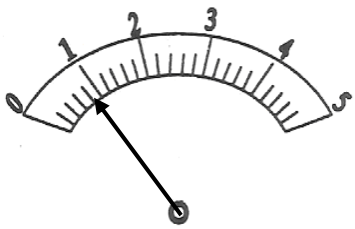
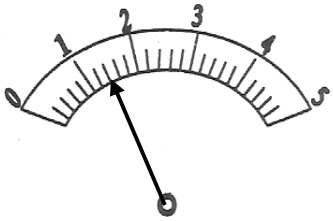
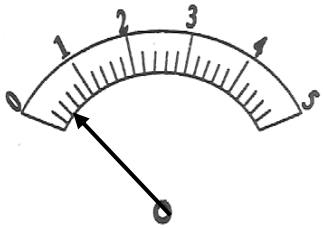
M and Cu  Reading: ……... *Bacaan:*	N and Cu  Reading: ……. *Bacaan:*
P and Cu  Reading: ……. *Bacaan:*	Q and Cu  Reading: ……. *Bacaan:*

Diagram 1.2
Rajah 1.2

(a) Record the voltmeter readings in the spaces provided in Diagram 1.2.
Catatkan bacaan voltmeter pada ruang yang disediakan dalam Rajah 1.2.

[3 marks]

1(a) 3

For Examiner's Use

(b) Construct a table to record the voltmeter reading for the different pairs of metals.
Bina satu jadual untuk merekod bacaan voltmeter untuk pasangan logam yang berlainan.

1(b) 3

[3 marks]

(c) State one hypothesis based on this experiment.
Nyatakan satu hipotesis berdasarkan eksperimen ini.

……

……

……

1(c) 3

[3 marks]

For Examiner's Use

(d) State the observations that can be made for this experiment after 20 minutes at:
Nyatakan pemerhatian yang dapat dibuat dalam eksperimen ini selepas 20 minit pada:

(i) The negative terminal
Terminal negatif

……

(ii) The positive terminal
Terminal positif

.....

(iii) The copper(II) sulphate solution
Larutan kuprum(II) sulfat

1(d)

……

[3 marks] 3

(e) Explain your answer for (d) (iii).
Terangkan jawapan anda untuk (d)(iii).

……

1(e)

……

……

[3 marks] 3

(f) State the operational definition for the position of metals in the electrochemical series.
Nyatakan definisi secara operasi bagi kedudukan logam dalam siri elektrokimia.

……

……

1(f)

……

[3 marks] 3

For Examiner's Use

(g) For this experiment, state:
Bagi eksperimen ini, nyatakan:

(i) The manipulated variable
Pembolehubah dimanipulasikan

……

(ii) The responding variable
Pembolehubah bergerak balas

……

1(g)

(iii) The constant variable
Pembolehubah dimalarkan

3

……

[3 marks]

(h) Based on the voltmeter readings, arrange all the metals in ascending order of their electropositivity.
Berdasarkan bacaan voltmeter, susunkan semua logam dalam susunan menaik keelektropositifan mereka.

1(h)

……

3

[3 marks]

(i) The experiment is repeated by using different pairs of metals as shown in Table 1. Predict the positive terminal and the voltage for each pair of metals by completing the table.
Eksperimen diulang dengan menggunakan pasangan logam yang berlainan seperti dalam Jadual 1. Ramalkan terminal positif dan voltan bagi tiap pasangan logam dengan melengkapkan jadual tersebut.

Pair of Metals *Pasangan logam*	Positive Terminal *Terminal Positif*	Voltage / V *Voltan / V*
M and N		
N and P		
M and P		

Table 1
Jadual 1

1(i)

6

[6 marks]

For Examiner's Use

(j) The following is a list of chemical substances:
Berikut ialah senarai beberapa bahan kimia:

- Sodium chloride
  Natrium klorida
- Silver chloride
  Argentum klorida
- Zinc sulphate
  Zink sulfat
- Lead(II) sulphate
  Plumbum(II) sulfat

Classify these substances into substances that can be made as an electrolyte and substances that cannot be made as an electrolyte.
Kelaskan bahan-bahan ini kepada bahan yang boleh dijadikan sebagai elektrolit dan bahan yang tidak boleh dijadikan sebagai elektrolit.

1(j)

[3 marks] 3

For Examiner's Use

2 Diagram 2.1 shows two methods of dissolving sugar cubes to make sugar solution.
Rajah 2.1 menunjukkan dua kaedah melarutkan ketulan gula untuk membuat larutan gula.

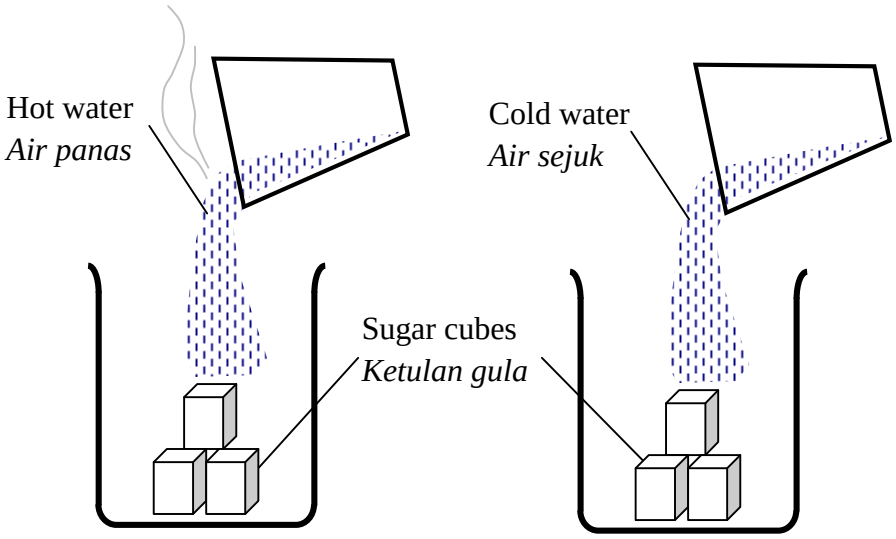


Diagram 2.1
Rajah 2.1

A group of students discovered that it is faster to dissolve the sugar cubes to make sugar solution by using hot water rather than cold water. This is due to the difference in the temperature of the water.
Sekumpulan pelajar mendapati bahawa lebih cepat untuk melarutkan ketulan gula menggunakan air panas berbanding air sejuk untuk membuat larutan gula. Ini disebabkan oleh perbezaan suhu air.

For Examiner's Use

Referring to the situation above, plan a laboratory experiment to investigate the effect of temperature on the rate of reaction between sulphuric acid and sodium thiosulphate solution .
Merujuk kepada situasi di atas, rancangkan satu eksperimen dalam makmal untuk mengkaji kesan suhu terhadap kadar tindak balas antara asid sulfurik dan larutan natrium tiosulfat.

Your planning should include the following aspects.
Perancangan anda hendaklah mengandungi aspek-aspek berikut.

a) Statement of the problem
Pernyataan masalah

b) All the variables
Semua pembolehubah

c) Statement of the hypothesis
Pernytaan hipotesis

d) Lists of substances and apparatus
Senarai bahan dan alat radas

e) Procedure
Prosedur

f) Tabulation of data
Penjadualan data

[17 marks]

END OF QUESTION

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN KLUSTER
KEMENTERIAN PELAJARAN MALAYSIA

CHEMISTRY
TRIAL-EXAM
SPM 2009
MARKING SCHEME

PAPER 1
PAPER 2
PAPER 3

Paper 1

1	B
2	C
3	C
4	C
5	A
6	A
7	D
8	A
9	B
10	C
11	A
12	D
13	C
14	C
15	D
16	C
17	D
18	B
19	D
20	B

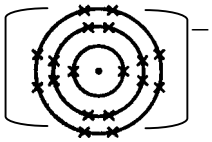
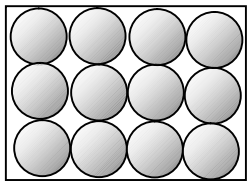
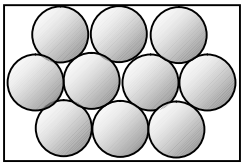
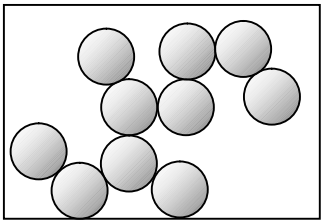
21	A
22	C
23	B
24	C
25	D
26	C
27	C
28	A
29	C
30	B
31	A
32	B
33	B
34	A
35	C
36	D
37	B
38	B
39	D
40	B

41	B
42	A
43	C
44	D
45	D
46	C
47	A
48	B
49	B
50	D

$$\frac{\textbf{Paper 1 (50) + Paper 2 (100)+ Paper3 (50)}}{\textbf{200}} \times \textbf{100\%}$$

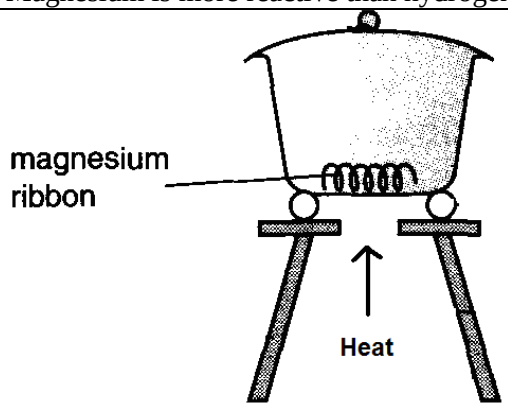
MARKING SCHEME FOR PAPER 2

Question			Description	Mark
1	(a)	(i)	Saponification	1
		(ii)	Ester	1
		(iii)	To reduce the solubility of soap in water// To precipitate the soap	1
		(iv)	Potassium hydroxide	1
	(b)	(i)	Water that contains calcium / magnesium ions	
		(ii)	Soaps form scum Detergents do not form scum	1 1
	(c)	(i)	Function: To slow down/ prevent the growth of bacteria and fungi/ microorganisms Type: Antioxidants	1 1
		(ii)	Headache/ nausea/ thirsty/ chest pain/ difficulty breathing	1
			Total	**10**

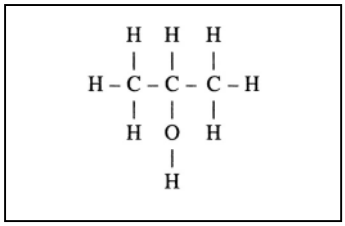
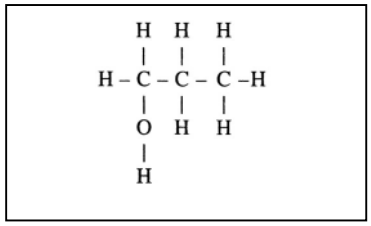
Question			Description	Mark
2	(a)	(i)	Proton, electron and neutron	1
		(ii)	 [shows 2.8.8]	1
		(iii)	V and X Because both have the same proton number but different in nucleon number	1 1
		(iv)	Group 1, Period 4	1
		(v)	18	1
	(b)	(i)	Q:  or  -Minimum three layers. -No overlapping -All particles must touch each other R: 	1 1
		(ii)	K = 65°C Because the heat loss to the surroundings is exactly balanced by the heat energy liberated / released as the particles **attract one another** to form a solid. **Or** During freezing process, the particles of Q **arrange closer** to each other (to form stronger forces of attraction). This arrangement release heat energy which is equal to the heat loss to the surroundings.	1 1
			Total	**10**

<table>
<tr><td>3</td><td>(a)</td><td>(i)</td><td>Zinc
hydrochloric acid / suphuric acid</td><td>1
1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Zn + 2HCl → $ZnCl_2$ + H_2</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td></td><td>The air in the combustion tube must be displaced before lighting the hydrogen gas// The heating, cooling and weighing is repeated until a constant mass is obtained</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>
<table>
<tr><td>Element</td><td>M</td><td>O</td></tr>
<tr><td>Mass</td><td>0.64</td><td>0.16</td></tr>
<tr><td>Number of mole</td><td>$\frac{0.64}{64} = 0.01$</td><td>$\frac{0.16}{16} = 0.01$</td></tr>
<tr><td>Simplest ratio</td><td>1</td><td>1</td></tr>
</table>
Empirical formula is MO
</td><td>1

1

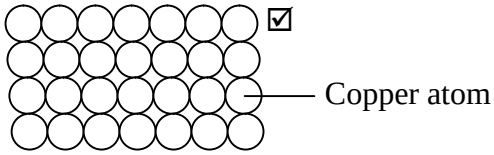
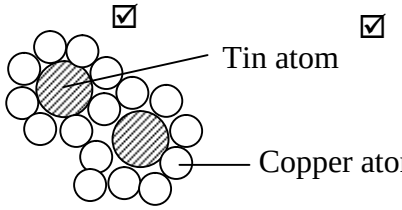
1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>MO + H_2 → M + H_2O</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td>Magnesium is more reactive than hydrogen.</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td> 
</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>10</td></tr>
</table>

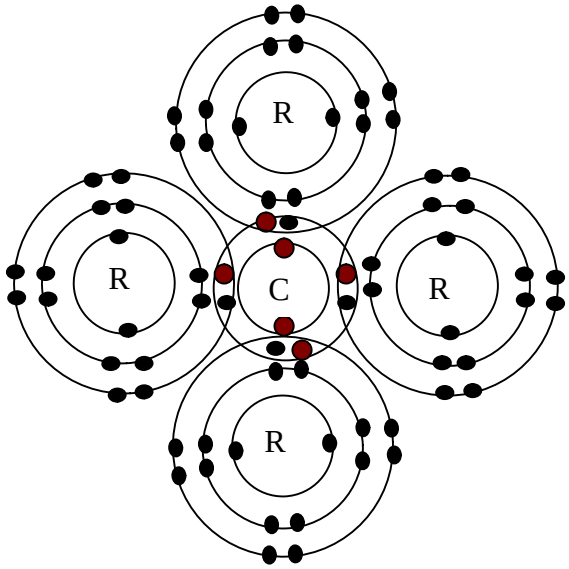
4	(a)	(i)	Neutralization	1
		(ii)	$HCl + NaOH \rightarrow NaCl + H_2O$	1
		(iii)	Pink turns colourless	1
		(iv)	$\frac{MaVa}{MbVb} = \frac{1}{1}, \frac{0.1 \times Va}{0.2 \times Vb} = \frac{1}{1}$, $V_a = 50\ cm^3$	1+1
	(b)	(i)	Double decomposition/ Precipitate reaction	1
		(ii)	Lead(II) iodide	1
		(iii)	$\mathbf{Pb^{2+} + 2I^- \rightarrow PbI_2}$	1
	(c)		Number of moles of $Pb(NO_3)_2 = \frac{1.0 \times 10}{1000} = 0.01$ Mass of $PbI_2 = 0.01 \times 461 = 4.61$ g	1 1
			Total	**10**

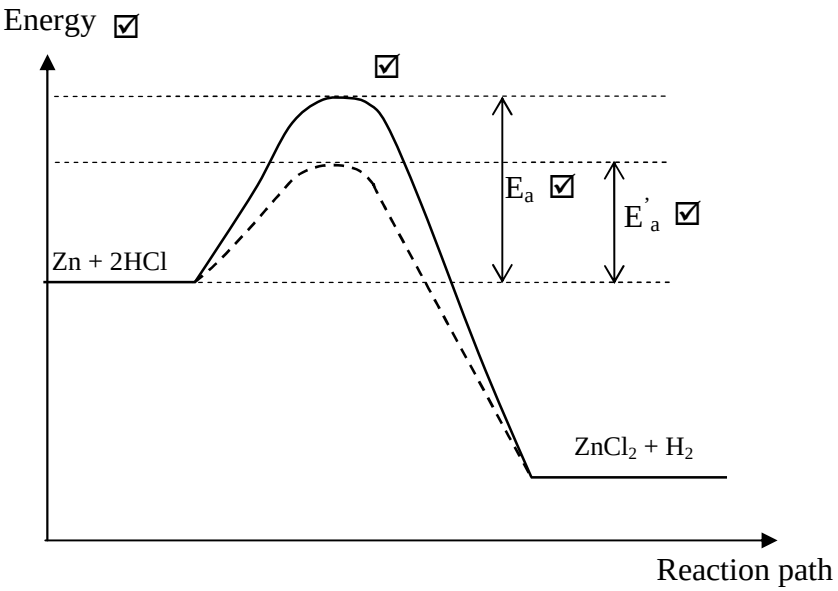
5	(a)		$2C_3H_8O + 9O_2 \longrightarrow 6CO_2 + 8H_2O$// $C_3H_8O + 9/2O_2 \longrightarrow 3CO_2 + 4H_2O$//	1
	(b)	(i)	Oxidation	1
		(ii)	Add 2 cm^3 of dilute sulphuric acid into a test tube that containing 2 cm^3 potassium manganate (VII) solution/potassium dichromate (VI) solution Pour 2 cm^3 of alcohol J into the above acidified solution	1 1
		(iii)	 	1 + 1
	(c)	(i)	Propyl propanoate	1
		(ii)	Sweet / pleasant smell	1
	(d)		Flow / Bubble propene and propane into two different test tubes containing bromine water / acidified potassium manganate(VII) Propene : Brorwn / purple turns colourless Propane : no change	1 1
			Total	**10**

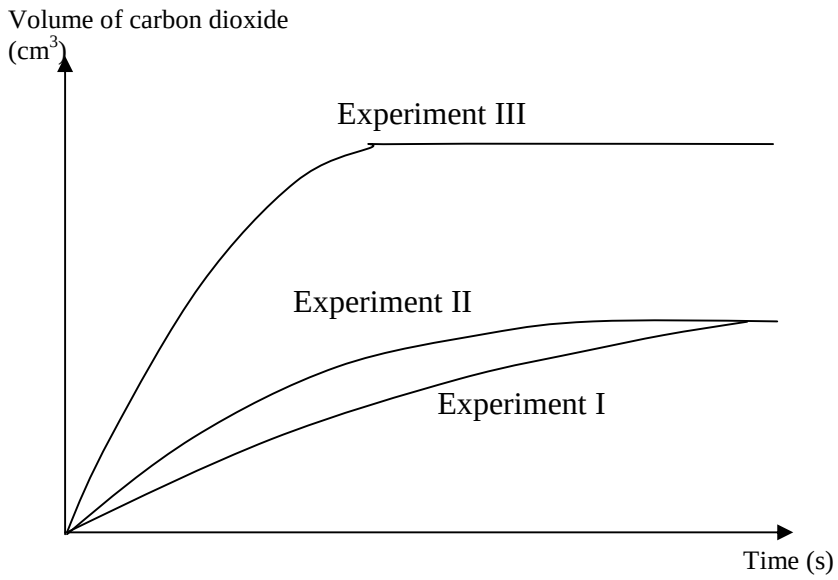
6	(a)	(i)	Acidified potassium manganate(VII) solution	1
		(ii)	Fe^{2+} ----------→ $Fe^{3+} + e^-$	1
			Green solution turns to colourless	1
		(iii)	From electrod carbon X to Y	1
		(iv)	X + 4 (-2) = -1 X + (-8) = -1 X = +7	1 1
	(b)	(i)	$Cl_2 + 2I^-$ ----------→ $I_2 + 2Cl^-$	1
		(ii)	An oxidizing agent//substance	1
		(iii)	-1 to 0	1
		(iv)	Bromine water	1
			Total	**10**

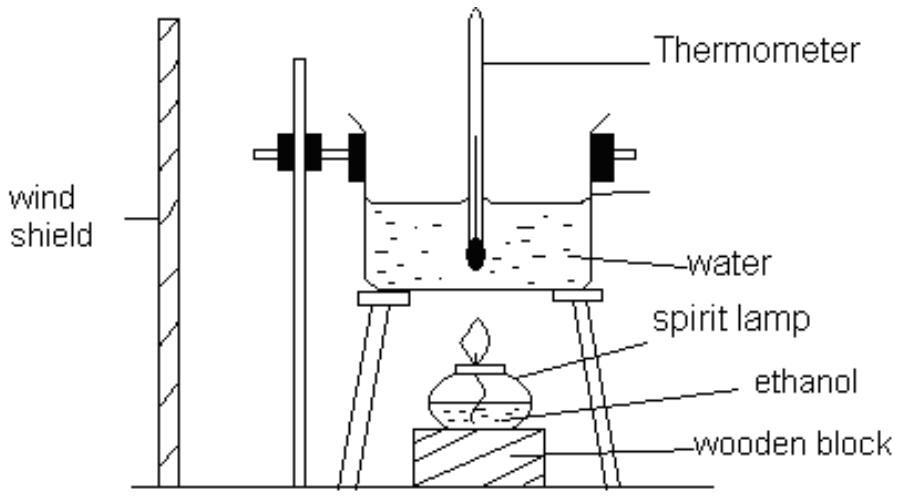
Section B

7	(a)	(i)	A mixture of two or more elements with a certain fixed composition in which the major component is a metal.	1 1 2
		(ii)	1. Improve the appearance 2. Improve the strength and hardness 3. Increase the resistance to corrosion [Any two corrections]	1+1 2
	(b)	(i)	Bronze is harder than copper.	1
		(ii)	1. Pure copper is made up of same type of atoms and are of the same size. 2. The atoms are arranged in an orderly manner. 3. The layer of atoms can slide over each other. 4. Bronze is made up of atoms of different size// In bronze, tin atoms and copper atoms are of different size. 5. The atoms **are not** orderly arranged// The presence of tin atoms disturb the orderly arrangement of copper atoms. 6. This reduces/prevents the layer of copper atoms from sliding.	1 1 1 1 1 1 Max5
		(iii)	Pure copper:  [minimum 3× 3 layers] Bronze:  	1 1+1 3
	(c)	(i)	Sulphur trioxide is dissolved in concentrated sulphuric acid to form oleum. Oleum is diluted with water to produce sulphuric acid.	1 1
		(ii)	$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$ $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$	1 1
		(iii)	Moles of S = moles of sulphur = 48 / 32 =1.5 Volume of SO_2 = 1.5 × 24 dm^3 = 36 dm^3	1 1 7
			Total	**20**

8	(a)		Atom R has 7 valence electrons and 3 shells occupied with electrons. Thus, R is located at Group 17 and Period 3.	1+1 1+1
	(b)		1. Atom Q has electron arrangement of 2.8.2 / 2 valence electrons. 2. Atom Q losses 1 electron/the single valence electron to achieve the stable octet electron arrangement/2.8.8 3. An positive ion, Q^{2+} is formed 4. Atom R has electron arrangement of 2.8.7 / 7 valence electrons. 5. Two atoms R, each receives 1 electron from atom Q to achieve the stable octet electron arrangement/2.8.8 6. Two negative ions, R^- are formed. 7. An ion Q^{2+} and two ion R^- are attracted together by strong electrostatic forces.	1 1 1 1 1 1 1 **7**
	(c)	(i) (ii)	CR_4  	1 2 **3**
	(d)		**<u>Melting point</u>** Compound (b) has high melting point whereas compound (c) has low melting point. Compound (b) consists of negative and positive ions which are held together by strong electrostatic forces. [A lot of energy is required to overcome the strong forces.] Compound (c) consists of molecule which are held together by weak intermolecular forces. [Less energy is required to overcome the weak intermolecular forces.] **<u>Electrical conductivity</u>** Compound (b) can conduct electricity in liquid or aqueous solution state. Compound (c) can not conduct electricity in any state. In liquid or aqueous solution state, the ions in the compound (b) can move freely. Compound (c) does not consists of free moving ions.	1 1 1 1 1 1 **6**
			Total	**20**

9	(a)		$N_2 + 3H_2 \rightarrow 2NH_3$	1
			• Use **iron** as catalyst • The reaction is carried out in high temperature /450^oC to 550^oC • The reaction is carried out in high pressure/200 atm	1 1 1 4
	(b)	(i)	Experiment I Copper(II) sulphate / copper sulphate	1 1 2
		(ii)	 • Label of energy on vertical axis • The position of the energy level of the reactants is higher than the energy level of the product. • Correct position for E_a • Correct position for E'_a	1 1 1 1 4
		(iii)	1. When a positive catalyst/copper(II) sulphate is used in Experiment I, it provides an alternative path with a lower the activation energy / lower the activation energy. 2. More colliding particles /zinc atoms and hydrogen ions are able to overcome that lower activation energy. 3. This causes the frequency of effective collision increases. 4. Hence, the rate of reaction of Experiment I increases.	1 1 1 1 4

	(c)		 • Correct position of the curve of Experiment I • Correct position of the curve of Experiment II • Correct position of the curve of Experiment III	1 1 1 **3**
			• The volume of carbon dioxide gas in Experiment I is the same as in Experiment II. • The concentration of H^+ ions in Experiment I and Experiment II is the same. • The volume of carbon dioxide gas in Experiment III is double/two times greater than in Experiment II. • The concentration of H^+ ions in Experiment III is double then in Experiment II // The concentration/number of hydrogen ions in sulphuric acid is double/two times the concentration/number of hydrogen ions in hydrochloric acid // Suphuric acid is a diprotic acid whereas hydrochloric acid is a monoprotic acid.	1 1 1 1 **Max 3**
			Total	**20**

10	(a)	<table><tr><td>Reaction I</td><td>Reaction II</td></tr><tr><td>Endothermic//heat absorbed from the surrounding</td><td>Exothermic//heat released to the surrounding</td></tr><tr><td>The total energy of content of calcium nitrate and potassium carbonate/reactant is lower than the total energy content of calcium carbonate and potassium nitrate/product</td><td>The total energy of the content of zinc and copper(II) sulphate/reactants is higher than the total energy content of zinc sulphate and copper/product</td></tr><tr><td>Heat absorbed during the reaction is 66 kJ mol^{-1}</td><td>Heat released during the reaction is 50.4 kJ mol^{-1}</td></tr></table>	1 1 1
	(b)	Heat of combustion of butanol is higher than propanol The molecular size/number of carbon atom per molecule butanol is bigger/higher than propanol Butanol produce more carbon dioxide and water molecules than propanol//released more heat energy	1 1 1
	(c)	Methanol/ethanol/ propanol, Diagram: -labelled diagram -arrangement of apparatus is functional  	1 1 + 1

		Procedure : 1. (100-250 cm^3)of water is measured and poured into a copper can and the copper can is placed on a tripod stand 2. The initial temperature of the water is measured and recorded 3. A spirit lamp with ethanol is weighed and its mass is recorded 4. The lamp is then placed under the copper can and the wick of the lamp is lighted up immediately 5. The water in the can is stirred continuously until the temperature of the water increases by about 30^oC. 6. The flame is put off and the highest temperature reached by the water is recorded. 7. The lamp and its content is weighed and the mass is recorded [Step 1 =1; Step 2, 6 = 1; Step 3, 7 = 1; Step 4, 5 = 1] Data : The highest temperature of water = t_2 The initial temperature of water = t_1 Increase in temperature, θ = $t_2 - t_1 = \theta$ Mass of lamp after burning = m_2 Mass of lamp before burning = m_1 Mass of lamp ethanol burnt, m = $m_2 - m_1 = m$ Calculation : Number of mole of ethanol, C_2H_5OH, n = $\frac{m}{46}$ The heat energy given out during combustion by ethanol = the heat energy absorbed by water = 100x x c x θ J Heat of combustion of ethanol = $\frac{m\ c\ \theta}{n}$ $Jmol^{-1}$ = p/1000 kJoule	Max=4 1 1 1 1
	(c)	No. of mol of silver nitrate = 100 X 0.5 /1000// 0.05 1 mol of silver nitrate reacted to release 105 kJ heat Therefore, 0.05 mol silver nitrate reacted to produce $\frac{105 \times 0.05}{1}$ = - 5.25 kJ/mol 5250 = 100 X 4.2 X Θ Θ = 12.5 ^OC	1 1 1 1
		Total	**20**

MARKING SCHEME FOR PAPER 3

<table>
<tr><th>Question</th><th>Rubric</th><th>Score</th></tr>
<tr><td>1(a)</td><td>Able to state all the voltmeter readings accurately with correct unit

<u>Sample answer:</u>

M and Cu : 2.80 V
N and Cu : 0.80 V
O and Cu : 1.40 V
P and Cu : 0.40 V</td><td>3</td></tr>
<tr><td></td><td>Able to state all the voltmeter readings accurately without unit//correct reading with unit.

<u>Sample answer:</u>

M and Cu : 2.80 / 2.8 V
N and Cu : 0.80 / 0.8 V
O and Cu : 1.40 / 1.4 V
P and Cu : 0.40 / 0.4 V</td><td>2</td></tr>
<tr><td></td><td>Able to state at least two readings correctly without unit</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
</table>

<table>
<tr><th>Question</th><th>Rubric</th><th>Score</th></tr>
<tr><td>1(b)</td><td>Able to construct a table to record the voltmeter reading for each pair of metals that contain:
1. Correct titles
2. Readings
<u>Sample answer:</u>
<table>
<tr><td>Pairs of metals</td><td>Voltage / V</td></tr>
<tr><td>M and Cu</td><td>2.80</td></tr>
<tr><td>N and Cu</td><td>0.80</td></tr>
<tr><td>O and Cu</td><td>1.40</td></tr>
<tr><td>P and Cu</td><td>0.40</td></tr>
</table></td><td>3</td></tr>
<tr><td></td><td>Able to construct a less accurate table that contains:
1. Titles
2. Readings</td><td>2</td></tr>
<tr><td></td><td>Able to construct a table with at least one title / reading</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
</table>

Question	Rubric	Score
1(c)	Able to state the relationship between the manipulated variable and the responding variable with direction. Sample answer: The further the distance between two metals in the Electrochemical Series the bigger the voltage value.	3
	Able to state the relationship between the manipulated variable and responding variable. Sample answer: Different pair of metals have different voltage value	2
	Able to state the idea of hypothesis Sample answer: Pair of different metals shows voltmeter reading	1
	No response or wrong response	0

Question	Rubric	Score
1(d)	Able to state all the correct observations Sample answers: (i) At negative terminal: electrode becomes thinner (ii) At postive terminal: electrode becomes thicker (iii) At copper(II) sulphate solution: intensity of blue solution decreases//blue solution turns pale blue	3
	Able to state **any two** correct observations	2
	Able to state **any one** correct observation	1
	No response or wrong response	0
1(e)	Able to give both explaination correctly Sample answer: 1. Concentration of Cu^{2+} ions decreases 2. Cu^{2+} ion is discharged by receiving 2 electrons to form copper atom	3
	Able to give any one correct explaination	2
	Able to give an idea of the discharge of ions Sample anwer: Cu^{2+} ions decrease//Cu^{2+} ions are discharged	1
	No response or wrong response	0

Question	Rubric	Score
1(f)	Able to state the correct operational definition for the position between two metals in the Electrochemical Series. Sample answer: The further the distance between two metals in the Electrochemical Series are dipped in an electrolyte the voltmeter reading is bigger	3
	Able to state the position of metals in the Electrochemical Series Sample answer: The further the distance between two metals in the Electrochemical Series the voltmeter reading is bigger	2
	Able to state an idea of position of metals Sample answer: Position of metals is influenced by voltage // different metals shows different voltmetrer reading	1
	No response or wrong response	0
1(g)	Able to state all the three variables correctly Sample answer: **Manipulated variable**: Pairs of metals **Responding variable**: Voltmeter reading/voltage **Constant variable**: copper electrode, copper(II) sulphate solution	3
	Able to state any two variables correctly	2
	Able to state any one variable correctly	1
	No response or wrong response	0

Question	Rubric	Score
1(h)	Able to arrange in ascending order of all the metals Sample answer: Cu, P, N, O, M	3
	Able to arrange any four metals in correct ascending order	2
	Able to arrange any three metals in correct ascending order	1
	No response or wrong response	0
1(i)	Able to predict the three positive terminals and three voltage values for all pairs of metals correctly Sample answer: Pairs of metals / Positive Terminal / Voltage /V M and N / N / 2.0 N and P / P / 0.4 M and P / P / 2.4	6
	Able to predict any five answers correctly	5
	Able to predict any four answers correctly	4
	Able to predict any three answers correctly	3
	Able to predict any two answers correctly	2
	Able to predict any one answer correctly	1

	No response or wrong response	0

Question	Rubric	Score
1(j)	Able to classify all the four substances correctly Sample answer: Can be made as electrolyte: Sodium chloride, Zinc sulphate Cannot be made as electrolyte: Silver chloride, Lead(II) sulphate	3
	Able to classify any three substances corectly	2
	Able to classify any two substances correctly	1
	No response or wrong response	0

Question	Rubric	Score
2(a)	Able to state the statement of the problem correctly Sample answer How does temperature effect the rate of reaction between sulphuric acid and sodium thiosulphate solution ?	3
	Able to state the statement of the problem less accurately Sample answer How does temperature effect the reaction between sulphuric acid and sodium thiosulphate solution ? // To investigate the effect of temperature on the rate of reaction between sulphuric acid and sodium thiosulphate solution	2
	Able to give an idea of the statement of the problem Sample answer Temperature effect the rate of reaction	1
	No response or wrong response	0

Question	Rubric	Score
2(b)	Able to state the three variables correctly Sample answer **Manipulated variable** Temperature of sodium thiosulphate solution **Responding variable** Time taken for the mark 'X' to disappear from sight// rate of reaction **Constant variable** Volume and concentration of sulphuric acid/ sodium thiosulphate solution// volume of conical flask.	3
	Able to state any two variables correctly	2
	Able to state any one variable correctly	1
	No response or wrong response	0

Question	Rubric	Score
2(c)	Able to state the relationship correctly between the manipulated variable and the responding variable with direction Sample answer The higher the temperature of sodium thiosulphate solution the higher the rate of reaction/time taken for the mark 'X' to disappear from sight	3
	Able to state the relationship between the manipulated variable and the responding variable with direction Sample answer The higher the temperature the higher the rate of reaction	2
	Able to state the idea of hypothesis Sample answer Different temperature different rate of reaction	1
	No response or wrong response	0

Question	Rubric	Score
2(d)	Able to give complete list of substances and apparatus Sample answer **Substances** Sodium thiosulphate solution [0.1 - 0.5] mol dm^{-3} , sulphuric acid [0.2 – 1.0] mol dm^{-3} **Apparatus** Conical flask [150 – 250] cm^3, measuring cylinder, thermometer, Bunsen burner, filter paper/white paper, tripod stand, wire gauze, stopwatch	3
	Able to give a list of substances and apparatus but less complete Sample answer **Substances** Sodium thiosulphate solution, sulphuric acid **Apparatus** Conical flask, thermometer, stopwatch	2
	Able to give at least one substance and at least one apparatus	1
	No response or wrong response	0

Question	Rubric	Score
2(e)	Able to list all the steps correctly Sample answer 1. 50 cm^3 of sodium thiosulphate solution is poured into a conical flask. 2. The temperature of the solution is recorded. 3. The conical flask is placed on top of a piece of white paper with a mark 'X' at the centre. 4. 5 cm^3 of sulphuric acid is added into the conical flask and the stopwatch is started immediately. 5. Swirl the conical flask and record the time taken for the mark 'X' to disappear from sight. 6. Repeat steps 1 to 5 by heating the sodium thiosulphate solution at different temperatures.	3
	Able to list down steps 1, 4, 5 and 6	2
	Able to list steps 1, 4 and 5	1
	No response or wrong response	0

Question	Rubric	Score
2(f)	Able to tabulate the data with the following aspects 1. Correct titles 2. List of three temperature Sample answer Temperature /^oC | Time / s 30 | 35 | 40 |	2
	Able to construct table with at least one title incomplete list of temperature Sample answer Temperature | Time |	1
	No response or wrong response or empty table	0

END OF MARKING SCHEME