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MAJLIS KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH
NEGERI KEDAH DARUL AMAN

PEPERIKSAAN PERCUBAAN SPM 2011

CHEMISTRY

Paper 1

One hour and fifteen minutes

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*
2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*
3. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

Kertas soalan ini mengandungi 24 halaman bercetak

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1 Which of the following pairs are matched **correctly** ?
*Antara berikut, yang manakah pasangan yang **betul** ?*

	Atom	Ion	Molecule
A	Iron *Ferum*	Mercury *Raksa*	Hydrogen *Hidrogen*
B	Aluminium *Aluminium*	Sodium *Natrium*	Chlorine *Klorin*
C	Sodium *Natrium*	Lithium oxide *Litium oksida*	Bromine *Bromin*
D	Ammonia *Ammonia*	Sulphur dioxide *Sulfur dioksida*	Carbon dioxide *Karbon dioksida*

2 Isotopes of an element are different in
Isotop suatu unsur berbeza dari segi

A chemical properties
sifat kimia
B physical properties
sifat fizik
C the number of protons
bilangan proton
D the number of electrons
bilangan elektron

3 Diagram 1 shows part of the Periodic Table.
Rajah 1 *menunjukkan sebahagian dari Jadual Berkala.*

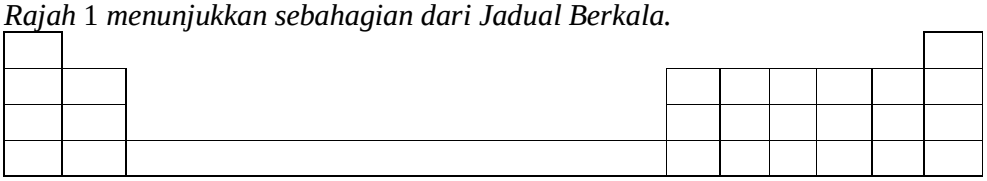

Diagram 1

The elements are arranged according to the increasing order of....
Unsur-unsur disusun mengikut pertambahan .....

A the atomic mass of the element.
jisim atom unsur.
B number of proton in the nucleus of atom.
bilangan proton dalam nukleus atom.
C number of neutron in the nucleus of atom.
bilangan neutron dalam nukleus atom.
D number of valence electron in an atom.
bilangan elektron valens dalam sesuatu atom.

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4 Which of the following is a covalent compound ?
Manakah antara berikut adalah sebatian kovalen ?

A $MgCl_2$
B Al_2O_3
C CaO
D SO_2

5 Diagram 2 shows the apparatus set-up of the electrolysis of substance X.
Rajah 2 *menunjukkan susunan radas bagi elektrolisis bahan* X.

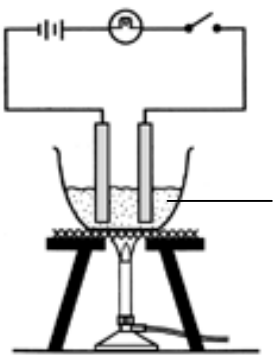

Diagram 2

Substance X is an electrolyte. What is X ?
Bahan X *adalah satu elektrolit. Apakah* X ?

A Iron
Besi
B Glucose
Glukosa
C Naphtalene
Naftalena
D Lead(II) bromide
Plumbum (II) bromida

6 The pH scale indicates the degree of acidity or alkalinity of a solution
Which of the following pH values is for strong alkaline solution?

Skala pH menunjukkan darjah keasidan atau kealkalian sesuatu larutan
Antara berikut yang manakah nilai pH bagi larutan alkali kuat ?

A pH 13
B pH 10
C pH 6
D pH 3

7 Diagram 3 shows the formula of a nitrate salt.
Rajah 3 menunjukkan formula bagi suatu garam nitrat.

XNO_3

Diagram 3

Which of the following are the possible ions of X?
Antara berikut yang manakah mungkin ion bagi X ?

I silver ion, Ag^+
ion argentum
II hydroxide ion, OH^-
ion hidroksida
III carbonate ion, CO_3^{2-}
ion karbonat
IV ammonium ion, NH_4^+
ion ammonium

A I and III only
B I and IV only
C II and III only
D II and IV only

8 Diagram 4 shows the steps involved in manufacturing sulphuric acid in the Contact Process.
Rajah 4 menunjukkan langkah-langkah yang terlibat dalam proses penghasilan asid sulfurik melalui Proses Sentuh.

S *I* → **SO_2** *II* → **SO_3** *III* → **Oleum $H_2S_2O_7$** *IV* → **H_2SO_4**

Diagram 4

In step III , sulphur trioxide reacts with
Dalam langkah III, *sulfur trioksida bertindak balas dengan*

A water.
air.
B oxygen.
oksigen.
C sulphur dioxide.
sulfur dioksida.
D concentrated sulphuric acid.
asid sulfurik pekat.

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9 Rate of reaction **does not** depend on
*Kadar tindak balas **tidak** bergantung kepada*

A volume of reactant
isipadu bahan tindak balas
B size of reactant
saiz bahan tindak balas
C temperature of reactant
suhu bahan tindak balas
D concentration of reactant
kepekatan bahan tindak balas

10 Ethanol is used as a solvent in the preparation of cough syrup
Which of the following is the homologous series of ethanol ?
Etanol digunakan sebagai pelarut di dalam penyediaan ubat batuk
Antara berikut yang manakah siri homolog bagi etanol ?

A Alkane
Alkana
B Alkene
Alkena
C Alcohol
Alkohol
D Carboxylic acid
Asid karbosilik

11 Diagram 5 shows the apparatus set-up for a displacement reaction.
Rajah 5 *menunjukkan susunan radas bagi satu tindak balas penyesaran.*

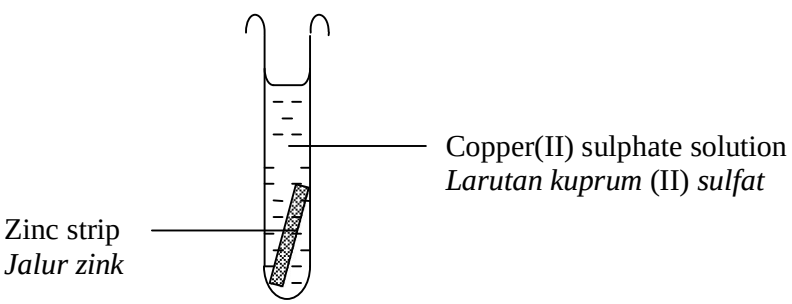

Diagram 5

Based on Diagram 5, what is the role of copper(II) sulphate solution?
Berdasarkan Rajah 5*, apakah peranan larutan kuprum*(II) *sulfat* ?

A Hydrating agent
Agen penghidratan
B Dehydrating agent
Agen pendehidratan
C Oxidising agent
Agen pengoksidaan
D Reducing agent
Agen penurunan

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12 Exothermic reaction is a chemical reaction that gives out heat
Which of the following is an exothermic reaction ?

Tindak balas exotermik adalah satu tindak balas kimia yang membebaskan haba
Antara berikut, yang manakah tindak balas eksotermik ?

A Photosynthesis
Fotosintesis
B Melting of ice
Peleburan ais
C Dissolving ammonium chloride in water
Melarutkan ammonium klorida dalam air
D Neutralisation reaction between acid and alkali
Tindak balas peneutralan antara asid dan alkali

13 Diagram 6 shows two examples of medicine Y
Rajah 6 *menunjukkan dua contoh ubat* Y

Penicillin *Penisilin*
Streptomycin *Streptomisin*

Diagram 6

What is the type of medicine Y?
Apakah jenis ubat Y ?

A Analgesic
Analgesik
B Antibiotic
Antibiotik
C Hormon
Hormon
D Psychotherapeutic medicine
Ubat psikoterapeutik

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14 Table 1 shows the melting point and boiling point of substance X.
Jadual 1 *menunjukkan takat lebur dan takat didih bagi bahan* X

	Temperature/ºC Suhu/ ºC
Melting point *Takat lebur*	78
Boiling point *Takat didih*	245

Table 1

What is the physical state of substance X at 100 ºC ?
Apakah keadaan fizik bahan X *pada suhu* 100 ºC ?

A Solid
Pepejal
B Liquid
cecair
C Solid and liquid
Pepejal dan cecair
D Liquid and gas
Cecair dan gas

15 Table 2 shows the proton number of elements X, Y and Z.
Jadual 2 *menunjukkan nombor proton bagi unsur* X, Y *dan* Z.

Element *Unsur*	Proton number *Nombor proton*
X	8
Y	13
Z	20

Table 2

What is the charge of the ion of element X, Y and Z?
Apakah cas bagi ion unsur X, Y *dan* Z ?

	Ion X	Ion Y	Ion Z
A	2+	3+	2-
B	2-	3+	2-
C	2-	3-	2+
D	2-	3+	2+

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16 Diagram 7 below shows the formulae of two compounds of M.
Rajah 7 dibawah menunjukkan formula-formula bagi dua sebatian M.

MCl_2	MCl_3

Diagram 7

Which of the following is **true** about element M?
*Antara berikut yang manakah **benar** tentang M* ?

A M is a very reactive metal.
M adalah unsur yang sangat reaktif.
B M only react with chlorine.
M hanya bertindakbalas dengan klorin.
C M has several oxidation number.
M mempunyai beberapa nombor pengoksidaan.
D M appear in colour in certain compound only.
M menunjukkan warna dalam sebatian tertentu sahaja.

17 Table 3 shows the proton number of several elements.
Jadual 3 *dibawah menunjukkan nombor proton bagi beberapa unsur.*

Element *Unsur*	S	T	U	V
Proton number *Nombor proton*	11	12	14	17

Table 3

Which of the following pairs of elements react to form an ionic compound?
Antara pasangan unsur-unsur berikut yang manakah bertindakbalas membentuk sebatian ionik ?

I S and V
II T and V
III S and U
IV U and V

A I and II
B I and III
C II and III
D III and IV

18 Diagram 8 shows the apparatus set-up for the electrolysis of copper(II) sulphate solution using **carbon electrodes**.
Rajah 8 *menunjukkan susunan radas bagi elektrolisis larutan kuprum*(II) *sulfat dengan menggunakan* ***elektrod karbon***.

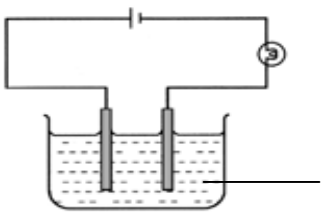

Diagram 8

The blue colour of the copper(II) sulphate solution turns light blue.
Which of the following explains this observation?
Warna biru larutan kuprum(II) *sulfat bertukar kepada biru muda.*
Antara berikut yang manakah menerangkan pemerhatian ini ?

A SO_4^{2-} ion is discharged at the anode
Ion SO_4^{2-} *dinyahcas di anod*
B H^+ ion is discharged at the cathode
Ion H^+ *dinyahcas di katod*
C Cu^{2+} ion is discharged at the cathode
Ion Cu^{2+} *dinyahcas di katod*
D OH^- ion is discharged at the anode
Ion OH^- *dinyahcas di anod*

19 Which of the following oxide forms an acidic solution when dissolved in water?
Antara berikut oksida yang manakah akan membentuk larutan berasid apabila dilarutkan dalam air ?

A SO_2
B ZnO
C Na_2O
D MgO

20 Diagram 9 shows a chemical equation to prepare an insoluble salt.
Rajah 9 *menunjukkan persamaan kimia bagi penyediaan garam tak terlarutkan* .

$$Na_2SO_4\ (aq) + Pb(NO_3)_2\ (aq) \rightarrow 2NaNO_3\ (aq) + PbSO_4\ (s)$$

Diagram 9

Which of the following is the **correct** ionic equation for the chemical equation?
Antara berikut, yang manakah persamaan ion yang ***betul*** *bagi persamaan kimia tersebut?*

A $Na^+ + NO_3^- \rightarrow NaNO_3$
B $Na^+ + SO_4^{2-} \rightarrow Na_2SO_4$
C $Pb^{2+} + 2NO_3^- \rightarrow Pb(NO_3)_2$
D $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$

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21 Diagram 10 shows the orderly arrangement of atoms in a metal.
Rajah 10 *menunjukkan susunan atom-atom yang teratur dalam suatu logam.*

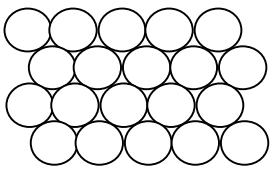

Diagram 10

The metal is ductile because
Logam itu mulur kerana

A the forces of attraction between the metal atoms are very weak.
daya tarikan antara atom logam sangat lemah.
B the forces of attraction between the metal atoms are very strong.
daya tarikan antara atom logam sangat kuat.
C the layers of metal atoms cannot slide over one another when a force is applied.
lapisan atom logam tidak boleh menggelongsor antara satu sama lain apabila dikenakan daya
D the layers of metal atoms can slide over one another when a force is applied.
lapisan atom logam boleh menggelongsor antara satu sama lain apabila dikenakan daya.

22 Diagram 11 shows an action carried out at 450 ºC in a compresser that contains mixture of hydrogen gas and nitrogen gas.
Rajah 11 *menunjukkan tindakan pada suhu* 450 ºC *terhadap sebuah pemampat yang mengandungi gas hidrogen dan gas nitrogen.*

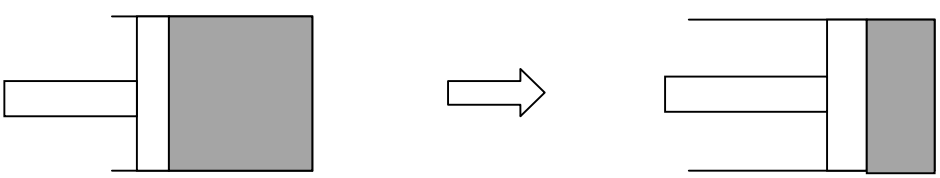

Diagram 11

What happen to the frequency of effective collision of the molecules?
Apakah yang berlaku kepada frekuensi pelanggaran berkesan molekul-molekul tersebut ?

A Decreases
Berkurang
B Increases
Bertambah
C Remain unchanged
Tidak berubah
D Decreases then increases
Berkurang kemudian bertambah

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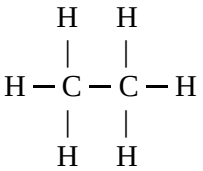
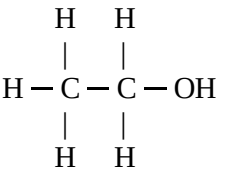
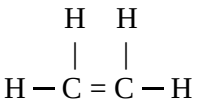
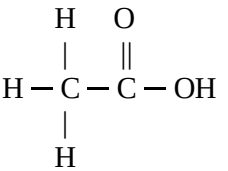
23 Which of the compounds are hydrocarbon?
Antara sebatian berikut yang manakah hidrokarbon?

I


III


II


IV


A I and II

B I and III

C II and IV

D III and IV

24 Iron (III) ions can be reduced to iron(II) ions by substance X
Which of the following is substance X ?

Ion *ferum*(III) *boleh diturunkan kepada ion ferum(II) oleh bahan* X
Antara berikut yang manakah bahan X ?

A Zinc
Zink

B Chlorine water
Air klorin

C Acidified potassium manganate(VII) solution
Larutan kalium manganat (VII) *berasid*

D Acidified potassium dichromate (VI) solution
Larutan kalium dikromat (VI) *berasid*

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25 Diagram 12 is an energy level diagram.
Rajah 12 *adalah gambar rajah aras tenaga.*

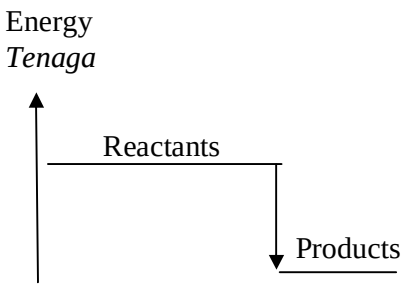

Diagram 12

Which statement is **true** about this energy level diagram ?
*Pernyataan manakah yang **benar** mengenai gambar rajah aras tenaga ini* ?

A Heat is absorbed
Haba diserap
B Heat is needed to start the reaction
Haba diperlukan untuk memulakan tindak balas.
C The surrounding temperature increases
Suhu persekitaran meningkat
D The products contain more energy than the reactants
Hasil tindak balas mengandungi lebih tenaga daripada bahan tindak balas

26 The information below shows the reaction between carboxylic acid and alcohol.
Maklumat berikut menunjukkan tindak balas antara asid karboksilik dan alkohol

Carboxylic acid + alcohol → substance X + water
Asid karboksilik + alkohol → bahan X + *air*

What is the function of substance X in food processing ?
Apakah fungsi bahan X *dalam pemprosesan makanan* ?

A Colouring
Pewarna
B Flavouring
Perisa
C Antioxidant
Antioksidan
D Preservative
Pengawet

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27 Diagram 13 shows the symbol of element R
Rajah 13 *menunjukkan simbol bagi unsur* R

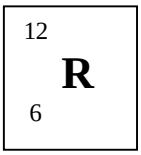

Diagram 13

Which of the following is true about R
Manakah antara berikut benar tentang R

A R atom has four valence electrons
Atom R *mempunyai empat elektron valens*
B R atom form a positively charged ion.
Atom R *membentuk ion positif*
C R atom has six protons and twelve neutrons.
Atom R *mempunyai enam proton dan dua belas neutron*
D Element R is located in Group 2 and Period 3 of the Periodic Table of Elements.
Unsur R *terletak dalam Kumpulan* 2 *dan Kala* 3 *dalam Jadual Berkala Unsur*

28 1.04 g of metal M react with 0.48 g of oxygen to form M oxide.
Determine the emperical formula of M oxide.
1.04 g *logam* M *bertindak balas dengan* 0.48 g *oksigen untuk membentuk oksida* M.
Tentukan formula empirik oksida M.

[Relative atomic mass: O = 16, M = 52]

A MO
B MO_2
C M_2O_3
D M_3O_2

29 Proton number of element Z is 20. Element T has the same chemical property as element Z. Which of the following is the electron arrangement for atom T ?
Nombor proton unsur Z *ialah* 20. *Unsur* T *mempunyai sifat kimia yang sama dengan unsur* Z. *Manakah antara berikut adalah susunan elektron bagi atom* T ?

A 2.
B 2.8
C 2.8.2
D 2.8.8

30 Diagram 14 shows the structure of water molecule.
Rajah 14 *menunjukkan struktur molekul air.*

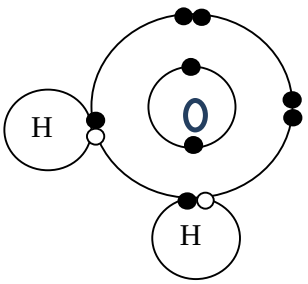

Diagram 14

Which of the following are **incorrect** about the molecule?
Manakah antara berikut adalah ***salah*** *tentang molekul tersebut* ?

I Each hydrogen atom donates one valence electron.
Tiap atom hidrogen menderma satu elektron.valens

II Oxygen atom share two electrons with two hydrogen atoms.
Oksigen atom berkongsi dua elektron dengan dua atom hidrogen

III One single covalent bond is formed in the molecule.
Satu ikatan kovalen tunggal terbentuk dalam molekul.

IV Hydrogen atoms and oxygen atom achieved a stable octet electron arrangement.
Atom-atom hidrogen dan oksigen mencapai susunan elektron oktet yang stabil.

A I, II and IV.
B I, III and IV.
C II, III and IV.
D I, II, III and IV.

31 Diagram 15 shows a simple chemical cell
Rajah 15 *menunjukkan satu sel kimia ringkas.*

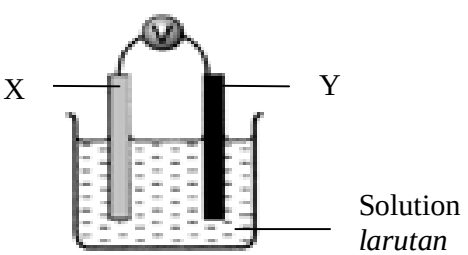

Diagram 15

Which combination of electrodes and solution used can cause deflection of the voltmeter pointer ?
Antara pasangan elektrod dan larutan yang berikut, yang manakah boleh menyebabkan jarum voltmeter terpesong ?

	Electrode X	Electrode Y	Solution
A	Copper	Iron	Tetrachloromethane
B	Zinc	Copper	Dilute sulphuric acid
C	Copper	Copper	Copper(II) sulphate
D	Carbon	Zinc	Methylbenzene

32 An acid is a compound that ionises in water to produce hydrogen ions, H^+ or hydroxonium ions, H_3O^+ .
Sulphuric acid is a diprotic acid because sulphuric acid molecule

Asid ialah sebatian yang menghasilkan ion hidrogen, H^+ *atau ion hidroksonium,* H_3O^+ *apabila melarut dalam air.*
Asid sulfurik ialah asid diprotik kerana molekul asid sulfurik

A ionise partially in water.
mengion separa dalam air.
B ionise completely in water.
mengion lengkap dalam air.
C produce one hydrogen ion when dissolved in water.
menghasilkan satu ion hidrogen apabila dilarutkan dalam air.
D produce two hydrogen ion when dissolved in water.
menghasilkan dua ion hidrogen apabila dilarutkan dalam air.

33 Diagram 16 shows the steps involved to prepare a soluble salt.
Rajah 16 *menunjukkan langkah-langkah untuk menyediakan suatu garam larut.*

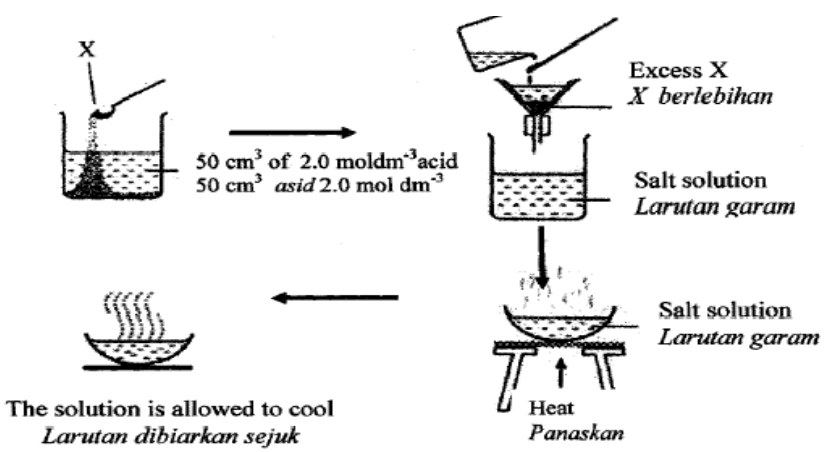

Diagram 16

Which of the following could be X ?
Antara berikut yang manakah mungkin X ?

A Copper
B Copper(II) oxide
C Sodium oxide
D Potassium oxide.

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34 Ceramic is suitable to make an engine block because it
Seramik sesuai untuk membina blok enjin disebabkan ia

A is chemically inert
adalah lengai secara kimia
B is an electrical conductor
adalah konduktor elektrik
C can withstand high temperature
boleh tahan suhu yang tinggi
D has a low specific heat capacity
mempunyai muatan haba tentu yang rendah

35 Hydrogen peroxide decompose to produce water and oxygen gas as follows:
Hidrogen peroksida terurai kepada air dan gas oksigen seperti berikut :

$$2\ H_2O_2 \rightarrow 2H_2O + O_2$$

Diagram 17 shows the graph of volume of oxygen gas against time .Curve X was obtained when 0.2 g of manganese (IV) oxide is added to 0.40 mol dm^{-3} hydrogen peroxide at 30 ºC.
Which of the following will produce curve *Y* ?

Rajah 17 *menunjukkan graf isipadu gas oksigen melawan masa .Lengkuk* X *diperolehi apabila* 0.2 g *mangan* (IV) *oksida ditambah kepada hidrogen peroksida* 0.40 mol dm^{-3} *pada* 30 ºC.
Antara yang berikut,yang manakah akan menghasilkan lengkung Y ?

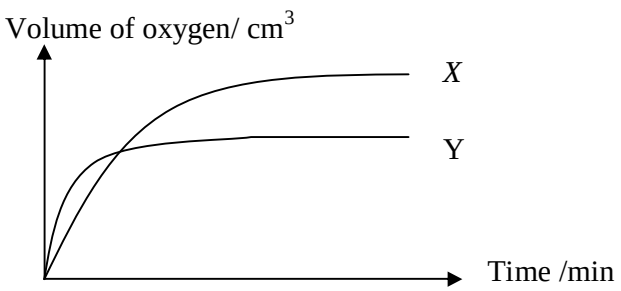

Diagram 17

	Volume of H_2O_2 /cm^3 *Isipadu* H_2O_2 /cm^3	Concentration of H_2O_2 /mol dm^{-3} *Kepekatan* H_2O_2 /mol dm^{-3}	Temperature / ºC *Suhu* / ºC	Mass of MnO_2/g *Jisim* MnO_2/g
A	10	0.60	30	0.2
B	15	0.20	30	0.2
C	20	0.60	40	0.2
D	30	0.30	40	0.2

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36 The chemical equation for the combustion of propane is shown below.
Persamaan kimia untuk pembakaran propana adalah seperti di bawah.

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

Which of the following statement is **true** when 100 cm^3 of propane is burnt at room condition ?
*Antara pernyataan berikut, yang manakah **benar** apabila* 100 cm^3 *propana dibakar pada keadaan bilik* ?
[Relative atomic mass : C=12; O=16; H=1]

I The reaction is an incomplete combustion
Tindak balas tersebut adalah pembakaran tidak lengkap

II The reaction is a complete combustion
Tindak balas tersebut adalah pembakaran lengkap

III 300 cm^3 of water is produced
300 cm^3 *air terbentuk*

IV 300 cm^3 of carbon dioxide gas is produced
300 cm^3 *gas karbon dioksida terbentuk*

A I and III
B I and IV
C II and III
D II and IV

37 What is the oxidation number of nitrogen in NO_2 ?
Apakah nombor pengoksidaan bagi nitrogen dalam NO_2 ?

A +2

B +3

C +4

D +6

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38 Diagram 18 shows a cold pack used to relieve pain due to injury.
Rajah 18 *menunjukkan pek sejuk yang digunakan untuk melegakan kesakitan akibat kecederaan.*

Substance P _____ _____ water

Diagram 18

When substance P and water are mixed, heat is absorbed.
Which of the following substance is most suitable to be P?
Apabila bahan P *dan air dicampur, haba diserap.*
Antara berikut , yang manakah paling sesuai sebagai P ?

A Sodium chloride
Natrium klorida
B Hydrochloric acid
Asid hidroklorik
C Ammonium nitrate
Ammonium nitrat
D Potassium hydroxide
Kalium hidroksida

39 A student discovered that a green apple that was cut into smaller pieces turned brown after 15 minutes .
Which of the following substances should be added to prevent the browning of apple?
Seorang pelajar mendapati potongan kecil epal hijau bertukar keperangan setelah dibiarkan selama 15 *minit*.
Antara berikut , bahan yang manakah boleh ditambah untuk mencegah keperangan epal tersebut ?

A Alcohol
Alkohol
B Sugar
Gula
C Lecithin
Lesitin
D Ascorbic acid
Asid askorbik

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40 The following equation represents the combustion of methane.
Persamaan berikut mewakili pembakaran metana.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Calculate the volume of carbon dioxide formed at standard temperature and pressure if 3.2 g of methane is used.
Kira isipadu karbon dioksida yang terhasil pada suhu dan tekanan piawai jika 3.2 g *metana digunakan.*
(Relative atomic mass: H=1, C=12, O=16)
Molar volume of gas at standard temperature and pressure 22.4 dm^3 mol^{-1}

A 4.48 dm^3
B 2.24 dm^3
C 1.63 dm^3
D 1.12 dm^3

41 Caffeine is found in coffee beans. Its molecular formula is $C_4H_5N_2O$. If one coffee bean contains 0.02 mole of caffeine, determine the mass of the compound in 10 coffee beans.
Kafein dijumpai di dalam biji kopi. *Formula molekulnya ialah* $C_4H_5N_2O$.
Jika sebutir biji kopi mengandungi 0.02 mol *kafein, tentukan jisim sebatian itu dalam* 10 *butir biji kopi*.

(Relative atomic mass : H=1, C=12, N=14, O=16)

A 0.97 g
B 1.94 g
C 9.70 g
D 19.4 g

42 Table 4 shows the position of four elements in the Periodic Table.
Jadual 4 *dibawah menunjukkan kedudukan empat unsur dalam Jadual Berkala.*

A				C				
	B						D	

Table 4

Which of the elements that can react to form a compound with a low melting point and boiling point?
Manakah antara unsur-unsur tersebut dapat bertindakbalas membentuk suatu sebatian dengan takat lebur dan takat didih yang rendah ?

A C and D
B B and C
C A and D
D A and C

43 Figure 19 shows a standard representation of two elements X and Y.
Rajah 19 *dibawah menunjukkan perwakilan piawai bagi dua unsur* X *dan* Y.

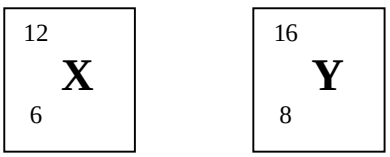

Diagram 19

Element X and Y react to form a covalent compound.
What is the chemical formula of the compound?
Unsur X *dan* Y *bertindakbalas membentuk suatu sebatian kovalen.*
Apakah formula kimia bagi sebatian tersebut?

A XY_2
B X_2Y
C X_2Y_3
D X_3Y_2

44 A concentrated aqueous sodium chloride solution is electrolysed using carbon electrodes. Which half equations represent the reactions at the anode and the cathode?
Satu larutan akueus natrium klorida pekat dielektrolisiskan dengan menggunakan elektrod karbon. Persamaan setengah manakah mewakili tindak balas yang berlaku di anod dan di katod?

	Anode	Cathode
A	$2Cl^- \rightarrow Cl_2 + 2e$	$Na^+ + e \rightarrow Na$
B	$2Cl^- \rightarrow Cl_2 + 2e$	$2H^+ + 2e \rightarrow H_2$
C	$4OH^- \rightarrow O_2 + 2H_2O + 4e$	$2H^+ + 2e \rightarrow H_2$
D	$4OH^- \rightarrow O_2 + 2H_2O + 4e$	$Na^+ + e \rightarrow Na$

45 The chemical equation below shows the reaction between sulphuric acid and potassium hydroxide solution.
Persamaan kimia di bawah menunjukkan tindak balas di antara asid sulfurik dan larutan kalium hidroksida.

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

Calculate the volume of potassium hydroxide solution 2.0 mol dm^{-3} needed to neutralise 50 cm^3 of sulphuric acid 0.5 mol dm^{-3} ?
Kirakan isipadu larutan kalium hidroksida 2.0 moldm^{-3} *yang diperlukan untuk meneutralkan* 50 cm^3 *asid sulfurik* 0.5 mol dm^{-3} ?

A 6.25 cm^3
B 12.5 cm^3
C 25.0 cm^3
D 50.0 cm^3

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46 Magnesium react with hydrochloric acid as follows:
Magnesium bertindak balas dengan asid hidroklorik seperti berikut :

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

Calculate the mass of the salt formed when excess magnesium powder is added to 50 cm^3 of 2.0 mol dm^{-3} hydrochloric acid.
Hitungkan jisim garam yang terbentuk apabila serbuk magnesium berlebihan ditambahkan kepada 50 cm^3 *asid hidroklorik* 2.0 mol dm^{-3}

[Relative atomic mass : Mg =24 ; Cl = 35.5]

A 2.98 g
B 4.75 g
C 5.95 g
D 9.50 g

47 Table 5 shows fertilisers and their respective relative molecular mass.
Jadual 5 *menunjukkan beberapa baja dan jisim molekul relatif masing-masing.*

Fertiliser	Relative molecular mass
Ammonium sulphate ,$(NH_4)_2SO_4$	132
Ammonium nitrate, NH_4NO_3	80
Potassium nitrate, KNO_3	101
Urea,$CO(NH_2)_2$	60

Table 5

Which of the following fertilisers contains the highest percentage of nitrogen by mass?
Yang manakah antara baja berikut mengandungi peratus nitrogen mengikut jisim yang paling tinggi ?

[Relative atomic mass of N = 14]

A Urea

B Ammonium nitrate

C Potassium nitrate

D Ammonium sulphate

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48 Table 6 shows the result obtained from the reaction between hydrochloric acid and calcium carbonate.
Jadual 6 *menunjukkan keputusan yang diperolehi daripada tindak balas antara asid hidroklorik dan kalsium karbonat.*

Time/minute *Masa/minit*	0	0.5	1.0	1.5	2.0	2.5	3.0
Volume of CO_2 gas / cm^3 *Isipadu gas* CO_2 / cm^3	0	170	260	305	340	350	350

Table 6

Calculate the average rate of reaction in the second minute.
Kira kadar tindak balas purata dalam minit kedua.

A $40.0\ cm^3\ min^{-1}$
B $80.0\ cm^3\ min^{-1}$
C $170.0\ cm^3\ min^{-1}$
D $340.0\ cm^3\ min^{-1}$

49 The following chemical equation shows the dehydration of propanol to produce propene gas.
Persamaan kimia berikut menunjukkan pendehidratan propanol kepada gas propena .

$$C_3H_5OH \rightarrow C_3H_6 + H_2O$$

If 15.0 g of propanol is dehydrated, calculate the volume of propene gas produced at room temperature .
Jika 15.0 g *propanol telah didehidratkan, hitung isipadu gas propena yang terhasil pada suhu bilik.*

[Relative atomic mass : C=12; O=16; H=1 ;
Molar volume of gas at room temperature=24 $dm^3\ mol^{-1}$]
[*Isipadu molar gas pada suhu bilik* = 24 $dm^3\ mol^{-1}$]

A $18.00\ dm^3$
B $17.14\ dm^3$
C $8.57\ dm^3$
D $6.00\ dm^3$

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50 Diagram 20 shows a apparatus set-up to investigate a redox reaction by transferring electrons at a distance.
Rajah 20 *menunjukkan susunan radas untuk mengkaji tindak balas redoks dengan memindahkan elektron pada suatu jarak.*

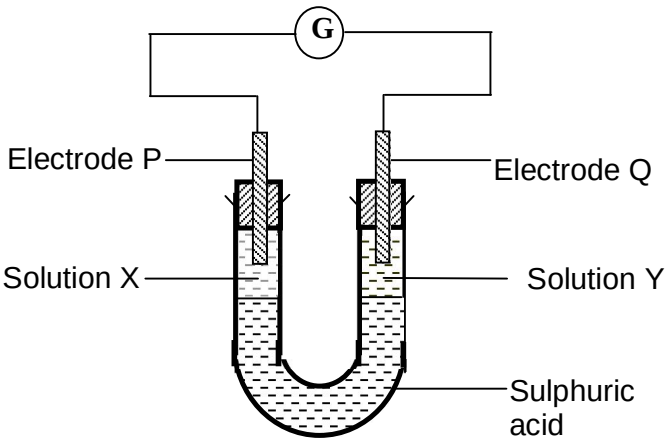

Diagram 20

In this reaction, electrons flow from electrode P to electrode Q.
Which of the following are the **correct** solutions for X and Y?

Dalam tindak balas ini, elektron mengalir daripada elektrod P *ke elektrod* Q.
Yang mana antara berikut adalah larutan yang ***betul*** *untuk* X *dan* Y ?

	Solution X *Larutan* X	Solution Y *Larutan* Y
A	Bromine water *Air bromin*	Iron(II) sulphate solution *Larutan ferum(II) sulfat*
B	Bromine water *Air bromin*	Potassium iodide solution *Larutan kalium iodida*
C	Acidified potassium dichromate(VI) solution *Larutan kalium dikromat*(VI) *berasid*	Potassium iodide solution *Larutan kalium iodida*
D	Potassium iodide solution *Larutan kalium iodida*	Acidified potassium dichromate(VI) solution *Larutan kalium dikromat* (VI) *berasid*

QUESTIONS END HERE

PEPERIKSAAN PERCUBAAN SPM 2011
KEDAH DARUL AMAN

PERATURAN PEMARKAHAN

CHEMISTRY

PAPER		MARKS
Paper 1		50
Paper 2		100
Paper 3		50
	Total	**200**

Jumlah markah diskalakan kepada 100%

CHEMISTRY
Paper 1

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

26	**B**
27	**A**
28	**C**
29	**C**
30	**B**
31	**B**
32	**D**
33	**B**
34	**C**
35	**B**
36	**D**
37	**C**
38	**C**
39	**D**
40	**A**
41	**D**
42	**A**
43	**A**
44	**B**
45	**C**
46	**B**
47	**A**
48	**B**
49	**D**
50	**D**

A = 12 ; B =14 ; C = 12 ; D = 12

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4541/2
CHEMISTRY
Kertas 2
22 Ogos 2011
2½ jam

No.Kad Pengenalan: …….....….....……..... Angka Giliran: .....…….....

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

MAJLIS KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH
NEGERI KEDAH DARUL AMAN

PEPERIKSAAN PERCUBAAN SPM 2011

CHEMISTRY

Paper 2

Two hours and thirty minutes

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*
2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam Bahasa Inggeris atau Bahasa Melayu.*
4. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

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 26 **halaman bercetak**

SULIT

2011 PSPM Kedah

Section A
[60 *marks*]
Answer **all** questions
Jawab ***semua*** *soalan*

1 Table 1 shows the element in Period 3 with their respective proton numbers.
Jadual 1 *menunjukkan unsur-unsur dalam Kala* 3 *bersama nombor proton masing-masing.*

Element *Unsur*	Na	Mg	Al	Si	P	S	Cl	Ar
Proton number *Nombor proton*	11	12	13	14	15	16	17	18

Table 1

(a) (i) Write the electron arrangement of silicon atom, Si
Tuliskan susunan elektron bagi atom silikon, Si

.....
[1 *mark*]

(ii) In which group of the Periodic Table is silicon, **Si** located?
*Dalam kumpulan manakah silikon,*Si *berada dalam Jadual Berkala?*

.....
[1 *mark*]

(b) (i) How does the atomic size change when going across Period 3 from left to right?
Bagaimanakah saiz atom berubah apabila merentasi Kala 3 dari kiri ke kanan?

.....
[1 *mark*]

(ii) Explain your answer in **1**(b)(i).
Terangkan jawapana anda dalam **1***(b)*(i).

.....

.....
[1 *mark*]

(c) Neon is chemically unreactive. Explain why?
Neon adalah tidak reaktif secara kimia. Terangkan mengapa?

……..

……..
[2 marks]

(d) (i) Which of the element when reacts with oxygen produces an amphoteric oxide?
Unsur yang manakah apabila bertindakbalas dengan oksigen membentuk oksida amfoterik?

……..
[1 mark]

(ii) Write the formula of the amphoteric oxide formed.
Tuliskan formula bagi oksida amfoterik yang terbentuk.

.....
[1 mark]

(e) Sodium atom reacts with chlorine atom to form the compound sodium chloride. Draw a diagram to show the electron arrangement of the compound.
Atom natrium bertindak balas dengan atom klorin membentuk sebatian natrium klorida. Lukis satu rajah untuk menunjukkan susunan elektron dalam sebatian ini.

[2 *marks*]

2 Diagram 2 shows the apparatus set-up for an experiment to determine the empirical formula of magnesium oxide.
Rajah 2 *menunjukkan susunan radas bagi satu eksperimen untuk menentukan formula empirik magnesium oksida*

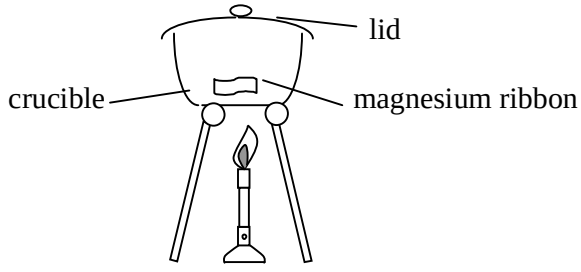


Diagram 2

Table 2 shows the results of this experiment.
Jadual 2 *menunjukkan keputusan eksperimen ini.*

Description *Penerangan*	Mass(g) *Jisim(g)*
Mass of the crucible + lid *Jisim mangkuk pijar + tudung*	20.50
Mass of the crucible + lid + magnesium ribbon *Jisim mangkuk pijar + tudung + pita magnesium*	22.30
Mass of the crucible + lid + magnesium oxide *Jisim mangkuk pijar + tudung + magnesium oksida*	23.50

Table 2

(a) The magnesium ribbon is cleaned with sandpaper before heating. Explain why.
Pita magnesium dibersihkan dengan kertas pasir sebelum dipanaskan. Terangkan mengapa.

.....
[1 *mark*]

(b) Based on Table 3,
Berdasarkan Jadual 3,

(i) Calculate the mass of:
Hitung jisim bagi:

Magnesium :

Oxygen:

[2 marks]

(ii) Calculate the ratio of moles of magnesium atoms to oxygen atoms.
[Relative atomic mass : O= 16 , Mg = 24]
Hitung nisbah mol bagi atom magnesium kepada atom oksigen.
[*Jisim atom relatif* : O =16 , Mg = 24]

[1 mark]

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

……
[1 mark]

(c) Write a balanced chemical equation for the reaction in the experiment.
Tulis persamaan kimia yang seimbang bagi eksperimen ini.

…….
[2 marks]

(d) Give a reason why the crucible lid is opened once in a while during the experiment.
Berikan sebab mengapa tudung mangkuk pijar perlu dibuka sekali sekala sepanjang eksperimen dijalankan.

.....
[1 mark]

(e) Metal W is less reactive than hydrogen towards oxygen.
Draw a labeled apparatus set-up to determine the empirical formula for the oxide of metal W.
Logam W adalah kurang reaktif berbanding hidrogen terhadap oksigen.
Lukiskan susunan radas berlabel bagi menentukan formula empirik oksida logam W.

[2 marks]

3 Diagram 3 shows the apparatus set- up to purify impure copper through electrolysis.
Rajah 3 *menunjukkan susunan radas untuk menulenkan kuprum tak tulen melalui elektrolisis.*

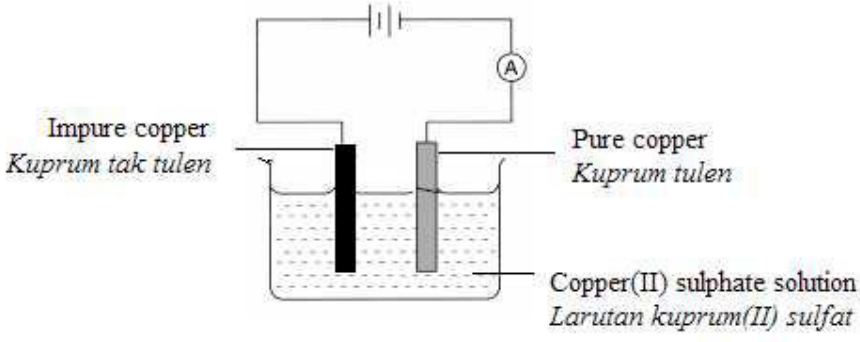


Diagram 3

(a) State the energy change in the electrolytic cell above.
Nyatakan perubahan tenaga dalam sel elektrolisis di atas.

……
[1 mark]

(b) Which electrode act as cathode?
Elektrod manakah bertindak sebagai katod ?

……
[1 mark]

(c) Write the formulae of all the **cations** present in copper(II) sulphate solution.
Tuliskan formula bagi semua ***kation*** *yang hadir dalam larutan kuprum*(II) *sulfat.*

……
[1 mark]

(d) (i) State one observation at impure copper electrode.
Nyatakan satu pemerhatian pada elektrod kuprum tak tulen.

……
[1 mark]

(ii) Write the half equation that occurs at impure copper electrode.
Tulis setengah persamaan yang berlaku di elektrod kuprum tak tulen.

……
[2 marks]

(e) The blue colour of copper(II) sulphate solution remains unchanged. Explain why?
Warna biru larutan kuprum(II) sulfat tidak berubah. Terangkan mengapa ?

……..

…….

[2 marks]

(f) State the type of reaction that occurs at pure copper electrode.
Nyatakan jenis tindak balas yang berlaku di elektrod kuprum tulen.

…….

[1 mark]

(g) State another use of electrolysis in industry.
Nyatakan satu lagi kegunaan elektrolisis dalam industri.

……

[1 mark]

4 Table 4 shows the results of an experiment to study the properties of hydrogen chloride in different solvents.
Jadual 4 *menunjukkan keputusan suatu eksperimen untuk mengkaji sifat-sifat hidrogen klorida dalam pelarut-pelarut yang berlainan*

Experiment	Hydrogen chloride in *Hidrogen klorida dalam*	
	Solvent P *Pelarut* P	Solvent Q *Pelarut* Q
Reaction with blue litmus paper. *Tindak balas dengan kertas litmus biru*	No change *Tiada perubahan*	Blue litmus paper turns red *Kertas litmus biru berubah kepada merah*
Reaction with a piece of magnesium *Tindak balas dengan pita magnesium*	No gas bubbles released *Tiada gelembung gas*	Colourless gas bubbles released *Gelembung gas tanpa warna terbebas*

Table 4

(a) Name the particles of hydrogen chloride found in
Namakan zarah-zarah hidrogen klorida yang terdapat dalam

(i) Solvent P
Pelarut P

……
[1 *mark*]

(ii) Solvent Q
Pelarut Q

……..
[1 *mark*]

(b) Suggest the solvent most likely to be
Cadangkan pelarut yang mungkin bagi

(i) Solvent P
Pelarut P
.....
[1 *mark*]

(ii) Solvent Q
Pelarut Q
.....
[1 *mark*]

(c) Write the chemical equation to represent the reaction between hydrogen chloride in solvent Q with magnesium.
Tuliskan persamaan kimia bagi mewakili tindak balas antara hidrogen klorida dalam pelarut Q *dengan magnesium.*

.....
[2 *marks*]

(d) (i) Predict whether hydrogen chloride in solvent P can conduct electricity.
Ramalkan sama ada hidrogen klorida dalam pelarut P *dapat mengkonduksi elektrik.*

.....
[1 *mark*]

(ii) Give the reason for your prediction.
Berikan sebab bagi ramalan anda.

.....
[1 *mark*]

(e) If 50 cm^3 of 0.1 mol dm^{-3} hydrogen chloride in solvent Q reacts with magnesium, calculate the mass of magnesium which has reacted.
[Relative atomic mass: Mg = 24; H = 1; Cl = 35.5]

Jika 50 cm^3 *hidrogen klorida* 0.1 mol dm^{-3} *dalam pelarut* Q *bertindak balas dengan magnesium , hitung jisim magnesium yang telah bertindak balas.*
[Jisim atom relatif: Mg = 24; H = 1; C = 35.5]

[2 marks]

5 Diagram 5 shows the flow chart of a series of reactions undergo by butene
Rajah 5 *menunjukkan carta alir siri tindakbalas yang dialami oleh butena*

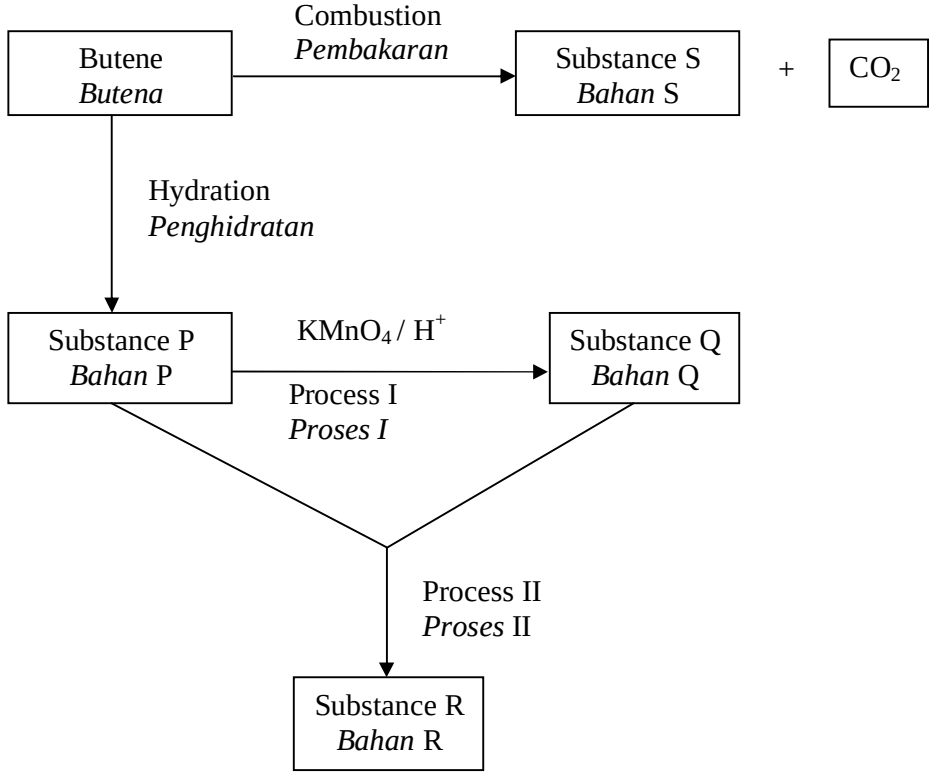


Diagram 5

(a) The molecular formula of butene is C_4H_8. State the meaning of molecular formula ?
Formula molekul butena adalah C_4H_8. *Nyatakan maksud formula molekul ?*

.....

.....

[1 *mark*]

(b) Butene is burnt completely in air to produce substance S and carbon dioxide gas.
Butena dibakar lengkap dalam udara untuk menghasilkan bahan S *dan gas karbon dioksida.*

(i) Complete the chemical equation below for the combustion reaction.
Lengkapkan persamaan kimia di bawah untuk tindak balas pembakaran tersebut.

$$C_4H_8 + ... O_2 \rightarrow 4CO_2 + ...$$

[1 *mark*]

(ii) How many moles of substance S will be produced if 0.2 mol of butene is used in the reaction?
Berapakah mol bahan S *akan terhasil jika* 0.2 mol *butena digunakan dalam tindak balas tersebut* ?

.....

[1 *mark*]

(c) Butene undergo hydration reaction to form substance P.
Butena mengalami tindak balas penghidratan untuk menbentuk bahan P.

(i) Draw the structural formula of substance P
Lukiskan formula struktur bahan P

[1 *mark*]

(ii) Substance P can undergo dehydration to form butene again.
Draw a labeled apparatus set- up for this dehydration reaction.
Bahan P *boleh mengalami pendehidratan untuk membentuk butena semula.*
Lukiskan susunan radas berlabel untuk tindak balas pendehidratan ini.

[2 *marks*]

(d) (i) Name another chemical substance that can be used to replace acidified potassium manganate(VII) solution in Process I .
Namakan bahan kimia lain yang boleh digunakan untuk menggantikan larutan kalium mangganat (VII) *berasid dalam Proses* I

.....

[1 *mark*]

(ii) State one physical property of substance Q.
Nyatakan satu sifat fizik bahan Q

.....

[1 *mark*]

(e) Based on Process II,
Berdasarkan Proses II,

(i) name substance R.
namakan bahan R

.....

[1 *mark*]

(ii) what would be observed when substance R is added to water?
apakah yang akan diperhatikan apabila bahan R ditambah kepada air ?

.....

[1 *mark*]

6 Diagram 6 shows the apparatus set-up to determine the heat of displacement of silver by copper from silver nitrate solution.
Rajah 6 *menunjukkan susunan radas untuk menentukan haba penyesaran argentum oleh kuprum dari larutan argentum nitrat.*

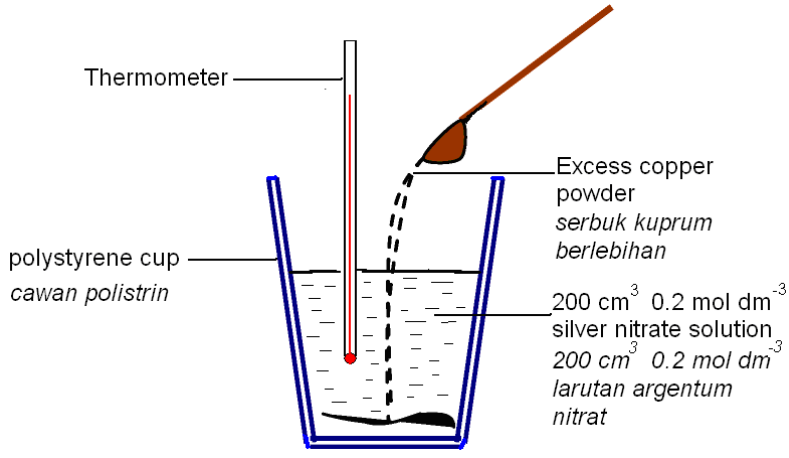


Diagram 6

Table 6 shows the results of the experiment.
Jadual 6 *menunjukkan keputusan eksperimen ini.*

Description *Penerangan*	Temperature (^oC) *Suhu (^oC)*
Initial temperature of the solution *Suhu awal larutan*	29.0
Final temperature of the solution *Suhu akhir larutan*	36.5

Table 6

(a) What is the function of the polystyrene cup in this experiment?
Apakah fungsi cawan polistrin dalam eksperimen ini?

..... [1 mark]
.

(b) State one observation in this experiment.
Nyatakan satu pemerhatian dalam eksperimen ini.

..... [1 mark]

(c) Write a balanced equation for the above reaction.
Tuliskan satu persamaan yang seimbang bagi tindak balas di atas.

……. [2 marks]

(e) From the results of the experiment, calculate
Dari keputusan eksperimen, kira

(i) the heat change
perubahan haba

[1 mark]

(ii) the heat of displacement
haba penyesaran
[Specific heat capacity of solution : 4.2 J g^{-1} $^{o}C^{-1}$]

[3 marks]

(f) Draw an energy level diagram for this reaction
Lukis rajah aras tenaga bagi tindak balas tersebut.

[2 marks]

Section B
[20 *marks*]
Answer any **one** question.
Jawab mana-mana ***satu*** *soalan.*

7 Diagram 7 shows the structural formula of substance P.
Rajah 7 *menunjukkan formula struktur bahan* P.

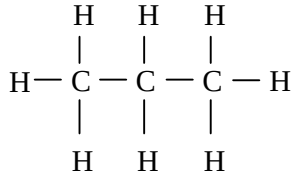


Diagram 7

(a) Based on Diagram 7:
Berdasarkan Rajah 7,

(i) State two informations that can be obtained.
Nyatakan dua maklumat yang boleh diperolahi.

[2 marks]

(ii) State the empirical formula and the molecular formula.
Nyatakan formula empirik dan formula molekul.

[2 marks]

(iii) Substance P is a gas at room temperature. Calculate the volume of 0.2 mol substance P at room temperature.
Bahan P *adalah gas pada suhu bilik. Kirakan isipadu* 0.2 mol *bahan* P *pada suhu bilik.*
[1 mol of any gas at room temperature is 24 dm^3]

[2 marks]

(b) Sodium chloride, NaCl is an ionic compound while carbon tertrachloride, CCl_4 is a covalent compound. These compounds have different physical properties. Compare and explain the differences between the two compounds based on:

- Melting point
- Electrical conductivity

Natrium klorida, NaCl *adalah sebatian ion manakala karbon tetraklorida,* CCl_4 *adalah sebatian kovalen. Bahan-bahan ini mempunyai sifat fizikal yang berbeza.*
Banding dan terangkan perbezaan di antara kedua sebatian ini berdasarkan:

- *Takat lebur*
- *Kekonduksian elektrik*

[8 marks]

(c) Carbon reacts with chlorine to form a covalent compound, carbon tetrachloride. Describe how the bonds between carbon atom and chlorine atoms are formed.
Proton number of C = 6 , Cl = 17
Karbon bertindakbalas dengan klorin untuk membentuk satu sebatian kovalen. karbon tetraklorida.
Terangkan bagaimana ikatan antara atom karbon dan atom klorin terbentuk.
Nombor proton C = 6, Cl = 17

[6 marks]

8

Our National Monument in Kuala Lumpur is more than forty years old.
It is made from bronze, an alloy of copper and tin.
Until today, it is still standing high, strong and beautiful.

Tugu Negara di Kuala Lumpur sudah menjangkau lebih empat puluh tahun.
Ia diperbuat daripada gangsa, suatu aloi kuprum dan stanum.
Sehingga sekarang ia masih berdiri teguh, kuat dan menarik.

(a)(i) Based on the above statement, state three reasons for alloying.
Berdasarkan kepada pernyataan di atas, nyatakan tiga sebab untuk pengaloian

[3 marks]

(ii) Draw the arrangement of the atoms in bronze alloy.
Lukiskan susunan atom dalam aloi gangsa.

[2 marks]

(b) Diagram 8.1 shows how the substance ammonium sulphate is produced.
Rajah 8.1 *menunjukkan bagaimana bahan ammonium sulfat dihasilkan.*

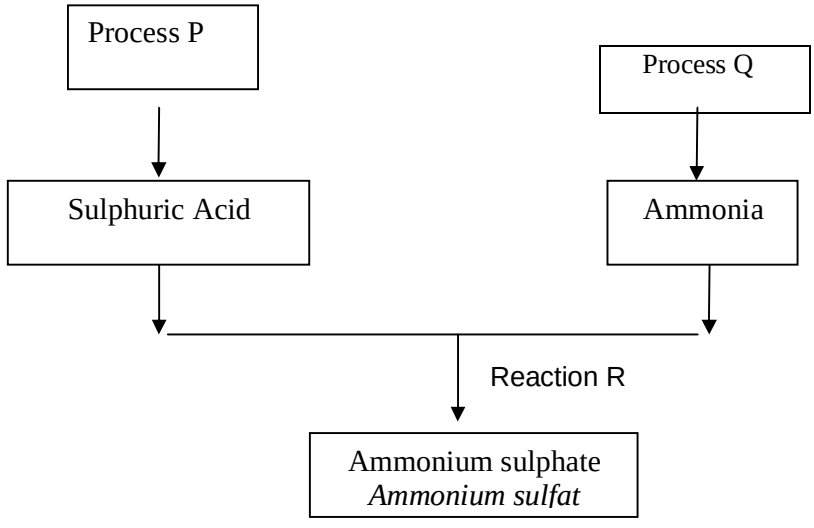


Diagram 8.1

State the names of process P and process Q.
Nyatakan nama bagi proses P dan proses Q.

Explain the industrial preparation of sulphuric acid in Process P.
In your answers, include the chemical equations involved.
Terangkan persediaan secara industri bagi asid sulfurik dalam proses P.

[12 marks]

(c) The widespread use of synthetic polymers and their improper disposal have contributed to pollution of the environment.
Penggunaan polimer sintetik secara berleluasa dan pembuangan secara sewenang-wenang bahan ini mengakibatkan pencemaran alam sekitar.

Name one synthetic polymer.
State two ways to reduce pollution caused by synthetic polymers.

Namakan satu polimer sintetik.
Nyatakan dua cara untuk mengurangkan pencemaran disebabkan polimer sintetik.

(3 marks)

Section C
[20 *marks*]
Answer any **one** question.
*Jawab mana-mana **satu** soalan.*

9 (a) The statement below shoes that one of the factor that affect the rate of reaction is the size of the reactant.
Pernyataan di bawah menunjukkan bahawa salah satu faktor yang mempengaruhi kadar tindak balas ialah saiz bahan.

> Mimi bought 1 kg of meat. She realizes that meat which is cut into big pieces will take a longer time to cook. The same meat if cut into small pieces will take a shorter time to cook under the same cooking conditions.
>
> *Mimi membeli* 1kg *daging. Dia menyedari bahawa daging yang dipotong besar mengambil masa yang lama untuk masak. Daging yang sama jika dipotong kecil mengambil masa yang singkat untuk masak dalam keadaan yang sama.*

(i) State two other factors that affect rate of reaction.
Nyatakan dua faktor lain yang mempengaruhi kadar tindak balas.

[2 marks]

(ii) Explain the effect of one factor stated in 9(a)(i) on rate of reaction based on the collision theory.
Terangkan kesan salah satu faktor yang dinyatakan dalam 9(a)(i) ke atas kadar tindak balas berdasarkan teori perlanggaran.

[4 marks]

(b)

$$CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O\ (l)$$

24 cm^3 of carbon dioxide gas was collected in a reaction between calcium carbonate and hydrochloric acid after 100 seconds as shown in the above equation. Calculate the average rate of reaction.

24 cm^3 *gas karbon dioksida dibebaskan dalam tindak balas antara kasium karbonat dan asid hidroklorik selepas* 100 saat *seperti yang ditunjukkan di dalam persamaan di atas. Kira kadar purata tindak balas ini.*

[2 marks]

(c) A student intends to investigate the effect of concentration on the rate of reaction between sodium thiosulphate solution and sulphuric acid.
Describe one laboratory experiment to study the effect of concentration on the rate of reaction.
Your answer should include the following:

- List of materials and apparatus
- Procedure of the experiment
- Sketch a graph to show the relationship between the rate of reaction and concentration

Seorang pelajar ingin menyiasat kesan kepekatan ke atas kadar tindak balas antara larutan natrium thiosulfat dan asid sulfurik.
Huraikan satu eksperimen untuk mengkaji kesan kepekatan ke atas kadar tindak balas.
Jawapan anda perlu mengandungi perkara berikut:

- *Senarai bahan dan radas*
- *Prosedur eksperimen*
- *Lakarkan graf untuk menunjukkan hubungan antara kadar tindak balas dengan kepekatan.*

[12 marks]

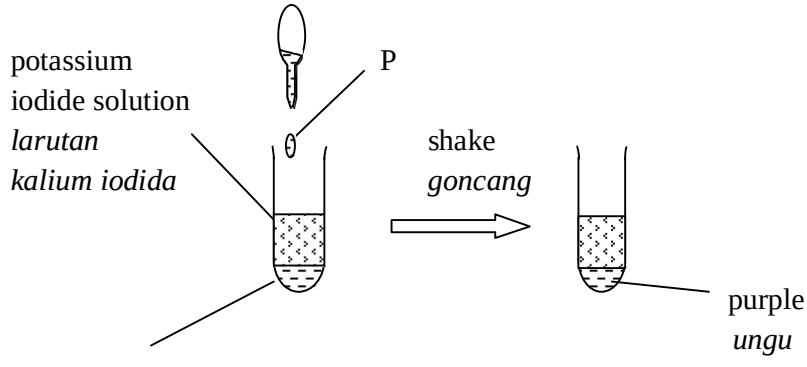
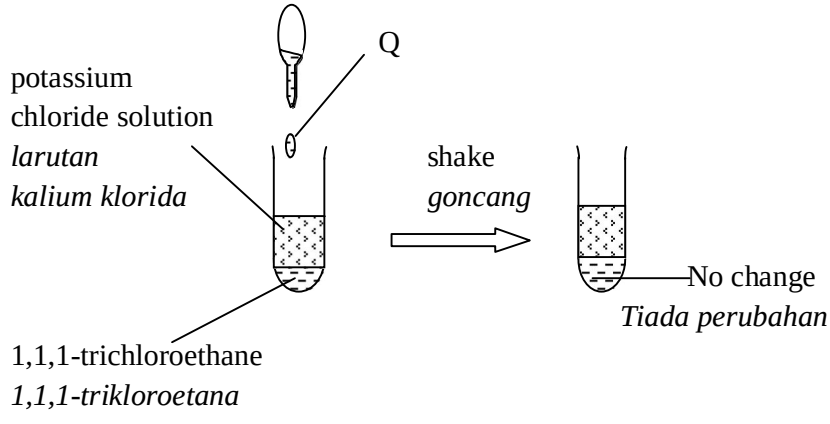
10 (a) The chemical equation below shows a redox reaction.
Persamaan kimia di bawah menunjukkan suatu tindak balas redoks.

$$2X\ (s) + Cl_2\ (g) \rightarrow 2XCl\ (s)$$

X is a metal of group 1 elements in the Periodic Table.
Suggest the identity of metal X.
State one physical property of the product formed.
Write half equations for oxidation and reduction that has occurs.
X *adalah logam unsur kumpulan* 1 *di dalam Jadual Berkala.*
Cadangkan identiti logam X.
Nyatakan satu sifat fizik bagi hasil tindak balas yang terbentuk.
Tulis setengah persamaan untuk tindak balas pengoksidaan dan penurunan yang telah berlaku.

[4 marks]

(b) Diagram 10.1 and 10.2 shows an apparatus set-up and its respective observation to investigate the displacement of halogen from its halide solution. Liquid halogen P and Q is added to the test tube.
Rajah 10.1 *dan* 10.2 *menunjukkan susunan radas dan pemerhatian masing-masing untuk mengkaji tindak balas penyesaran halogen daripada larutan halida .*
Cecair halogen P dan Q ditambahkan ke dalam tabung uji .

Set I	 Diagram 10.1
Set II	 Diagram 10.2

Based on Diagram 10.1 and 10.2 , suggest the identity of halogens, P and Q.
Explain your reason for each of your choices by referring to

- Electronegativity
- oxidation and reduction

Berdasarkan Rajah 10.1 *dan* 10.2 *, cadangkan identiti halogen,* P *dan* Q.
Terangkan sebab untuk setiap pilihan anda dengan merujuk kepada

- *keelektronegatifan*
- *pengoksidaan dan penurunan*

[6 marks]

(c) The position of carbon is above metal M and below metal N in the Reactivity Series of metal
Kedudukan karbon adalah di atas logam M *dan di bawah logam* N *dalam Siri Kereaktifan logam*

You are provided with metal M oxide , MO , metal N oxide , NO, carbon powder and apparatus needed. Describe an experiment to verify the above statement.
Your answer should consist of the following :

- A labelled diagram of the apparatus set-up
- Procedure
- Observation
- Chemical equation

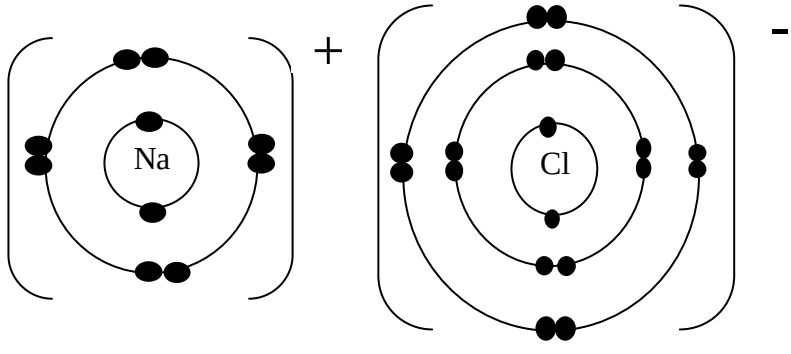
Anda dibekalkan dengan logam M *oksida ,*MO *, logam N oksida,* NO *, serbuk karbon dan radas-radas yang diperlukan. Huraikan eksperimen untuk mengesahkan kenyataan di atas.*
Jawapan anda perlu mengandungi perkara berikut :

- *Gambarajah berlabel susunan radas*
- *Prosedur*
- *Pemerhatian*
- *Persamaan kimia*

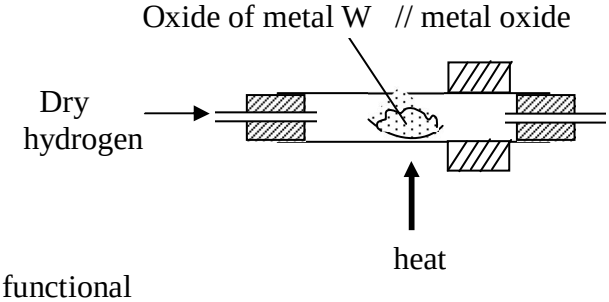
[10 marks]

END OF QUESTION PAPER

Mark scheme

1	Answers			Marks
	(a)	(i)	2.8.4	1
		(ii)	14	1
	(b)	(i)	Decreases // Become smaller	1
		(ii)	Proton number / Positive charges increases // Forces of attraction increases	1
	(c)		Achieved octet electron arrangement // Has 8 electron valence Do not accept or share electron	1 1
	(d)	(i)	Al // Aluminium	1
		(ii)	Al_2O_3	1
	(e)		 Pt 1: Label nucleus and correct number of shells Pt 2: Octet electron arrangement and correct charges	1 1
			Total	**10**

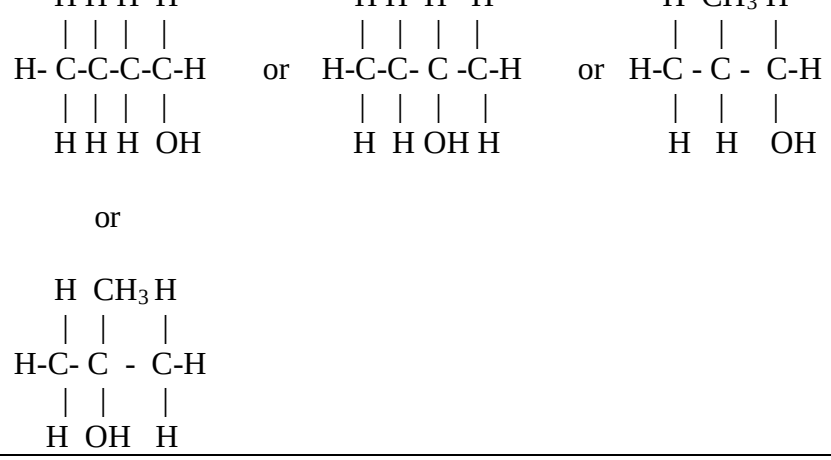
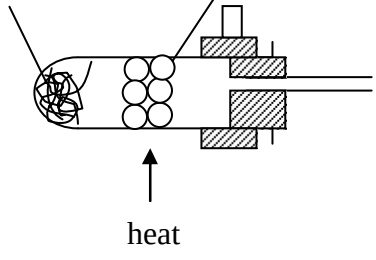
2	(a)	To remove the oxide layer		1
	(b)	(i)	Mass of magnesium = 22.30 – 20.50 g // 1.80 g	1 + 1

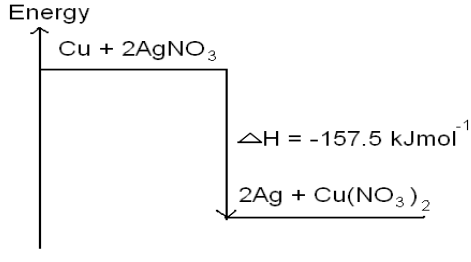
			Mass of oxygen = 23.50 – 22.30 g // 1.20 g	
		(ii)	Mg O 1 mol 1 mol	1
		(iii)	MgO	1
	(c)		$2Mg + O_2 \longrightarrow 2MgO$ Pt 1: correct reactants and product Pt 2: balanced equation	 1 1
	(d)		To let the oxygen in // to prevent loss of white fumes	1
			 Pt 1– functional Pt 2– correct labeling	1 + 1
				10

3	(a)		Electrical energy to chemical energy	1
	(b)		Pure copper	1
	(c)		Cu^{2+} , H^{+}	1
	(d)	(i)	Become thinner // it dissolves // it corrodes // a : size reduces	1
		(ii)	$Cu \rightarrow Cu^{2+} + 2e$ Pt. 1 : Correct formula of reactant and products Pt. 2 : Balanced equation	 1 1

	(e)		Cu^{2+} ion discharged to Cu atom at the cathode is replaced by Cu^{2+} produced when the anode ionises. // The rate of ionization of Cu atom to Cu^{2+} at the anode is equal to the rate of discharge of Cu^{2+} to Cu atom at the cathode. a: Concentration of Cu^{2+} is the same : only 1 mark	1 + 1
	(f)		Reduction	1
	(g)		Electroplating of metals // Extraction of metals	1
			Total	**10**

4		Answers	Marks
(a)	(i)	Molecules	1
	(ii)	Ions	1
(b)	(i)	Methylbenzene // Tetrachloromethane a: any suitable solvent	1
	(i)	Water / H_2O	1
(c)		$Mg + 2HCl \rightarrow MgCl_2 + H_2$ Pt 1: Correct formula of reactants and products Pt 2: Balanced equation	 1 1
(d)	(i)	No	1
	(ii)	No [free] moving ions // Only molecules	1
(e)		No of mol HCl = $\frac{0.1 \times 50}{1000}$ // 0.005 No of mol Mg = $\frac{0.005}{2}$ // 0.0025 Mass Mg = 0.0025 x 24 g // 0.06 g [unit is compulsory]	1 1
		Total	10

5	(a)		Formula that shows the actual number of atom of each element in a compound	1
	(b)	(i)	**6** O_2 → + **4** H_2O	1
		(ii)	0.8	1
	(c)	(i)		1
		(ii)	1.Functional apparatus and heat 2.correct label : butanol, glass wool, name of dehyrating agent a: other correct dehydating agent e.g porcelain chip / porous pot /aluminium oxide / ceramic a: dehydrating agent using concentrated sulphuric acid butanol soaked with glass wool Alumina  heat	2
	(d)	(i)	acidified potassium dichromate (VI) solution	
		(ii)	Colourless liquid // low melting /boiling point // soluble in water //conduct electricity in aqueous state	1 1
	(e)	(i)	Butyl butanoate	1
		(ii)	Two layers are formed // insoluble in water	1
			Total	**10**

6	(a)		To reduce heat lost to the surrounding	1
	(b)		Temperature increases // colourless solution turns blue	1
	(c)		$Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$ // $Cu + 2Ag^+ \rightarrow 2Ag + Cu^{2+}$	2
	(d)	(i)	heat change, Q = mcθ = 200 x 4.2 x 7.5 J // = 6300 J	1
		(ii)	no. of moles, n = $\frac{0.2 \times 200}{1000}$ // 0.04 heat of displcement , ΔH = - Q / n = - $\frac{6.3\ kJ}{0.04\ mol}$ = - 157.5 kJ mol^{-1} Note: i. unit is compulsory ii. symbol negative is compulsory	1 1 1
	(e)		 Pt 1: y-axis labelled enerqy and two layers Pt 2: correct chemical or ionic equation. Value of ΔH is not compulsory	1 1
				10

<table>
<tr><td>7</td><td>(a) (i)</td><td>- Elements present is carbon and hydrogen
- Made up of 3 atoms of carbon and 8 atoms of hydrogen</td><td>1
1</td></tr>
<tr><td></td><td>(ii)</td><td>- Empirical formula = C_3H_8

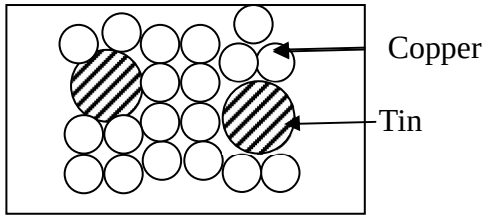
- Molecular formula = C_3H_8</td><td>1
1</td></tr>
<tr><td></td><td>(iii)</td><td>Volume – 0.2 X 24 dm^3 = 4.8 dm^3</td><td>1
1</td></tr>
<tr><td></td><td>(b)</td><td>
<table>
<tr><td></td><td>NaCl</td><td>CCl_4</td></tr>
<tr><td>Melting point</td><td>High</td><td>Low</td></tr>
<tr><td>Explanation</td><td>Forces of attraction between ions is stronger.</td><td>Forces of attraction between molecules</td></tr>
</table>
<table>
<tr><td></td><td>NaCl</td><td>CCl_4</td></tr>
<tr><td>Electrical conductivity</td><td>Conduct electricity in aqueous or molten</td><td>Cannot conduct electricity</td></tr>
<tr><td>Explanation</td><td>Has free moving ions</td><td>Has molecules</td></tr>
</table>
</td><td>1+ 1

1 + 1

1+1

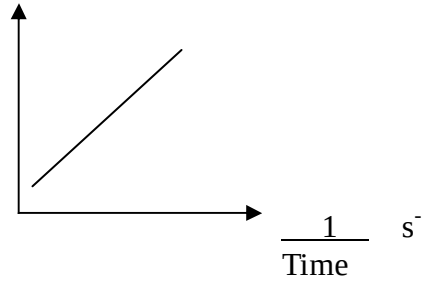
1 + 1</td></tr>
<tr><td></td><td>(c)</td><td>1. Carbon atom, electron arrangement 2.4 / 4 valence electrons
2. contribute 4 electrons for sharing
to achieve the octet electron arrangement.
3. Chlorine atom, electron arrangement 2.8.7 / 7 valence electrons
4. contribute one electron for sharing
5. to achieve the octet electron arrangement.
6. four chlorine atoms share electrons with one carbon atom</td><td>1
1

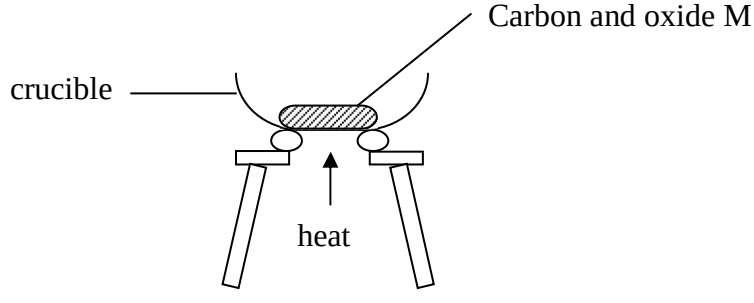
1
1
1
1</td></tr>
<tr><td></td><td></td><td>Total</td><td>20</td></tr>
</table>

8	(a) (i)	- Improve strength / hardness - Improve appearance - Increase resistance to corrosion	1 1 1
	(ii)	 Note: Copper atoms more than Tin atoms Copper atoms smaller than Tin atoms Correct label	 1 1
	(b)	Process P : Contact process Process Q: Haber process 1- Sulphur is burnt in air to produce sulphur oxide 2- $S + O_2 \longrightarrow SO_2$ 3- Sulphur dioxide and excess oxygen is passed over vanadium(V) oxide at 450 – 550 C / pressure 1 atm to produce sulphur trioxide 4- $2SO_2 + O_2 \longrightarrow 2SO_3$ 5- Sulphur trioxide is dissolved in concentrated sulphuric acid to produce oleum 6- $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$ 7- Oleum is diluted with water to produce sulphuric acid. 8- $H_2S_2O_7 + H_2O \longrightarrow 2H_2SO_4$	1 1 1 1 1 1 1 1 1 1 1 1 8
	(c)	Polythene // Polypropene // Polyvinyl chloride // Polystyrene //Perspex // Teflon [any other correct named synthetic polymer] - Recycle / reuse / reduce the polymers - Use biodegradable polymers - No burning of the polymers [any 2 correct answers]	1 1 1 3
		Total	20

*i*k

9	(a) (i)	Two other factors that affect the rate of reaction - Concentration of reactant - Temperature - Pressure - Use of catalyst [Any two correct answers]	2
	(ii)	Based on collision theory explain factors: *Concentration: - The **higher the concentration** of reactants, the **higher the number of particles in a unit volume** - The **frequency of collision between particles** increases - The **frequency of effective collision** increases - The **rate of reaction increases** *Temperature of the reactant - The **higher the temperature, the higher the kinetic energy of reactant particles**. - The **frequency of collision between particles** increases - The **frequency of effective collision** increases - The **rate of reaction increases** *Adding catalyst - By adding catalyst to the reactant, it provides an alternative path with a **lower activation energy.-** - More particles can overcome the activation energy - The **frequency of effective collision** increases - The **rate of reaction increases** -Pressure - The **higher the pressure of the reactant,** the **higher the number of particles in a unit volume** - The **frequency of collision between particles** increases - The **frequency of effective collision** increases - The **rate of reaction increases** **[***Any one explanation]	1 1 1 1
	(b)	$\frac{24\ cm^3}{100\ s}$	1

		= 0.24 cm^3 s^{-1} [units is compulsory]	1
	(c)	--material **:** sodium thiosulphate solution [**0.2 – 0.5 mol dm^{-3}]** , hydrochloric acid [**1.0 to 2.0 mol dm^{-3}]** -apparatus **:** [50 – 100 cm^3] measuring cylinder, 10 cm^3 measuring cylinder, [100 - 250 cm^3] conical flask, stop watch, paper Procedure: 1. Measure 50 cm^3 of sodium thiosulphate solution [using a measuring cylinder] and poured into a conical flask. 2. Place the conical flask on a piece of paper marked with an 'X'. 3. Measure 5 cm^3 of sulphuric acid and add into the conical flask. 4.Start the stopwatch quickly. 5.Stop the stop watch when the 'X' mark becomes invisible/ not seen.. 6.Record the time. 7. Repeat step 1 to 6 using different concentrations of sodium thiosulphate solution. Chemical equations of the reaction $Na_2S_2O_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + S + SO_2$ Correct reactants – 1 mark Correct products – 1 mark Graph: Concentration $Na_2S_2O_3$,mol dm^{-3}  $\frac{1}{\text{Time}}$ s^{-} Correct axes with units – 1 mark Correct straight line – 1 mark	1 1 1 1 1 1 1 1 1 Max 5 2 2
		Total	**20**

10	(a)	Li / Na / K [name of element is accepted]	1
		- High melting/ boiling point // high density // dissolved in water // insoluble in organic compound // conduct electricity in molten / aqueous state // white solid / powder [any one correct answer]	1
		- oxidation : $X \rightarrow X^{+} + e$ or symbol of example	1
		- reduction : $Cl_2 + 2e \rightarrow 2Cl^{-}$	1
	(b)	- P : chlorine / bromine [formula is accepted]	1
		- Q : bromine / iodine	1
		<u>Set I</u>	
		- P is more electronegative [than iodine] // iodine is less electronegative [than P]	1
		- P is reduced to P^{-} ion / P undergo reduction to P^{-}	1
		- I^{-} ion is oxidised to iodine / I^{-} ion undergo oxidation to iodine [accept: Oxidation and reduction can be shown by writing half equations]	1
		Set II	
		- Q is less electronegative [than chlorine] // Chlorine is more electronegative [than Q] // Q does not undergo reduction // chloride ion does not undergo oxidation	1
	(c)		
		<u>apparatus set-up</u>	1
		1.functional diagram and label heat	1
		2. correct label	

		<u>Procedure</u> 1. Put a spatula / a little of carbon powder in a crucible. 2. Add a spatula / a little of oxide M. 3. Mixed thoroughly / evenly 4. Heat the mixture strongly / until glowed / red-hot 5. Repeat steps 1 to 4 with oxide N	 1 1 1 1 1 Max 4
		<u>Observation</u> 1.Carbon + oxide M = burns with bright flame 2.Carbon + oxide N = no changes // no observation	 1 1
		<u>Chemical equation</u> 1.correct formula of reactant and product 2.balanced equation $C + 2MO \rightarrow CO_2 + 2M$	 1 1
		Total	20

END OF MARKING SCHEME

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No. Kad Pengenalan: …….....…....…….... Angka Giliran: .....…….....

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

MAJLIS KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH
NEGERI KEDAH DARUL AMAN

PEPERIKSAAN PERCUBAAN SPM 2011

CHEMISTRY

Paper 3

One hour and thirty minutes

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa*.
2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam Bahasa Inggeris atau Bahasa Melayu*.
4. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini*.

Untuk Kegunaan Pemeriksa		
Soalan	Markah penuh	Markah diperoleh
1	33	
2	17	
JUMLAH		

Kertas soalan ini mengandungi **8 halaman bercetak**

1. Diagram 1.1 shows the apparatus set-up to determine the position of metals in the **reactivity series**. Solid potassium manganate(VII) is heated to produce oxygen gas to react with metal powder. The experiment is carried out using powdered metals of magnesium,aluminium, zinc and copper.

   Rajah 1.1 *menunjukkan susunan radas untuk menentukan kedudukan logam di dalam siri reaktiviti. Pepejal kalium manganat(VII) dipanaskan bagi menghasilkan gas oksigen untuk bertindakbalas dengan serbuk logam. Eksperimen dijalankan menggunakan serbuk logam magnesium,aluminium, zink dan kuprum.*

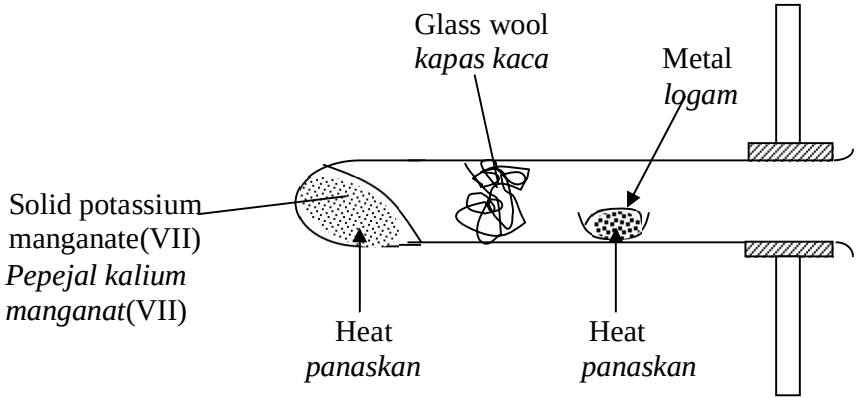


Diagram 1.1

Table 1.1 shows the observations of the experiment.
Jadual 1.1 *menunjukkan pemerhatian dalam eksperimen ini.*

Metal ***Logam***	**Observations** ***Pemerhatian***
Magnesium	Burns with bright flame and white powder *Terbakar dengan nyalaan terang dan serbuk putih*
Aluminium	Burns with moderate flame and white powder *Terbakar dengan nyalaan sederhana dan serbuk putih*
Zinc	Glows brightly.Yellow powder when hot but white when cold *Membara terang. Serbuk kuning apabila panas tetapi putih apabila sejuk*
Copper	

Table 1.1

(a) Write the observations for the reaction of copper powder with oxygen gas in Table 1.1
Tuliskan pemerhatian bagi tindak balas serbuk kuprum dengan gas oksigen dalam Jadual 1.1

[3 *marks*]

(b) Complete Table 1.2 for all the variables involved in this experiment.
Lengkapkan Jadual 1.2 *untuk semua pembolehubah yang terlibat di dalam eksperimen ini.*

Variables *Pembolehubah*	Actions to be taken *Tindakan yang diambil*
(i) Manipulated variable *Pemboleubah dimanipulasikan* ……	(i) The method to control the manipulated variable *Cara mengawal pembolehubah dimanipulasikan* ……..
(ii) Responding variables *Pembolehubah bergerakbalas* ……	(ii) What to observe in the responding variables. *Apakah yang diperhatikan dalam pembolehubah gerakbalas.* …….
(iii) Controlled variable *Pembolehubah dimalarkan* …… …….	(iii) Method to maintain the controlled variable *Cara menetapkan pembolehubah dimalarkan* …… ……

Table 1.2

[6 *marks*]

(c) State the hypothesis for the experiment.
Nyatakan hipotesis bagi eksperimen ini.

……

……

[3 *marks*]

(d) State the function of the glass wool.
Nyatakan fungsi wul kaca.

……

[3 *marks*]

(e) State the operational definition for the reactivity of metal powder with oxygen.
Nyatakan definisi operasi bagi kereaktifan serbuk logam dengan oksigen.

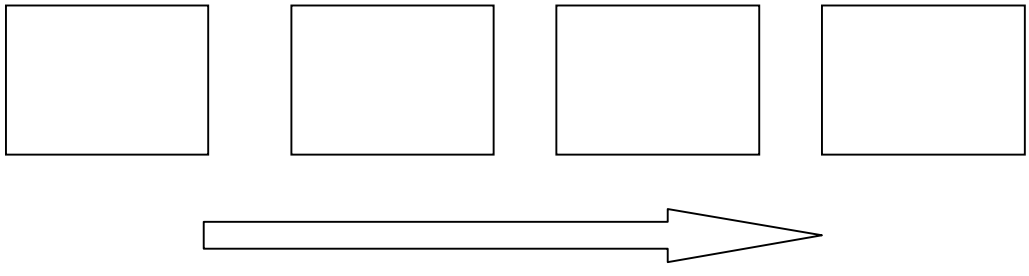
……

……

[3 *marks*]

(f) Based on the observations in Table 1.1, arrange magnesium, aluminium, zinc and copper in **descending order** of reactivity towards oxygen.

Berdasarkan pemerhatian dalam Jadual 1.1, *susun magnesium, aluminium, zink dan kuprum dalam* ***urutan menurun*** *bagi reaktiviti terhadap oksigen.*



Reactivity of metal decreasing
Reaktiviti logam berkurang

[3 marks]

(g) Diagram 1.2 shows the apparatus set-up to construct the Electrochemical Series. The voltage produced when dipping the copper and magnesium electrodes into the solution is measured. The experiment is repeated by replacing magnesium with aluminium and zinc.

Rajah 1.2 *menunjukkan susunan radas yang digunakan untuk membina Siri Elektrokimia. Voltan yang dihasilkan dengan mencelup elektrod kuprum dan magnesium diukur. Eksperimen ini diulangi dengan menggantikan magnesium dengan aluminium dan zink.*

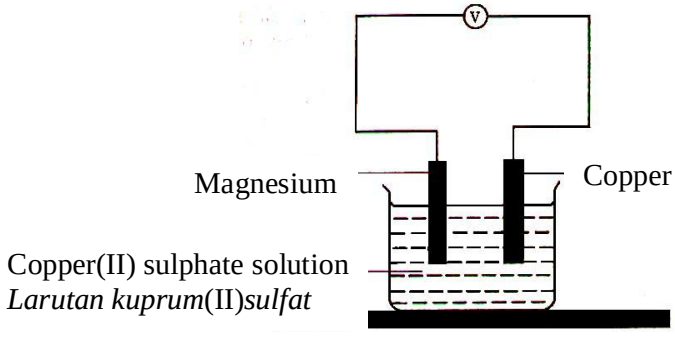


Diagram 1.2

(i) Copper(II) sulphate solution is an electrolyte.
Classify the ions that exist in copper(II) sulphate solution into cation and anion.

Larutan kuprum(II) sulfat adalah satu elektrolit.
Kelaskan ion-ion yang hadir dalam larutan ini kepada kation dan anion.

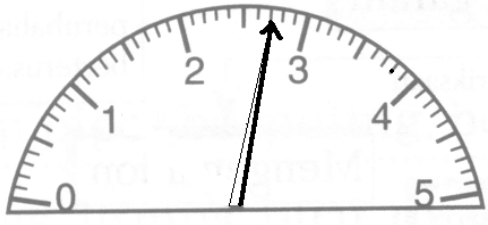
Cation	**Anion**

[3 marks]

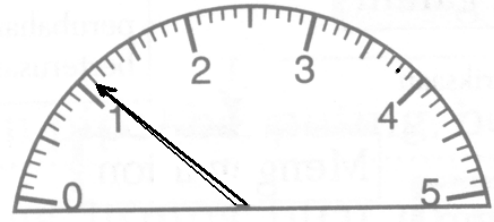
Diagram 1.2 shows the readings of three voltmeters each using **different metals paired with copper.**

Rajah 1.2 *menunjukkan tiga bacaan voltmeter yang menggunakan* ***logam berlainan berpasangan dengan kuprum.***

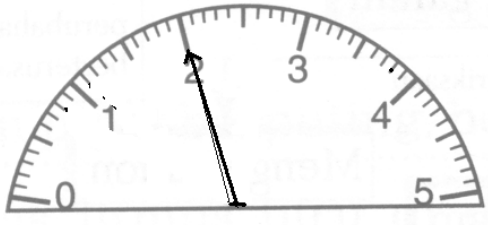
Diagram 1.2



Copper and Magnesium



Copper and Zinc



Copper and Aluminium

(ii) Based on Diagram 1.2, record the voltmeter readings in Table 1.3
Berdasarkan kepada Rajah 1.2, *rekodkan bacaan voltmeter dalam Jadual* 1.3

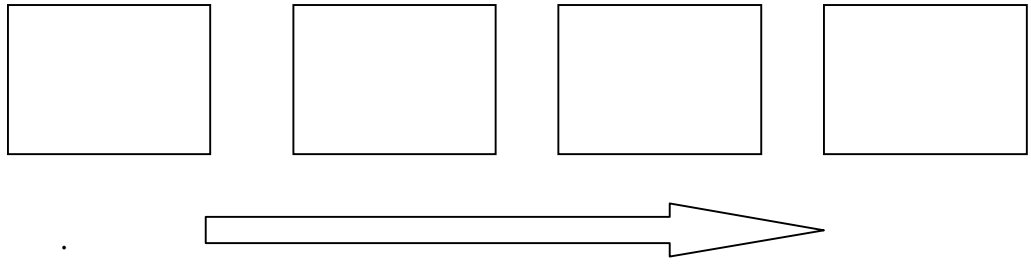
Pair of metals ***Pasangan logam***	**Negative Terminal** ***Terminal negatif***	**Voltage/ V** ***Voltan /V***
Cu and Mg	Magnesium	
Cu and Zn	Zinc	
Cu and Al	Aluminium	

[3 marks]

Table 1.3

(iii) Based on the voltmeter readings, arrange magnesium, aluminium, zinc and copper in **ascending order** of tendency to release electrons.

Berdasarkan bacaan voltmeter, susunkan magnesium, aluminium, zink dan kuprum mengikut kecenderungan menderma elektron dalam ***turutan menaik***



Tendency to release electron increases
Kecenderungan menderma elektron bertambah

[3 marks]

(iv) The experiment is repeated using the pair of metals : **magnesium** and **zinc**
Predict the voltmeter reading.

Eksperimen ini diulangi dengan menggunakan pasangan logam : ***magnesium*** *dan* ***zink.*** *Ramalkan bacaan voltmeter.*

……

[3 marks]

2.

Glacial ethanoic acid, CH_3COOH is a dry acid. It only shows acidic properties when water is added to it.

Asid etanoik glasial.* CH_3COOH *adalah satu asid kering. Ia hanya menunjukkan sifat asid apabila air ditambah padanya.

Using the acid given, plan a laboratory experiment to investigate the role of water in showing the properties of acids. Use distilled water and dry propanone as solvents.
Your planning should include the following aspects:

Menggunakan asid yang diberi, rancang satu eksperimen makmal untuk mengkaji peranan air dalam menunjukkan sifat-sifat asid. Gunakan air suling dan propanon kering sebagai pelarut.
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(a) Problem statement
Pernyataan masalah

(b) All the variables
Semua pemboleh ubah

(c) Hypothesis
Hipotesis

(d) List of materials and apparatus
Senarai bahan dan radas

(e) Procedure
Prosedur

(f) Tabulation of data
Penjadualan data

[17 marks]

END OF QUESTION PAPER

<table>
<tr><th>Question</th><th>Mark Scheme</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>Able to state all the observations correctly
Sample answer :
<table><tr><th>Metal</th><th>Observations</th></tr><tr><td>Copper</td><td>Glows faintly.
Black solid when hot and cold.</td></tr></table></td><td>3</td></tr>
<tr><td></td><td>Able to state 2 of the above
Sample answer:
Glows. Black solid.</td><td>2</td></tr>
<tr><td></td><td>Able to state any 1 of the above
Sample answer:
Glows // Black solid</td><td>1</td></tr>
<tr><td></td><td>[No response given or wrong response]</td><td>0</td></tr>
</table>

<table>
<tr><th>Question</th><th>Mark Scheme</th><th>Marks</th></tr>
<tr><td>1 (b)</td><td>Able to state all the variables and actions to be taken correctly
Sample answer:
<table><tr><th>Variables</th><th>Actions to be taken</th></tr><tr><td>(i) Types of metals // Different types of metals // Magnesium, Aluminium, Zinc, Copper</td><td>(i) Use magnesium , aluminium, zinc and copper alternately. // Use magnesium then aluminium then zinc then copper</td></tr><tr><td>(ii) Brightness of the flame // Intensity of flame / glow</td><td>(ii) Observe the brightness/ glow / how vigorously</td></tr></table></td><td></td></tr>
</table>

	(iii) Amount of metal powder / potassium manganate(VII) solid (iii) Use same amount /mass of metal powder // potassium manganate(VII) each reaction	
	[Able to state any 6 of the above correctly] *[Able to state any 5 of the above correctly]* *[Able to state any 4 of the above correctly]* *[Able to state any 3 of the above correctly]* *[Able to state any 2 of the above correctly]* *[Able to state any 1 of the above correctly]*	6 5 4 3 2 1
	[[No response given or wrong response]	0
Question	**Mark scheme**	**Marks**
1 (c)	*Able to state the relationship between the manipulated variable and the responding variable* ***with direction*** *correctly* *Sample answer*: The more reactive metal react more vigorous with oxygen // The more reactive a metal is, the more vigorous the metal burns in oxygen	3
	Able to state the relationship between the manipulated variable and the responding variable *Sample answer*: Reactive metal react vigorously // Reactive metal burns vigorously // The more reactive metal react more vigorously // The more reactive a metal is, the more vigorously the metal burns	2
	Able to state an idea of hypothesis *Sample answer*: Metals have different reactivity // Metals burn in oxygen // Metals burn in oxygen, so more reactive	1
	[No response given or wrong response]	0

Question	Marks scheme	Marks
1 (d)	*Able to state the function correctly* *Sample answer*: Prevent the metal powder from mixing with potassium manganate(VII) solid because this mixture will explode when heated // Separate the metal powder from the potassium manganate(VII) solid because this mixture will explode when heated	3
	Able to state the function *Sample answer:* Prevent the metal powder from mixing with potassium manganate(VII) solid // Separate the metal powder from the potassium manganate(VII) solid	2
	Able to give an idea of the function *Sample answer:* Separate the metal powder / potassium manganate(VII) solid // Prevent the metal powder / potassium manganate(VII) solid from mixing	1
	No response given or wrong response	0

Question	Mark Scheme	Marks
1(e)	*Able to state the operational definition for the reactivity of metal powder with oxygen correctly* *Sample answer:* A metal that reacts more vigorously with oxygen is a more reactive metal.	3
	Able to state the operational definition for the reactivity of metal powder with oxygen *Sample answer:* A metal reacts vigorously with oxygen	2

	Able to give an idea of the operational definition for the reactivity of metal powder elements with oxygen *Sample answer* A metal is reactive // A metal react with oxygen	1
	[No response given or wrong response]	0

Question	Marks scheme	Marks
1 (f)	*Able to arrange the position of all metals in descending order of reactivity towards oxygen correctly* *Sample answer*: Magnesium/Mg , Aluminium/Al , Zinc / Zn, Copper/Cu	3

	Able to arrange the position of at least three metals in descending order of reactivity towards oxygen
	Sample answer:
	Magnesium/Mg, Aluminium/Al , Zinc/Zn
	// Magnesium/Mg, Zinc/Zn , Copper / Cu
	// Aluminium/Al , Zinc/Zn, Copper / Cu
		2

	Able to give an idea to arrange the metals
	Sample answer:
	Magnesium/Mg, Copper/Cu Zinc/Zn
	// Aluminium/Al , Magnesium /Mg , Zinc/Zn
	// Copper/ Cu, Zinc/Zn, Aluminium / Al, Magnesium/Mg
		1

	No response given or wrong response	0

<table>
<tr><th>Question</th><th>Mark Scheme</th><th>Marks</th></tr>
<tr><td rowspan="4">1(g)(i)</td><td>Able to classify all the ions correctly
Sample answer
<table><tr><th>Cation</th><th>Anion</th></tr><tr><td>Hydrogen ion / H^+

Copper(II) ion / Cu^{2+}</td><td>Hydroxide ion / OH^{-1}

Sulphate ion / SO_4^{2-}</td></tr></table></td><td>3</td></tr>
<tr><td>Able to classify the ions less accurately
Sample answer
<table><tr><th>Cation</th><th>Anion</th></tr><tr><td>Hydrogen ion / H^+

// Copper(II) ion / Cu^{2+}</td><td>Hydroxide ion / OH^{-1}

// Sulphate ion / SO_4^{2-}</td></tr></table></td><td>2</td></tr>
<tr><td>Able to classify one ion</td><td>1</td></tr>
<tr><td>No response or wrong response</td><td>0</td></tr>
<tr><td rowspan="3">1(g)(ii)</td><td>Able to record all the readings correctly to 2 dec .p
Sample answer
<table><tr><th>Voltage / V</th></tr><tr><td>2.70</td></tr><tr><td>1.10</td></tr><tr><td>2.00</td></tr></table></td><td>3</td></tr>
<tr><td>Able to record all the readings correctly to 1 dec.p
Sample answer
<table><tr><th>Voltage / V</th></tr><tr><td>2.7</td></tr><tr><td>1.1</td></tr><tr><td>2.0</td></tr></table></td><td>2</td></tr>
<tr><td>Able to record 2 readings correctly</td><td>1</td></tr>
</table>

	No response or wrong response	0
1(g)(iii)	*Able to arrange the metals in ascending order of tendency to lose electrons correctly* *Sample answer:* Copper,/ Cu, Zinc /Zn, Alumium/ Al, Magnesium/ Mg,	3
	Able to arrange 3 metals in ascending order of tendency to lose electrons *Sample answer* Copper,/ Cu, Zinc /Zn, Alumium/ Al Zinc /Zn, Alumium/ Al, Magnesium/ Mg, Copper,/ Cu, Zinc /Zn, Alumium/ Al	2
	Able to arrange at least 2 the metals in order of tendency to lose electrons *Sample answer* Copper,/ Cu, Alumium/ Al Zinc /Zn, Magnesium/ Mg, Copper,/ Cu, Zinc /Zn, Magnesium/Mg , Aluminium/Al, Zinc/Zn, Copper, Cu	1
	No response or wrong response	0
1(g)(iv)	*Able to predict the voltmeter reading with unit and 2 dec. place correctly* *Sample answer* 1.70 V	3
	Able to predict the voltmeter reading less accurately/ with no unit *Sample answer* 1.7 // 1.70	2
	Able to have an idea to predict the voltmeter reading *Sample answer* Between 1.1 to 1.65	1
	No response or wrong response	0

Question	Marks Scheme	Marks
2 (a)	*Able to state the problem statement by relating to the following 2 information correctly*: 1. *Role of water* 2. *Properties of acid* Sample answer Is water needed for an acid to show its acidic properties? // Does an acid need water to show its acidic properties?	3
	Able to state the aim of the experiment. Sample answer To investigate the role of water in showing the properties of acids. // Water has an effect for the properties of acids	2
	Able to give an idea of statement of the problem. <u>Sample answer</u>: To investigate the effect of water on acids // To investigate the properties of acids	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(b)	*Able to state all variables correctly*: <u>Sample answer</u>: *Manipulated variable*: Types of solvents // Water and dry propanone *Responding variable*: Properties of the acid tested // [any suitable observations: e.g. change in colour of blue litmus paper] *Fixed variable*: Type of acid // Ethanoic acid	3

	*Able to state **any two** variables correctly*.	2
	*Able to state **any one** variable correctly*.	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(c)	*Able to state the relationship between the manipulated variable and the responding variable with direction correctly*: Sample answer: Water is **needed** for an acid to show its acidic properties // An acid **will only** show its acidic properties when dissolve in water	3
	Able to state the relationship between the manipulated variable and the responding variable: <u>Sample answer</u>: Water helps acids to show its acidic properties	2
	Able to state an idea of hypothesis: <u>Sample answer</u>: Water affect the properties of acids.	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(d)	*Able to give a complete list of materials and apparatus:* <u>Sample answer</u>: Apparatus: Test-tubes , droppers, test-tube rack Materials: Glacial ethanoic acid, dry propanone, distilled water, blue litmus paper	3
	Able to give a list of materials and apparatus : Sample answer: Apparatus: Test-tubes, droppers Materials: Etanoic acid , propanone , water, blue litmus paper	2
	Able to give a list of basic materials and apparatus Apparatus: any suitable container Materials: Ethanoic acid , propanone, water, litmus paper	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(e)	*Able to state the following 6 steps:* 1. *[Label two test-tubes]* 2. *[Use a dropper to put in the glacial ethanoic acid to each test-tube]* 3. *[Add distilled water in one test-tube]* 4. *[Add dry propanone in the other test-tube]* 5. *[Put litmus paper]* 6. *[Record your observation]* <u>Sample answer</u>: 1. Label two test-tubes as A and B and place in a test-tube rack. 2. Put in 5cm^3 / a little of glacial ethanoic acid into each test-tube using a dropper. 3. Add 2 cm^3 / a little of distilled water in test-tube A 4. Add 2 cm^3 / a little of dry propanone in test-tube	3

	5. Put a dry blue litmus paper in both test-tubes 6. Record any changes.	
	Steps 2,3,4,5	2
	Step 2,3, 5	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(f)	*Able to exhibit the tabulation of data that includes the following four information.* *1. Heading for the manipulated variables* *test-tube // solvents* *2. Examples of solvents //test-tube* *water, dry propanone* *3. Heading for responding variable* *observation* <u>Sample answer</u>: Test-tube // solvents | Observation A // B // water // dry propanone | |	2
	Able to exhibit the tabulation of data that includes the following two information. <u>Sample answer</u>: Test-tube // solvents | Observation |	1
	No response or wrong response.	0

END OF MARKING SCEME