PROGRAM PENINGKATAN PRESTASI AKADEMIK
SPM
TAHUN 2012

CHEMISTRY

Kertas 1

Satu jam dan lima belas minit

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

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **50** questions.
   Kertas soalan ini mengandungi **50** *soalan.*

2. Answer **all** questions.
   Jawab ***semua*** *soalan.*

3. Each question is followed by four alternative answers, **A,B.C** and **D**. For each question, choose one answer only. Blacken your answer on the objective answer sheet provided.
   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. If you wish to change your answer, erase the blackened mark that you have made. Then blacken the new answer.
   Sekiranya anda hendak menukar jawapan, padamkan tanda yang telah dibuat. Kemudian hitamkan jawapan yang baru.

6. The diagrams in the questions provided are not drawn to scale unless stated.
   Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.

7. You may use a non-programmable scientific calculator.
   Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.

1 Diagram 1 shows a structure of ammonia molecule, NH_3.
Rajah 1 *menunjukkan satu struktur molekul ammonia,* NH_3.

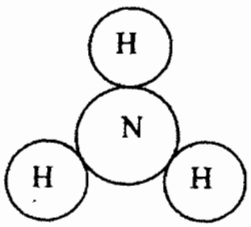


Diagram 1

How many atoms of hydrogen are there in one molecule of ammonia, NH_3 ?
Berapakah atom hidrogen yang terdapat dalam satu molekul ammonia, NH_3?

A 2
B 3
C 4
D 5

2 Which of the following are anions?
Manakah antara berikut adalah anion?

A Li^+ , H^+

B Al^{3+}, Cl^-

C O^{2-} , $Cr_2O_7^{2-}$

D MnO_4^-, NH_4^+

3 Diagram 2 shows the elements in the Periodic Table.
Rajah 2 *menunjukkan unsur-unsur dalam Jadual Berkala*

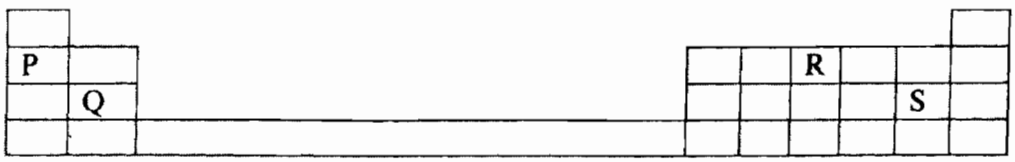


Diagram 2

Which element is a halogen?
Unsur manakah adalah suatu halogen?

A P
B Q
C R
D S

4 What type of chemical bond exist in water, H_2O ?
Apakah jenis ikatan kimia yang wujud dalam air , H_2O ?

A Covalent bond
Ikatan kovalen
B Ionic bond
Ikatan ionik
C Metallic bond
Ikatan logam
D Single bond
Ikatan tunggal

5 Diagram 3 shows the apparatus set-up for an experiment.
Rajah 3 *menunjukkan susunan radas untuk suatu eksperimen*

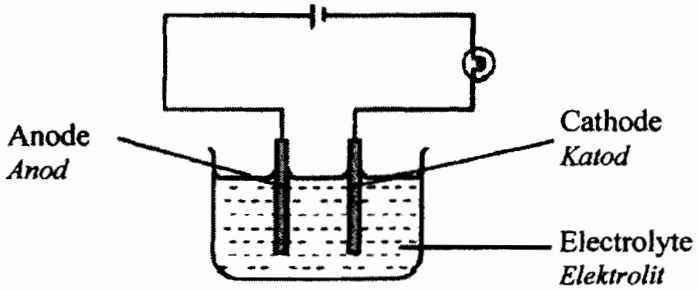


Diagram 3

Which of the following substances could be used as an electrolyte?
Antara bahan yang berikut, yang manakah boleh digunakan sebagai elektrolit?

A Solid naphthalene
Pepejal naftalena
B Hydrochloric acid
Asid hidroklorik
C Molten glucose
Leburan glukosa
D Pure ethanol
Etanol tulen

6 Which of the following is **true** about an acid?
Antara pernyataan berikut yang manakah ***benar*** *tentang suatu asid* ?

A An acid is not corrosive
Asid tidak mengkakis
B A strong acid has a low pH value
Asid kuat mempunyai nilai pH *yang rendah*
C A weak acid has a high degree of ionisation
Asid lemah mempunyai kadar pengionan yang tinggi
D An acid is a chemical compound that is soluble in water to produce OH^- ion
Asid ialah sebatian kimia yang larut dalam air menghasilkan ion OH^-

7 Which of the following substances is a soluble salt?
Antara bahan berikut , yang manakah garam terlarutkan ?

I Sodium chloride, NaCl
Natrium klorida, NaCl
II Barium sulphate, $BaSO_4$
Barium sulfat, $BaSO_4$
III Potassium nitrate , KNO_3
Kalium nitrat , KNO_3
IV Lead (II) carbonate , $PbCO_3$
Plumbum(II) *karbonat,* $PbCO_3$

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

8 Diagram 4 shows a type of material used to make buildings.
Rajah 4 *menunjukkan sejenis bahan yang digunakan untuk membina bangunan*

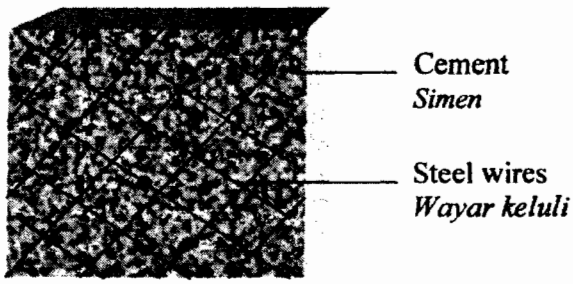


Diagram 4

What are the characteristics of the material?
Apakah ciri-ciri bahan tersebut?

A High tensile strength
Kekuatan regangan yang tinggi
B Hard and brittle
Keras dan rapuh
C High boiling point and melting point
Takat didih dan takat lebur yang tinggi
D Capable to conduct electricity
Kebolehan mengkonduksikan elektrik

9 Which of the following explains the meaning of effective collision?
Antara berikut, yang manakah menerangkan maksud perlanggaran berkesan ?

A The collision where its energy is less than the activation energy
Perlanggaran yang mempunyai tenaga kurang daripada tenaga pengaktifan
B The collision that has a low energy
Perlanggaran yang mempunyai tenaga yang rendah
C The collision which takes place before a reaction
Perlanggaran yang berlaku sebelum tindak balas
D The collision that causes a reaction
Perlanggaran yang menghasilkan tindak balas

10 Which of the homologous series is a saturated hydrocarbon?
Antara siri homolog berikut, yang manakah hidrokarbon tepu ?

A Alcohol
Alkohol
B Alkenes
Alkena
C Alkanes
Alkana
D Carboxylic acid
Asid karboksilik

11 The following information is about the effect of magnesium towards the rusting of iron.
Maklumat berikut adalah tentang kesan magnesium terhadap pengaratan besi.

Magnesium that is in contact with iron will protect iron from rusting *Magnesium yang bersentuhan dengan besi akan melindungi besi daripada berkarat*

Which of the following explains the statement?
Antara berikut, yang manakah merupakan penerangan bagi pernyataan itu?

A Magnesium is softer than iron
Magnesium lebih lembut daripada besi
B Magnesium is a good heat conductor
Magnesium adalah konduktor haba yang baik
C Magnesium has a lower melting point
Magnesium mempunyai takat lebur yang lebih rendah
D Magnesium is more tendency to release electrons
Magnesium lebih cenderung untuk membebaskan elektron

12 Which statement is **correct** about exothermic reaction?
*Pernyataan manakah yang **betul** mengenai tindak balas eksotermik ?*

A The reaction absorbs heat from the surrounding
Tindak balas menyerap haba dari persekitaran
B The surrounding temperature decreases
Suhu persekitaran menurun
C In this reaction, heat energy is converted to chemical energy
Di dalam tindak balas ini, tenaga haba diubah kepada tenaga kimia.
D The products contain less energy than the reactants
Hasil tindak balas mengandungi kurang tenaga daripada bahan tindak balas

13 Which of the following medicines is an antibiotic?
Antara ubat berikut, yang manakah suatu antibiotik?

A Insulin
Insulin
B Aspirin
Aspirin
C Streptomycin
Streptomisin
D Paracetamol
Parasetamol

14 Diagram 5 shows the change of state of matter.
Rajah 5 menunjukkan satu perubahan keadaan jirim.

Diagram 5

What is the name of this process?
Apakah nama proses yang terlibat?

A Sublimation
Pemejalwapan
B Boiling
Pendidihan
C Freezing
Pembekuan
D Melting
Peleburan

15 The molecular formula of hexene is C_6H_{12}.
Which of the following has the same empirical formula as hexene?
Formula molekul bagi heksena adalah C_6H_{12}.
Manakah antara berikut mempunyai formula empirik yang sama dengan heksena?

A C_5H_{10}
B C_5H_{12}
C C_6H_6
D C_6H_{14}

16 Potassium is situated in the same group as sodium in the Periodic Table.
Which of the following statements is **true** about the element potassium?
Kalium berada di dalam kumpulan yang sama dengan natrium di dalam Jadual Berkala..
Antara pernyataan berikut, yang mana benar tentang unsur kalium?

A Reacts with water to produce acidic solution
Bertindak balas dengan air menghasilkan larutan berasid.
B React with chlorine gas to produce a black solid.
Bertindak balas dengan gas klorin menghasilkan pepejal hitam.
C Potassium has several oxidation numbers.
Kalium mempunyai beberapa nombor pengoksidaan.
D Potassium has low melting point and boiling point.
Kalium mempunyai takat lebur dan takat didih yang rendah.

17 Which of the following are the properties of sodium oxide?
Antara berikut , yang manakah sifat-sifat natrium oksida ?

I Low melting point
Mempunyai takat lebur rendah
II Insoluble in water
Tidak terlarutkan dalam air
III Insoluble in organic solvent
Tidak terlarutkan dalam pelarut organik
IV Decomposes to its constituent element by electrolysis in molten state
Terurai kepada unsur juzuknya melalui elektrolisis dalam bentuk leburan

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

18 Diagram 6 shows the apparatus set-up for an electrolytic cell.
Rajah 6 menunjukkan susunan radas bagi sebuah sel elektrolisis.

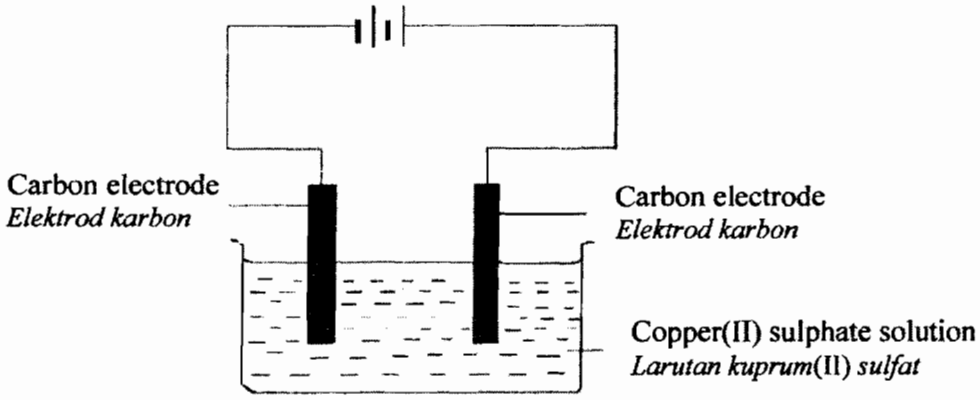


Diagram 6

Which of the following ions are attracted to anode and cathode?
Yang manakah antara ion-ion berikut tertarik ke anod dan katod ?

	Anode *Anod*	Cathode *Katod*
A	SO_4^{2-}	Cu^{2+}
B	Cu^{2+}	OH^-
C	SO_4^{2-}, OH^-	Cu^{2+}, H^+
D	Cu^{2+}, H^+	SO_4^{2-}, OH^-

19 Which of the following is **not** a chemical property of acids?
*Antara yang berikut, yang manakah **bukan** sifat kimia bagi asid ?*

A Reacts with magnesium carbonate to produce salt, water and carbon dioxide
Bertindak balas dengan magnesium karbonat untuk menghasilkan garam, air dan karbon dioksida

B Reacts with copper metal to produce salt and hydrogen gas
Bertindak balas dengan logam kuprum untuk menghasilkan garam dan hidrogen

C Reacts with zinc oxide to produce salt and water
Bertindak balas dengan zink oksida untuk menghasilkan garam dan air

D Reacts with alkali to produce salt and water
Bertindak balas dengan alkali untuk menghasilkan garam dan air

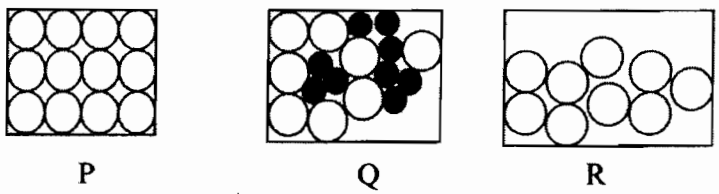
20 The following information shows the properties of salt X.
Maklumat berikut menunjukkan sifat-sifat garam X.

Releases brown gas and a gas which lights up glowing splinter when heated strongly *Membebaskan gas perang dan gas yang menyalakan kayu uji berbara apabila dipanaskan dengan kuat* Residue after heating is brown when it is hot and yellow when it is cold *Baki yang berwarna perang semasa panas dan kuning semasa sejuk*

What is salt X?
Apakah garam X?

A Zinc nitrate
Zink nitrat
B Zinc carbonate
Zink karbonat
C Lead(II) nitrate
Plumbum(II) *nitrat*
D Lead (II) carbonate
Plumbum(II) *karbonat*

21 Diagram 7 shows the arrangements of atoms in three substances.
Rajah 7 menunjukkan susunan atom-atom dalam tiga jenis bahan.



P Q R

Diagram 7

Arrange the substances from the most ductile to the least ductile.
Susun bahan-bahan tersebut dari paling mulur ke kurang mulur.

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

22 The following equation shows the reaction between calcium carbonate, $CaCO_3$ and hydrochloric acid, HCl.
Persamaan berikut menunjukkan tindak balas antara serbuk kalsium karbonat, $CaCO_3$ *dan asid hidroklorik,* HCl.

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

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

A Change in the temperature of the solution with time
Perubahan suhu larutan dengan masa
B Change in the volume of carbon dioxide gas with time
Perubahan isipadu 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

23 Alkane can be produced from the hydrogenation of alkene.
Name the catalyst used in this reaction.
Alkana dapat dihasilkan daripada tindak balas penghidrogenan alkena.
Namakan mangkin yang digunakan di dalam tindak balas ini.

A Nickel
Nikel

B Phosphoric acid
Asid fosforik

C Sulphuric acid
Asid sulfurik

D Aluminium oxide
Aluminium oksida

24 Which of the following are oxidising agents?
Antara berikut yang manakah agen pengoksidaan?

I Magnesium
Magnesium
II Chlorine water
Air klorin
III Potassium iodide solution
Larutan kalium iodida
IV Acidified potassium manganate(VII) solution
Larutan kalium mangganat (VII) berasid

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

25 The following equation shows the reaction between silver nitrate solution , $AgNO_3$ and sodium chloride solution, NaCl.
Persamaan berikut menunjukkan tindak balas antara larutan argentum nitrat, $AgNO_3$ *dan larutan natrium klorida,* NaCl

$$AgNO_3\,(aq) + NaCl\,(aq) \rightarrow AgCl\,(s) + NaNO_3\,(aq) \qquad \Delta H = -80.64\ kJ\ mol^{-3}$$

Which of the following is true about the heat change and type of reaction for the chemical equation?
Antara berikut yang manakah benar mengenai perubahan haba dan jenis tindak balas bagi persamaan kimia ini ?

	Heat change *Perubahan haba*	Type of reaction *Jenis tindak balas*
A	Heat is released *Haba dibebaskan*	Endothermic
B	Heat is released *Haba dibebaskan*	Exothermic
C	Heat is absorbed *Haba diserap*	Exothermic
D	Heat is absorbed *Haba diserap*	Endothermic

26 Which equation represents a reaction of saponification?
Persamaan manakah mewakili tindak balas saponifikasi ?

A Acid + Alkali → salt + water
Asid + Alkali → garam + air
B Alcohol + Carboxylic acid → ester + water
Alkohol + Asid karbosilik → ester + air
C Fats + Alkali → Fatty acid salt + Glycerol
Lemak + Alkali → garam asid lemak + gliserol
D Yeast + Glucose → alcohol + carbon dioxide
Yis + Glukosa → alkohol + karbon dioksida

27 Table 1 shows the proton number and the number of electrons in four different particles. The letter used is not the actual symbol of the elements.
Jadual 1 menunjukkan nombor proton dan bilangan elektron dalam empat zarah. Huruf yang digunakan bukan simbol yang sebenar.

Element *Unsur*	Proton number *Nombor proton*	Number of electron *Bilangan elektron*
P	17	17
Q	17	18
R	12	10
S	8	8

Table 1

Which is an anion?
Yang manakah suatu anion?

A P

B Q

C R

D S

28 Which substance contains the same number of atoms as in 12 g of carbon?
[Relative atomic mass: He = 4, C = 12, O = 16, Mg = 24, Al = 27, 1 mole of any gas occupies 24 dm^3 at room condition]
Bahan manakah mengandungi bilangan atom yang sama dengan 12 g karbon?
[*Jisim atom relatif*: He = 4, C = 12, O = 16, Mg = 24, Al = 27]

A 24 dm^3 of helium gas
24 dm^3 *gas helium*

B 12 g of magnesium
12 g *magnesium*

C 16 g of oxygen
16 g *oksigen*

D 54 g of aluminium
54 g *aluminium*

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 8 show the electron arrangement of elements X and Y.
Rajah 8 *di bawah menunjukkan susunan elektron bagi unsur* X *dan* Y.

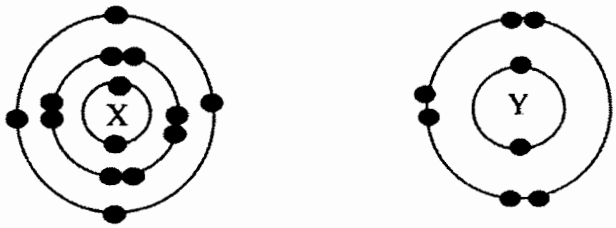


Diagram 8

Which of the following is true about the formula and type of bond formed by elements X and Y?
Antara berikut yang manakah benar mengenai formula dan jenis ikatan yang terbentuk antara unsur X *dan* Y ?

	Formulae *Formula*	Type of bond *Jenis ikatan*
A	XY_2	Ionic
B	X_2Y	Ionic
C	XY	Covalent
D	XY_2	Covalent

31 Diagram 9 shows the apparatus set-up used to electroplate iron spoon with silver.
Rajah 9 menunjukkan susunan radas untuk menyadur sudu besi dengan argentum.

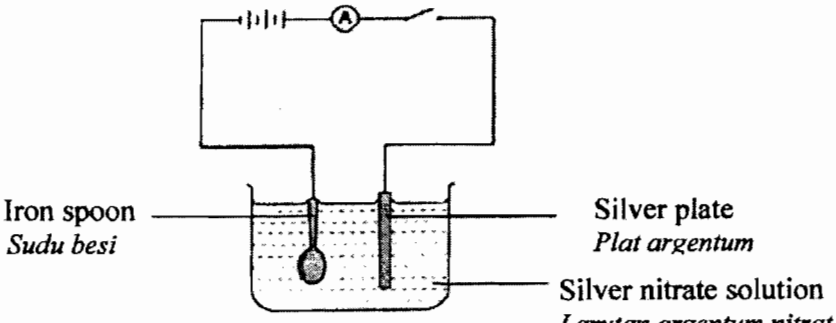


Diagram 9

What is observed at the anode and cathode after 30 minutes?
Apakah pemerhatian di anod dan di katod selepas 30 minit ?

	Anode *Anod*	Cathode *Katod*
A	Silver plate becomes thinner *Plat argentum semakin nipis*	Silvery deposit formed *Mendakan berwarna perak terbentuk*
B	Silvery deposit formed *Mendakan berwarna perak terbentuk*	Gas bubbles released *Gelembung gas terbebas*
C	Silver plate becomes thinner *Plat argentum semakin nipis*	Gas bubbles released *Gelembung gas terbebas*
D	Gas bubbles released *Gelembung gas terbebas*	Gas bubbles released *Gelembung gas terbebas*

32 Alkali Y of concentration 1 mol dm^{-3} has a pH of 8.
Which statement is **true** about alkali Y?
Alkali Y dengan kepekatan 1 mol dm^{-3} *mempunyai* pH 8.
Pernyataan manakah yang ***benar*** *tentang alkali* Y?

I Insoluble in water
Tidak larut dalam air
II Reacts with a weak acid
Bertindak balas dengan asid lemah
III The degree of ionisation in water is high
Darjah pengionan dalam air adalah tinggi
IV Has a low concentration of hydroxide ions
Mempunyai kepekatan ion hidroksida yang rendah

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

33 Diagram 10 shows some reaction of zinc compounds.
Which changes is made by adding an acid?
Rajah 10 menunjukkan sebahagian tindak balas yang melibatkan sebatian zink.
Antara perubahan tersebut yang manakah berlaku dengan penambahan asid ?

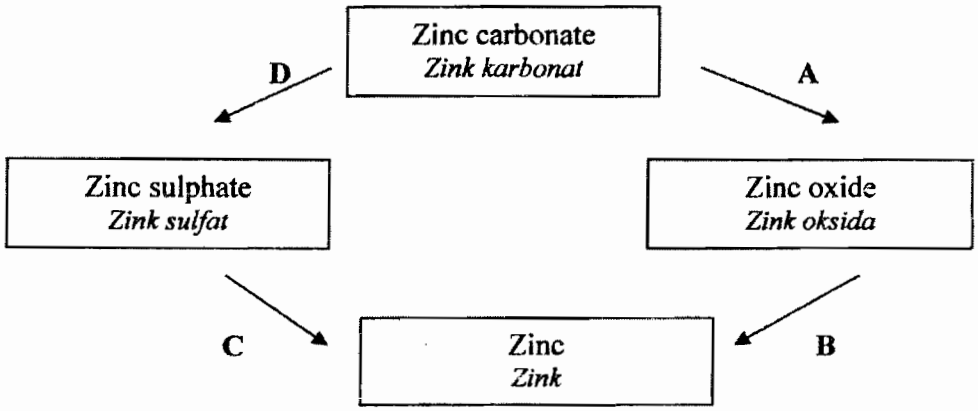


Diagram 10

34 The following equation is a reaction to prepare a synthethic fertiliser, Z.
Persamaan berikut adalah tindakbalas untuk menyediakan baja sintetik, Z.

Ammonia + Y → Z

Which of the following is Y?
Manakah antara berikut adalah Y?

A Urea
Urea

B Nitric acid
Asid nitric

C Ammonium nitrate
Ammonium nitrat

D Ammonium hydroxide
Ammonium hidroksida

35 In an experiment, 25 cm^3 of 0.2 mol dm^{-3} hydrogen peroxide solution decomposes to produce oxygen gas. Graph of volume of oxygen gas against time is sketched and curve R is obtained as shown in Diagram 11
Dalam satu eksperimen, 25 cm^3 0.2 mol dm^{-3} *larutan hidrogen peroksida terurai menghasilkan gas oksigen. Graf isipadu gas oksigen melawan masa dilakarkan dan lengkung* R *terhasil seperti ditunjukkan dalam Rajah* 11

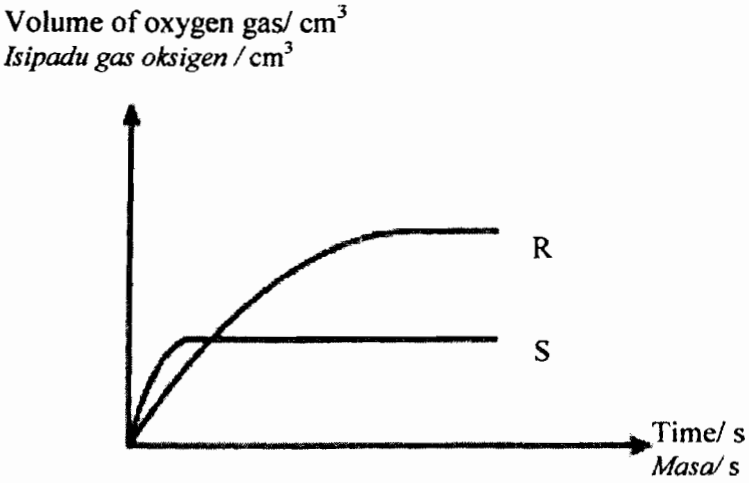


Diagram 11

Which of the following solution will produce curve S?
Yang manakah di antara larutan berikut akan menghasilkan lengkung S?

A 20 cm^3 0.1 mol dm^{-3} hydrogen peroxide
20 cm^3 0.1 mol dm^{-3} *hidrogen peroksida*

B 30 cm^3 0.2 mol dm^{-3} hydrogen peroxide
30 cm^3 0.2 mol dm^{-3} *hidrogen peroksida*

C 20 cm^3 0.3 mol dm^{-3} hydrogen peroxide
20 cm^3 0.3 mol dm^{-3} *hidrogen peroksida*

D 10 cm^3 0.3 mol dm^{-3} hydrogen peroxide
10 cm^3 0.3 mol dm^{-3} *hidrogen peroksida*

36 Ester is a carbon compound that can be derived from the reaction between alcohol and carboxylic acid. Diagram 12 shows the structure of an ester.
Ester ialah satu sebatian karbon yang diterbitkan daripada tindak balas antara alkohol dan asid karboksilik. Rajah 12 menunjukkan struktur suatu ester.

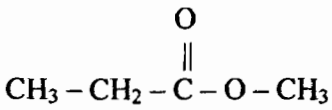


Diagram 12

Which of the alcohol and carboxylic acid used to form the ester?
Yang manakah alkohol dan asid karboksilik yang digunakan bagi membentuk ester ini?

	Alcohol *Alcohol*	Carboxylic Acid *Asid karbosilik*
A	Methanol *Metanol*	Ethanoic Acid *Asid etanoik*
B	Ethanol *Etanol*	Ethanoic acid *Asid Etanoik*
C	Ethanol *Etanol*	Propanoic acid *Asid Propanoik*
D	Methanol *Metanol*	Propanoic acid *Asid Propanoik*

37 Diagram 13 shows the set up of the apparatus of a simple chemical cell.
Rajah 13 menunjukkan susunan radas bagi satu sel kimia ringkas.

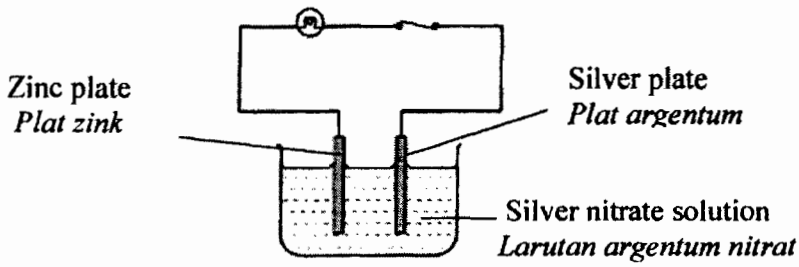


Diagram 13

Which half equations represent reaction occurs at silver plate?
Antara berikut, setengah persamaan manakah mewakili tindak balas yang berlaku di kepingan argentum?

A $Zn \rightarrow Zn^{2+} + 2e$

B $Ag \rightarrow Ag^{+} + e$

C $Ag^{+} + e \rightarrow Ag$

D $2H^{+} + 2e \rightarrow H_2$

38 Hot packs contain chemicals that react to produce heat.
Which substance is used in hot packs?
Pek panas mengandungi bahan kimia yang bertindak balas untuk membebaskan haba.
Bahan manakah yang digunakan dalam pek panas?

A Sodium carbonate
Natrium karbonat

B Ammonium nitrate
Ammonium nitrat

C Magnesium sulphate
Magnesium sulfat

D Calsium carbonate
Kalsium karbonat

39 Which of the following is **not true** about soap?
*Antara yang berikut, yang manakah **tidak benar** tentang sabun?*

A Soap forms when fats react with an alkali
Sabun terbentuk apabila lemak bertindak balas dengan alkali

B Soap forms scum in soft water
Sabun membentuk kekat dengan air lembut

C Scum decreases the effectiveness of the cleansing action of a soap
Kekat mengurangkan keberkesanan tindakan pencucian sabun

D The presence of magnesium ions and calcium ions in soap forms scums
Kehadiran ion magnesium dan ion kalsium dalam sabun menghasilkan kekat

40 Table 2 shows the subatomic particles of P and Q.
Jadual 2 menunjukkan zarah-zarah subatom bagi P *dan* Q.

	Neutron	Proton
P	6	5
Q	5	5

Table 2

It shows that P and Q
Ini menunjukkan P *dan* Q

I are both positively charged
adalah bercas positif
II have the same nucleon number
mempunyai nombor nukleon yang sama
III have the same number of electrons
mempunyai bilangan elektron yang sama
IV are particles of the same elements
adalah unsur yang sama

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

41 The following equation shows the reaction between magnesium and hydrochloric acid.
Persamaan berikut menunjukkan tindak balas antara magnesium dan asid hidroklorik.

$$Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$$

What is the volume of hydrogen gas, H_2 produced if 0.05 mol of hydrochloric acid react with excess magnesium ribbon at standard temperature and pressure (STP)?
[Molar volume of gas at STP = 22.4 $dm^3 mol^{-1}$]

Apakah isipadu gas hidrogen, H_2 *yang terhasil jika* 0.05 mol *asid hidroklorik bertindakbalas dengan pita magnesium berlebihan pada suhu dan tekanan piawai* (STP)?
[*Molar volume of gas at* STP = 22.4 $dm^3 mol^{-1}$]

A 56 cm^3
B 60 cm^3
C 112 cm^3
D 120 cm^3

42 Gas X is used in airships and weather balloons because of its low density.
Gas X is
Gas X digunakan dalam kapal udara dan belon kajicuaca disebabkan ketumpatannya yang rendah. Gas X adalah

A Helium
B Neon
C Argon
D Krypton

43 The following equation shows the formation of magnesium oxide.
Persamaan berikut menunjukkan pembentukan magnesium oksida.

$$2Mg + O_2 \rightarrow 2MgO$$

What is the relative formula mass of the compound, magnesium oxide?
Apakah jisim formula relatif bagi sebatian magnesium oksida tersebut ?
[Relative atomic mass : Mg =24 ; O =16]

A 40
B 32
C 24
D 16

44 Table 3 shows information about two voltaic cells.
Jadual 3 menunjukkan maklumat tentang dua sel kimia .

Pairs of metal *Pasangan logam*	Potential difference / V *Beza keupayaan / V*	Negative terminal *Terminal negatif*
Q and Copper Q *dan Kuprum*	1.70	Q
R and Copper R *dan Kuprum*	0.53	Cu

Table 3

What is the potential difference between metal Q and R?
Apakah beza keupayaan di antara logam Q *dan* R?

A 0.97 V

B 2.14 V

C 2.23 V

D 2.67 V

45 The equation shows the reaction between sulphuric acid and potassium hydroxide.
Persamaan di bawah menunjukkan tindakbalas antara asid sulfurik dan kalium hidroksida.

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

What is the volume of 0.1 mol dm^{-3} potassium hydroxide solution which can neutralise 20.0 cm^3 of 0.1 mol dm^{-3} sulphuric acid?
Berapakah isipadu larutan kalium hidroksida 0.1 mol dm^{-3} *yang diperlukan untuk meneutralkan* 20.0 cm^3 0.1 mol dm^{-3} *asid sulfurik* ?

A 10.0 cm^3
B 20.0 cm^3
C 40.0 cm^3
D 80.0 cm^3

46 The following equation shows a double decomposition reaction.
Persamaan berikut menunjukkan tindak balas penguraian ganda dua.

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

The ionic equation for this reaction is
Persamaan ion untuk tindak balas ini adalah

A $Pb^{2+} + I^- \rightarrow PbI_2$
B $Pb^{2+} + 2I^- \rightarrow PbI_2$
C $K^+ + NO_3^- \rightarrow KNO_3$
D $2K^+ + NO_3^- \rightarrow 2KNO_3$

47 A compound FeX_3 is formed from the reaction between 0.1 mol of iron and 10.65 g of element X.
What is the relative atomic mass of element X?
[Relative atomic mass : Fe = 56]
Suatu sebatian FeX_3 *terbentuk dari tindakbalas antara* 0.1mol *besi dengan 10.65 g unsur X.*
Apakah jisim atom relatif bagi unsur X?
[*Jisim atom relatif* : Fe = 56]

A 35.5
B 35.0
C 32.5
D 32.0

48 Table 3 shows the total volume of gas collected at regular intervals in a reaction.
Jadual 3 menunjukkan jumlah isipadu gas yang dikumpul pada sela masa yang sekata dalam suatu tindak balas.

Time/ s *Masa/ s*	0	30	60	90	120	150	180	210
Total volume of gas/ cm^3 *Jumlah isipadu gas/* cm^3	0	2.0	3.7	5.2	6.4	7.3	8.6	8.6

Table 3

What is the average rate of reaction in the second minute?
Berapakah kadar tindak balas purata dalam minit kedua?

A $0.040\ cm^3s^{-1}$

B $0.045\ cm^3s^{-1}$

C $0.053\ cm^3s^{-1}$

D $0.062\ cm^3s^{-1}$

49 A glass of wine becomes acidic if it is left in the air in certain time.
Which of the following equation represents these changes?
Segelas wain bertukar menjadi berasid apabila ditinggalkan untuk beberapa ketika.
Antara persamaan berikut yang manakah mewakili perubahan ini?

A $2C_2H_5OH + 2CO_2 \longrightarrow 2C_2H_5COOH + O_2$

B $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$

C $C_2H_5OH + O_2 \longrightarrow CH_3COOH + H_2O$

D $C_2H_5OH + CO \longrightarrow C_2H_5COOH$

50 Diagram 15 shows the apparatus set-up to investigate a redox reaction.
Rajah 15 *menunjukkan susunan radas untuk mengkaji satu tindak balas redoks.*

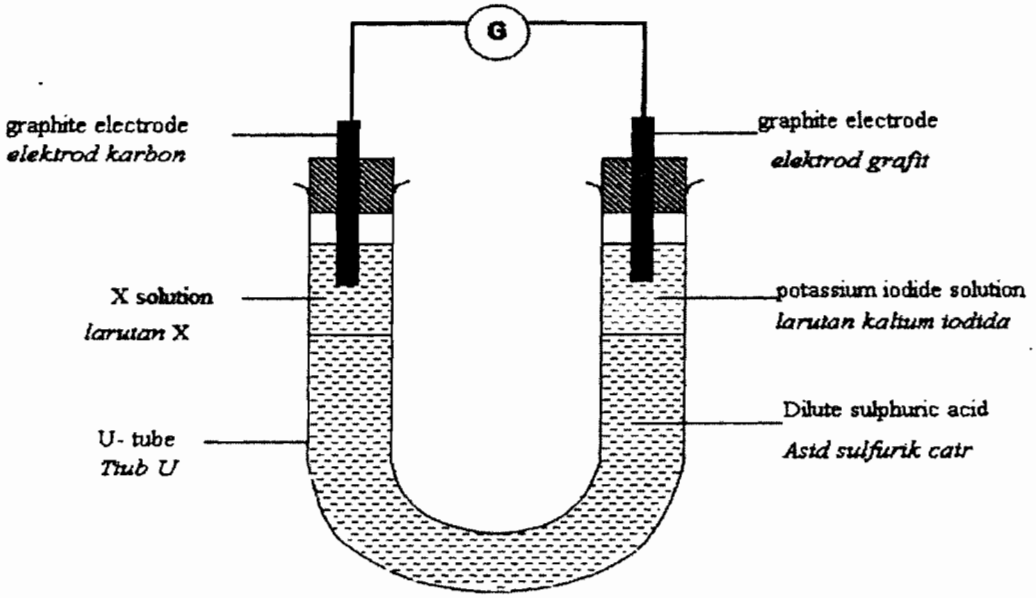


Diagram 15

The colourless potassium iodide solution becomes a brown solution.
Which of the following is X solution?
Larutan kalium iodida tanpa warna menjadi larutan perang.
Antara berikut, yang manakah merupakan larutan X?

A Chlorine water
Air klorin

B Iron(II) sulphate
Ferum(II) *sulfat*

C Hydrogen sulphide
Hidrogen sulfida

D Sodium chloride
Natrium klorida

QUESTIONS END HERE

PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM
TAHUN 2012

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

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

A = 12 ; B = 13 ; C = 12 ; D = 13

SULIT

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

PROGRAM PENINGKATAN PRESTASI AKADEMIK
SPM
TAHUN 2012

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	24	
2	9	
3	17	
JUMLAH		

Kertas soalan ini mengandungi **9 halaman bercetak**

INFORMATION FOR CANDIDITES

1. This question paper consists of three questions. Answer all questions.
2. Write your answers for **Question 1 and Question 2** in the spaces provided in the question paper.
3. Write your answers for **Question 3** on the "helaian tambahan". You may use equation, diagrams, tables, graphs and other suitable methods to explain your answer.
4. Show your working, it may help you to get marks.
5. If you wish to change your answer, neatly cross out the answer that you have done. Then write down the new answer.
6. The diagrams in the questions are not drawn to scale unless stated.
7. Mark allocated for each question or part question are shown in brackets.
8. The time suggested to answers **Question 1 and Question 2** is 45 minutes and **Question 3** is 45 minutes.
9. You may use a non-programmable scientific calculator.
10. Hand your answer sheets at the end of the examination.

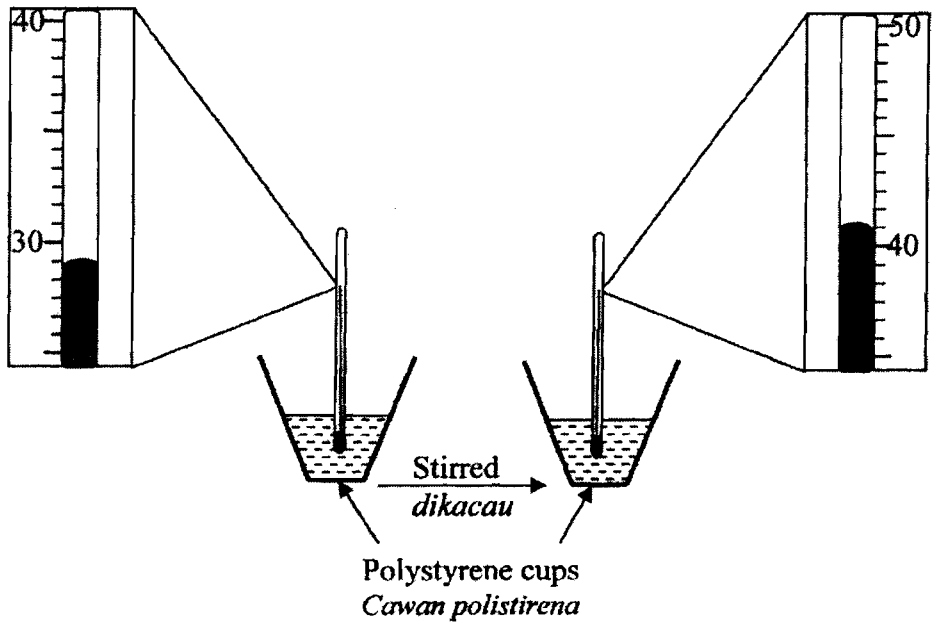
Marks awarded:

Mark	Description
3	Excellent : The best response
2	Satisfactory : An average response
1	Weak : An inaccurate response
0	No response or wrong response

1 Diagram 1.1 shows two experiments to determine the heat of neutralization.
Rajah 1.1 *menunjukkan dua eksperimen untuk menentukan haba peneutralan*

Experiment I

Reaction between 25 cm^3 of sodium hydroxide solution , NaOH 1.0 mol dm^{-3} and 25 cm^3 of hydrochloric acid, HCl 1.0 mol dm^{-3}
Tindak balas antara 25cm^3 *larutan natrium hidroksida,* NaOH 1.0 mol dm^{-3} *dengan* 25cm^3 *asid hidroklorik,* HCl 1.0 mol dm^{-3}



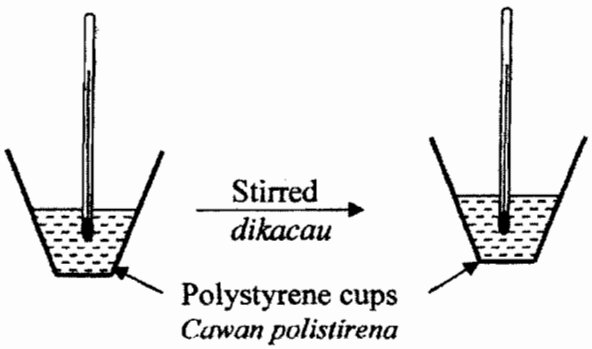
Initial temperature of the mixture : ..... °C
Suhu awal campuran

Highest temperature of the mixture: ..... °C
Suhu tertinggi campuran

Change in temperature : ..... °C
Perubahan suhu

Experiment II

Reaction between 25 cm^3 of sodium hydroxide solution , NaOH 2.0 mol dm^{-3} and 25 cm^3 of ethanoic acid, CH_3 COOH 2.0 mol dm^{-3}
Tindak balas antara 25 cm^3 *larutan natrium hidroksida,* NaOH 2.0 mol dm^{-3} *dengan* 25 cm^3 *asid etanoik* 2.0 mol dm^{-3}



Initial temperature of the mixture : T_1 °C
Suhu awal campuran

Highest temperature of the mixture: T_2 °C
Suhu tertinggi campuran

Change in temperature : T_3 °C
Perubahan suhu

(a) Write the initial and the highest temperature of the mixture and change in temperature for Experiment I in Diagram 1.1
Tulis suhu awal dan suhu tertinggi campuran serta perubahan suhu untuk Eksperimen I *dalam Rajah* 1.1

[3 *marks*]

(b) Construct a table that can be used to record the data from both experiments.
Bina satu jadual yang boleh digunakan untuk merekod data bagi kedua-dua eksperimen

[3 *marks*]

(c) State one hypothesis for both experiments.
Nyatakan satu hipotesis bagi kedua-dua eksperimen

.....

.....

[3 *marks*]

(d) Based on the temperatures in Experiment I, predict the change in temperature in Experiment II
Berdasarkan suhu dalam Eksperimen I , *ramalkan perubahan suhu bagi Eksperimen* II

.....

[3 *marks*]

(e) Why must the initial temperature and the highest temperature be recorded in these experiments?
Mengapakah suhu awal dan suhu tertinggi perlu direkodkan dalam eksperimen ini?

.....

.....

[3 *marks*]

(f) How can the value of the change of temperature be obtained?
Bagaimanakah nilai perubahan suhu diperoleh?

.....

....

[3 *marks*]

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

(i) Manipulated Variable
Pembolehubah dimanipulasi

.....

(ii) Responding Variable
Pembolehubah bergerakbalas

.....

(iii) Constant Variable
Pembolehubah dimalarkan

.....

[3 marks]

(h) Diagram 1.2 shows the calculation to determine the heat of neutralisation for the reactions in Experiments I and II
Rajah 1.2 *menunjukkan perhitungan untuk menentukan haba peneutralan bagi tindak balas dalam Eksperimen* I *dan Eksperimen* II

Experiment I	**Experiment II**
Heat released *Haba yang dibebaskan* $= mc\theta$ $= 50\ g \times 4.2\ J\ g^{-1} \times$ _____ °C $= x\ J$	Heat released *Haba yang dibebaskan* $= mc\theta$ $= 50\ g \times 4.2\ J\ g^{-1} \times T_3$ °C $= y\ J$
Heat of neutralisation *Haba peneutralan* $= \frac{x\ kJ}{\text{number of mole of water produced}}$ *bilangan mol air yang dihasilkan*	Heat of neutralisation *Haba peneutralan* $= \frac{y\ kJ}{\text{number of mole of water produced}}$ *bilangan mol air yang dihasilkan*

It was found that the value of x is greater than value of y.
Explain why.
Didapati nilai x *lebih besar daripada nilai* y.
Terangkan mengapa.

.....

.....

.....

[3 *marks*]

2 Table 1 shows Experiment I, Experiment II and Experiment III which are conducted to study the solubility of salts in water.

Jadual 1 menunjukkan Eksperimen I, Eksperimen II dan Eksperimen III yang diljalankan untuk mengkaji keterlarutan garam dalam air.

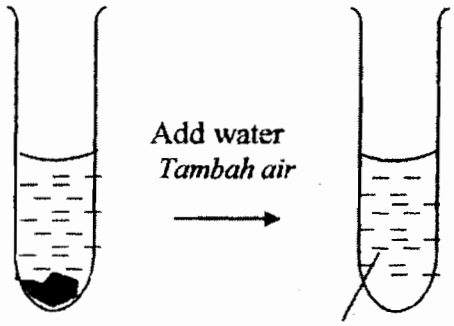
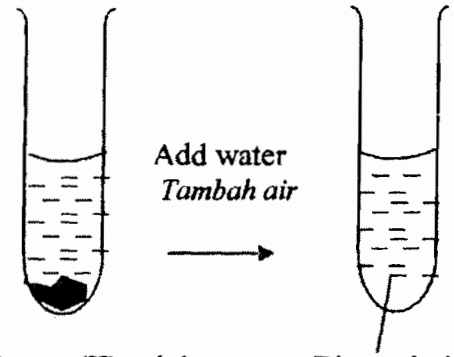
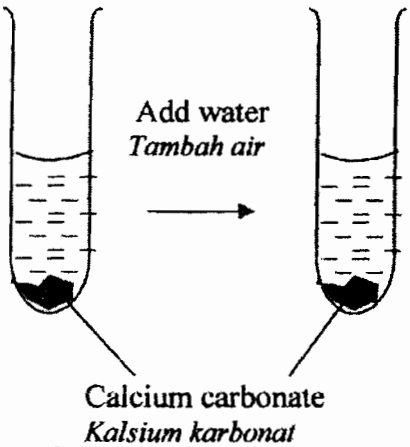
Experiment	Reaction *Tindak balas*	Observations *Pemerhatian*
I		
II		
III		

Table 1

(a) Write the observation for Experiment I, II and III in Table 1.
Tulis pemerhatian bagi Eksperimen I, II *dan* III *dalam Jadual* 1.

[3 *marks*]

(b) Based on Experiment I and II, state the operational definition of soluble salt.
Berdasarkan Eksperimen I *dan* II, *nyatakan definisi secara operasi bagi garam terlarut.*

.....

.....

[3 *marks*]

(c) Classify the following salts into soluble salts and insoluble salts.
Kelaskan garam-garam di bawah kepada garam terlarut dan garam tak terlarut.

Sodium sulphate, Lead(II) sulphate, Barium sulphate, Magnesium sulphate *Natrium sulfat, Plumbum*(II) *sulfat, Barium sulfat, Magnesium sulfat*

[3 *marks*]

3

The distance between pairs of different metals in the electrochemical series affect the voltage produced.
Jarak di antara pasangan logam yang berlainan di dalam siri elektrokimia mempengaruhi voltan yang terhasil.

Diagram 3 shows a voltaic cell which consist of two different metals dipped in an electrolyte.
Rajah 3 menunjukkan satu sel voltan yang terdiri daripada dua logam yang berlainan di celup dalam satu elektrolit.

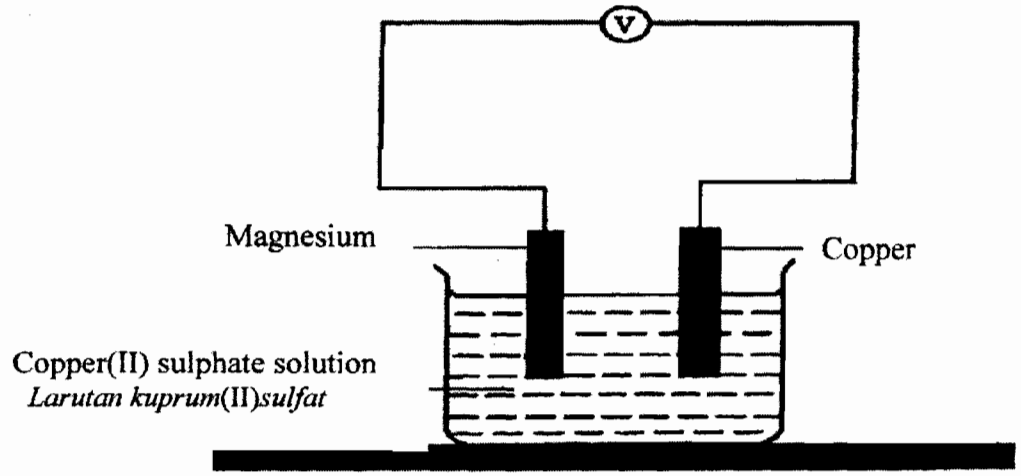


Diagram 3

Based on Diagram 3, plan **one** laboratory experiment to investigate the effect of the distance between two metals in the electrochemical series on the voltage produced.
*Berdasarkan Rajah 3, rancang **satu** eksperimen makmal untuk mengkaji kesan jarak di antara dua logam dalam siri elektrokimia ke atas voltan yang terhasil.*

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

Problem statement
Pernyataan masalah

All the variables
Semua pemboleh ubah

Hypothesis
Hipotesis

List of materials and apparatus
Senarai bahan dan radas

Procedure
Prosedur

Tabulation of data
Penjadualan data

[17 marks]

END OF QUESTION PAPER

PAPER 3: CHEMISTRY

<table>
<tr><th>Question</th><th>Mark Scheme</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>Able to record all the temperature accurately
Answer
Initial temperature = 29.0
Highest temperature = 41.0
Change of temperature = 12.0</td><td>3</td></tr>
<tr><td></td><td>Able to record all the temperature correctly
Sample answers
Initial temperature = 29
Highest temperature = 41
Change of temperature = 12</td><td>2</td></tr>
<tr><td></td><td>Able to record one temperature correctly</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
<tr><td>1(b)</td><td>Able to construct table accurately with correct title and unit
Sample answer
<table>
<tr><th rowspan="2">Temperature°C</th><th colspan="2">Experiment</th></tr>
<tr><th>I</th><th>II</th></tr>
<tr><td>Initial temperature of mixture</td><td>29.0</td><td>T_1</td></tr>
<tr><td>Highest temperature of mixture</td><td>41.0</td><td>T_2</td></tr>
</table></td><td>3</td></tr>
<tr><td></td><td>Able to construct table correctly without unit</td><td>2</td></tr>
</table>

	Able to construct table less accurate with at least one experiment	1
	No response or wrong response	0
1(c)	**Able to state the hypothesis accurately** Sample answer The heat of neutralization of a weak acid and strong alkali is smaller than the heat of neutralization of strong acid by a strong alkali	3
	Able to state the hypothesis correctly Sample answer The heat of neutralization changes when different acids react with strong alkali	2
	Able to state the idea of hypothesis Sample answer The heat of neutralization changes	1
	No response or wrong response	0
1(d)	**Able to predict the change of temperature accurately** 11°C	3
	Able to predict the change of temperature correctly 9-10°C	2
	Able to predict less correctly 7-8°C	1
	No response or wrong answer	0
1(e)	**Able to explain with two correct reasons** Sample answer *This is to enable the change in temperature to be measured. *The change of temperature is needed to calculate the heat of neutralization	3

	Able to explain at least one reason from the above	2
	Able to give an idea of explaining	1
	No response or wrong response	0
1(f)	**Able to state the formula accurately** Sample answer Change in temperature= Highest temperature of mixture- initial temperature of mixture	3
	Able to state the formula correctly Sample answer Difference of temperature between highest and lowest	2
	Able to give an idea of calculating	1
	No response or wrong response	0
1(g)	**Able to state all the variables correctly** Answer Manipulated Variable: The type of acid used // ethanoic acid, hydrochloric acid Responding Variable : The heat of neutralisation Constant Variable : The concentration and the volume of acid and alkali // the type of container that is used to hold the mixture	3
	Able to state two variables correctly	2
	Able to state one variable correctly	1
	No response or wrong response	0

1(h)	**Able to explain with two reasons correctly** Sample answer 1.Experiment I uses a strong acid whereas Experiment II uses a weak acid. The heat of neutralization of a weak acid by a strong alkali is less than the heat of neutralization of a strong acid by a strong alkali . 2 This is because during neutralization of a weak acid such as ethanoic acid , part of the heat is used to dissociate the acid molecules	3
	Able to explain with one of the reasons	2
	Able to give an idea Sample answer Ethanoic acid is a weak acid	1
	No response or wrong response	0

<table>
<tr><th>Question</th><th>Mark Scheme</th><th>Marks</th></tr>
<tr><td>2 (a)</td><td>Able to state all observation correctly

<u>Sample answer</u>

<table>
<tr><td>EXPERIMENT</td><td>Observation</td></tr>
<tr><td>EXPT I</td><td>Calcium nitrate dissolves //
Colourless solution is formed.</td></tr>
<tr><td>EXPT II</td><td>Copper(II) sulphate dissolves//
Blue solution is formed</td></tr>
<tr><td>EXPT III</td><td>.
Calcium carbonate does not dissolve/remains unchanged // No change.</td></tr>
</table></td><td>3</td></tr>
<tr><td></td><td>Able to state any 2 observations correctly.</td><td>2</td></tr>
<tr><td></td><td>Able to state any 1 observation correctly.</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
<tr><td>(b)</td><td>Able to state the operational definition of soluble salt correctly

<u>Sample answer:</u>

When a salt is added into water and dissolves to form a solution, it is a soluble sal t.//

When a salt dissolves in water to form a solution, it is a soluble salt.</td><td>3</td></tr>
<tr><td></td><td>Able to state the operational definition of soluble salt less correctly

<u>Sample answer</u>

When a salt is added into water and forms a solution, it is a soluble salt.

When a salt dissolves to form a solution, it is a soluble salt.

Salt dissolves in water to form a solution.</td><td>2</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>Able to state any idea of operational definition of soluble salt

Salt dissolves//Salt dissolves in water.

Solution forms.</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
<tr><td>(d)</td><td>Able to classify all the solutions correctly

<u>Sample answer</u>

<table>
<tr><td>Soluble salt</td><td>Insoluble salt</td></tr>
<tr><td>Potassium sulphate
Zinc sulphate</td><td>Lead(II) sulphate
Barium sulphate</td></tr>
</table>
Score 1 – if state in the reverse</td><td>3</td></tr>
<tr><td></td><td>Able to classify at least 3 salts correctly</td><td>2</td></tr>
<tr><td></td><td>Able to classify any 2 salts correctly</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
</table>

Question	Mark	Score
3(a)	Able to state the problem statement correctly <u>Sample answer:</u> How does the distance between two metals in the electrochemical series affect the voltage produced?	2
	Able to state the problem statement less correctly	1
	No response or wrong response	0

Question	Rubric	Score
3(b)	Able to state the three variables correctly <u>Sample answer:</u> Manipulated: Pairs of metals Responding: Voltage // Voltmeter reading Constant: Electrolyte // Copper(II) sulphate solution // Copper electrode//Concentration of electrolyte	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
3(c)	Able to state the hypothesis correctly and with direction Sample answer: Hypothesis: The further the distance of the pairs of metals in the electrochemical series, the greater the voltage produced	3
	Able to state the relationship between manipulated variable and responding variable but in the opposite direction // no direction	2
	Able to state an idea of the hypothesis	1
	No response or wrong response	0

Question	Rubric	Score
3(d)	Able to give complete list of substances and apparatus Sample answer: Substances Copper (II) sulphate solution, magnesium metal, zinc metal, iron metal, copper metal, sandpaper. Apparatus Beaker, connecting wire, voltmeter	3
	Able to give at least **two** substances and at least **two** apparatus	2
	Able to give at least **one** substance and at least **one** apparatus	1
	No response or wrong response	0

Question	Rubric	Score
3(e)	Able to list all the steps correctly Sample answer: 1. Clean the strips of magnesium and copper with sandpaper. 2. Measure 50 – 100 cm^3 of copper(II)sulphate solution and pour into a beaker. 3. Dip the magnesium and copper strips into the copper(II) sulphate solution. 4. Complete the circuit // Connect the strips to the voltmeter. 5. Record the voltmeter reading. 6. Repeat steps 1 to 5 by replacing pairs of Mg/Cu with Zn/Cu, Al/Cu and Fe/Cu .	3
	Able to list down steps **2, 3, 4 and 5**	2
	Able to list down steps **3 and 4**	1
	No response or wrong response	0

<table>
<tr><th>Question</th><th>Marks Scheme</th><th>Marks</th></tr>
<tr><td>2(f)</td><td>Able to exhibit the tabulation of data that includes the following four information.

1. Heading for the manipulated variables

2.. Heading for responding variable

3. All Manipulated variables

<u>Sample answer</u>:

<table>
<tr><td>Pairs of metals</td><td>Voltmeter reading // Voltage (V)</td></tr>
<tr><td>Mg / Cu</td><td></td></tr>
<tr><td>Al / Cu</td><td></td></tr>
<tr><td>Fe / Cu</td><td></td></tr>
<tr><td>Zn / Cu</td><td></td></tr>
</table>
</td><td>3</td></tr>
<tr><td></td><td>Able to exhibit the tabulation of data that includes the following three information.
1. Heading for the manipulated variables
2.. Heading for responding variable
3. One Manipulated variable
<u>Sample answer</u>:

<table>
<tr><td>Pairs of metals</td><td>Voltmeter reading // Voltage (V)</td></tr>
<tr><td>Mg / Cu</td><td></td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>2</td></tr>
</table>

<table>
<tr>
<td></td>
<td>
Able to exhibit the tabulation of data that includes the following two information.
1. Heading for the manipulated variables
2.. Heading for responding variable

Sample answer:
<table>
<tr><th>Pairs of metals</th><th>Voltmeter reading // Voltage

(V)</th></tr>
<tr><td></td><td></td></tr>
</table>
</td>
<td>1</td>
</tr>
</table>

END OF MARKING SCHEME