LEMBAGA PEPERIKSAAN
KEMENTERIAN PENDIDIKAN MALAYSIA

SIJIL PELAJARAN MALAYSIA 2021

KIMIA 4541/1

Kertas 1

1 jam 15 minit

JANGAN BUKA KERTAS PEPERIKSAAN INI SEHINGGA DIBERITAHU

1. *Kertas peperiksaan ini mengandungi* **40** *soalan.*
2. *Jawab* **semua** *soalan.*
3. *Bagi setiap soalan, pilih* **satu** *jawapan sahaja.* **Hitamkan** *jawapan anda pada kertas jawapan objektif yang disediakan.*
4. *Kertas peperiksaan ini adalah dalam dwibahasa.*
5. **Kertas jawapan objektif** *hendaklah diserahkan kepada pengawas peperiksaan pada akhir peperiksaan.*

Kertas peperiksaan ini mengandungi 37 halaman bercetak dan 3 halaman tidak bercetak.
(Nota penerbit: Bilangan halaman dalam buku ini telah diubah suai.)

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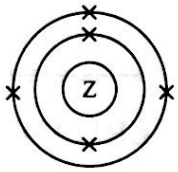
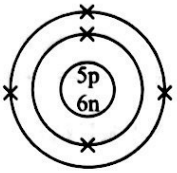
1 Rajah 1 menunjukkan perwakilan piawai bagi atom Z.
Diagram 1 shows the standard representation of the atom Z.

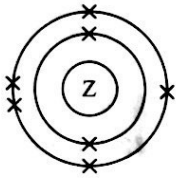
$^{11}_{5}Z$

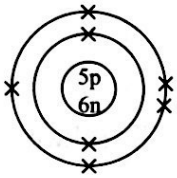
Rajah 1
Diagram 1

Antara yang berikut, rajah manakah yang menunjukkan struktur atom yang betul untuk atom itu?
Which of the following diagrams shows the correct atomic structure of the atom?

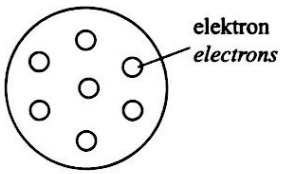
A 

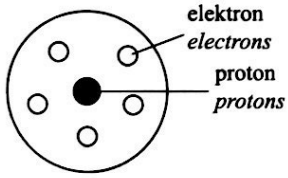
C 

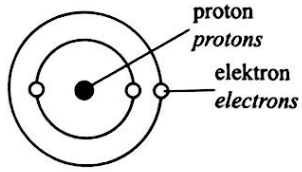
B 

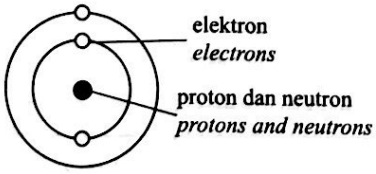
D 

2 Antara yang berikut, model atom yang manakah dikemukakan oleh Rutherford?
Which of the following atomic models was presented by Rutherford?

A 

B 

C 

D 

3 Seorang penduduk di Kampung Sentosa membuat aduan kepada Jabatan Air bahawa bil air rumahnya melonjak naik secara drastik. Pegawai jabatan itu mendapati terdapat kebocoran paip air bawah tanah di kawasan rumahnya dengan menggunakan sebuah alat pengesan.
Apakah bahan dalam alat pengesan yang digunakan oleh pegawai itu?
A resident in Kampung Sentosa made a complaint to the Water Department because his water bill increased drastically. The officer of the department found that there was an underground water pipe leakage in the house area by using a detector.
What is the substance in the detector used by the officer?

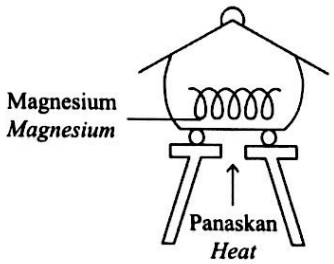
A Karbon-14 *Carbon-14*
B Kobalt-60 *Cobalt-60*
C Fosforus-32 *Phosphorus-32*
D Natrium-24 *Sodium-24*

4 Antara yang berikut, bahan manakah yang bersamaan dengan 1 mol?
Which of the following substances equal to 1 mol?
[Pemalar Avogadro, $N_A = 6.02 \times 10^{23}$ mol^{-1}]
[*Avogadro constant,* $N_A = 6.02 \times 10^{23}$ mol^{-1}]
[Jisim atom relatif: Na = 23, Cl = 35.5]
[*Relative atomic mass:* Na = 23, Cl = 35.5]
[Isi padu molar gas pada keadaan bilik = 24 dm^3 mol^{-1}]
[*Molar volume of gas at room conditions* = 24 dm^3 mol^{-1}]

I Zink klorida mengandungi 6.02×10^{24} formula unit
Zinc chloride has 6.02×10^{24} *formula units*
II Natrium klorida mempunyai jisim 58.5 g
Sodium chloride has mass of 58.5 g
III Isi padu gas karbon dioksida pada keadaan bilik adalah 2400 cm^3
The volume of carbon dioxide gas at room conditions is 2400 cm^3
IV Ferum mengandungi 6.02×10^{23} atom
Iron has 6.02×10^{23} *atoms*

A I dan/*and* II
B I dan/*and* III
C III dan/*and* IV
D II dan/*and* IV

5 Rajah 2 menunjukkan susunan radas untuk menentukan formula empirik bagi suatu logam oksida.
Diagram 2 shows the apparatus set-up to determine the empirical formula of a metal oxide.



Rajah 2
Diagram 2

Antara yang berikut, logam manakah yang menggunakan kaedah yang sama untuk menentukan formula empiriknya?
Which of the following metals uses the same method to determine its empirical formula?

A Stanum/*Tin*
B Ferum/*Iron*
C Zink/*Zinc*
D Kuprum/*Copper*

6 Jadual 1 menunjukkan nombor proton bagi dua unsur dalam Kumpulan 18 dalam Jadual Berkala Unsur.
Table 1 shows the proton number of two elements in Group 18 of The Periodic Table of Elements.

Unsur/*Elements*	Nombor proton/*Proton number*
X	2
Y	18

Jadual 1
Table 1

Antara yang berikut, pernyataan manakah yang betul tentang X dan Y?
Which of the following is the correct statement about X and Y?

A Saiz atom Y lebih kecil daripada X
Atomic size of Y is smaller than X
B Takat lebur Y lebih tinggi daripada X
Melting point of Y is higher than X
C Daya tarikan antara atom X lebih kuat daripada Y
Forces of attraction between atoms X are stronger than Y
D Bilangan petala berisi elektron bagi atom X lebih banyak daripada Y
The number of shells filled with electrons of atom X is more than Y

7 Rajah 3 menunjukkan formula dua ion bagi unsur Y.
Diagram 3 shows the formulae of two ions of element Y.

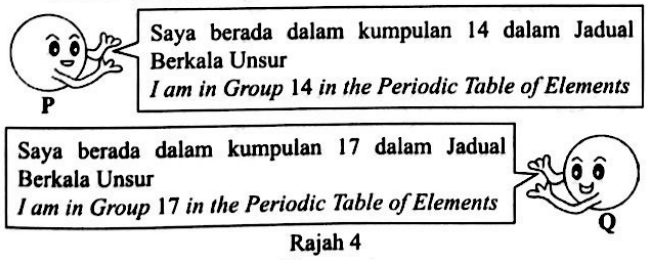
$[Y(CN)_6]^{3-}$ $[Y(CN)_6]^{4-}$

Rajah 3
Diagram 3

Antara yang berikut, logam manakah ialah unsur Y?
Which of the following metals is element Y?

A Ferum/*Iron*
B Zink/*Zinc*
C Kalsium/*Calcium*
D Aluminium/*Aluminium*

8 Rajah 4 menunjukkan satu ilustrasi perbualan antara atom **P** dan atom **Q**.
Diagram 4 shows an illustration of conversation between atom P and atom Q.

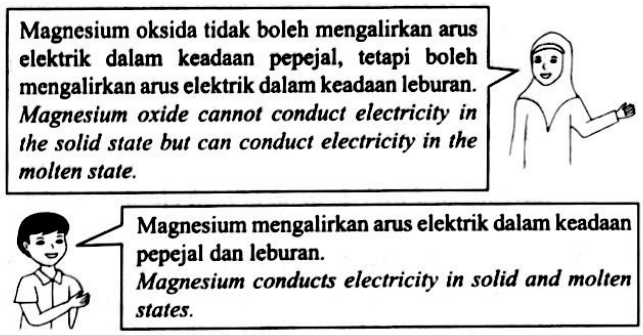


Rajah 4
Diagram 4

Apakah jenis ikatan kimia yang akan terbentuk antara atom **P** dan atom **Q**?
What is the type of chemical bond that will be formed between atom P and atom Q?

A Ion/*Ionic*
B Logam/*Metallic*
C Datif/*Dative*
D Kovalen/*Covalent*

9 Rajah 5 menunjukkan perbualan antara dua orang murid.
Diagram 5 shows a conversation between two students.

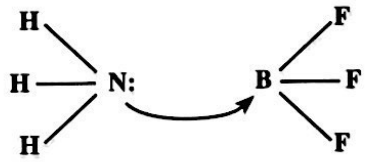


Rajah 5
Diagram 5

Antara yang berikut, penerangan manakah yang betul?
Which of the following explanations are correct?

	Magnesium *Magnesium*	**Magnesium oksida** *Magnesium oxide*
A	Terdiri daripada atom-atom *Made up of atoms*	Terdiri daripada ion-ion *Made up of ions*
B	Mengandungi elektron yang dinyah setempat dalam keadaan pepejal *Contains delocalised electrons in solid state*	Mengandungi ion yang bebas bergerak dalam keadaan leburan *Contains freely moving ions in molten state*
C	Atom-atom diikat oleh ikatan logam yang kuat *Atoms are held by strong metallic bond*	Ion-ion dipegang oleh daya elektrostatik yang kuat *Ions are held by strong electrostatic force*
D	Mempunyai struktur kekisi yang kuat *Has strong lattice structure*	Mempunyai struktur kekisi yang lemah *Has weak lattice structure*

10 Rajah 6 menunjukkan pembentukan sejenis ikatan.
Diagram 6 shows the formation of a type of bond.



Rajah 6
Diagram 6

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Antara yang berikut, pernyataan manakah yang betul tentang ikatan itu?
Which of the following statements is correct about the bond?

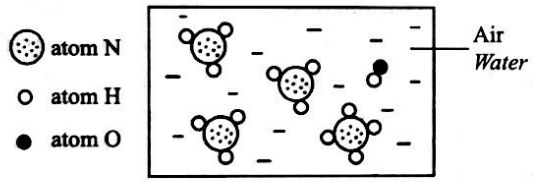
A Pemindahan elektron antara atom logam dengan atom bukan logam
Transfer of electrons between metal atoms and non-metal atoms

B Perkongsian elektron antara atom-atom bukan logam yang berasal daripada satu atom sahaja
Sharing of electrons between non-metal atoms that come from one atom only

C Daya tarikan antara atom hidrogen yang terikat dengan satu atom yang lebih elektronegatif dalam molekul lain
The forces of attraction between hydrogen atoms that have bonded with an atom of high electronegativity in another molecule

D Daya elektrostatik antara lautan elektron dengan ion logam bercas positif
The electrostatic forces between the sea of electrons and the positively-charged metal ions

11 Rajah 7 menunjukkan pengionan bagi suatu bahan, dalam air.
Diagram 7 shows the ionisation of a substance, in water.



Rajah 7
Diagram 7

Antara yang berikut, penyataan manakah yang betul tentang bahan tersebut?
Which of the following statements is correct about the substance?

A Nilai pH kurang daripada 7
pH *value is less than* 7

B Pengionan lengkap dalam air
Complete ionisation in water

C Kepekatan ion hidroksida yang rendah
Low concentration of hydroxide ions

D Bilangan mol ion hidrogen yang tinggi
High number of moles of hydrogen ions

12 Rajah 8 menunjukkan pemerhatian bagi suatu eksperimen apabila bahan X ditambah ke dalam dua larutan.
Diagram 8 shows the observations of an experiment when substance X is added into two solutions.

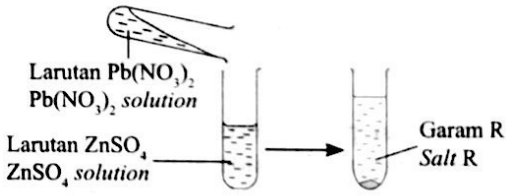
Set *Set*	Pemerhatian/*Observation*	
	Sebelum eksperimen *Before experiment*	**Selepas eksperimen** *After experiment*
I	Bahan X *Substance X* Asid nitrik *Nitric acid*	Larutan tidak berwarna *Colourless solution*
II	Bahan X *Substance X* Larutan natrium hidroksida *Sodium hydroxide solution*	Larutan natrium hidroksida *Sodium hydroxide solution* Bahan X *Substance X*

Rajah 8
Diagram 8

Apakah bahan X?
What is substance X?

A MgO
B Al_2O_3
C Cl_2O_7
D P_4O_{10}

13 Rajah 9 menunjukkan suatu eksperimen untuk menghasilkan garam R.
Diagram 9 shows an experiment to produce salt R.

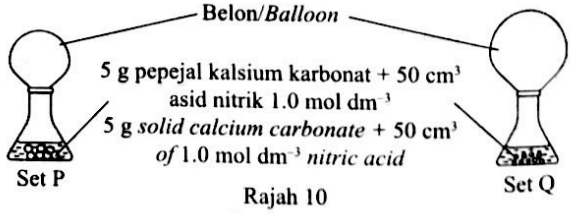


Rajah 9
Diagram 9

Apakah larutan garam yang boleh digunakan untuk menggantikan larutan $Pb(NO_3)_2$ untuk menghasilkan garam yang mempunyai keterlarutan yang sama seperti garam R?
What salt solution can be used to replace $Pb(NO_3)_2$ *solution to produce salt that has the same solubility as salt* R?

A $Cu(NO_3)_2$
B $Ca(NO_3)_2$
C $Fe(NO_3)_2$
D $Mg(NO_3)_2$

14 Rajah 10 menunjukkan keadaan belon dalam set P dan set Q selepas beberapa minit tindak balas berlaku.
Diagram 10 shows the conditions of balloons in set P and set Q a few minutes after a reaction occured.



Rajah 10
Diagram 10

Antara yang berikut, pernyataan manakah yang menerangkan pemerhatian itu?
Which of the following statements explains the observation?

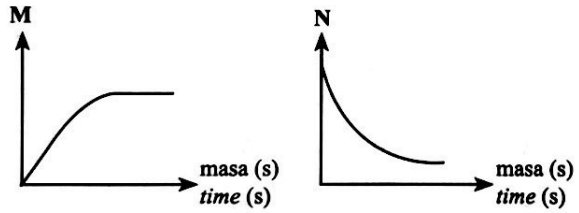
A Zarah bahan tindak balas dalam set P bergerak lebih cepat.
Reacting particles in set P *move faster.*

B Lebih banyak zarah kalsium karbonat hadir dalam set Q.
More particles of calcium carbonate are present in set Q.

C Jumlah luas permukaan kalsium karbonat dalam set Q adalah lebih besar.
Total surface area of calcium carbonate in set Q *is larger.*

D Lebih banyak zarah bahan tindak balas mencapai tenaga pengaktifan yang rendah dalam set P.
More reacting particles achieve low activation energy in set P.

15 Rajah 11 menunjukkan dua graf yang diperoleh daripada tindak balas antara asid sulfurik dengan pita magnesium.
Diagram 11 *shows two graphs obtained from a reaction between sulphuric acid and magnesium ribbon.*



Rajah 11
Diagram 11

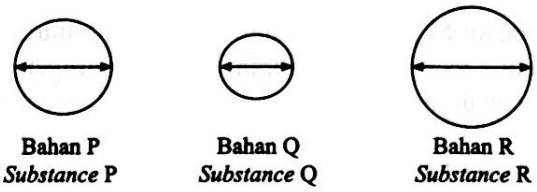
Apakah **M** dan **N**?
What are **M** *and* **N**?

	M	N
A	Jisim pita magnesium *Mass of magnesium ribbon*	Kepekatan asid sulfurik *Concentration of sulphuric acid*
B	Kepekatan asid sulfurik *Concentration of sulphuric acid*	Isi padu gas hidrogen *Volume of hydrogen gas*
C	Kepekatan asid sulfurik *Concentration of sulphuric acid*	Jisim pita magnesium *Mass of magnesium ribbon*
D	Isi padu gas hidrogen *Volume of hydrogen gas*	Kepekatan asid sulfurik *Concentration of sulphuric acid*

16 Piuter ialah campuran antara R, kuprum dan antimoni.
Apakah R?
Pewter is a mixture of R, *copper and antimony.*
What is R?

A Plumbum/ *Lead*
B Stanum/*Tin*
C Argentum/*Silver*
D Karbon/*Carbon*

17 Rajah 12 menunjukkan diameter lekuk yang terhasil dalam eksperimen untuk mengkaji kekerasan bagi tiga bahan P, Q dan R.
Diagram 12 *shows the diameters of the dents which are produced in an experiment to investigate the hardness of three different substances* P, Q *and* R.

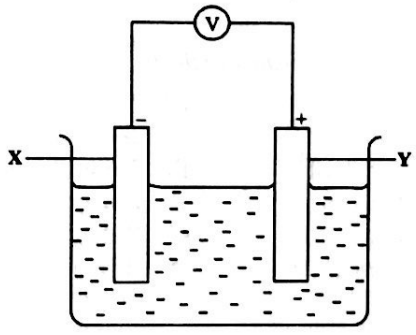


Rajah 12
Diagram 12

Apakah P, Q dan R serta susunan kekerasan bahan dalam tertib menaik yang betul?
What are P, Q, *and* R *the correct arrangement of hardness of the substances in ascending order?*

	P	Q	R	Susunan *Arrangement*
A	Keluli *Steel*	Kuprum *Copper*	Loyang *Brass*	R, P, Q
B	Loyang *Brass*	Keluli *Steel*	Kuprum *Copper*	R, P, Q
C	Keluli *Steel*	Loyang *Brass*	Kuprum *Copper*	Q, P, R
D	Loyang *Brass*	Kuprum *Copper*	Keluli *Steel*	Q, P, R

18 Rajah 13 menunjukkan suatu sel kimia.
Diagram 13 *shows a chemical cell.*



Rajah 13
Diagram 13

Antara yang berikut, proses manakah yang betul berlaku di **X** dan **Y**?
Which of the following is the correct process that occurs at **X** *and* **Y**?

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	X	Y
A	Kehilangan oksigen *Loss of oxygen*	Menerima oksigen *Gain of oxygen*
B	Pertambahan nombor pengoksidaan *Increase in oxidation number*	Pengurangan nombor pengoksidaan *Decrease in oxidation number*
C	Menerima elektron *Gain of electrons*	Kehilangan elektron *Loss of electrons*
D	Menerima hidrogen *Gain of hydrogen*	Kehilangan hidrogen *Loss of hydrogen*

19 Logam M bertindak balas dengan asid hidroklorik untuk menghasilkan garam dan gas hidrogen.
Apakah tindak balas yang berlaku pada logam M?
Metal M *reacts with hydrochloric acid to produce salt and hydrogen gas.*
What is the reaction that occurs on metal M?

A Penurunan
Reduction
B Pengoksidaan
Oxidation
C Pemendakan
Precipitation
D Peneutralan
Neutralisation

20 Campuran metana dan klorin bertindak balas apabila terdedah kepada cahaya matahari. Persamaan berikut mewakili tindak balas tersebut.
A mixture of methane and chlorine react when it is exposed to sunlight. The following equation represents the reaction.

$$CH_4 + Cl_2 \longrightarrow CH_3Cl + HCl$$

Bahan manakah yang diturunkan dalam tindak balas itu?
Which substance is reduced in the reaction?

A CH_4
B Cl_2
C CH_3Cl
D HCl

21 Antara yang berikut, yang manakah isomer bagi C_4H_9OH?
Which of the following are the isomers for C_4H_9OH?

I Propan-2-ol
Propan-2-ol
II Butan-1-ol
Butan-1-ol
III 2-metilpropan-2-ol
2-*methylpropan*-2-ol
IV 2-metilbutan-2-ol
2-*methylbutan*-2-ol

A I dan/*and* II
B I dan/*and* IV
C II dan/*and* III
D III dan/*and* IV

22 Persamaan berikut mewakili tindak balas penghidratan etena untuk menghasilkan etanol secara industri.
The following equation represents the hydration of ethene to produce ethanol in industry.

$$CH_2 = CH_2 + H_2O \xrightarrow[Y\ °C,\ 60\ atm]{\text{Mangkin X}\ /\ \textit{Catalyst X}} C_2H_5OH$$

Apakah **X** dan **Y**?
What are **X** *and* **Y**?

	X	Y
A	Nikel *Nickel*	180
B	Ferum *Iron*	450
C	Asid fosforik *Phosphoric acid*	300
D	Asid sulfurik pekat *Concentrated sulphuric acid*	180

23 Sebatian Q mempunyai sifat-sifat berikut.
Compound Q *has the following properties.*

- Tidak mengkonduksi elektrik
  Cannot conduct electricity
- Tidak larut dalam air
  Insoluble in water
- Menyahwarna kalium manganat (VII) berasid
  Decolourise acidified potassium manganate (VII)

Apakah sebatian Q?
What is compound Q?

A Asid etanoik
Ethanoic acid
B Etanol
Ethanol
C Etena
Ethene
D Etana
Ethane

24 Formula molekul berikut mewakili satu sebatian karbon yang terbentuk daripada tindak balas antara sebatian X dan sebatian Y.
The following molecular formula represents a carbon compound formed from the reaction between compounds X *and* Y.

$$C_2H_5COOC_3H_7$$

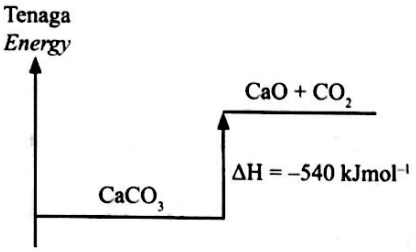
Apakah sebatian X dan sebatian Y?
What are compounds X *and* Y?

	Sebatian X ***Compound* X**	**Sebatian Y** ***Compound* Y**
A	CH_3CH_2COOH	CH_3CH_2OH
B	CH_3CH_2COOH	$CH_3CH_2CH_2OH$
C	$CH_3CH_2CH_2COOH$	CH_3CH_2OH
D	$CH_3CH_2CH_2CH_2COOH$	$CH_3CH_2CH_2OH$

25 Persamaan berikut mewakili tindak balas penguraian bagi kalsium karbonat, $CaCO_3$.
The following equation represents the decomposition reaction of calcium carbonate, $CaCO_3$.

$$CaCO_3 \longrightarrow CaO + CO_2$$

Haba yang diserap apabila 1 mol $CaCO_3$ terurai ialah 540 kJmol^{-1}.
Gambar rajah aras tenaga yang manakah betul bagi tindak balas itu?
Heat absorbed when 1 mol *of* $CaCO_3$ *decomposed is* 540 kJmol^{-1}.
Which energy level diagram is correct for the reaction?

A


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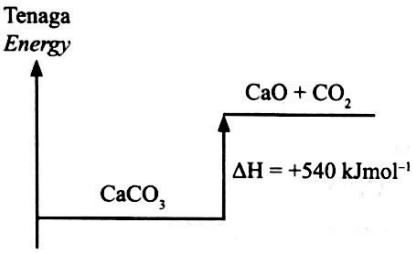

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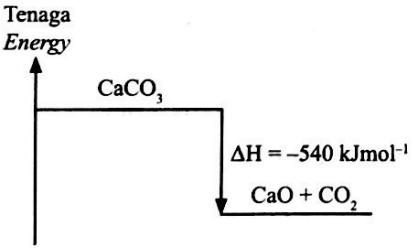
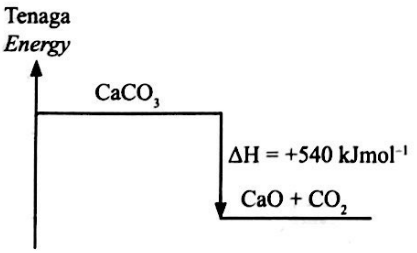
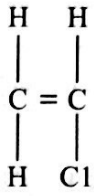


D


26 Persamaan kimia yang manakah mewakili tindak balas yang menghasilkan haba paling tinggi?
Which chemical equation represents the reaction that produces the highest heat?

A $HCl + NaOH \longrightarrow NaCl + H_2O$
B $HCl + NH_4OH \longrightarrow NH_4Cl + H_2O$
C $H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$
D $H_2SO_4 + 2NH_4OH \longrightarrow (NH_4)2SO_4 + 2H_2O$

27 Rajah 14 menujukkan formula struktur suatu monomer.
Diagram 14 *shows a structural formula of a monomer.*



Rajah 14
Diagram 14

Antara yang berikut, yang manakah persamaan antara monomer tersebut dengan polimernya?
Which of the following is the similarity between the monomer and its polymer?

A Formula molekul ialah C_2H_3Cl
Molecular formula is C_2H_3Cl
B Mempunyai ikatan ganda dua antara atom-atom karbon
Have double bond between carbon atoms
C Mempunyai atom karbon, atom hidrogen dan atom klorin
Contain carbon atom, hydrogen atom and chlorine atom
D Bilangan atom karbon dalam molekul
Number of carbon atoms in the molecule

28 Bahan manakah mempercepatkan penggumpalan lateks?
Which substance speeds up the coagulation of latex?

A Air
Water
B Metanol
Methanol
C Larutan ammonia
Ammonia solution
D Asid metanoik
Methanoic acid

29 Bahan tambah makanan manakah dipadankan dengan betul dengan contohnya?
Which food additives is matched correctly with its example?

	Bahan tambah makanan *Food additive*	**Contoh** *Example*
A	Pengantioksida *Antioxidants*	Asid askorbik *Ascorbic acid*
B	Pewarna *Colouring*	Aspartam *Aspartame*
C	Pengawet *Preservatives*	Mononatrium glutamat *Monosodium glutamate*
D	Pemekat *Thickeners*	Sebatian azo *Azo compound*

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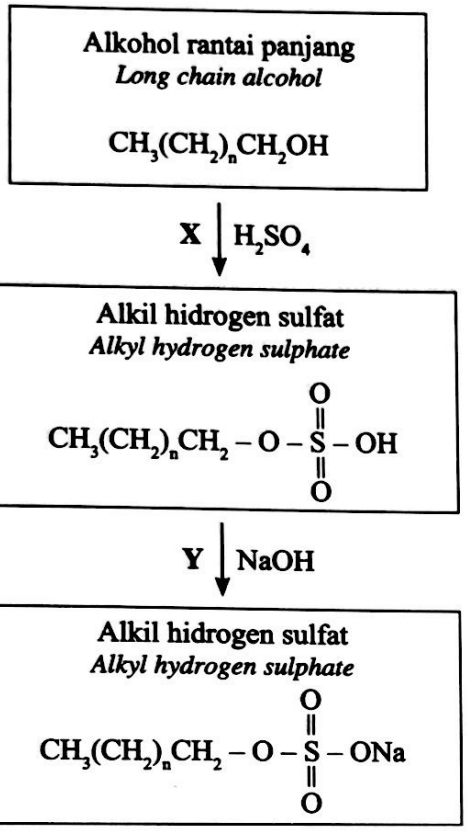
30 Rajah 15 menunjukkan satu proses dalam penyediaan suatu detergen.
Diagram 15 shows a process in the preparation of a detergent.

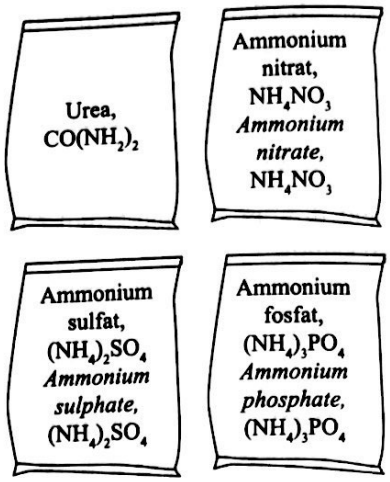


Rajah 15
Diagram 15

Apakah tindak balas X dan Y?
What are reactions X and Y?

	X	Y
A	Pendehidratan *Dehydration*	Pensulfatan *Sulphation*
B	Pensulfatan *Sulphation*	Peneutralan *Neutralisation*
C	Peneutralan *Neutralisation*	Saponifikasi *Saponification*
D	Saponifikasi *Saponification*	Pendehidratan *Dehydration*

31 Rajah 16 menujukkan empat jenis baja yang dijual di sebuah kedai.
Ahmad telah dinasihati supaya membeli baja yang sesuai untuk tumbesaran pokok rambutan yang lebih baik.
Diagram 16 shows four types of fertilisers sold in a shop. Ahmad is advised to buy a suitable fertiliser for a better growth of rambutan tree.



Rajah 16
Diagram 16

Antara yang berikut, baja yang manakah menjadi pilihan Ahmad?
[Jisim atom relatif : H = 1; N = 14; O = 16; P = 31; S = 32; C = 12]
Which of the following fertilisers becomes Ahmad's choice?
[*Relatif atomic mass* : H = 1; N = 14; O = 16; P = 31; S = 32; C = 12]

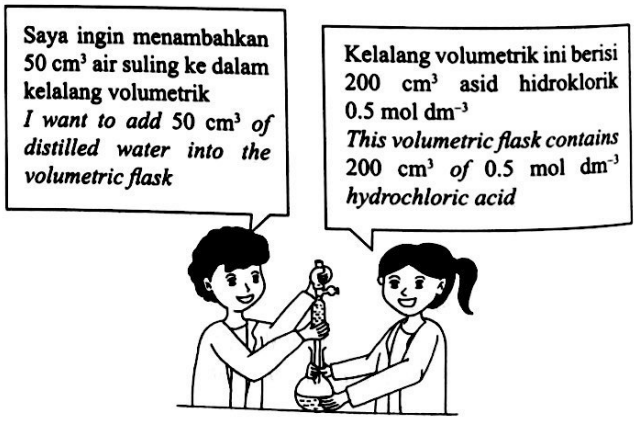
A Urea, $CO(NH_2)_2$
Urea, $CO(NH_2)_2$

B Ammonium nitrat, NH_4NO_3
Ammonium nitrate, NH_4NO_3

C Ammonium sulfat, $(NH_4)_2SO_4$
Ammonium sulphate, $(NH_4)_2SO_4$

D Ammonium fosfat, $(NH_4)_3PO_4$
Ammonium phosphate, $(NH_4)_3PO_4$

32 Rajah 17 menunjukkan perbualan antara dua murid.
Diagram 17 shows a conversation between two students.

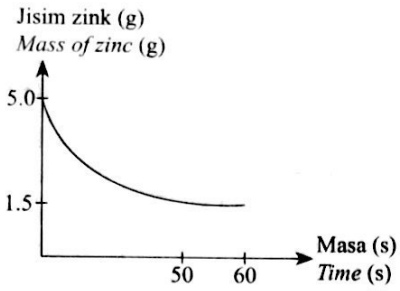


Rajah 17
Diagram 17

Apakah nilai pH akhir?
What is the final pH *value?*

A 0.20
B 0.30
C 0.40
D 0.50

33 Rajah 18 menunjukkan suatu graf bagi tindak balas antara zink dan larutan kuprum (II) sulfat.
Diagram 18 shows a graph for the reaction between zinc and copper (II) sulphate solution.

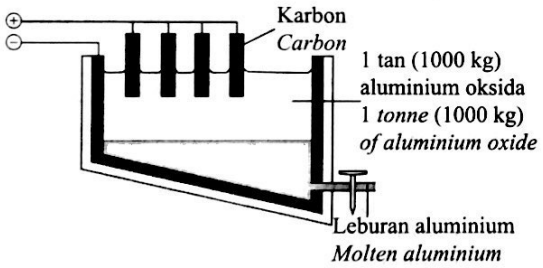


Rajah 18
Diagram 18

Apakah kadar tindak balas purata?
What is the average rate of reaction?

A $0.025\ g\ s^{-1}$ **C** $0.058\ g\ s^{-1}$
B $0.030\ g\ s^{-1}$ **D** $0.070\ g\ s^{-1}$

34 Rajah 19 menunjukkan tangki elekrolisis yang digunakan untuk mengestrak aluminium daripada bijihnya, aluminium oksida.
Diagram 19 shows the electrolytic tank used to extract aluminium from its ore, aluminium oxide.



Rajah 19
Diagram 19

Persamaan berikut mewakili tindak balas dalam tangki tersebut.
The following equation represents the reaction in the tank.

$$2Al_2O_3 \longrightarrow 4Al + 3O_2$$

Apakah jisim aluminium yang diekstrak?
[Jisim atom relatif: O = 16, Al = 27]
What is the mass of aluminium extracted?
[*Relative atomic mass*: O = 16, Al = 27]

A 1058 kg **C** 264 kg
B 529 kg **D** 235 kg

35 Persamaan berikut mewakili penurunan ferum (III) oksida oleh magnesium.
The following equation represents the reduction of iron (III) oxide by magnesium.

$$3Mg + Fe_2O_3 \longrightarrow 3MgO + 2Fe$$

Berapakah jisim magnesium yang diperlukan untuk menurunkan 16.0 g ferum (III) oksida?
[Jisim atom relatif: Fe = 56, Mg = 24, O = 16]
What is the mass of magnesium needed to reduce 16.0 g of iron (III) oxide?
[*Relative atomic mass*: Fe = 56, Mg = 24, O = 16]

A 2.4 g **C** 7.2 g
B 5.6 g **D** 16.0 g

36 Formula empirik bagi suatu hidrokarbon ialah CH_2.
The empirical formula of a hydrocarbon is CH_2.
Apakah formula molekul bagi hidrokarbon itu?
[Jisim atom relatif: C = 12, H = 1; Jisim molar hidrokarbon = $56\ g\ mol^{-1}$]
What is the molecular formula of the hydrocarbon?
[*Relative atomic mass*: C = 12, H = 1; *Molar mass of hydrocarbon* = $56\ g\ mol^{-1}$]

A C_4H_8
B C_4H_{10}
C C_2H_4
D C_2H_6

37 Maklumat berikut menunjukkan keputusan bagi suatu eksperimen untuk menentukan haba pembakaran bahan api X.
The following information shows the results of an experiment to determine the heat of combustion of fuel X.

Jisim bahan api X yang terbakar = 18.0 g
Mass of fuel X burnt = 18.0 g

Isi padu air dalam bekas kuprum = $250.0\ cm^3$
Volume of water in the copper container = $250.0\ cm^3$

Peningkatan suhu = 16.0 °C
Increase in temperature = 16.0 °C

Berapakah haba pembakaran bahan api X?
[Jisim molar bahan api X = $180\ g\ mol^{-1}$; Muatan haba tentu air = $4.2\ Jg^{-1}\ °C^{-1}$; ketumpatan air = $1.0\ g\ cm^{-3}$]
What is the heat of combustion of fuel X?
[*Molar mass of fuel X* = $180\ g\ mol^{-1}$; *Specific heat capacity of water* = $4.2\ Jg^{-1}\ °C^{-1}$; *Density of water* = $1.0\ g\ cm^{-3}$]

A $-1.68\ kJmol^{-1}$
B $-18.00\ kJmol^{-1}$
C $-168.00\ kJmol^{-1}$
D $-180.00\ kJmol^{-1}$

38 Persamaan berikut mewakili tindak balas penguraian zink nitrat.
The following equation represents the decomposition reaction of zinc nitrate.

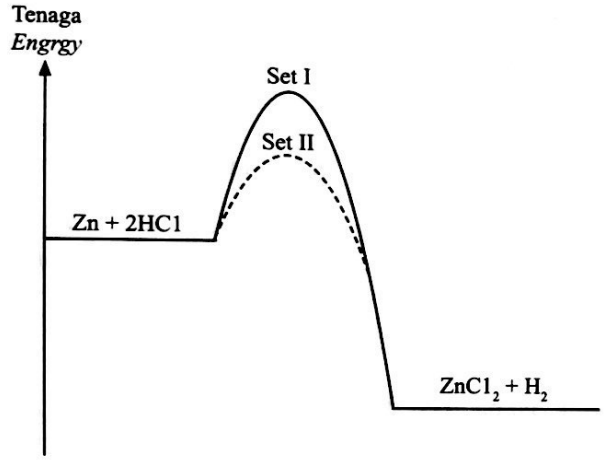
$$2\ Zn(NO_3)_2 \longrightarrow 2\ ZnO + 4\ NO_2 + O_2$$

[Lihat halaman sebelah

Berapakah isi padu maksimum gas nitrogen dioksida yang terbebas pada suhu dan tekanan piawai (STP) apabila 18.9 g zink nitrat dipanaskan? [Jisim formula relatif: $Zn(NO_3)_2$ = 189 g mol^{-1} ; Isi padu molar gas pada STP = 22.4 dm^3 mol^{-1}]
What is the maximum volume of nitrogen dioxide gas released at standard temperature and pressure (STP) *when* 18.9 g *of zinc nitrate was heated*?
[*Relative formula mass:* $Zn(NO_3)_2$ = 189 g mol^{-1} ; *Molar volume of gas at* STP = 22.4 dm^3mol^{-1}]

A 1.12 dm^3
B 2.24 dm^3
C 3.36 dm^3
D 4.48 dm^3

39 Rajah 20 menunjukkan suatu gambar rajah aras tenaga yang diperolehi daripada dua set eksperimen.
Diagram 20 *shows energy profile diagram that obtained from two sets of experiment.*

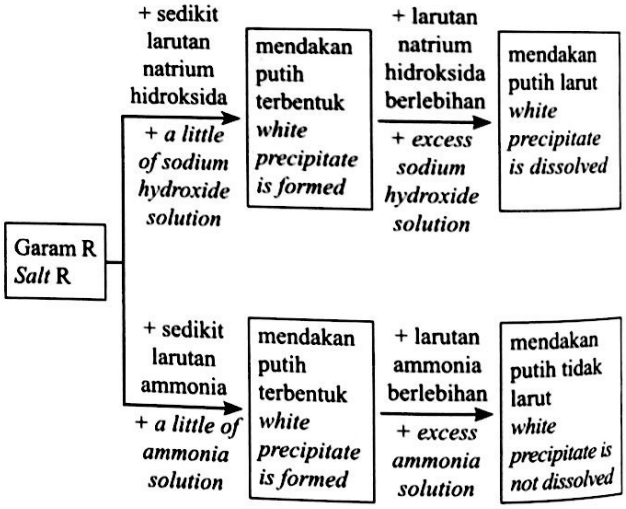


Rajah 20
Diagram 20

Antara yang berikut, pernyataan manakah yang betul tentang Set I dan Set II?
Which of the following statements are correct about Set I *and* Set II?

	Set I	Set II
A	Tindak balas membebaskan haba tanpa kehadiran mangkin *The reaction releases heat without the presence of catalyst*	Tindak balas membebaskan haba dengan kehadiran mangkin *The reaction releases heat with the presence of catalyst*
B	Tindak balas membebaskan haba dengan kehadiran mangkin *The reaction releases heat with the presence of catalyst*	Tindak balas membebaskan haba tanpa kehadiran mangkin *The reaction releases heat without the presence of catalyst*
C	Tindak balas menyerap haba dengan kehadiran mangkin *The reaction absorbs heat with the presence of catalyst*	Tindak balas menyerap haba tanpa kehadiran mangkin *The reaction absorbs heat without the presence of catalyst*
D	Tindak balas menyerap haba tanpa kehadiran mangkin *The reaction absorbs heat without the presence of catalyst*	Tindak balas menyerap haba dengan kehadiran mangkin *The reaction absorbs heat with the presence of catalyst*

40 Rajah 21 menunjukkan proses bagi mengesahkan kehadiran kation dalam larutan garam R.
Diagram 21 *shows a process to confirm the presence of the cation in salt solution* R.



Rajah 21
Diagram 21

Antara yang berikut, kation manakah yang hadir dalam larutan garam R?
Which of the following cations is present in salt solution R?

A Al^{3+}
B Ca^{2+}
C Mg^{2+}
D Zn^{2+}

KERTAS PEPERIKSAAN TAMAT

NO. KAD PENGENALAN

ANGKA GILIRAN

LEMBAGA PEPERIKSAAN
KEMENTERIAN PENDIDIKAN MALAYSIA

SIJIL PELAJARAN MALAYSIA 2021

KIMIA 4541/2

Kertas 2

2 jam 30 minit

JANGAN BUKA KERTAS PEPERIKSAAN INI SEHINGGA DIBERITAHU

1. *Tulis* **nombor kad pengenalan** *dan* **angka giliran** *anda pada ruang yang disediakan.*
2. *Kertas peperiksaan ini mengandungi* **tiga** *bahagian*: **Bahagian A, Bahagian B** *dan* **Bahagian C**.
3. *Jawapan hendaklah ditulis pada ruang jawapan yang disediakan di dalam kertas peperiksaan ini.*
4. *Kertas peperiksaan ini adalah dalam dwibahasa.*
5. *Jawapan boleh ditulis dalam bahasa Melayu atau bahasa Inggeris.*
6. *Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
7. *Kerja mengira anda mesti ditunjukkan.*
8. **Kertas peperiksaan** *ini hendaklah diserahkan kepada pengawas peperiksaan pada akhir peperiksaan.*

Tampal pelekat di sini

Kertas peperiksaan ini mengandungi 47 halaman bercetak 1 halaman tidak bercetak.
(Nota penerbit: Bilangan halaman dalam buku ini telah diubah suai)

[Lihat halaman sebelah

***Bahagian* A**

[60 markah]

Jawab **semua** *soalan dalam bahagian ini.*

1 Jadual 1 menunjukkan nombor proton dan nombor nukleon bagi atom X dan atom Y. Huruf X dan Y bukan simbol sebenar bagi atom tersebut.
Table 1 *shows the proton number and nucleon number of atoms* X *and* Y. *The letters* X *and* Y *are not the actual symbol of the atoms.*

Atom	**Nombor proton** ***Proton number***	**Nombor nukleon** ***Nucleon number***
X	8	16
Y	6	12

Jadual 1
Table 1

Berdasarkan Jadual 1,
Based on Table 1,

(*a*) Apakah yang dimaksudkan dengan nombor nukleon?
What is meant by nucleon number?

.....

[1 *markah*]
[1 *mark*]

(*b*) Nyatakan bilangan proton dalam atom X.
State the number of protons in atom X.

.....

[1 *markah*]
[1 *mark*]

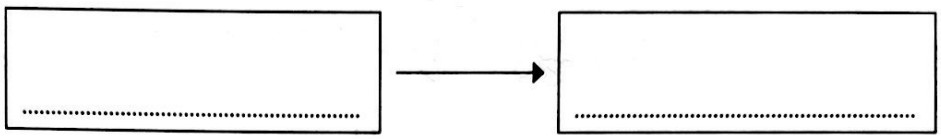
(c) Tulis perwakilan piawai bagi atom Y dalam bentuk ${}^{A}_{Z}Y$.
Write the standard representation for atom Y *in the form of* ${}^{A}_{Z}Y$.

.....

[1 *markah*]
[1 *mark*]

(d) X bertindak balas dengan Y membentuk sebatian YX_2. Sebatian YX_2 mengalami proses pemejalwapan pada –78 °C.
X *reacts with* Y *to form compound* YX_2. *Compound* YX_2 *undergoes sublimation process at* –78 °C.

(i) Lengkapkan kotak berikut bagi menunjukkan perubahan keadaan fizik YX_2 ketika pemejalwapan.
Complete the following boxes to show the change in physical state of compound YX_2 *during sublimation.*



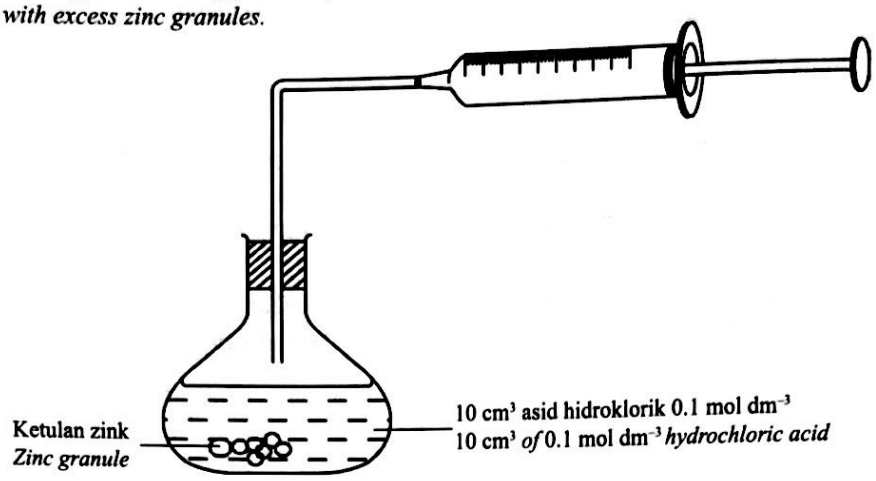
[1 *markah*]
[1 *mark*]

(ii) Nyatakan pergerakan zarah dalam YX_2 pada suhu bilik.
State the movement of particles in YX_2 *at room temperature.*

.....

[1 *markah*]
[1 *mark*]

2 Rajah 1.1 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji kadar tindak balas antara 10 cm^3 asid hidroklorik 0.1 mol dm^{-3} dengan ketulan zink berlebihan.
Diagram 1.1 *shows the apparatus set-up for an experiment to study the rate of reaction between* 10 cm^3 *of* 0.1 mol dm^{-3} *hydrochloric acid with excess zinc granules.*



Rajah 1.1
Diagram 1.1

Jadual 2 menunjukkan isi padu gas yang terkumpul pada setiap sela masa 1 minit apabila 1 cm^3 larutan kuprum (II) sulfat 0.1 mol dm^{-3} ditambah dalam eksperimen ini.
Table 2 *shows the volume of gas collected at* 1 *minute intervals when* 1 cm^3 *of* 0.1 mol dm^{-3} *copper* (II) *sulphate solution is added in this experiment.*

Masa(min) ***Time*(min)**	0.0	1.0	2.0	3.0	4.0	5.0
Isi padu gas (cm^3) ***Volume of gas* (cm^3)**	0.0	11.2	15.8	18.0	18.0	18.0

Jadual 2
Table 2

(*a*) Apakah fungsi kuprum (II) sulfat dalam eksperimen ini?
What is the function of copper (II) *sulphate in this experiment*?

.....

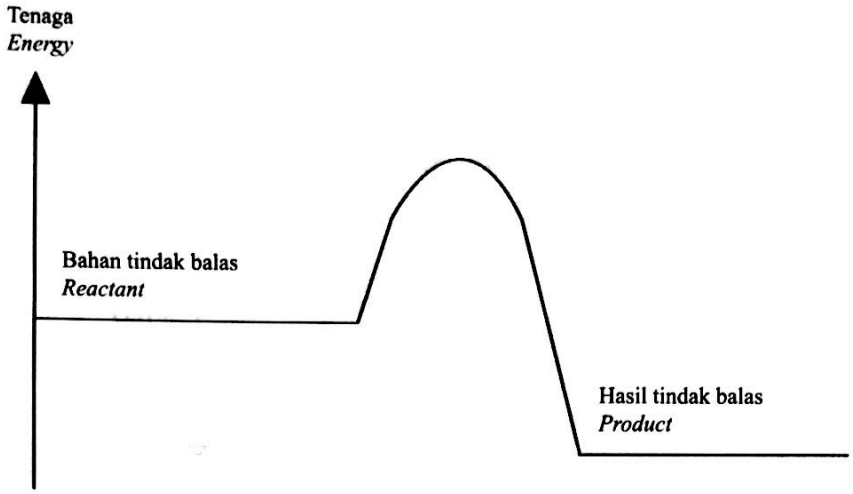
[1 *markah*]
[1 *mark*]

(*b*) Nyatakan isi padu gas yang terkumpul apabila kepekatan larutan kuprum (II) sulfat 0.1 mol dm^{-3} yang digunakan dalam eksperimen ini digantikan dengan larutan kuprum (II) sulfat 0.5 mol dm^{-3}.
State the volume of gas collected when the concentration of 0.1 mol dm^{-3} *copper* (II) *sulphate solution used in this experiment is replaced by* 0.5 mol dm^{-3} *copper* (II) *sulphate solution.*

.....

[1 *markah*]
[1 *mark*]

(*c*) Rajah 1.2 menunjukkan gambar rajah profil tenaga bagi tindak balas dalam eksperimen ini.
Diagram 1.2 *shows the energy profile diagram for the reaction in this experiment.*



Rajah 1.2
Diagram 1.2

Menggunakan paksi yang sama dalam Rajah 1.2, lakarkan lengkungan profil tenaga apabila kuprum (II) sulfat tidak ditambah dalam eksperimen itu.
By using the same axis in Diagram 1.2, *sketch the curve of energy profile when copper* (II) *sulphate is not added in the experiment.*

[1 *markah*]
[1 *mark*]

(*d*) Tindak balas antara zink dengan asid hidroklorik berlaku apabila zarah bahan tindak balas berlanggar antara satu sama lain. Hanya perlanggaran berkesan akan menghasilkan hasil tindak balas.
Reaction between zinc and hydrochloric acid occured when the particles of reactant collide with each other. Only effective collision will produce products.

Nyatakan dua keadaan yang diperlukan untuk perlanggaran berkesan berlaku.
State two conditions needed for an effective collision to occur.

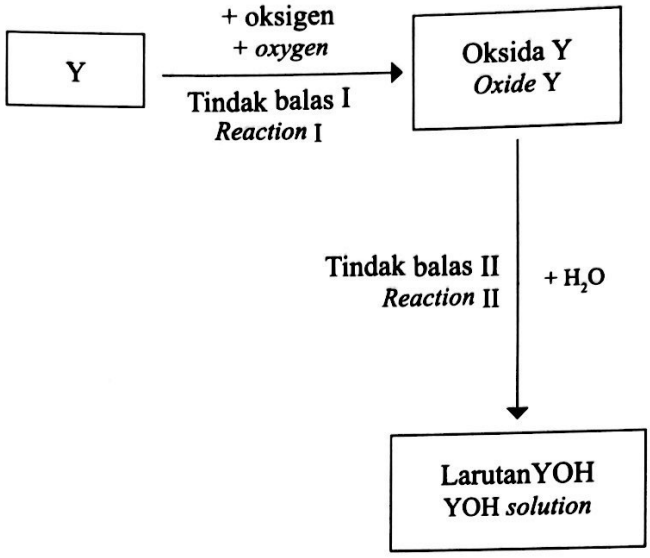
1. .....

2. .....

[2 *markah*]
[2 *marks*]

[Lihat halaman sebelah
SULIT

3 Rajah 2 menunjukkan carta alir bagi tindak balas bermula dengan unsur Y. Unsur Y terletak dalam Kumpulan 1 Jadual Berkala Unsur.
Diagram 2 shows the flow chart for the reaction starting with element Y. *Element* Y *is located in Group* 1 *of the Periodic Table of Elements.*



Rajah 2
Diagram 2

(*a*) Nyatakan bilangan elektron valens bagi unsur Kumpulan 1.
State the number of valence electron of Group 1 *elements.*

.....

[1 *markah*]
[1 *mark*]

(*b*) Tulis persamaan kimia bagi Tindak balas 1.
Write the chemical equation for Reaction 1.

.....

[2 *markah*]
[2 *marks*]

(c) 0.5 mol unsur Y terbakar dalam oksigen seperti yang ditunjukkan dalam Tindak balas I.
Hitung jisim oksida Y yang terbentuk.
0.5 mol *of element* Y *is burnt in oxygen as shown in Reaction* I.
Calculate the mass of Y *oxide formed.*
[Jisim molar oksida Y = 62 g mol^{-1}]
[*Molar mass of oxide* Y = 62 g mol^{-1}]

[2 *markah*]
[2 *marks*]

(d) Ramalkan nilai pH bagi larutan YOH yang terbentuk.
Predict the pH *value of* YOH *solution formed.*

.....

[1 *markah*]
[1 *mark*]

[Lihat halaman sebelah
SULIT

4 Rajah 3 menunjukkan perwakilan piawai bagi atom natrium dan atom klorin.
Diagram 3 shows the standard representation for sodium atom and chlorine atom.

$^{23}_{11}Na$ $^{35}_{17}Cl$

Rajah 3
Diagram 3

(*a*) Tulis formula kimia bagi molekul klorin.
Write a chemical formula for chlorine molecule.

.....

[1 *markah*]
[1 *mark*]

(*b*) Natrium bertindak balas dengan klorin membentuk sebatian Q.
Sodium reacts with chlorine to form compound Q.

(i) Nyatakan jenis ikatan bagi sebatian Q.
State the type of bond in compound Q.

.....

[1 *markah*]
[1 *mark*]

(ii) Nyatakan bagaimana ikatan di 4(*b*)(i) terbentuk.
State how is the bond in 4(*b*)(i) *formed.*

.....

[1 *markah*]
[1 *mark*]

(iii) Tulis persamaan kimia bagi pembentukan sebatian Q.
Write the chemical equation for the formation of compound Q.

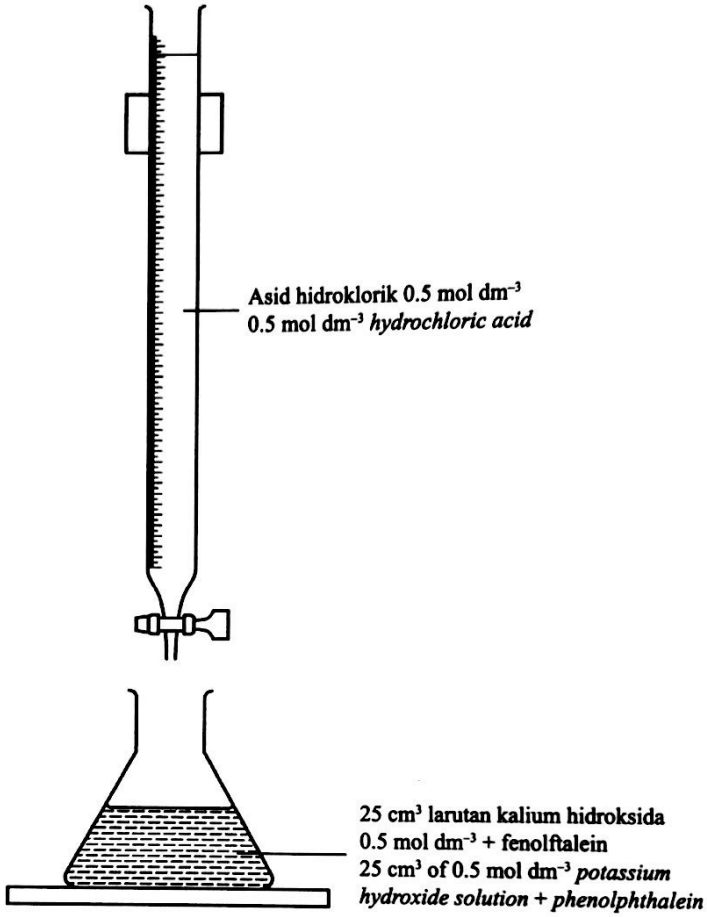
.....

[2 *markah*]
[2 *marks*]

(iv) 2.3 g natrium bertindak balas dengan klorin berlebihan.
Hitung jisim bagi sebatian Q yang terhasil.
2.3 g *of sodium reacts with excess chlorine.*
Calculate the mass of compound Q *produced.*

[2 *markah*]
[2 *marks*]

5 (*a*) Rajah 4.1 menunjukkan satu susunan radas untuk menentukan takat akhir pentitratan antara asid hidroklorik dan larutan kalium hidroksida dengan menggunakan fenolftalein sebagai penunjuk.
Diagram 4.1 shows an apparatus set-up to determine the end point of titration between hydrochloric acid and potassium hydroxide solution by using phenolphthalein as an indicator.



Rajah 4.1
Diagram 4.1

(i) Nyatakan maksud asid.
State the meaning of acid.

.....

[1 *markah*]
[1 *mark*]

(ii) Tuliskan persamaan kimia bagi tindak balas itu.
Write the chemical equation for the reaction.

.....

[2 *markah*]
[2 *marks*]

(iii) Hitung isi padu asid yang diperlukan untuk meneutralkan larutan kalium hidroksida.
Calculate the volume of acid needed to neutralise the potassium hydroxide solution.

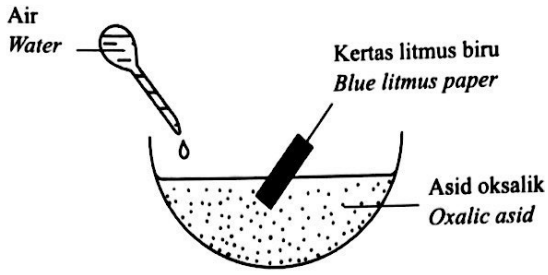
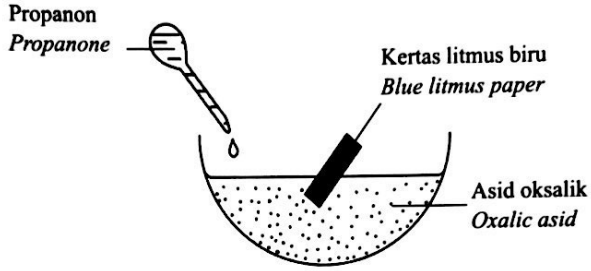
[2 *markah*]
[2 *marks*]

(iv) Eksperimen itu diulangi dengan menggantikan asid hidroklorik dengan Asid P. Didapati isi padu Asid P yang perlu untuk meneutralkan kalium hidroksida ialah separuh daripada isi padu asid hidroklorik yang digunakan.
Kenal pasti Asid P.
The experiment is repeated by replacing hydrochloric acid with Acid P. *It was found that the volume of Acid* P *needed to neutralise potassium hydroxide solution is half of the volume of the hydrochloric acid used.*
Identify Acid P.

.....

[1 *markah*]
[1 *mark*]

(*b*) Rajah 4.2 menunjukkan susunan radas yang digunakan dalam eksperimen untuk mengkaji sifat keasidan asid oksalik.
Diagram 4.2 *shows the apparatus set-up used in experiment to study the acidic properties of oxalic acid.*

Eksperimen *Experiment*	**Susunan radas** *Apparatus set-up*	**Pemerhatian** *Observation*
I		Kertas litmus biru bertukar merah *Blue litmus paper turns red*
II		Tiada perubahan *No change*

Rajah 4.2
Diagram 4.2

Terangkan perbezaan bagi pemerhatian antara Eksperimen I dengan Eksperimen II.
Explain the difference in the observation between Experiment I *and Experiment* II.

.....

.....

.....

.....

[2 *markah*]
[2 *marks*]

6 Jadual 3 menunjukkan persamaan perkataan bagi dua tindak balas melibatkan logam X dan oksida logam Y. Formula empirik bagi oksida X dan oksida Y ditentukan melalui Kaedah I dan Kaedah II.
Table 3 shows the word equations for two reactions involving metal X and metal oxide Y. The empirical formulae of X oxide and Y oxide are determined through Method I and Method II.

Kaedah *Method*	**Persamaan perkataan** *Word equation*
I	X + Oksigen ⟶ Oksida X X + *Oxygen* ⟶ X *Oxide*
II	Hidrogen + Oksida Y ⟶ Y + Air *Hydrogen* + Y *Oxide* ⟶ Y + *Water*

Jadual 3
Table 3

(*a*) Apakah yang dimaksudkan dengan formula empirik?
What is meant by empirical formula?

.....

[1 *markah*]
[1 *mark*]

(*b*) Cadangkan logam X dan logam Y.
Terangkan mengapa anda memilih logam tersebut.
Suggest metal X and metal Y.
Explain why you choose the metal.

Logam X : .....
Metal X

Penerangan : .....
Explanation

Logam Y : .....
Metal Y

Penerangan : .....
Explanation

[4 *markah*]
[4 *marks*]

[Lihat halaman sebelah
SULIT

(c) (i) 1.08 g X bertindak balas dengan 0.96 g oksigen.
Apakah formula empirik bagi oksida X?
1.08 g *of* X *reacts with* 0.96 g *oxygen.*
What is the empirical formula of X *oxide*?
[Jisim atom relatif : X = 27, O = 16]
[*Relatif atomic mass* : X = 27, O = 16]

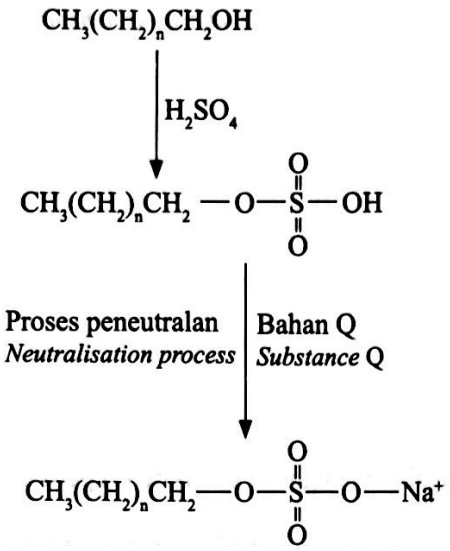
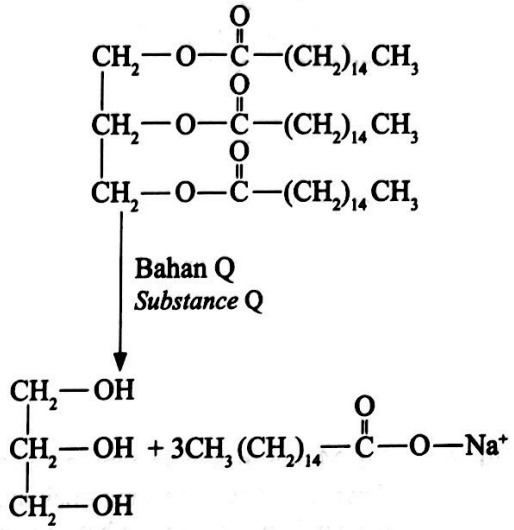
[3 *markah*]
[3 *marks*]

(ii) Kaedah yang manakah lebih sesuai digunakan untuk menentukan formula empirik bagi oksida plumbum?
Which method is suitable to be used to determine the empirical formula for lead oxide?

.....

[1 *markah*]
[1 *mark*]

7 (*a*) Jadual 4 menunjukkan persamaan kimia bagi penyediaan agen pencuci A dan agen pencuci B.
Table 4 shows the chemical equation in the preparation of cleaning agent A *and cleaning agent* B.

Agen pencuci A *Cleaning agent* **A**	**Agen pencuci B** *Cleaning agent* **B**
	

Jadual 4
Table 4

(i) Apakah maksud sabun?
What is the meaning of soap?

.....

[1 *markah*]
[1 *mark*]

(ii) Nyatakan nama bagi bahan Q.
State the name of substance Q.

.....

[1 *markah*]
[1 *mark*]

[Lihat halaman sebelah
SULIT

(iii) Ahmad telah menyertai satu perkhemahan di pantai Tanjung Bidara. Bajunya diselaputi lumpur dan dia telah mencuci bajunya dengan sejenis pencuci. Didapati kesan lumpur pada bajunya masih ada.
Cadangkan agen pencuci A atau agen pencuci B yang sesuai untuk digunakan bagi menghilangkan kotoran tersebut.
Berikan alasan anda.
Ahmad participated a camping at a beach in Tanjung Bidara. His shirt was stained with mud and he washed his shirt with a type of cleaning agent. It was found that the mud stain on his shirt remained.
Suggest cleaning agent A *or cleaning agent* B *which is more suitable to be used to remove the stain.*
Give your reasons.

.....

.....

.....

.....

[3 *markah*]
[3 *marks*]

(*b*) (i) En. M merupakan seorang pesakit yang mengalami gangguan pemikiran seperti mendengar suara dan melihat sesuatu yang tidak nyata.
Cadangkan satu jenis ubat moden berserta dengan contohnya bagi merawat masalah kesihatan En. M.
Bagaimana ubat tersebut dapat meredakan masalah yang dialaminya?
Mr. M *is a patient who suffers from thought disorder such as hearing voices and seeing things that are not real.*
Suggest one type of modern medicine and its example to treat Mr. M's *health problem.*
How the medicine can reduce the problem that he faced?

.....

.....

.....

.....

[3 *markah*]
[3 *marks*]

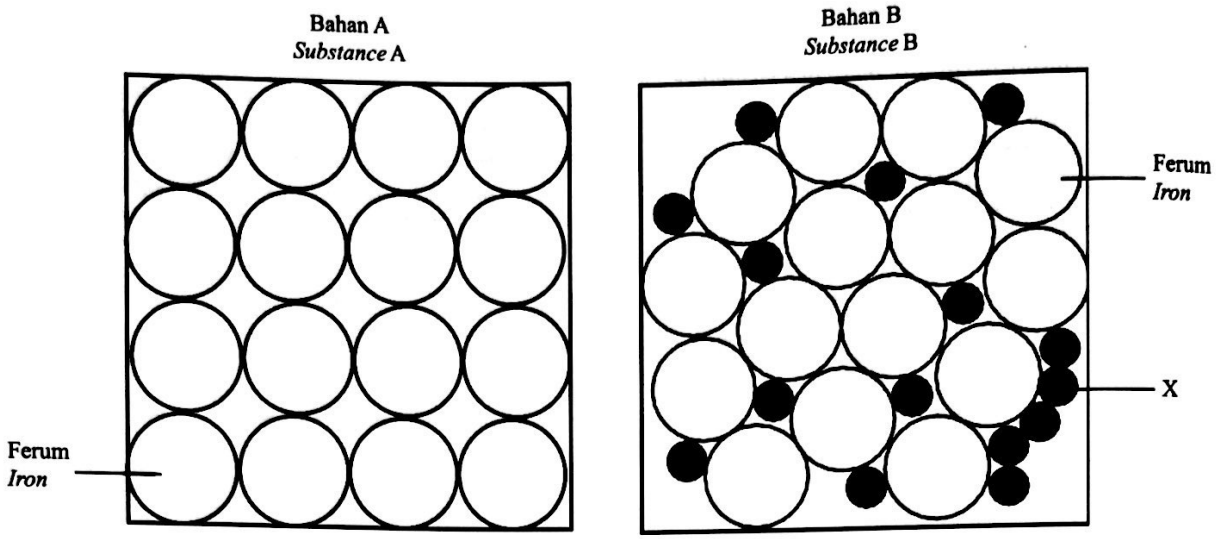
(ii) Batuk dapat dikurangkan dengan menggunakan ubat tradisional iaitu jus asam jawa atau menggunakan ubat moden iaitu kodeina.
Wajarkan penggunaan dua jenis ubat itu.
Cough can be reduced by using traditional remedies such as tamarind juice or modern medicine such as codeine.
Justify the uses of these two medicines.

.....

.....

[2 *markah*]
[2 *marks*]

8 (a) Rajah 5 menunjukkan dua jenis bahan yang sering digunakan dalam pembinaan bangunan tinggi.
Diagram 5 shows two types of substances that are frequently used in the construction of high rise building.



Rajah 5
Diagram 5

Berdasarkan Rajah 5,
Based on Diagram 5,

(i) apakah bahan X?
what is substance X?

.....

[1 *markah*]
[1 *mark*]

(ii) dalam pembinaan bangunan tinggi, bahan B lebih banyak digunakan dalam industri pembinaan. Berikan sebab anda.
in the construction of high rise buldings, substance B *is used more in construction industry. Give your reason.*

.....

[1 *markah*]
[1 *mark*]

(iii) satu tiang jeti telah dilanggar oleh sebuah feri dan menyebabkannya pecah. Sebagai seorang jurutera,pilih salah **satu** bahan dalam Rajah 5 dan apakah yang perlu anda lakukan dengan bahan tersebut bagi memperkukuhkan tiang jeti itu? Berikan alasan anda.
A jetty pillar was hit by a ferry and cause it to break. As an engineer, choose **one** *of the substances in Diagram 5 and what should be done with the substance to strengthen the jetty pillar? Give your reason.*

.....

.....

.....

.....

[3 *markah*]
[3 *marks*]

(*b*) Jadual 5 menunjukkan maklumat tentang dua jenis kaca P dan kaca Q.
Table 5 shows information about two types of glasses P *and* Q.

Jenis kaca *Type of glass*	**Komposisi** *Composition*	**Kegunaan** *Uses*
P	Silika *Silica* Natrium karbonat *Sodium carbonate* Kalsium karbonat *Calcium carbonate*	Tingkap kaca *Window glass*
Q	Silika *Silica* Argentum klorida *Silver chloride* Kalsium karbonat *Calcium carbonate*	Tingkap kaca *Window glass*

Jadual 5
Table 5

[Lihat halaman sebelah
SULIT

(i) Nyatakan **dua** persamaan sifat bagi kaca P dan kaca Q.
State **two** *similarities of the properties of glass* P *and glass* Q.

.....

.....

[2 *markah*]
[2 *marks*]

(ii) Jika anda ingin memasang tingkap kaca di rumah anda yang dapat menghalang sinar ultraungu, jenis kaca yang manakah yang anda akan pilih?
Berikan alasan anda.
If you wish to install a glass window at your house that is able to prevent the ultraviolet rays, which type of glass will be chosen?
Give your reason.

.....

.....

[2 *markah*]
[2 *marks*]

(iii) Nyatakan **satu** kegunaan lain kaca yang dinyatakan di **8**(*b*)(ii).
State **one** *other uses of the glass that is stated in* **8**(*b*)(ii).

.....

.....

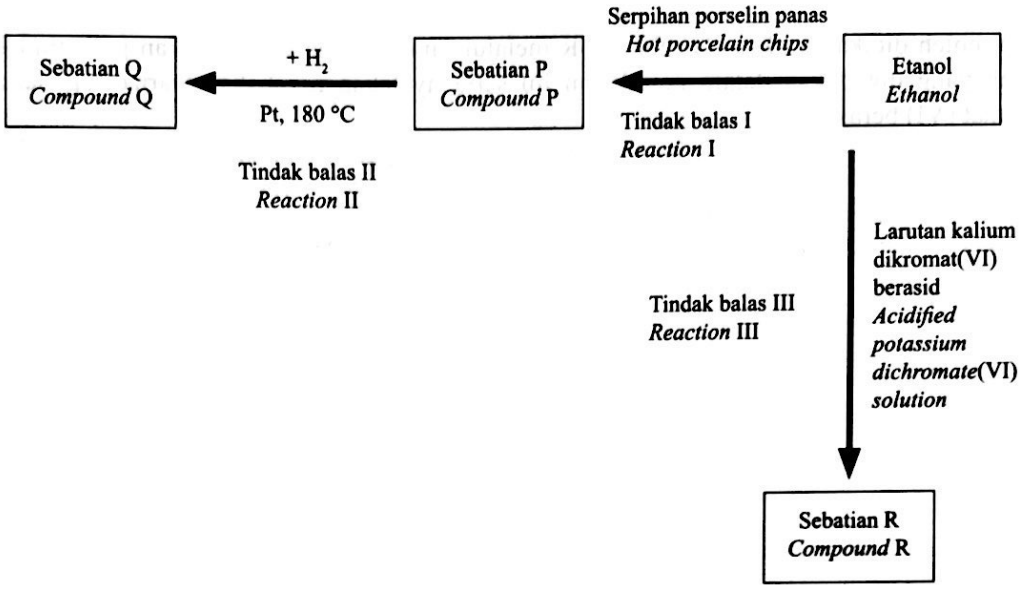
[1 *markah*]
[1 *mark*]

Bahagian B

[20 *markah*]

Jawab mana-mana **satu** *soalan dalam bahagian ini.*

9 Rajah 6 menunjukkan carta alir pertukaran etanol kepada beberapa sebatian.
Diagram 6 shows a flow chart for the conversion of ethanol to a few compounds.



Rajah 6
Diagram 6

(*a*) Apakah yang dimaksudkan dengan hidrokarbon?
What is meant by hydrocarbon?

[1 *markah*]
[1 *mark*]

(*b*) Kenal pasti sebatian P, Q dan R. Nyatakan siri homolog dan lukiskan formula struktur bagi sebatian P, Q dan R.
Identify compounds P, Q *and* R. *State the homologous series and draw the structural formula of compounds* P, Q *and* R.

[9 *markah*]
[9 *marks*]

[Lihat halaman sebelah
SULIT

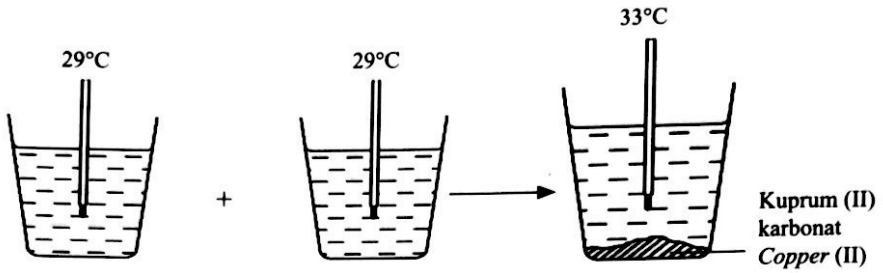
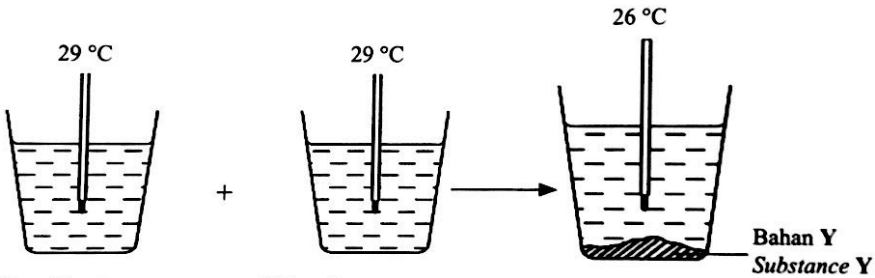
(*c*) Tulis persamaan kimia bagi Tindak balas II. Jika 480 cm^3 sebatian P digunakan, hitung isi padu sebatian Q yang terhasil.
[1 mol gas menempati 24 dm^3 pada keadaan bilik]
Write the chemical equation for Reaction II. *If* 480 cm^3 *of compound* P *is used, calculate the volume of compound* Q *produced.*
[1 mol *of gas occupies* 24 dm^3 *at room temperature*]

[5 *markah*]
[5 *marks*]

(*d*) Etanol boleh ditukarkan kepada sebatian R melalui Tindak balas III. Nyatakan jenis tindak balas dan kaedah yang digunakan dalam pertukaran itu serta nyatakan perubahan warna bagi larutan kalium dikromat (VI) berasid.
Lukis gambarajah susunan radas bagi pertukaran etanol kepada sebatian P melalui Tindak balas I.
Ethanol can be converted into compound R *through Reaction* III. *State the type of reaction and state the method that is used in the conversion and state the colour changes of acidified potassium dichromate* (VI) *solution.*
Draw an apparatus set-up for the conversion of ethanol to compound P *through Reaction* I.

[5 *markah*]
[5 *marks*]

10 (*a*) Rajah 7 menunjukkan dua set eksperimen yang dijalankan oleh seorang pelajar untuk mengkaji haba pemendakan bagi kuprum (II) karbonat dan bahan **Y**.
Diagram 7 shows two sets of experiments carried out by a student to investigate the heat of precipitation of copper (II) carbonate and substance **Y**.

Set	Susunan radas *Apparatus set-up*
I	 100 cm³ larutan kuprum (II) sulfat 0.1 mol dm⁻³ 100 cm³ *of* 0.1 mol dm⁻³ *copper (II) sulphate solution* 100 cm³ larutan **X** karbonat 0.1 mol dm⁻³ 100 cm³ *of* 0.1 mol dm⁻³ **X** *carbonate solution* Suhu tertinggi yang dicapai *The highest temperature reached*
II	 100 cm³ larutan Natrium karbonat 0.1 mol dm⁻³ 100 cm³ *of* 0.1 mol dm⁻³ *Sodium carbonate* 100 cm³ larutan magnesium nitrat 0.1 mol dm⁻³ 100 cm³ *of* 0.1 mol dm⁻³ *magnesium nitrate solution* Suhu terendah yang dicapai *The lowest temperature reached*

Rajah 7
Diagram 7

Berdasarkan Rajah 7,
Based on Diagram 7,

(i) Nyatakan definisi bagi haba pemendakan dan warna bagi kuprum (II) karbonat yang terhasil
State the definition of heat of precipitation and the colour of copper (II) *carbonate formed*

[2 *markah*]
[2 *marks*]

(ii) Cadangkan larutan **X** karbonat dan bahan **Y**
Suggest **X** *carbonate solution and substance* **Y**

[2 *markah*]
[2 *marks*]

(iii) Hitung haba pemendakan bagi tindak balas dalam Set I dan Set II
[Diberi muatan haba tentu bagi larutan ialah C = 4.2 Jg^{-1} $°C^{-1}$; ketumpatan larutan = 1 g cm^{-3}]
Calculate the heat of precipitation of the reaction in Set I *and Set* II
[*Given the specific heat capacity of solution is* C = 4.2 Jg^{-1} $°C^{-1}$; *density of solution* = 1 g cm^{-3}]

[6 *markah*]
[6 *marks*]

(iv) Nyatakan jenis tindak balas yang berlaku dalam Set I dan Set II. Bandingkan perbezaan jenis tindak balas bagi Set I dan Set II dari segi perubahan suhu, perbezaan kandungan tenaga bahan tindak balas dan hasil tindak balas serta perubahan tenaga sewaktu pemecahan ikatan dan pembentukan ikatan.
Lukis gambar rajah aras tenaga bagi Set I **atau** Set II.
State the type of reaction that occurs in Set I *and Set* II. *Compare the difference in the type of reaction for Set* I *and Set* II *in terms of the change in temperature, difference in energy content of reactants and products and energy changes during bond breaking and bond formation.*
Draw the energy level diagram for Set I **or** *Set* II.

[7 *markah*]
[7 *marks*]

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SULIT

(*b*) Jadual 6 menunjukkan haba peneutralan bagi larutan natrium hidroksida dan dua jenis asid iaitu **asid P** dan **asid Q**.
Table 6 shows heat of neutralisation of sodium hydroxide solution and two types of acids which are **acid P** *and* **acid Q**.

Set	**Eksperimen** *Experiment*	**Haba peneutralan** ($kJ\ mol^{-1}$) *Heat of neutralisation* ($kJ\ mol^{-1}$)
I	50 cm^3 **asid P** 0.1 mol dm^{-3} + 50 cm^3 larutan natrium hidroksida 0.1 mol dm^{-3} 50 cm^3 0.1 mol dm^{-3} **acid P** + 50 cm^3 0.1 mol dm^{-3} *sodium hydroxide solution*	– 57.5
II	50 cm^3 **asid Q** 0.1 mol dm^{-3} + 50 cm^3 larutan natrium hidroksida 0.1 mol dm^{-3} 50 cm^3 0.1 mol dm^{-3} **acid Q** + 50 cm^3 0.1 mol dm^{-3} *sodium hydroxide solution*	– 54.5

Jadual 6
Table 6

Berdasarkan maklumat Jadual 6, terangkan mengapa terdapat perbezaan haba peneutralan antara Set I dan Set II.
Based on the information in Table 6, explain why there is a difference in heat of neutralisation between Set I *and Set* II.

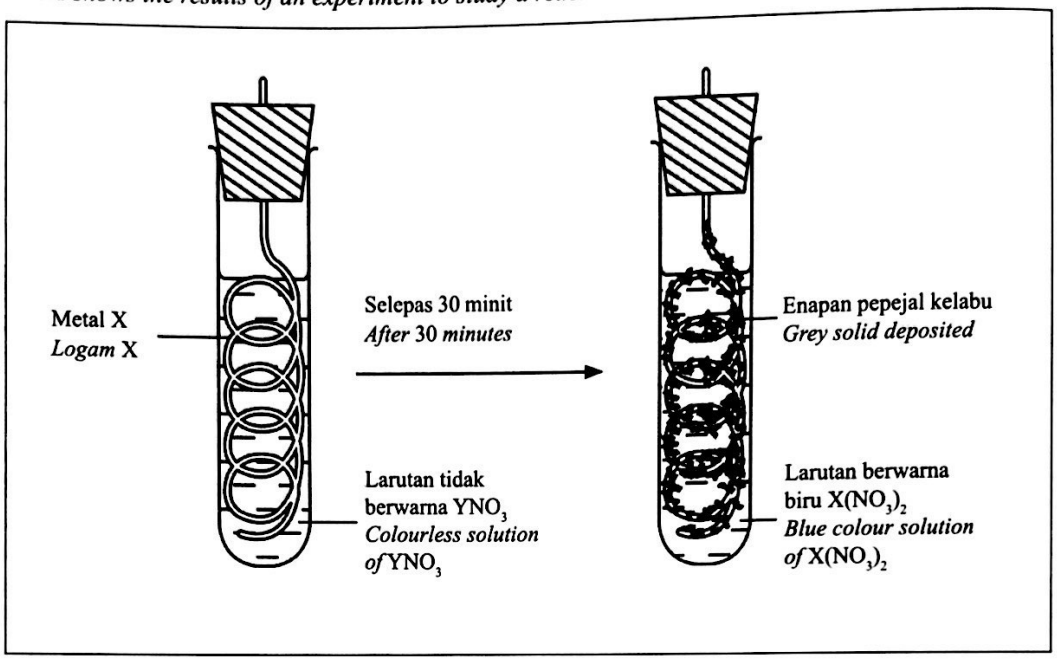
[3 *markah*]
[3 *marks*]

Bahagian C

[20 *markah*]

Jawab soalan dalam bahagian ini.

11 (*a*) Rajah 8.1 menunjukkan keputusan suatu eksperimen untuk mengkaji tindak balas redoks.
Diagram 8.1 *shows the results of an experiment to study a redox reaction.*



Rajah 8.1
Diagram 8.1

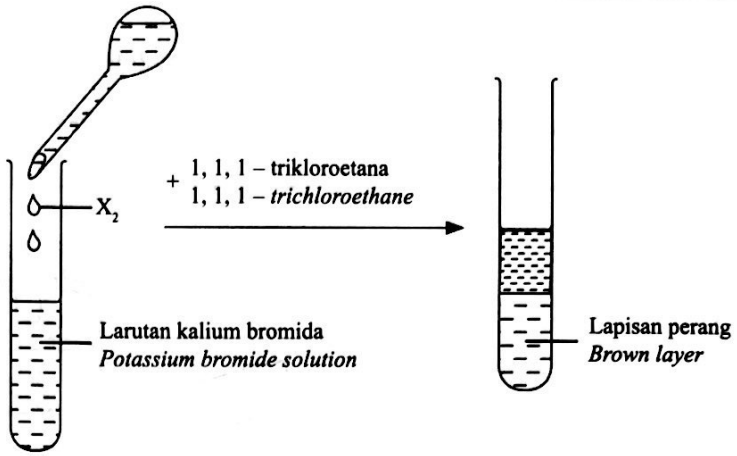
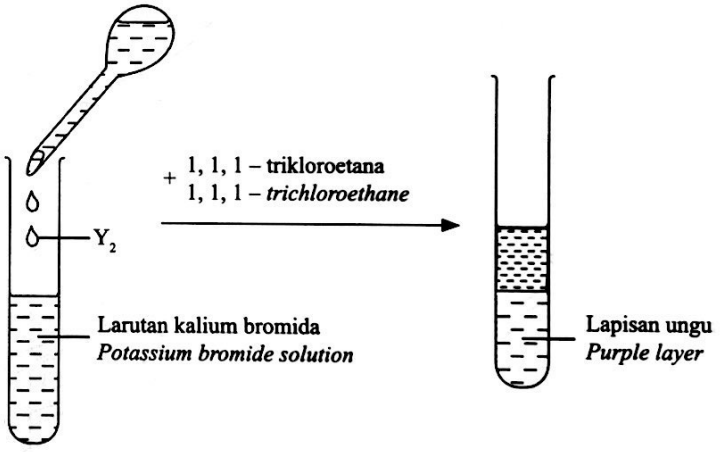
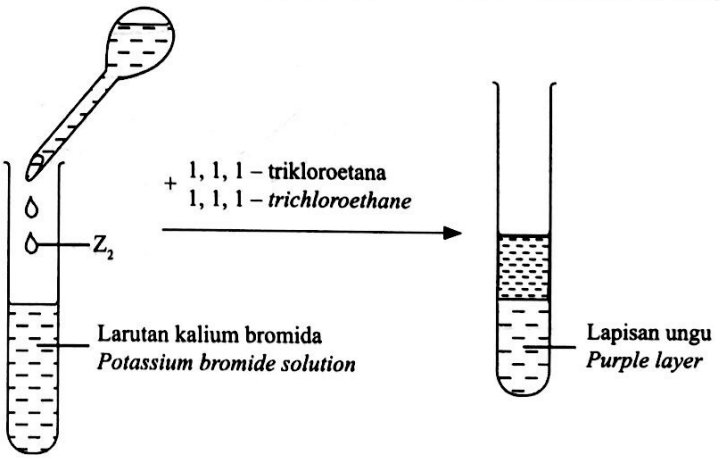
(i) Apakah maksud bagi tindak balas redoks?
What is meant by redox reaction?

[1 *markah*]
[1 *mark*]

(ii) Berdasarkan Rajah 8.1, nyatakan logam X dan larutan YNO_3. Tulis persamaan kimia bagi tindak balas yang berlaku.
Based on Diagram 8.1, *state metal* X *and* YNO_3 *solution. Write the chemical equation for the redox reaction occurs.*

[4 *markah*]
[4 *marks*]

(*b*) Rajah 8.2 menunjukkan susunan radas bagi mengkaji tindak balas redoks dalam penyesaran halogen.
Diagram 8.2 *shows the apparatus set-up to study a redox reaction in displacement of halogen.*

Eksperimen *Experiment*	**Pemerhatian** *Observation*
I	
II	
III	

Rajah 8.2
Diagram 8.2

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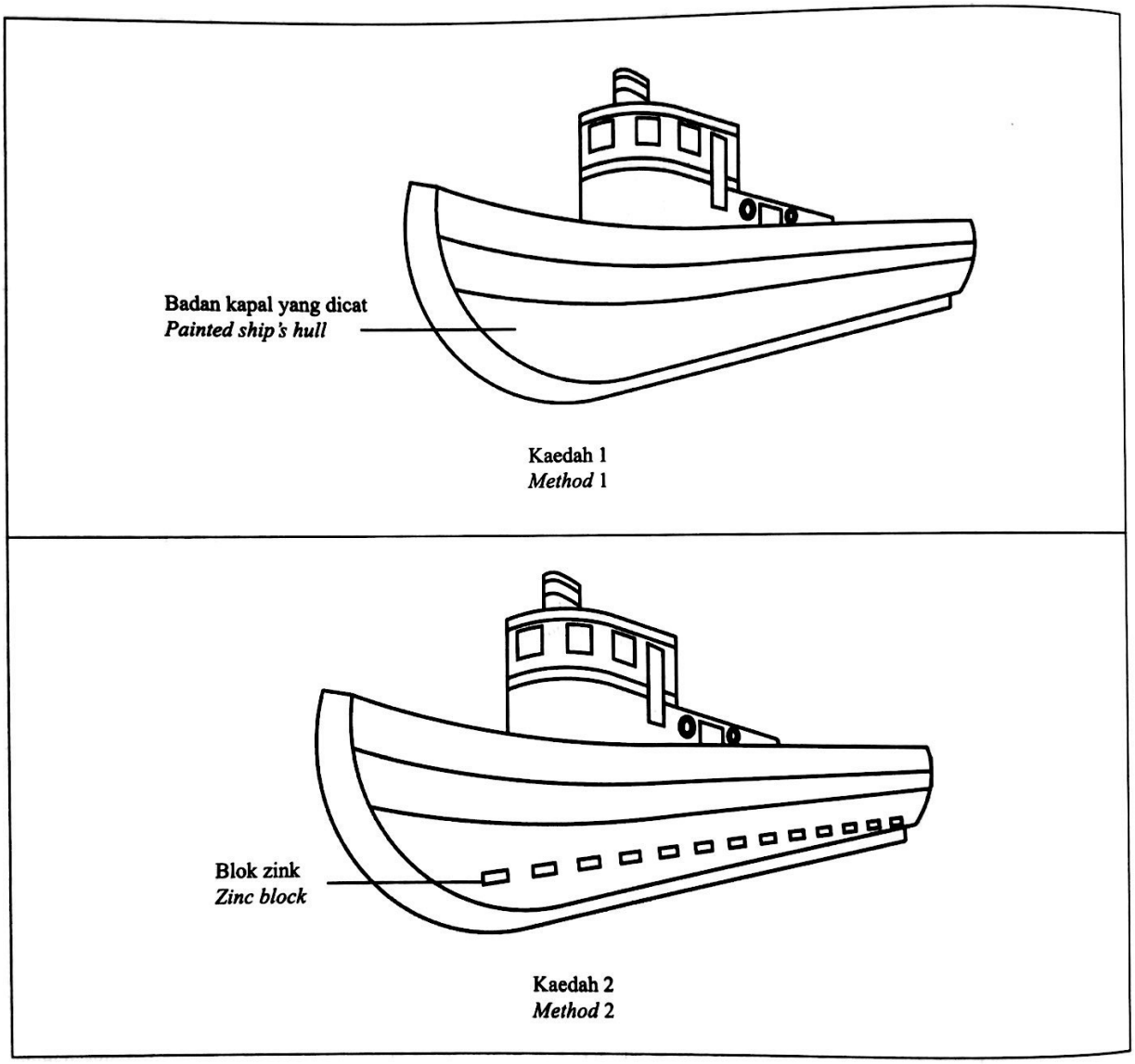
SULIT

Berdasarkan Rajah 8.2, kenal pasti halogen X, Y dan Z. Pilih **dua** eksperimen di mana tindak balas redoks berlaku. Tulis setengah persamaan pengoksidaan dan setengah persamaan penurunan daripada satu eksperimen yang anda pilih.
Based on Diagram 8.2, identify halogens X, Y and Z. Choose **two** *experiments which redox reaction occurs. Write the oxidation half equation and reduction half equation from one of the experiment that you have chosen.*

[7 *markah*]
[7 *marks*]

(c) **Rajah 8.3 menunjukkan dua kaedah yang boleh digunakan untuk melindungi dasar sebuah kapal daripada terkakis.**
Diagram 8.3 *shows two methods that can be used to protect the hull of the ships from corrodes.*

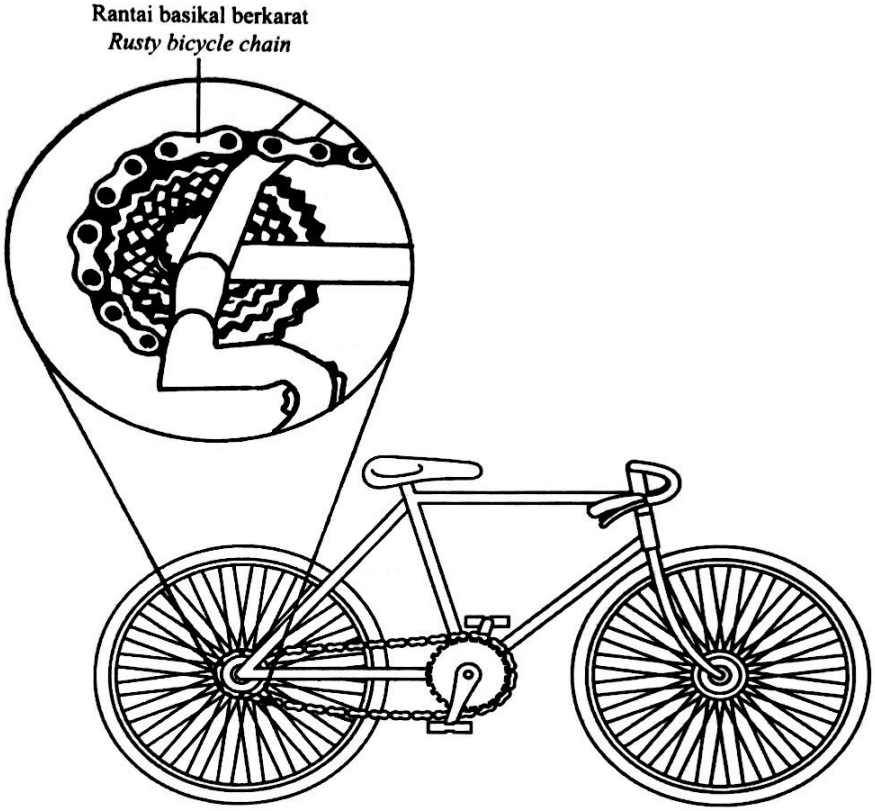


Rajah 8.3
Diagram 8.3

Anda ditugaskan untuk menilai kaedah yang lebih sesuai untuk melindungi dasar kapal itu daripada terkakis.
Nyatakan pilihan anda berdasarkan Rajah 8.3 dan wajarkan jawapan anda.
You are assigned to evaluate which method is more suitable to protect the hull of the ship from corrodes.
State your choice based on the Diagram 8.3 and justify your answer.

[2 *markah*]
[2 *marks*]

(*d*) Rajah 8.4 menunjukkan sebuah basikal lama yang tidak boleh bergerak disebabkan rantai basikal yang berkarat.
Diagram 8.4 shows an old bicycle which is unable to move due to the rusty chain.



Rajah 8.4
Diagram 8.4

Cadang dan terangkan cara untuk mengatasi masalah tersebut supaya basikal itu boleh digunakan semula.
Suggest and explain way to overcome the problem so that the bicycle can be used again.

[6 *markah*]
[6 *marks*]

KERTAS PEPERIKSAAN TAMAT

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