

4541/1  
CHEMISTRY  
Kertas 1  
Ogos  
2010  
1 ¼ jam



BAHAGIAN PENGURUSAN  
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER  
KEMENTERIAN PELAJARAN MALAYSIA

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PEPERIKSAAN PERCUBAAN  
SIJIL PELAJARAN MALAYSIA 2010

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CHEMISTRY  
Kertas 1

Satu jam lima belas minit

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JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Kertas soalan ini mengandungi **50** soalan.
2. Jawab **semua** soalan
3. Tiap-tiap soalan diikuti oleh empat pilihan jawapan, iaitu **A, B, C** dan **D**. Bagi setiap soalan, pilih **satu jawapan sahaja**. Hitamkan jawapan anda pada kertas jawapan objektif yang disediakan.
4. Jika anda hendak menukar jawapan, padamkan tanda yang telah dibuat, kemudian hitamkan jawapan yang baru.
5. Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan
6. Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan.

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Kertas soalan ini mengandungi **23** halaman bercetak

- 1 Diagram 1 shows an experiment to study the particles theory of matter.  
*Rajah 1 menunjukkan eksperimen untuk mengkaji teori zarah jirim.*

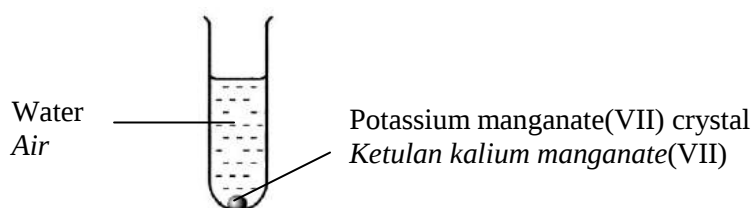


Diagram 1  
*Rajah 1*

After 30 minutes, the water turns purple. What is the process occur in the experiment shown in the diagram 1?

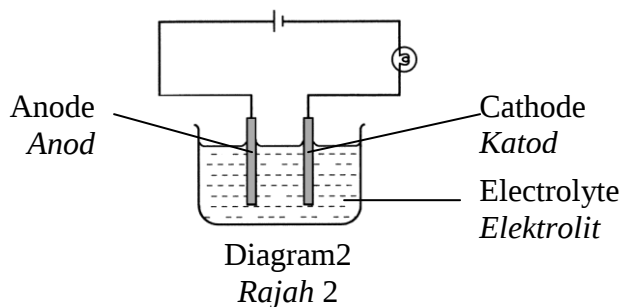
*Selepas 30 minit, air menjadi ungu. Apakah proses yang berlaku dalam eksperimen yang ditunjukkan dalam rajah 1?*

- A Melting process  
*Proses peleburan*
- B Freezing process  
*Proses pembekuan*
- C Diffusion process  
*Proses resapan*
- D Evaporation process  
*Proses penyejatan*
- 2 The relative formula mass hydrated X carbonate.  $X_2CO_3 \cdot 10H_2O$  is 286.  
 What is the relative atomic mass of element X?  
 [Relative atomic mass : H=1, C=12, O=16 ]  
*Jisim formula relatif bagi X karbonat terhidrat,  $X_2CO_3 \cdot 10H_2O$  adalah 286.*  
*Berapakah jisim atom relatif bagi unsur X?*  
*[Jisim atom relatif; H=1, C=12, O=16]*
- A 23
- B 46
- C 120
- D 240
- 3 Neon and argon are **unreactive properties**. It means  
*Neon dan argon bersifat tidak reaktif secara kimia. Ini kerana*
- A they have octet electron arrangement.  
*kedua-duanya mempunyai susunan elektron oktet.*
- B they belongs to Group 18 in the Periodic Table.  
*kedua-duanya dari Kumpulan 18 di dalam Jadual Berkala.*
- C they are held together by weak Van der Waals forces of attraction.  
*kedua-duanya tertarik oleh daya tarikan Van der Waals yang lemah.*
- D they are known as noble gasses.  
*kedua-duanya dikenal sebagai gas adi.*

- 4 Which of the following compounds is an ionic compound ?  
*Antara sebatian berikut, yang manakah adalah sebatian ionik?*

A  $\text{SO}_2$   
B  $\text{SO}_3$   
C  $\text{H}_2\text{O}$   
B  $\text{MgBr}_2$

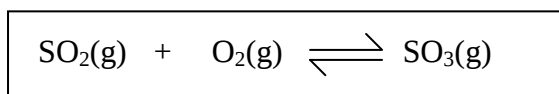
- 5 Diagram 2 shows the set-up of apparatus for an experiment.  
*Rajah 2 menunjukkan susunan alat radas untuk satu eksperimen.*



Which substances is suitable to use as an electrolyte?  
*Antara bahan berikut, yang manakah sesuai sebagai elektrolit?*

- A Solid naphthalene  
*Pepejal naftalena*  
B Molten glucose  
*Leburan glukosa*  
C Sulphuric acid  
*Asid sulfurik*  
D Pure ethanol  
*Ethanol tulen*
- 6 Which of the following causes alkaline properties of ammonia aqueous solution?  
*Antara yang berikut, yang manakah menyebabkan sifat alkali larutan ammonia akueus?*
- A  $\text{H}^+$   
B  $\text{OH}^-$   
C  $\text{NH}_3$   
D  $\text{NH}_4^+$

- 7 Which of the following salts is soluble in water?  
*Antara garam berikut, yang manakah larut dalam air?*
- A Zinc sulphate  
*Zink sulfat*
- B Silver chloride  
*Argentum klorida*
- C Barium sulphate  
*Barium sulfat*
- D Magnesium carbonate  
*Magnesium karbonat*
- 8 Which of the following is the slowest reaction?  
*Antara yang berikut, yang manakah tindak balas paling perlahan?*
- A A few manganese(IV) oxide powder is added to hydrogen peroxide solution  
*Sedikit serbuk mangan(IV) oksida ditambahkan ke dalam larutan hidrogen peroksida*
- B Lead(II) nitrate solution is added to sodium chloride solution  
*Larutan plumbum(II) nitrat ditambahkan ke dalam larutan natrium klorida*
- C Dilute sulphuric acid is added to sodium thiosulphate solution  
*Asid sulfurik cair ditambahkan ke dalam larutan natrium tiosulfat*
- D A few zinc powder is added to copper(II) sulphate solution.  
*Sedikit serbuk zink ditambahkan ke dalam larutan kuprum(II) sulfat*
- 9 The chemical equation below shows the reaction of the manufacture of sulphuric acid in stage II.  
*Persamaan kimia dibawah menunjukkan tindak balas untuk penghasilan asid sulfurik dalam peringkat II*



What is the optimum conditions for the reaction in stage II  
*Apakah keadaan optimum untuk tindak balas dalam peringkat II ini*

|   | Temperature/°C<br><i>Suhu/°C</i> | Catalyst<br><i>Mangkin</i>                     | Pressure/ atm<br><i>Tekanan /atm</i> |
|---|----------------------------------|------------------------------------------------|--------------------------------------|
| A | 450                              | Iron<br><i>besi</i>                            | 1                                    |
| B | 250                              | Iron<br><i>besi</i>                            | 10                                   |
| C | 250                              | Vanadium(V) oxide<br><i>Vanadium(V) oksida</i> | 10                                   |
| D | 450                              | Vanadium(V) oxide<br><i>Vanadium(V) oksida</i> | 1                                    |

- 10 In which of the chemical reactions releases heat to the surroundings?  
*Antara tindak balas kimia berikut, yang manakah membebaskan haba ke persekitaran?*

- A Dissolving potassium nitrate in water  
*Melarutkan kalium nitrat dalam air*  
 B Dissolving ammonium sulphate in water  
*Melarutkan ammonium sulfat dalam air*  
 C Adding calcium carbonate to nitric acid  
*Menambahkan kalsium karbonat kepada asid nitrik*  
 D Adding potassium hydrogen carbonate to hydrochloric acid  
*Menambah kalium hidrogen karbonat kepada asid hidroklorik*

- 11 Diagram 3 shows the structural formulae of compound X  
*Rajah 3 menunjukkan formula struktur suatu sebatian X*

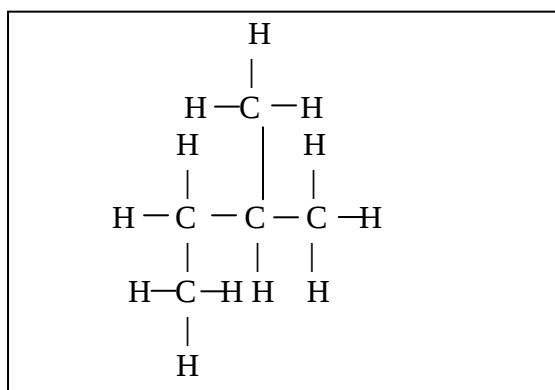


Diagram 3  
*Rajah 3*

Which of the following is the IUPAC name of this alkane?  
*Antara yang berikut, yang manakah nama IUPAC untuk alkana ini?*

- A 2-methylbutane  
*2-metilbutana*  
 B 3-methylbutane  
*3-metilbutana*  
 C 2,4- dimethylpropane  
*2,4 -dimetilpropa*  
 D 1,2-dimethylpropane  
*1,2-dimetilpropa*
- 12 Which of the following chemical equation, not redox reaction?  
*Antara persamaan kimia berikut, yang manakah bukan tindak balas redok?*
- A  $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$   
 B  $\text{Cl}_2(\text{g}) + \text{S}^{2-}(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{S}(\text{s})$   
 C  $2\text{Fe}^{3+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{Zn}^{2+}(\text{aq})$   
 D  $\text{Mg}(\text{p}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{Cu}(\text{s})$

- 13 Which substance is **not** a required to prepare soap?  
*Bahan manakah **tidak** diperlukan untuk menghasilkan sabun?*
- A sodium chloride  
*natrium klorida*
- B sodium hydroxide  
*natrium hidoksida*
- C glycerol  
*gliserol*
- D tripalmitin  
*Tripalmitin*
- 14 Which of the following substance contains  $1.204 \times 10^{24}$  atoms?  
*Antara bahan berikut, yang manakah mengandungi  $1.204 \times 10^{24}$  atom?*
- A 1 mol of nitrogen gas  
*1 mol gas nitrogen*
- B 1 mol of ammonia  
*1 mol ammonia*
- C 1 mol of water  
*1 mol air*
- D 1 mol of argon  
*1 mol argon*
- 15 Which of the following statements is true about atomic model proposed by Ernest Rutherford.  
*Antara pernyataan berikut, yang manakah betul mengenai model atom yang dicadangkan oleh Ernest Rutherford.*
- A The electrons in an atom move in shells around the nucleus which contains proton.  
*Elektron sesuatu atom bergerak di petalanya mengelilingi nukleus yang mengandungi proton.*
- B The atom was described as a sphere of positive charge embedded with electron.  
*Atom merujuk sebuah sfera yang bercas positif dengan elektron bertaburan diatasnya.*
- C The nucleus of the atom contains proton and neutrons.  
*Nukleus bagi atom mengandungi proton dan neutron.*
- D The nucleus of the atom contains proton.  
*Nukleus atom mengandungi proton.*

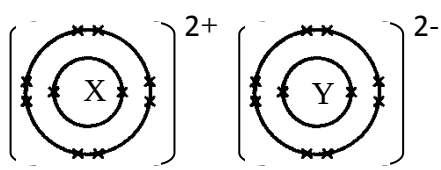
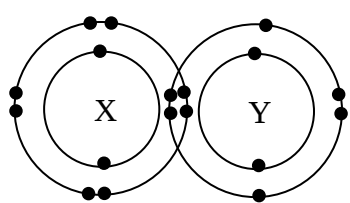
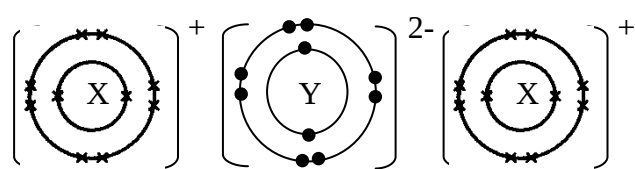
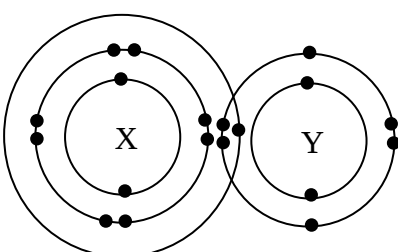
- 16 Table 1 shows the proton number of elements X and Y.  
*Jadual 1 menunjukkan nombor proton bagi unsur X dan Y.*

| Element<br><i>Unsur</i> | Proton number<br><i>Nombor proton</i> |
|-------------------------|---------------------------------------|
| X                       | 11                                    |
| Y                       | 8                                     |

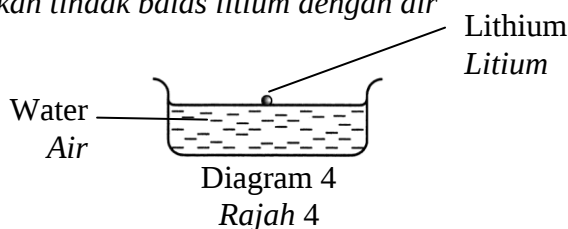
Table 1  
*Jadual 1*

Which of the following shows the electron arrangement of the compound formed when element X reacts with element Y?

*Antara yang berikut, yang manakah menunjukkan susunan elektron bagi sebatian yang terbentuk apabila unsur X bertindak balas dengan unsur Y?*

- A 
- B 
- C 
- D 

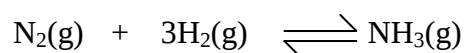
- 17 Diagram 4 show reaction lithium with water.  
 Rajah 4 menunjukkan tindak balas litium dengan air



Lithium reacts with water to produce solution that  
 Litium bertindak balas dengan air untuk menghasilkan larutan yang bersifat

- A turns red litmus paper blue.  
 menukarkan kertas litmus merah kepada biru.
- B turns blue litmus paper red.  
 menukarkan kertas litmus biru kepada merah.
- C no visible change in the colour of the blue litmus paper.  
 tiada perubahan warna oleh kertas litmus biru.
- D no visible change in the colour of the red litmus paper.  
 tiada perubahan warna oleh kertas litmus merah.
- 18  $1 \text{ mol dm}^{-3}$  solution X is electrolysed using carbon electrodes.  
 A greenish-yellow gas with a pungent and choking smell is released at the anode.  
 Which of the following may be solution X?
- $1 \text{ mol dm}^{-3}$  larutan X menjalani elektrolisis dengan menggunakan elektrod karbon.  
 Gas berwarna kuning kehijauan dan sengit dibebaskan pada elektrod anod.  
 Antara berikut, yang manakah kemungkinan larutan X?
- A  $0.0001 \text{ mol dm}^{-3}$  potassium sulphate  
 $0.0001 \text{ mol dm}^{-3}$  kalium sulfat
- B  $0.0001 \text{ mol dm}^{-3}$  hydrochloric acid  
 $0.0001 \text{ mol dm}^{-3}$  asid hidroklorik
- C  $2 \text{ mol dm}^{-3}$  potassium sulphate  
 $2 \text{ mol dm}^{-3}$  kalium sulfat
- D  $2 \text{ mol dm}^{-3}$  hydrochloric acid  
 $2 \text{ mol dm}^{-3}$  asid hidroklorik
- 19 Which of the following solutions has the highest pH value?  
 Antara larutan berikut, yang manakah mempunyai nilai pH yang paling tinggi?
- A  $0.01 \text{ mol dm}^{-3}$  nitric acid  
 Asid nitrik  $0.01 \text{ mol dm}^{-3}$
- B  $0.10 \text{ mol dm}^{-3}$  nitric acid  
 Asid nitrik  $1.0 \text{ mol dm}^{-3}$
- C  $0.01 \text{ mol dm}^{-3}$  sodium hydroxide  
 Natrium hidroksida  $0.01 \text{ mol dm}^{-3}$
- D  $0.10 \text{ mol dm}^{-3}$  sodium hydroxide  
 Natrium hidroksida  $0.10 \text{ mol dm}^{-3}$

- 20 The chemical equation below shows the reaction which occur in Haber Process  
*Persamaan kimia di bawah menunjukkan tindak balas yang berlaku dalam proses Haber*



Which of the following represents catalyst, temperature and pressure?  
*Antara berikut yang manakah mewakili mangkin, suhu dan tekanan?*

- A Temperature 200°C, pressure 60 atm and platinum as catalyst.  
*Suhu 200°C, tekanan 60 atm dan platinum sebagai mangkin*
- B Temperature 450°C, pressure 200 atm and iron as catalyst.  
*Suhu 450°C, tekanan 200 atm dan besi sebagai mangkin*
- C Temperature 800°C, pressure 1 atm and nickel as catalyst.  
*Suhu 800°C, tekanan 1 atm dan nikel sebagai mangkin*
- D Temperature 450°C, pressure 1 atm and iron as catalyst.  
*Suhu 450°C, tekanan 1 atm dan besi sebagai mangkin*
- 21 Table 2 shows the total volume of gas collected at regular intervals in a reaction.  
*Jadual 2 menunjukkan jumlah isipadu gas yang dikumpul pada sela masa tertentu bagi suatu tindak balas*

| Time/s<br>Masa/ s                                             | 0 | 30  | 60  | 90  | 120 | 150 | 180 | 210 | 240 |
|---------------------------------------------------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|
| Volume of gas/cm <sup>3</sup><br>Isipadu gas/ cm <sup>3</sup> | 0 | 3.5 | 5.0 | 6.1 | 6.9 | 7.6 | 8.1 | 8.1 | 8.1 |

Table 2  
 Jadual 2

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

- A 0.034 cm<sup>3</sup> s<sup>-1</sup>
- B 0.039 cm<sup>3</sup> s<sup>-1</sup>
- C 0.045 cm<sup>3</sup> s<sup>-1</sup>
- D 0.054 cm<sup>3</sup> s<sup>-1</sup>

- 22 Diagram 5 represents the structural formula of but -1- ene.  
*Rajah 5 mewakili formula struktur bagi but-1-ena.*

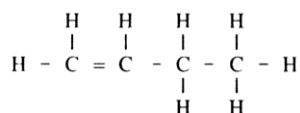
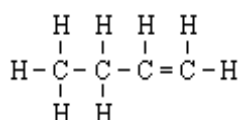


Diagram 5  
*Rajah 5*

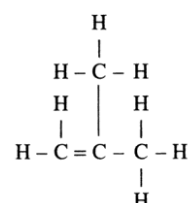
Which of the following is the structural formula and name for an isomer of but-1-ene?  
*Antara yang berikut, yang manakah formula struktur dan nama bagi isomer but-1-ena?*

A



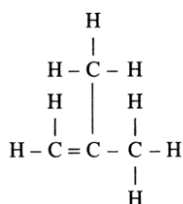
But-3-ene  
*But-3-ena*

B



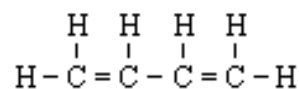
2-methylpropene  
*2-metilpropena*

C



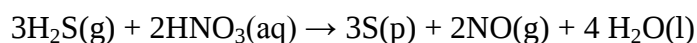
2-methylprop - 2 - ene  
*2-metilprop - 2 - ena*

D



2-methylprop - 2 - ene  
*2-metilprop - 2 - ena*

- 23 The following chemical equation shows one redox reaction.  
*Persamaan kimia berikut menunjukkan satu tindak balas redok.*



Which of the following oxidation number in this reaction is correct?  
*Antara yang berikut, yang manakah nombor pengoksidaan bagi tindak balas itu adalah betul?*

- A Oxidation number of hydrogen change from -1 to +1  
*Nombor pengoksidaan hidrogen berubah daripada -1 kepada +1*
- B Oxidation number of nitrogen change from +5 to +2  
*Nombor pengoksidaan nitrogen berubah daripada +5 kepada +2*
- C Oxidation number of oxygen change from -1 to -2  
*Nombor pengoksidaan oksigen berubah daripada -1 kepada -2*
- D Oxidation number of sulfur change from -1 to 0  
*Nombor pengoksidaan sulfur berubah daripada -1 kepada 0*

- 24 The following equation shows the reaction between potassium hydroxide solution and nitric acid.  
*Persamaan berikut menunjukkan tindak balas antara larutan kalium hidroksida dan asid nitrik*



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

- A 57 kJ of heat energy is absorbed to form 1 mole of water  
*57 kJ tenaga haba diserap untuk membentuk 1 mol air*
- B The temperature of the solution mixtures rises  
*Suhu larutan campuran meningkat*
- C The heat is absorbed from the surroundings  
*Haba diserap dari persekitaran*
- D The reaction is endothermic  
*Tindak balas ini adalah endotermik*
- 25 Chlorine react with cold sodium hydroxide solution.  
Which of the chemical equation shows the reaction?  
*Klorin bertindak balas dengan larutan natrium hidroksida sejuk.*  
*Persamaan kimia yang manakah menunjukkan tindak balas tersebut ?*

- A  $\text{Cl}_{2(\text{g})} + \text{NaOH}_{(\text{aq})} \rightarrow \text{NaOCl}_{(\text{aq})} + \text{HCl}_{(\text{aq})}$
- B  $\text{Cl}_{2(\text{g})} + 2\text{NaOH}_{(\text{aq})} \rightarrow 2\text{NaCl}_{(\text{aq})} + \text{H}_2(\text{g}) + \text{O}_2(\text{g})$
- C  $2\text{Cl}_{2(\text{g})} + 4\text{NaOH}_{(\text{aq})} \rightarrow 4\text{NaCl}_{(\text{aq})} + 2\text{H}_2\text{O(l)} + \text{O}_{2(\text{g})}$
- D  $\text{Cl}_{2(\text{g})} + 2\text{NaOH}_{(\text{aq})} \rightarrow \text{NaCl}_{(\text{aq})} + \text{NaOCl}_{(\text{aq})} + \text{H}_2\text{O(l)}$

- 26 The following equation shows the reaction between copper(II) carbonate and hydrochloric acid.  
*Persamaan berikut menunjukkan tindak balas antara kuprum(II) karbonat dan asid hidroklorik.*



7.0 g copper(II) carbonate is added to 50 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> hydrochloric acid.  
What is the mass of copper(II) carbonate left at the end of the reaction?  
[Relative atomic mass; Cu=64, C=12, O=16]

*7.0 g kuprum(II) karbonat ditambahkan 50 cm<sup>3</sup> asid hidroklorik 1.0 mol dm<sup>-3</sup>.  
Berapakah jisim kuprum(II) karbonat yang tertinggal di akhir tindak balas?  
[Jisim atom relatif; Cu=64, C=12, O=16]*

- A 0.8 g
- B 3.1 g
- C 3.9 g
- D 6.2 g

- 27 The information below shows the electron arrangement and the number of neutrons in an atom Y. Y is not the actual symbols of elements.

*Maklumat menunjukkan susunan elektron dan bilangan neutron dalam atom Y. Y bukan simbol sebenar unsur*

- Electron arrangement 2.8.3  
*Susunan elektron 2.8.3*
- Number of neutrons 14  
*Bilangan neutron 14*

Which of the following symbol represents the atom Y?  
*Antara simbol yang menunjukkan atom Y?*

- A  ${}_{13}^{14}\text{Y}$   
B  ${}_{13}^{27}\text{Y}$   
C  ${}_{14}^{13}\text{Y}$   
D  ${}_{27}^{13}\text{Y}$

- 28 Which of the following is **incorrect** about the conversion of unsaturated fats to saturated fats?

*Antara berikut, yang manakah **tidak benar** berkaitan penukaran lemak tak tepu kepada lemak tepu*

- A The boiling point of the oil increases  
*Takat didih minyak meningkat*  
B Physical state changes from liquid to solid  
*Sifat fizik berubah dari cecair kepada pepejal*  
C Relative molecular mass of the oil molecule increases  
*Jisim molekul relatif molekul minyak meningkat*  
D Intermolecular forces become weaker  
*Daya tarikan antara molekul semakin lemah*

- 29 Table 3 shows information about five element.  
*Jadual 3 menunjukkan maklumat tentang lima unsur.*

| Element<br><i>Unsur</i>                         | J   | K     | L     | M     | N     |
|-------------------------------------------------|-----|-------|-------|-------|-------|
| Electron arrangement<br><i>Susunan elektron</i> | 2.4 | 2.8.1 | 2.8.3 | 2.8.6 | 2.8.7 |

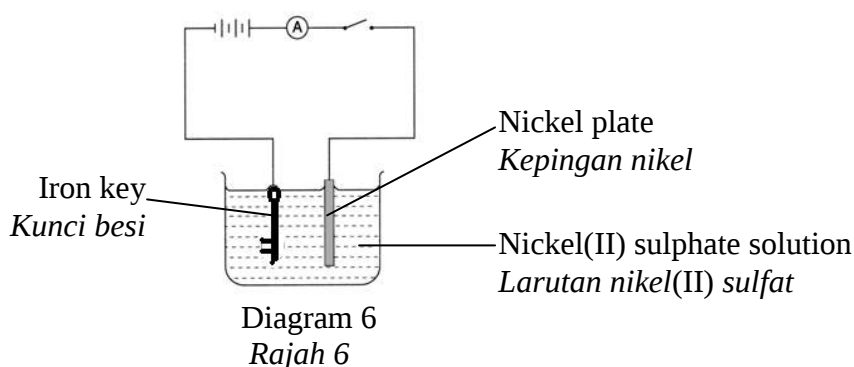
Table 3  
*Jadual 3*

Each element in the table 3 can reacts each other.  
 Which formula is covalent compound ?

*Setiap unsur dalam jadual 3 boleh bertindak balas antara satu sama lain.  
 Antara formula yang berikut, yang manakah sebatian kovalen ?*

- A KN  
 B  $J_4N$   
 C  $JM_2$   
 D  $LN_3$

- 30 Diagram 6 shows the set-up of the apparatus used to electroplate an iron key with nickel by electrolysis.  
*Rajah 6 menunjukkan susunan radas yang digunakan untuk menyadur kunci besi dengan nikel melalui proses elektrolisis.*



Which of the following is **true** in this experiment ?  
*Antara pernyataan berikut yang manakah **benar** tentang eksperimen itu?*

- A Nickel foil becomes thicker.  
*Kepingan nikel semakin tebal.*  
 B Grey solid deposited at the iron key.  
*Pepejal kelabu terenal pada kunci besi.*  
 C Gas bubbles released around iron key.  
*Gelembung gas terbebas di sekeliling kunci besi.*  
 D Brown solid deposited at the iron key.  
*Pepejal perang terenal pada kunci besi.*

- 31 11 g oxide M reduced to form 6.2 g metal M. Empirical formulae of oxide M is  
[Relative atomic mass; O=16, M=31]

11 g suatu oksida M diturunkan menjadi 6.2 g logam M. Formula empirik bagi oksida M ialah

[Jisim atom relatif; O=16, M=31]

- A MO  
B  $M_2O$   
C  $M_3O_2$   
D  $M_2O_3$

- 32 Table 4 shows the pH values of two acids.  
*Jadual 4 menunjukkan nilai pH bagi dua asid.*

| Acid<br><i>Asid</i>                          | Concentration / $\text{mol dm}^{-3}$<br><i>Kepekatan / <math>\text{mol dm}^{-3}</math></i> | pH value<br><i>Nilai pH</i> |
|----------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------|
| Hydrochloric acid<br><i>Asid hidroklorik</i> | 0.1                                                                                        | 1                           |
| Ethanoic acid<br><i>Asid etanoik</i>         | 0.1                                                                                        | 4                           |

Table 4  
*Jadual 4*

Which of the following statements explain the differences in the pH value?  
*Antara pernyataan berikut, yang manakah menerangkan perbezaan nilai pH?*

- I Hydrochloric acid contains hydrogen ions whereas ethanoic acid does not  
*Asid hidroklorik mengandungi ion hidrogen manakala asid etanoik tiada*
- II Hydrochloric acid is a weak acid whereas ethanoic acid is a strong acid  
*Asid hidroklorik adalah asid lemah manakala asid etanoik adalah asid kuat*
- III Hydrochloric acid dissociates completely in water whereas ethanoic acid dissociates partially  
*Asid hidroklorik berceraai lengkap dalam air manakala asid etanoik berceraai separa*
- IV The concentration of hydrogen ions in hydrochloric acid is higher whereas in ethanoic acid is lower  
*Kepekatan ion hidrogen dalam asid hidroklorik adalah tinggi manakala dalam asid etanoik rendah*
- A I and II  
*I dan II*
- B II and III  
*II dan III*
- C III and IV  
*III dan IV*
- D I, II, III and IV  
*I, II, III dan IV*

- 33 Copper(II) sulphate solution is added into a beaker from zinc. Zinc beaker with contains left for one day. Which the following is happen in the beaker?  
*Larutan kuprum(II) sulfat dituang ke dalam sebuah bikar yang diperbuat daripada zink. Bikar zink dengan kandungannya dibiarkan selama satu hari. Antara yang berikut, yang manakah akan berlaku dalam bikar itu?*
- A Zinc gain electron  
*Zink menerima elektron*
- B Grey solid form in the beaker  
*Pepejal kelabu terbentuk dalam bikar itu*
- C Oxidation number of copper change form +2 to +1  
*Nombor pengoksidaan kuprum berubah daripada +2 kepada +1*
- D Blue colour copper(II) sulphate solution become paler.  
*Warna biru larutan kuprum(II) sulfat menjadi pudar.*
- 34 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  
*Menghasilkan 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*

- 35 Which of the following reactions are suitable to prepare copper(II) sulphate?  
 Antara tindak balas berikut, yang manakah sesuai untuk menyediakan garam kuprum(II) sulfat?

- I Copper and sulphuric acid  
Kuprum dan asid sulfurik
- II Copper(II) oxide and sulphuric acid  
Kuprum(II)oksida dan asid sulfurik
- III Copper(II) carbonate and sulphuric acid  
Kuprum(II)karbonat dan asid sulfurik
- IV Copper(II) chloride and sodium sulphate  
Kuprum(II) klorida dan natrium sulfat
- A I and II  
I dan II
- B II and III  
II dan III
- C III and IV  
III dan IV
- D I, II, III and IV  
I, II, III dan IV

- 36 Which of the following is not a composite material?  
 Antara berikut yang manakah bukan bahan komposit?

- A Photochromic glass  
Kaca fotokromik
- B Reinforced concrete  
Konkrit yang diperkukuhkan
- C Fiber optic  
Gentian optik
- D Perspex  
Perspeks

- 37 Diagram 7 shows the arrangement of atoms in alloy X.  
 Rajah 7 menunjukkan susunan atom dalam aloi X

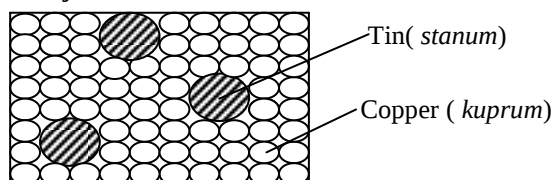
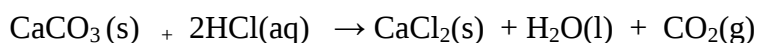


Diagram 7  
 Rajah 7

What is the name of alloy X?  
 Apakah nama aloi X?

- |                    |                          |
|--------------------|--------------------------|
| A Steel<br>Keluli  | B Brass<br>Loyang        |
| C Bronze<br>Gangsa | D Duralumin<br>Duralumin |

- 38 The following equation represents the reaction between calcium carbonate and hydrochloric acid  
*Persamaan berikut mewakili tindak balas antara kalsium karbonat dan asid hidroklorik*

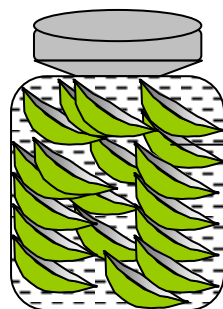


Which of the following factors **cannot** increase the rate of this reaction

*Antara faktor berikut, yang manakah **tidak boleh** meningkatkan kadar tindak balas ini?*

- A Decrease the size of calcium carbonate  
*Mengurangkan saiz kalsium karbonat*
- B Increase the temperature of the mixture  
*Meningkatkan suhu campuran*
- C Increase the concentration of hydrochloric acid  
*Meningkatkan kepekatan asid hidroklorik*
- D Increase the volume of hydrochloric acid  
*Meningkatkan isipadu asid hidroklorik*
- 39 Which of the following acids, when added to 50 cm<sup>3</sup> of 0.01 mol dm<sup>-3</sup> sodium hydroxide solution, produce the same rise in temperature of the mixture?  
*Antara asid berikut, yang manakah bila ditambahkan kepada 50 cm<sup>3</sup> natrium hidroksida 0.01 mol dm<sup>-3</sup> akan menghasilkan kenaikan suhu yang sama dalam campuran?*
- I 50 cm<sup>3</sup> of 0.01 mol dm<sup>-3</sup> hydrochloric acid  
50 cm<sup>3</sup> asid hidroklorik 0.01 mol dm<sup>-3</sup>
- II 25 cm<sup>3</sup> of 0.01 mol dm<sup>-3</sup> sulphuric acid  
25 cm<sup>3</sup> asid sulfurik 0.01 mol dm<sup>-3</sup>
- III 50 cm<sup>3</sup> of 0.01 mol dm<sup>-3</sup> nitric acid  
50 cm<sup>3</sup> asid nitrik 0.01 mol dm<sup>-3</sup>
- IV 50 cm<sup>3</sup> of 0.01 mol dm<sup>-3</sup> ethanoic acid  
50 cm<sup>3</sup> asid etanoik 0.01 mol dm<sup>-3</sup>
- A I and III  
*I dan III*
- B III and IV  
*III dan IV*
- C I, II and III  
*I, II dan III*
- D I, II, III and IV  
*I, II, III dan IV*

- 40 Diagram 8 shows a bottle of pickled mangoes.  
*Rajah 8 menunjukkan sebotol jeruk mangga.*



Mango soaked in vinegar  
*Buah mangga direndam dalam cuka*

Diagram 8  
*Rajah 8*

Which type of food additive is represented by vinegar?  
*Apakah jenis bahan tambah makanan yang diwakili oleh cuka?*

- A Dyes  
*Pewarna*  
 B Thickener  
*Pemekat*  
 C Antioxidant  
*Pengantioksida*  
 D Preservative  
*Pengawet*
- 41 Diagram 9 shows the symbols for two elements.  
 The letters used are not the actual symbol of the elements.  
*Rajah 9 menunjukkan simbol bagi dua unsur.*  
*Huruf yang digunakan bukan simbol sebenar unsur itu.*



Diagram 9  
*Rajah 9*

X and Y reacts to form compound XY.  
 Which of the following is true about XY?  
*X dan Y bertindak balas membentuk sebatian XY*  
*Antara berikut, yang manakah benar tentang XY?*

- A dissolve in tetrachloromethane  
*Larut dalam tetraklorometana*  
 B exist as a gas at room temperature  
*wujud sebagai gas pada suhu bilik .*  
 C has high melting and boiling points.  
*Mempunyai takat lebur dan takat didih yang tinggi.*  
 D do not conduct electricity in the solid and molten states.  
*tidak mengkonduksi arus elektrik dalam keadaan pepejal dan leburan.*

- 42 Diagram 10 shows one fossil .  
Rajah 10 menunjukkan satu fosil.



Diagram 10  
Rajah 10

Which of the following isotopes is used to estimate the age fossil?  
Antara isotop berikut yang manakah digunakan untuk menentukan umur fosil?

- A Sodium-24  
Natrium-24
- B Iodine-131  
Iodin-131
- C Cobalt-60  
Kobalt-60
- D Carbon-14  
Karbon-14
- 43 Table 5 shows the properties of oxide of elements in the Periodic Table.  
Jadual 5 menunjukka sifat oksida bagi suatu unsur dalam Jadual Berkala.

| Oxide<br>Oksida | Observation<br>Pemerhatian                                                                                  |                                                                                                                |
|-----------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                 | With sodium hydroxide solution<br>Dengan larutan natrium hidroksida                                         | With dilute nitric acid<br>Dengan asid nitrik cair                                                             |
| $R_xO_z$        | The white powder dissolves to form colourless solution<br>Serbuk putih larut membentuk larutan tanpa warna. | The white powder dissolves to form a colourless solution.<br>Serbuk putih larut membentuk larutan tanpa warna. |

What is the **inference** that can make from the observation ?  
Apakah inferens yang dapat dibuat berdasarkan pemerhatian tersebut ?

- A  $R_xO_z$  shows acidic properties only.  
 $R_xO_z$  menunjukkan sifat-sifat asid sahaja.
- B  $R_xO_z$  shows basic properties only.  
 $R_xO_z$  menunjukkan sifat-sifat bes sahaja.
- C  $R_xO_z$  shows acidic and basic properties.  
 $R_xO_z$  menunjukkan sifat-sifat asid dan bes.
- D  $R_xO_z$  shows acidic , basic and non-metallic properties.  
 $R_xO_z$  menunjukkan sifat-sifat asid . bes dan bukan logam.

- 44 Table 6 shows the potential difference obtained when different pairs of metals are dipped in aqueous copper(II) sulphate and circuit is completed.  
*Jadual 6 menunjukkan voltan yang diperolehi antara pasangan logam yang berlainan yang dimasukkan ke dalam larutan kuprum(II) sulfat dan litar dilengkapkan.*

| <b>Metal pair</b><br><i>Pasangan logam</i> | <b>Potential difference/V</b><br><i>Beza keupayaan/V</i> | <b>Positive terminal</b><br><i>Terminal positif</i> |
|--------------------------------------------|----------------------------------------------------------|-----------------------------------------------------|
| X / Y                                      | 2.0                                                      | Y                                                   |
| Z / Y                                      | 2.7                                                      | Y                                                   |
| R / Y                                      | 1.1                                                      | Y                                                   |

Table 6  
*Jadual 6*

Based on the results in the table 6, predict the potential difference that will be obtained between metal pair X and R.

*Berdasarkan keputusan di dalam jadual 6, ramalkan beza keupayaan yang diperolehi antara pasangan logam X dan R.*

- A 0.7 volt  
 B 0.9 volt  
 C 1.1 volt  
 D 1.6 volt
- 45 The rate of decomposition of hydrogen peroxide solution is increased by adding a little manganese(IV) oxide as a catalyst.  
 Which of the following is a role of catalyst to increase the rate of decomposition hydrogen peroxide solution?

*Kadar penguraian larutan hidrogen peroksida boleh ditingkatkan dengan menambah sedikit mangan(IV) oksida sebagai mangkin.*

*Antara yang berikut, yang manakah adalah peranan yang dimainkan oleh mangkin dalam meningkatkan kadar penguraian larutan hidrogen peroksida?*

- A It increase the kinetic energy of the reacting particle  
*Ia boleh meningkatkan tenaga kinetik zarah bahan tindak balas*  
 B It increase the surface area of the reacting particle  
*Ia boleh meningkatkan luas permukaan zarah bahan tindak balas*  
 C It lowers the level of activation energy in the reaction  
*Ia boleh merendahkan tenaga pengaktifan di dalam tindak balas*  
 D It decrease the number of collision per second in the reaction  
*Ia boleh mengurangkan jumlah pelanggaran per saat di dalam tindak balas*

- 46 The information below shows two examples of medicine Y.  
*Maklumat di bawah menunjukkan dua contoh ubat Y.*

- Penicillin
- Streptomycin

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

- A Antibiotic  
*Antibiotik*
- B Analgesic  
*Analgesik*
- C Hormone  
*Hormon*
- D Psychotherapeutic medicine  
*Ubat psikoterapeutik*
- 47 Diagram 10 shows the titration of hydrochloric acid and potassium hydroxide solution.  
*Rajah 10 menunjukkan pentitratan asid hidroklorik dan larutan kalium hidroksida.*

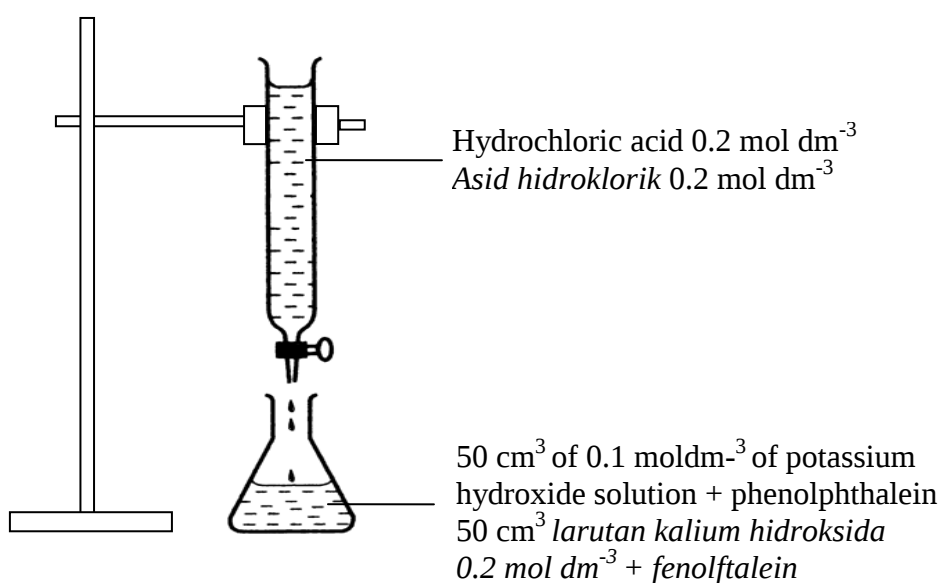


Diagram 10  
*Rajah 10*

What is the volume of hydrochloric acid needed to neutralise potassium hydroxide solution?  
*Berapakah isipadu asid hidroklorik yang diperlukan untuk meneutralkan larutan kalium hidroksida?*

- A 25 cm<sup>3</sup>
- B 50 cm<sup>3</sup>
- C 75 cm<sup>3</sup>
- D 100 cm<sup>3</sup>

- 48 The aircraft tyres are made from vulcanized rubber  
What property of vulcanized rubber makes it suitable to be used for making these aircraft tyres?

*Tayar kapal terbang diperbuat daripada getah tervulkan.*

*Apakah sifat getah tervulkan yang menyebabkannya sesuai digunakan dalam pembuatan tayar kapal terbang ?*

- A It can take the tremendous stress and strength  
*Ia boleh menerima tegangan yang terlalu besar dan kuat*
- B It is harder and stronger  
*Ia keras dan kuat*
- C It resist to the oxidation  
*Ia tahan pengoksidaan*
- D It can maintain their elasticity  
*Ia boleh mengekalkan keelastikkannya*

- 49 Diagram 11 show set-up apparatus one cell U-tube. Sulfurus acid,  $\text{H}_2\text{SO}_3$  react with chlorine water as chemical equation below.

*Rajah 11 menunjukkan susunan radas sebuah sel tiub-U. Asid sulfurus,  $\text{H}_2\text{SO}_3$  bertindak balas dengan air klorin mengikut persamaan kimia berikut,*

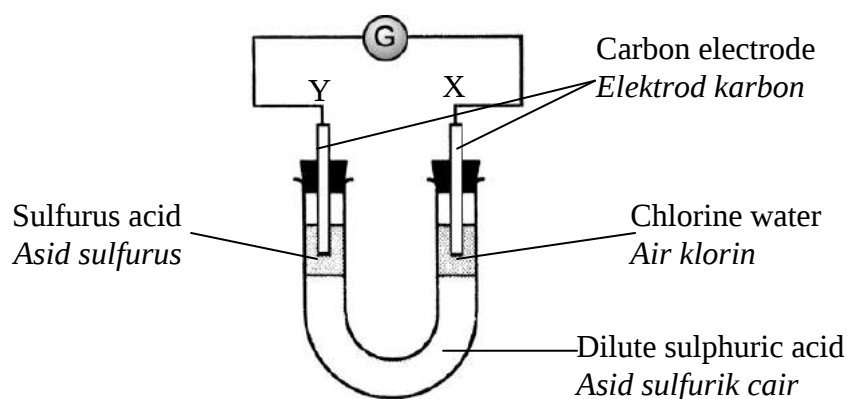
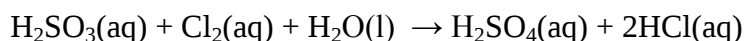


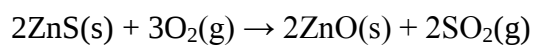
Diagram 11  
*Rajah 11*

Which of the following statement is true about cell U-tube?

*Antara pernyataan berikut, yang manakah betul mengenai sel tiub-U?*

- A Sulfurus acid is reduced  
*Asid sulfurus diturunkan*
- B Electron move from electrode Y to electrode X through wire  
*Elektron bergerak dari elektrod Y ke elektrod X melalui wayar.*
- C Chlorine acts as reducing agent  
*Klorin bertindak sebagai agen penurunan*
- D Half equation at electrode X,  $2\text{Cl}^-(\text{aq}) \rightarrow \text{Cl}_2(\text{aq}) + 2\text{e}^-$   
*Persamaan setengah pada elektrod X,  $2\text{Cl}^-(\text{aq}) \rightarrow \text{Cl}_2(\text{aq}) + 2\text{e}^-$*

- 50 Chemical equation show reaction zinc sulfide with oxygen.  
*Persamaan kimia menunjukkan tindak balas zink silfida dengan oksigen.*



What is volume of oxygen is needed for complete reaction with 38.8g zink sulfide at room temperature?

[Relative formula mass  $\text{ZnS}=97$ , 1 mol gas occupied  $24 \text{ dm}^3$  at room temperature]

*Berapakah isipadu oksigen yang diperlukan untuk bertindak balas lengkap dengan 38.8 g zink sulfida pada suhu bilik?*

*[Jisim formula relatif  $\text{ZnS}=97$ , 1 mol gas menempati  $24 \text{ dm}^3$  pada keadaan bilik]*

- A  $4.8 \text{ dm}^3$
- B  $9.6 \text{ dm}^3$
- C  $14.4 \text{ dm}^3$
- D  $28.8 \text{ dm}^3$

**END OF QUESTION PAPER**  
**KERTAS SOALAN TAMAT**

Nama:.....

Tingkatan :.....

4541/2  
**CHEMISTRY**  
**Kertas 2**  
**Ogos**  
**2010**  
 2 ½ jam



**BAHAGIAN PENGURUSAN  
 SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER  
 KEMENTERIAN PELAJARAN MALAYSIA**

**PEPERIKSAAN PERCUBAAN  
 SIJIL PELAJARAN MALAYSIA 2010**

**CHEMISTRY**  
 Kertas 2

**Dua jam tiga puluh minit**

**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

1. Tulis Nama dan Tingkatan anda pada ruangan yang disediakan
2. Kertas soalan ini adalah dalam dwibahasa
3. Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu
4. Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu
5. Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.

| Untuk Kegunaan Pemeriksa |        |              |                  |
|--------------------------|--------|--------------|------------------|
| Bahagian                 | Soalan | Markah penuh | Markah diperoleh |
| A                        | 1      | 9            |                  |
|                          | 2      | 9            |                  |
|                          | 3      | 10           |                  |
|                          | 4      | 10           |                  |
|                          | 5      | 11           |                  |
|                          | 6      | 11           |                  |
| B                        | 7      | 20           |                  |
|                          | 8      | 20           |                  |
| C                        | 9      | 20           |                  |
|                          | 10     | 20           |                  |
| Jumlah                   |        |              |                  |

Kertas soalan ini mengandungi 22 halaman bercetak

**Section A**  
**Bahagian A**

[60 marks]

[60 markah]

Answer **all** questions.

Jawab **semua** soalan dalam bahagian ini.

- 1 Table 1 shows the melting point and boiling point of substance X, Y and Z

Jadual 1 menunjukkan takat lebur dan takat didih bagi bahan X, Y dan Z

| Substance<br><i>Bahan</i> | Melting point / °C<br><i>Takat lebur / °C</i> | Boiling point / °C<br><i>Takat didih / °C</i> |
|---------------------------|-----------------------------------------------|-----------------------------------------------|
| X                         | - 110                                         | 5                                             |
| Y                         | - 18                                          | 66                                            |
| Z                         | 98                                            | 413                                           |

Table 1

Jadual 1

- (a) (i) What is the state of matter of substance X at room temperature?

*Apakah keadaan jirim bagi bahan X pada suhu bilik?*

..... [1 mark]

- (ii) Give reason to your answer in (a)(i).

*Beri sebab kepada jawapan anda di (a)(i).*

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

- (b) (i) Substance Y is heated from room temperature to 100 °C. Sketch a graph of temperature against time for the heating of substance Y.

*Bahan Y dipanaskan daripada suhu bilik ke 100 °C. Lakar graf suhu melawan masa bagi pemanasan bahan Y.*

[2 marks]

(ii) What is the state of matter of substance Y at  $66^{\circ}\text{C}$ ?

*Apakah keadaan jirim bagi bahan Y pada  $66^{\circ}\text{C}$ ?*

.....  
[1 mark]

(c) Explain why the melting point of substance Z is higher than substance Y.

*Terangkan mengapa takat lebur bahan Z lebih tinggi daripada bahan Y.*

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

(d) What is meant by melting point?

*Apakah yang dimaksudkan dengan takat lebur?*

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

(e) Draw the particle arrangement of substance Z at room condition.

*Lukiskan susunan zarah bagi bahan Z pada keadaan bilik.*



[1 mark]

- 2 (a) Diagram 2.1 shows the stages in the industrial process for the manufacture of sulphuric acid.

Rajah 2.1 menunjukkan peringkat-peringkat dalam proses industri bagi pembuatan asid sulfurik..

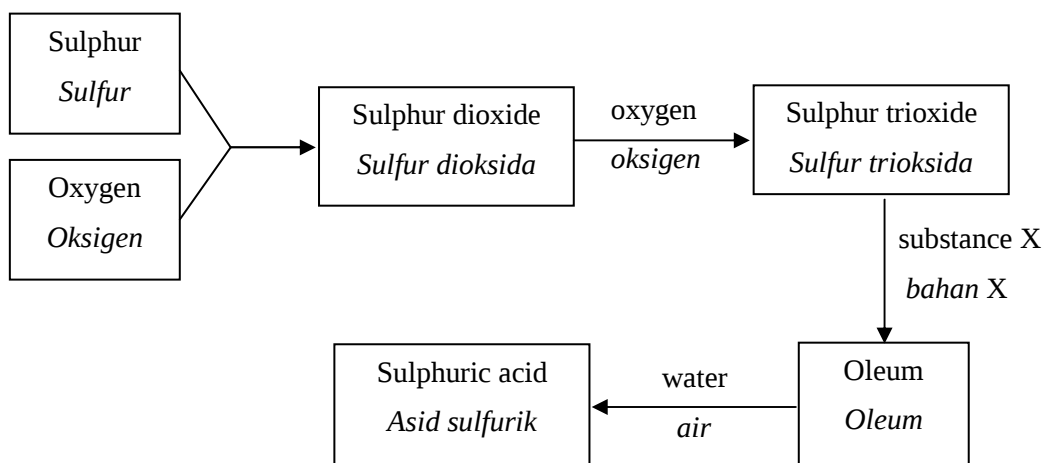


Diagram 2.1

Rajah 2.1

- (i) State the name of this process.

Nyatakan nama proses ini.

..... [1 mark]

- (ii) State the name of substance X

Nyatakan nama bahan X.

..... [1 mark]

- (iii) Sulphur dioxide reacts with oxygen to form sulphur trioxide. Write the chemical equation for this reaction.

Sulfur dioksida bertindak balas dengan oksigen untuk membentuk sulfur trioksida. Tuliskan persamaan kimia untuk tindak balas ini.

..... [ 2 marks]

- (b) The sulphuric acid produced from the above process is used to manufacture detergent. Diagram 2.2 shows the structural formulae of the detergent. Detergent dissolves in water to form detergent anions

*Asid sulfurik yang terhasil daripada proses di atas digunakan untuk membuat detergen.*

*Rajah 2.2 menunjukkan formula struktur bagi detergen. Detergen larut dalam air membentuk anion detergen.*

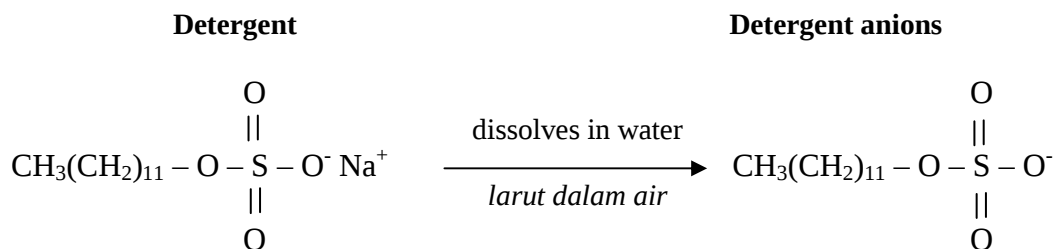


Diagram 2.2

Rajah 2.2

- (i) State the type of reactions involved during the preparation of detergent.

*Nyatakan jenis tindak balas yang terlibat dalam penyediaan detergen.*

1. ....
  2. ....
- [2 marks]

- (ii) Labelled the hydrophilic part and the hydrophobic part of the detergent anions in diagram 2.2

*Labelkan bahagian hidrofilik dan bahagian hidrofobik bagi anion detergen dalam rajah 2.2*

[1 mark]

- (iii) Detergent is more effective as cleaning agent in hard water compared to soap. Explain why.

*Detergen lebih berkesan sebagai agen pencuci dalam air liat berbanding sabun. Terangkan mengapa.*

.....

.....

.....

[2 marks]

- 3 (a) Diagram 3.1 shows the pH value of glacial ethanoic acid in solvent P and solvent Q respectively

Rajah 3.1 menunjukkan nilai pH bagi asid etanoik glacial dalam masing-masing pelarut P dan pelarut Q.

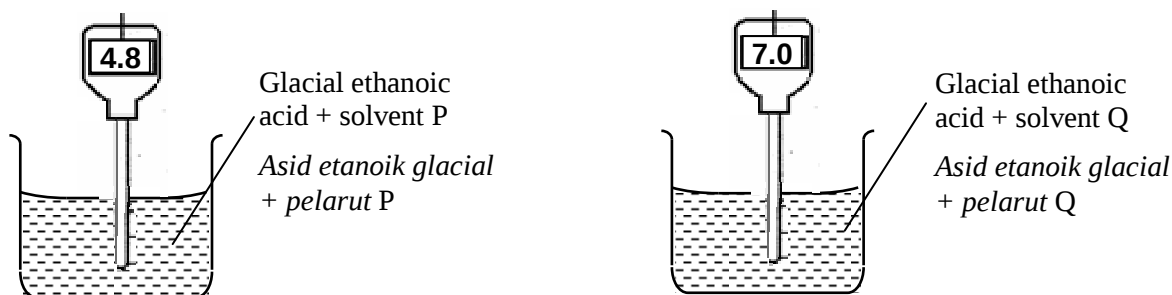


Diagram 3.1

Rajah 3.1

- (i) Give one example of each solvent P and solvent Q.

Berikan satu contoh bagi setiap pelarut P dan pelarut Q.

Solvent P:

Pelarut P: .....

Solvent Q:

Pelarut Q: .....

[2 marks]

- (ii) If magnesium ribbon is added into beaker containing glacial ethanoic acid and solvent P, what can be observed?

Sekiranya pita magnesium dimasukkan ke dalam bikar yang mengandungi asid etanoik glacial dan pelarut P, apakah yang dapat diperhatikan?

.....

[1 mark]

- (iii) Explain why ethanoic acid in solvent P has the pH value of 4.8

Terangkan mengapa asid etanoik dalam pelarut P mempunyai nilai pH 4.8

.....

.....

.....

.....

[3 marks]

- (b) Diagram 3.2 shows the concentration of hydrochloric acid decrease when water is added into beaker J

*Rajah 3.2 menunjukkan kepekatan asid hidroklorik berkurangan apabila air ditambahkan ke dalam bikar J*

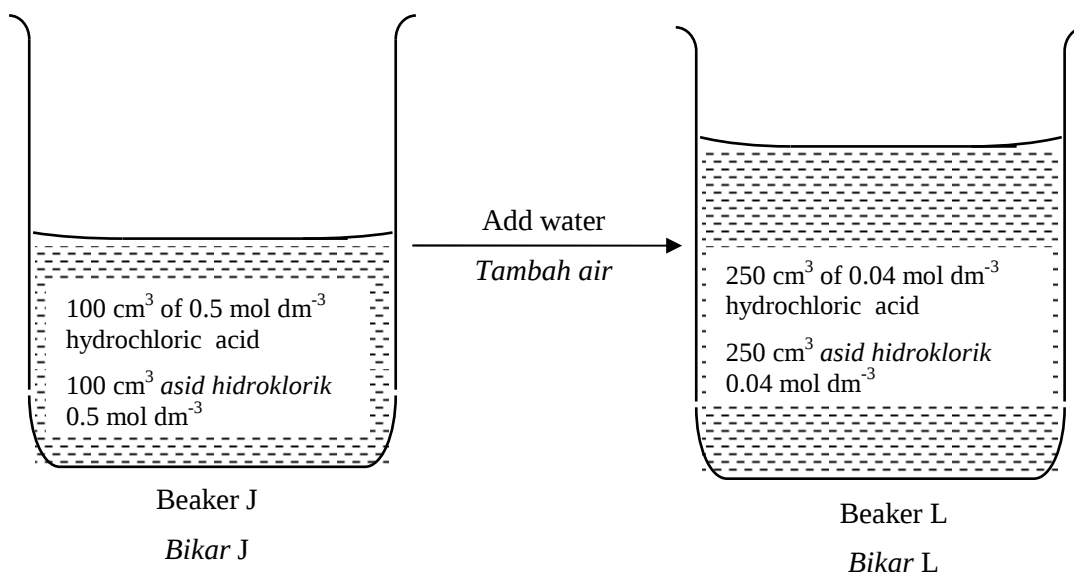


Diagram 3.2  
*Rajah 3.2*

- (i) When water is added into beaker J, what happen to the pH value of the hydrochloric acid? Give reason to your answer.

*Apabila air ditambahkan ke dalam bikar J, apakah yang berlaku kepada nilai pH asid hidroklorik itu? Berikan sebab kepada jawapan anda.*

.....

.....

.....

[2 marks]

- (ii) Calculate the volume of hydrochloric acid in beaker J that is needed to prepare hydrochloric acid in beaker L.

*Hitung isipadu asid hidroklorik dalam bikar J yang diperlukan untuk menyediakan asid hidroklorik dalam bikar L.*

[2 marks]

- 4 Diagram 4 shows the series of reactions that involve zinc compounds.

Rajah 4 menunjukkan siri tindak balas yang melibatkan sebatian zink.

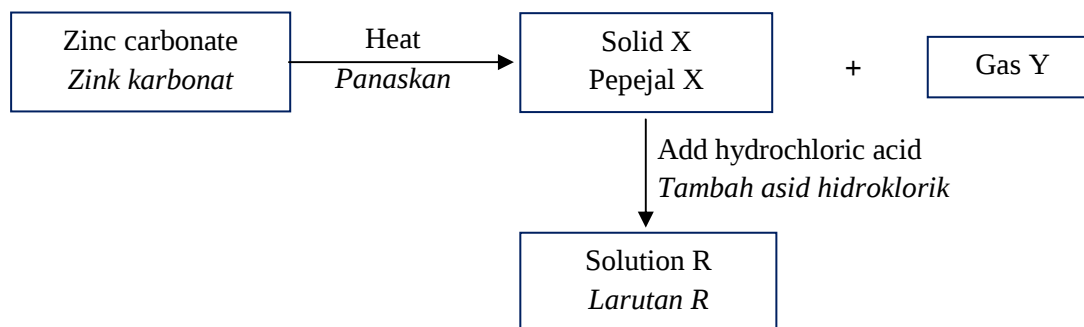


Diagram 4  
Rajah 4

- (a) Zinc carbonate is an insoluble salt.  
State two reactants that can be used to prepare zinc carbonate.

*Zink karbonat adalah satu garam tak terlarut.*

*Nyatakan dua bahan tindak balas yang boleh digunakan untuk menyediakan zink karbonat.*

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

- (b) (i) Solid X and gas Y are formed when zinc carbonate is heated strongly. State the name of solid X.

*Pepejal X dan gas Y terbentuk apabila zink karbonat dipanaskan dengan kuat. Nyatakan nama bagi pepejal X.*

.....  
[1 mark]

- (ii) Draw a labelled diagram to show the apparatus set-up for the heating of zinc carbonate. Show how the presence of gas Y is verified.

*Lukiskan gambar rajah berlabel yang menunjukkan susunan radas bagi pemanasan zink karbonat. Tunjukkan bagaimana kehadiran gas Y disahkan.*

[2 marks]

- (c) Reaction between solid X and hydrochloric acid produced solution R.

*Tindak balas antara pepejal X dan asid hidroklorik menghasilkan larutan R*

- (i) Write a chemical equation for the reaction.

*Tuliskan persamaan kimia bagi tindak balas itu.*

..... [2 marks]

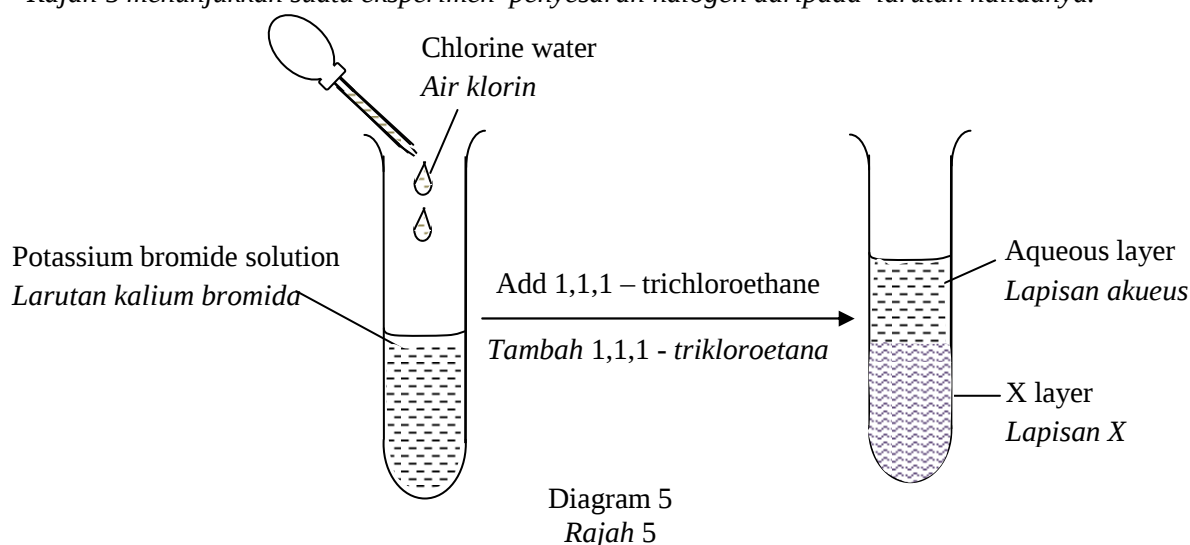
- (ii) Describe how to obtain a dry crystal salt R from solution R.

*Huraikan bagaimana hablur garam R diperolehi daripada larutan R*

.....  
 .....  
 ..... [3 marks]

- 5 Diagram 5 shows an experiment of displacement of halogen from its halide solution.

*Rajah 5 menunjukkan suatu eksperimen penyesaran halogen daripada larutan halidanya.*



- (a) (i) State an observation for the reaction in the test tube before 1,1,1 - trichloroethane is added

*Nyatakan satu pemerhatian bagi tindak balas di dalam tabung uji sebelum 1,1,1- trikloroetana ditambahkan.*

..... [1 mark]

- (ii) State the name of the substance that is oxidized

*Nyatakan nama bahan yang dioksidakan.*

..... [1 mark]

(iii) Write the oxidation reaction equation for this reaction.

*Tuliskan persamaan tindak balas pengoksidaan bagi tindak balas ini.*

.....  
[ 2 marks]

(b) After 1,1,1- trichloroethane is added into the test tube, state the colour of X layer

*Selepas 1,1,1- trikloroetana ditambahkan ke dalam tabung uji, nyatakan warna lapisan X.*

.....  
[ 1 mark]

(c) Name the oxidising agent for this reaction and give reason in terms of electron transfer.

*Namakan agen pengoksidaan dalam tindak balas ini dan berikan sebab daripada segi pemindahan elektron.*

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

(d) State the change of oxidation number for chlorine water.

*Nyatakan perubahan nombor pengoksidaan air klorin*

.....  
[ 1 mark]

(e) State another reagent that can replace chlorine water.

*Nyatakan satu bahan reagen lain yang boleh menggantikan air klorin.*

.....  
[ 1 mark]

(f) By using suitable chemical substance and apparatus, draw a labelled diagram to show the transfer of electron at a distance.

*Dengan menggunakan bahan kimia dan alat radas yang sesuai, lukiskan gambar rajah berlabel untuk menunjukkan pemindahan elektron pada suatu jarak.*

[ 2 marks]

- 6 An experiment is carried out to determine the heat of combustion of propanol. Table 6 shows the results obtained.

*Satu eksperimen telah dijalankan untuk menentukan haba pembakaran bagi propanol. Jadual 6 menunjukkan keputusan yang diperolehi.*

|                                                                                                       |       |
|-------------------------------------------------------------------------------------------------------|-------|
| Mass of lamp + propanol before combustion / g<br><i>Jisim lampu + propanol sebelum pembakaran / g</i> | 30.69 |
| Mass of lamp + propanol after combustion / g<br><i>Jisim lampu + propanol setelah pembakaran / g</i>  | 29.85 |
| Volume of water / cm <sup>3</sup><br><i>Isipadu air / cm<sup>3</sup></i>                              | 200   |
| Initial temperature / °C<br><i>Suhu awal / °C</i>                                                     | 28.0  |
| Highest temperature / °C<br><i>Suhu tertinggi / °C</i>                                                | 59.0  |

Table 6  
*Jadual 6*

- (a) Draw a labelled diagram of apparatus set-up used in this experiment.

*Lukiskan satu gambar rajah berlabel susunan radas yang digunakan dalam eksperimen ini.*

[2 marks]

- (b) Write the chemical equation for the complete combustion of propanol.

*Tuliskan persamaan kimia bagi pembakaran lengkap propanol.*

.....  
[2 marks]

(c) Based on the results of the experiment, calculate:

*Berdasarkan keputusan eksperimen, hitung;*

(i) heat released when propanol is burnt.

[Given that the specific heat capacity for water is  $4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$ ]

*haba yang dibebaskan apabila propanol dibakar*

*[Diberi muatan haba tentu air adalah  $4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$ ]*

[1 mark]

(ii) number of moles of propanol burnt.

[Given that relative molecular mass of propanol is 60]

*bilangan mol propanol yang terbakar*

*[Diberi jisim molekul relatif propanol adalah 60]*

[1 mark]

(iii) heat of combustion of propanol.in this experiment

*haba pembakaran propanol dalam eksperimen ini.*

[2 marks]

(iv) Draw the energy level diagram for this reaction.

*Lukiskan gambar rajah aras tenaga bagi tindak balas ini.*

[2 marks]

(d) The heat of combustion obtained in this experiment is less than the actual theoretical value. Suggest one precaution that should be taken to obtain a more accurate value of the heat of combustion.

*Haba pembakaran yang diperolehi daripada eksperimen ini adalah lebih rendah daripada nilai teori sebenar. Cadangkan satu langkah berjaga-jaga yang patut diambil untuk mendapatkan nilai haba pembakaran yang lebih tepat*

.....

[1 mark]

**Section B**  
**Bahagian B**

[20 marks]

[20 markah]

Answer any **one** question from this section  
*Jawab mana-mana **satu** soalan daripada bahagian ini.*

- 7 (a) Element X react with element Y to form a compound. Diagram 7.1 shows the electron arrangement of the compound.

*Unsur X bertindak balas dengan unsur Y membentuk suatu sebatian. Rajah 7.1 menunjukkan susunan elektron bagi sebatian itu.*

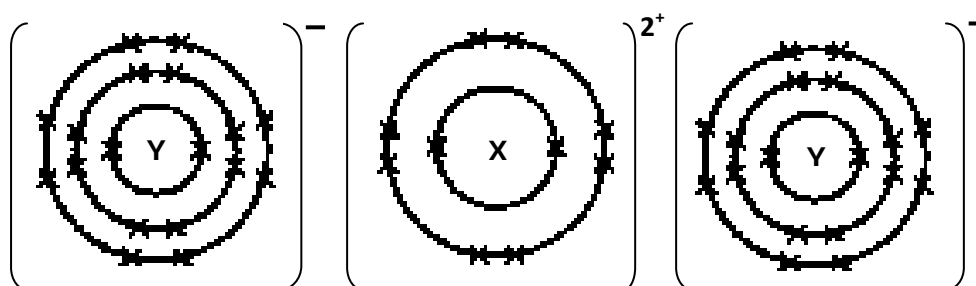


Diagram 7.1

Rajah 7.1

- (i) Write the electron arrangement of atom of element X. State the position of element X in the Periodic Table of Element.

*Tuliskan susunan electron bagi atom unsur X. Nyatakan kedudukan unsur X dalam Jadual Berkala Unsur.*

[3 marks]

- (ii) Write the chemical equation for the reaction between element X and element Y. Explain how the bond in the compound formed .

*Tuliskan persamaan kimia bagi tindak balas antara unsur X dan unsur Y. Terangkan bagaimana ikatan dalam sebatian itu terbentuk .*

[7 marks]

- (b) Diagram 7.2 shows the set up of apparatus to investigate the electrical conductivity of lead(II) bromide and naphthalene.

Rajah 7.2 menunjukkan susunan radas untuk mengkaji kekonduksiaan elektrik bagi plumbum(II) bromida dan naftalena.

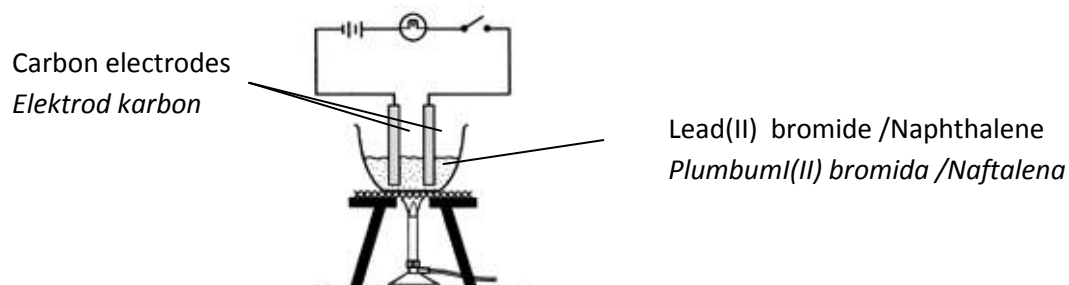


Diagram 7.2  
Rajah 7.2

Table 7 shows the result obtained.

Jadual 7 menunjukkan keputusan yang diperolehi.

| Substance<br><i>Bahan</i>                      | State of substance<br><i>Keadaan bahan</i> | Observation<br><i>Pemerhatian</i>                      |
|------------------------------------------------|--------------------------------------------|--------------------------------------------------------|
| Lead(II) bromide<br><i>Plumbum(II) bromida</i> | Solid<br><i>Pepejal</i>                    | The bulb does not glow<br><i>Mentol tidak menyala</i>  |
|                                                | Molten<br><i>Leburan</i>                   | The bulb glow brightly<br><i>Mentol menyala terang</i> |
| Naphthalene<br><i>Naftalena</i>                | Solid<br><i>Pepejal</i>                    | The bulb does not glow<br><i>Mentol tidak menyala</i>  |
|                                                | Molten<br><i>Leburan</i>                   | The bulb does not glow<br><i>Mentol tidak menyala</i>  |

Table 7  
Jadual 7

Explain the observation in table 7.

Write the chemical equation for the reaction at cathode and anode.

Terangkan pemerhatian dalam Jadual 7.

Tuliskan persamaan kimia bagi tindak balas pada katod dan anod.

[10 marks]

8. Diagram 8 shows the flow chart for the reactions of propan-1-ol.

Rajah 8 menunjukkan carta alir bagi tindakbalas propanol.

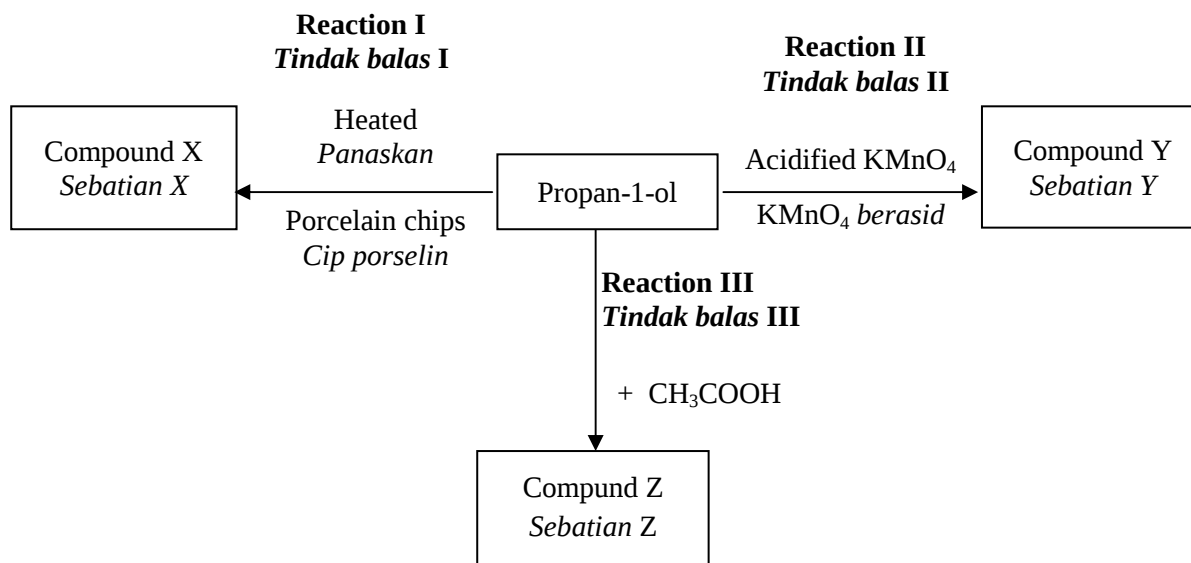


Diagram 8  
Rajah 8

- (a) Draw the structural formula and state the name of compound X, Y and Z.  
*Lukiskan formula struktur dan nyatakan nama sebatian X, Y dan Z.* [6 marks]
- (b) State the type of Reaction I and explain a chemical test to identify compound X  
*Nyatakan jenis Tindak balas I dan terangkan ujian kimia untuk mengenal pasti sebatian X* [3 marks]
- (c) Compound X can be converted into propan-1-ol. Write the chemical equation and state the condition needed for the reaction.  
*Sebatian X boleh ditukarkan kepada propan-1-ol. Tuliskan persamaan kimia dan nyatakan keadaan diperlukan untuk tindak balas itu* [3 marks]
- (d) In Reaction III, describe the method of preparing compound Z in the laboratory.  
*Dalam Tindak balas III, huraikan kaedah penyediaan sebatian Z di makmal.* [4 marks]
- (e) When calcium carbonate is added to compound Y, carbon dioxide gas is liberated.
- State the name of the functional group of compound Y
  - Write the general formula of compound Y
  - Write the chemical equation of the reaction
- Apabila kalsium karbonat ditambahkan kepada sebatian Y, gas karbon dioksida dibebaskan*
- Nyatakan nama kumpulan berfungsi sebatian Y
  - Tuliskan formula am bagi sebatian Y
  - Tuliskan persamaan kimia bagi tindak balas itu.
- [4 marks]

**Section C**  
**Bahagian C**

[20 marks]

[20 markah]

Answer any **one** question from this section  
*Jawab mana-mana **satu** soalan daripada bahagian ini.*

- 9 (a) Table 9.1 shows the potential difference and the negative terminal when different pairs of metals are used in a simple voltaic cell to construct electrochemical series.

*Jadual 9.1 menunjukkan beza keupayaan apabila pasangan logam yang berbeza digunakan dalam suatu sel voltan untuk membina siri elektrokimia.*

| Pair of metal<br><i>Pasangan logam</i> | Potential difference / V<br><i>Beza upaya / V</i> | Negative terminal<br><i>Terminal negatif</i> |
|----------------------------------------|---------------------------------------------------|----------------------------------------------|
| Q – R                                  | 0.2                                               | Q                                            |
| R – S                                  | 0.8                                               | R                                            |
| P – S                                  | 2.6                                               | P                                            |
| P – Q                                  | x                                                 | y                                            |

Table 9.1  
*Jadual 9.1*

- (i) By using a simple voltaic cell, describe an experiment to determine the position of metals P, Q, R and S in electrochemical series.

*Dengan menggunakan sel voltan ringkas, huraikan satu eksperimen untuk menentukan kedudukan logam-logam P, Q, R dan S dalam siri elektrokimia.*

[10 marks]

- (ii) Based on data in Table 9.1, predict the x value of the potential difference of pair of metal P – Q and the negative terminal, y.

If metal Q is zinc, suggest the identity of metal P. Explain your answer.

*Berdasarkan data dalam Jadual 9.1, ramalkan nilai beza keupayaan, x dan terminal negatif, y bagi pasangan logam P – Q.*

*Jika logam Q adalah zink, cadangkan identiti logam P. Terangkan jawapan anda.*

[4 marks]

- (b) Table 9.2 shows the observations at the anode when two different electrolytes are electrolysed using carbon electrodes.

*Jadual 9.2 menunjukkan pemerhatian di anod apabila dua larutan berbeza dielektrolisiskan menggunakan elektrod-elektrod karbon.*

| <b>Electrolyte<br/><i>Elektrolit</i></b>                                                          | <b>Observation at anode<br/><i>Pemerhatian di anod</i></b>        |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1.0 mol dm <sup>-3</sup> sodium chloride<br>1.0 mol dm <sup>-3</sup> <i>natrium klorida</i>       | A yellowish gas is release<br><i>Gas kekuningan dibebaskan</i>    |
| 0.0001 mol dm <sup>-3</sup> sodium chloride<br>0.0001 mol dm <sup>-3</sup> <i>natrium klorida</i> | A colourless gas is release<br><i>Gas tak berwarna dibebaskan</i> |

Table 9.2  
*Jadual 9.2*

Based on the information in Table 9.2, explain the observations at the anode for both electrolytes.

*Berdasarkan maklumat dalam Jadual 9.2, jelaskan pemerhatian di anod bagi kedua-dua elektrolit.*

[6 marks]

10. A student carried out three experiments to investigate the factors affecting the rate of reaction. Table 10 shows the results of the experiments. The reaction between sodium thiosulphate and hydrochloric acid produced sodium chloride, sulphur, sulphur dioxide and water.

*Seorang pelajar menjalankan tiga eksperimen untuk mengkaji faktor yang mempengaruhi kadar tindak balas. Jadual 10 menunjukkan keputusan bagi eksperimen itu. Tindak balas antara natrium tiosulfat dan asid hidroklorik menghasilkan natrium klorida, sulfur, sulfur dioksida dan air*

| Experiment<br><i>Eksperimen</i> | Reactants<br><i>Bahan tindak balas</i>                                                                                                                                                                                                                                              | Temperature/ °C<br><i>Suhu / °C</i> | Time taken for mark 'X' disappears from sight/s<br><i>Masa untuk pangkah 'X' hilang dari penglihatan/s</i> |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------|
| I                               | 50 cm <sup>3</sup> of 0.2 mol dm <sup>-3</sup> sodium thiosulphate solution + 5 cm <sup>3</sup> of 1 mol dm <sup>-3</sup> hydrochloric acid<br><i>50 cm<sup>3</sup> larutan natrium tiosulfat 0.2 mol dm<sup>-3</sup> + 5 cm<sup>3</sup> asid hidroklorik 1 mol dm<sup>-3</sup></i> | 30.0                                | 18.0                                                                                                       |
| II                              | 50 cm <sup>3</sup> of 0.2 mol dm <sup>-3</sup> sodium thiosulphate solution + 5 cm <sup>3</sup> of 1 mol dm <sup>-3</sup> hydrochloric acid<br><i>50 cm<sup>3</sup> larutan natrium tiosulfat 0.2 mol dm<sup>-3</sup> + 5 cm<sup>3</sup> asid hidroklorik 1 mol dm<sup>-3</sup></i> | 40.0                                | 11.0                                                                                                       |
| III                             | 50 cm <sup>3</sup> of 0.2 mol dm <sup>-3</sup> sodium thiosulphate solution + 5 cm <sup>3</sup> of 2 mol dm <sup>-3</sup> hydrochloric acid<br><i>50 cm<sup>3</sup> larutan natrium tiosulfat 0.2 mol dm<sup>-3</sup> + 5 cm<sup>3</sup> asid hidroklorik 2 mol dm<sup>-3</sup></i> | 40.0                                | 2.0                                                                                                        |

Table 10

Jadual 10

(a) (i) Based on Table 10,

- arrange the rate of reaction for experiments I, II and III in ascending order.
- state the factor that affect the rate of reaction between
  - Experiment I and Experiment III
  - Experiment II and Experiment III
- write the chemical reaction for Experiment III

*Berdasarkan Jadual 10*

- susunkan kadar tindak balas bagi eksperimen I, II dan III dalam tertib menaik.
- nyatakan faktor yang mempengaruhi kadar tindak balas di antara
  - Eksperimen I dan Eksperimen III
  - Eksperimen II dan Eksperimen III
- tuliskan persamaan kimia untuk Eksperimen III

[5 marks]

- (i) Explain using collision theory the difference in the rate of reaction between Experiment II and Experiment III.

*Terangkan dengan menggunakan teori perlanggaran perbezaan kadar tindak balas antara Eksperimen II dan Eksperimen III.*

[5 marks]

- (b) Referring to Table 10, describe a laboratory experiment using one of the factor that affecting the rate of reaction between sodium thiosulphate solution and hydrochloric acid. In your description, include an experiment procedure, observation and an ionic equation.

*Merujuk kepada Jadual 10, huraikan satu eksperimen yang menggunakan salah satu faktor yang mempengaruhi kadar tindak balas di antara larutan natrium thiosulfat dengan larutan asid hidroklorik. Dalam huraian anda, sertakan kaedah eksperimen, pemerhatian dan persamaan ion.*

[10 marks]

**END OF QUESTION PAPER**

**KERTAS SOALAN TAMAT**

## THE PERIODIC TABLE OF ELEMENTS

|                                    |                                    |                                     |                                    |                                        |                                     |                                      |                                     |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       |                                  |                                |
|------------------------------------|------------------------------------|-------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|---------------------------------------|----------------------------------|--------------------------------|
| 1<br><b>H</b><br>Hydrogen<br>1     |                                    |                                     |                                    |                                        |                                     |                                      |                                     |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       |                                  | 2<br><b>He</b><br>Helium<br>4  |
| 3<br><b>Li</b><br>Lithium<br>7     | 4<br><b>Be</b><br>Beryllium<br>9   |                                     |                                    |                                        |                                     |                                      |                                     |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       |                                  | 10<br><b>Ne</b><br>Neon<br>20  |
| 11<br><b>Na</b><br>Sodium<br>23    | 12<br><b>Mg</b><br>Magnesium<br>24 |                                     |                                    |                                        |                                     |                                      |                                     |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       |                                  | 18<br><b>Ar</b><br>Argon<br>40 |
| 19<br><b>K</b><br>Potassium<br>39  | 20<br><b>Ca</b><br>Calcium<br>40   | 21<br><b>Sc</b><br>Scandium<br>45   | 22<br><b>Ti</b><br>Titanium<br>48  | 23<br><b>V</b><br>Vanadium<br>51       | 24<br><b>Cr</b><br>Chromium<br>52   | 25<br><b>Mn</b><br>Manganese<br>55   | 26<br><b>Fe</b><br>Iron<br>56       | 27<br><b>Co</b><br>Cobalt<br>59     | 28<br><b>Ni</b><br>Nickel<br>59      | 29<br><b>Cu</b><br>Copper<br>64     | 30<br><b>Zn</b><br>Zinc<br>65         | 31<br><b>Ga</b><br>Gallium<br>70      | 32<br><b>Ge</b><br>Germanium<br>73 | 33<br><b>As</b><br>Arsenic<br>75       | 34<br><b>Se</b><br>Selenium<br>79   | 35<br><b>Br</b><br>Bromine<br>80      | 36<br><b>Kr</b><br>Krypton<br>84 |                                |
| 37<br><b>Rb</b><br>Rubidium<br>86  | 38<br><b>Sr</b><br>Strontium<br>88 | 39<br><b>Y</b><br>Yttrium<br>89     | 40<br><b>Zr</b><br>Zirconium<br>91 | 41<br><b>Nb</b><br>Niobium<br>93       | 42<br><b>Mo</b><br>Molybdenum<br>96 | 43<br><b>Tc</b><br>Technetium<br>98  | 44<br><b>Ru</b><br>Ruthenium<br>101 | 45<br><b>Rh</b><br>Rhodium<br>103   | 46<br><b>Pd</b><br>Palladium<br>106  | 47<br><b>Ag</b><br>Silver<br>108    | 48<br><b>Cd</b><br>Cadmium<br>112     | 49<br><b>In</b><br>Indium<br>115      | 50<br><b>Sn</b><br>Tin<br>119      | 51<br><b>Sb</b><br>Antimony<br>122     | 52<br><b>Te</b><br>Tellurium<br>128 | 53<br><b>I</b><br>Iodine<br>127       | 54<br><b>Xe</b><br>Xenon<br>131  |                                |
| 55<br><b>Cs</b><br>Cesium<br>133   | 56<br><b>Ba</b><br>Barium<br>137   | 57<br><b>La</b><br>Lanthanum<br>139 | 58<br><b>Ce</b><br>Cerium<br>140   | 59<br><b>Pr</b><br>Praseodymium<br>141 | 60<br><b>Nd</b><br>Neodymium<br>144 | 61<br><b>Pm</b><br>Promethium<br>147 | 62<br><b>Sm</b><br>Samarium<br>150  | 63<br><b>Eu</b><br>Europium<br>152  | 64<br><b>Gd</b><br>Gadolinium<br>157 | 65<br><b>Tb</b><br>Terbium<br>159   | 66<br><b>Dy</b><br>Dysprosium<br>163  | 67<br><b>Ho</b><br>Holmium<br>165     | 68<br><b>Er</b><br>Erbium<br>167   | 69<br><b>Tm</b><br>Thulium<br>169      | 70<br><b>Yb</b><br>Ytterbium<br>173 | 71<br><b>Lu</b><br>Lutetium<br>175    |                                  |                                |
| 87<br><b>Fr</b><br>Francium<br>223 | 88<br><b>Ra</b><br>Radium<br>226   | 89<br><b>Ac</b><br>Actinium<br>227  | 90<br><b>Th</b><br>Thorium<br>232  | 91<br><b>Pa</b><br>Protactinium<br>231 | 92<br><b>U</b><br>Uranium<br>238    | 93<br><b>Np</b><br>Neptunium<br>237  | 94<br><b>Pu</b><br>Plutonium<br>244 | 95<br><b>Am</b><br>Americium<br>243 | 96<br><b>Cm</b><br>Curium<br>247     | 97<br><b>Bk</b><br>Berkelium<br>247 | 98<br><b>Cf</b><br>Californium<br>249 | 99<br><b>Es</b><br>Einsteinium<br>254 | 100<br><b>Fm</b><br>Fermium<br>253 | 101<br><b>Md</b><br>Mendelevium<br>256 | 102<br><b>No</b><br>Nobelium<br>254 | 103<br><b>Lr</b><br>Lawrencium<br>257 |                                  |                                |

10  
**Ne**  
Neon  
20

Proton number

Symbol

Name of element

Relative atomic mass

|                                    |                                    |                                    |                                     |                                    |                                  |
|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|------------------------------------|----------------------------------|
| 5<br><b>B</b><br>Boron<br>11       | 6<br><b>C</b><br>Carbon<br>12      | 7<br><b>N</b><br>Nitrogen<br>14    | 8<br><b>O</b><br>Oxygen<br>16       | 9<br><b>F</b><br>Flourine<br>19    | 10<br><b>Ne</b><br>Neon<br>20    |
| 13<br><b>Al</b><br>Aluminium<br>27 | 14<br><b>Si</b><br>Silicon<br>28   | 15<br><b>P</b><br>Phosphorus<br>31 | 16<br><b>S</b><br>Sulfur<br>32      | 17<br><b>Cl</b><br>Chlorine<br>35  | 18<br><b>Ar</b><br>Argon<br>40   |
| 31<br><b>Ga</b><br>Gallium<br>70   | 32<br><b>Ge</b><br>Germanium<br>73 | 33<br><b>As</b><br>Arsenic<br>75   | 34<br><b>Se</b><br>Selenium<br>79   | 35<br><b>Br</b><br>Bromine<br>80   | 36<br><b>Kr</b><br>Krypton<br>84 |
| 48<br><b>In</b><br>Indium<br>115   | 49<br><b>Sn</b><br>Tin<br>119      | 50<br><b>Sb</b><br>Antimony<br>122 | 51<br><b>Te</b><br>Tellurium<br>128 | 52<br><b>I</b><br>Iodine<br>127    | 53<br><b>Xe</b><br>Xenon<br>131  |
| 81<br><b>Tl</b><br>Thallium<br>204 | 82<br><b>Pb</b><br>Lead<br>207     | 83<br><b>Bi</b><br>Bismuth<br>209  | 84<br><b>Po</b><br>Polonium<br>210  | 85<br><b>At</b><br>Astatine<br>210 | 86<br><b>Rn</b><br>Radon<br>222  |

|                                   |                                        |                                     |                                      |                                     |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       |
|-----------------------------------|----------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|---------------------------------------|
| 58<br><b>Ce</b><br>Cerium<br>140  | 59<br><b>Pr</b><br>Praseodymium<br>141 | 60<br><b>Nd</b><br>Neodymium<br>144 | 61<br><b>Pm</b><br>Promethium<br>147 | 62<br><b>Sm</b><br>Samarium<br>150  | 63<br><b>Eu</b><br>Europium<br>152  | 64<br><b>Gd</b><br>Gadolinium<br>157 | 65<br><b>Tb</b><br>Terbium<br>159   | 66<br><b>Dy</b><br>Dysprosium<br>163  | 67<br><b>Ho</b><br>Holmium<br>165     | 68<br><b>Er</b><br>Erbium<br>167   | 69<br><b>Tm</b><br>Thulium<br>169      | 70<br><b>Yb</b><br>Ytterbium<br>173 | 71<br><b>Lu</b><br>Lutetium<br>175    |
| 90<br><b>Th</b><br>Thorium<br>232 | 91<br><b>Pa</b><br>Protactinium<br>231 | 92<br><b>U</b><br>Uranium<br>238    | 93<br><b>Np</b><br>Neptunium<br>237  | 94<br><b>Pu</b><br>Plutonium<br>244 | 95<br><b>Am</b><br>Americium<br>243 | 96<br><b>Cm</b><br>Curium<br>247     | 97<br><b>Bk</b><br>Berkelium<br>247 | 98<br><b>Cf</b><br>Californium<br>249 | 99<br><b>Es</b><br>Einsteinium<br>254 | 100<br><b>Fm</b><br>Fermium<br>253 | 101<br><b>Md</b><br>Mendelevium<br>256 | 102<br><b>No</b><br>Nobelium<br>254 | 103<br><b>Lr</b><br>Lawrencium<br>257 |

|                               |               |        |                 |                      |
|-------------------------------|---------------|--------|-----------------|----------------------|
| 10<br><b>Ne</b><br>Neon<br>20 | Proton number | Symbol | Name of element | Relative atomic mass |
|-------------------------------|---------------|--------|-----------------|----------------------|

Reference: Chang, Raymond (1991). Chemistry, McGraw-Hill, Inc.

**INFORMATION FOR CANDIDATES**  
**MAKLUMAT UNTUK CALON**

1. This question paper consists of three sections: **Sections A**, **Section B** and **Section C**.  
*Kertas soalan ini mengandungi tiga bahagian: **Bahagian A**, **Bahagian B** dan **Bahagian C**.*
2. Answer **all** questions in **Section A**. Write your answers for **Section A** in the spaces provided in the question paper.  
*Jawab **semua** soalan dalam **Bahagian A**. Jawapan anda bagi **Bahagian A** hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan*
3. Answer any **one** question from **Section B** and any **one** question from **Section C**.  
 Write your answers for **Section B** and **Section C** on the 'helaian tambahan' provided by the invigilators.  
 You may use equations, diagrams, tables, graphs and other suitable methods to explain your answers.  
*Jawab mana-mana **satu** soalan daripada **Bahagian B** dan mana-mana **satu** soalan daripada **Bahagian C**. Tulis jawapan anda bagi **Bahagian B** dan **Bahagian C** dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan.  
 Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda*
4. The diagrams in the questions are not drawn to scale unless stated  
*Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan*
5. Marks allocated for each question or part question are shown in brackets.  
*Markah yang diperuntukkan bagi setiap soalan atau ceraihan soalan ditunjukkan dalam kurungan*
6. Show your working. It may help you to get marks.  
*Tunjukkan kerja mengira. Ini membantu anda mendapatkan markah.*
7. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.  
*Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.*
8. The Periodic Table of Elements is provided  
*Jadual Berkala Unsur disediakan*
9. You may use a non-programmable scientific calculator.  
*Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan.*
10. You are advised to spend 90 minutes to answer questions in **Section A**, 30 minutes for **Section B** and 30 minutes for **Section C**.  
*Anda dinasihatkan supaya mengambil masa 90 minit untuk menjawab soalan dalam **Bahagian A** ialah 90 minit, 30 minit untuk **Bahagian B** dan 30 minit untuk **Bahagian C**.*
11. Hand in your answer sheets at the end of the examination.  
*Serahkan semua kertas jawapan anda di akhir peperiksaan*

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

4541/3  
CHEMISTRY  
Kertas 3  
Ogos  
2010  
1 ½ jam



BAHAGIAN PENGURUSAN  
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER  
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN  
SIJIL PELAJARAN MALAYSIA 2010

CHEMISTRY  
Kertas 3

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tuliskan nama dan tingkatan pada ruang yang disediakan.
2. Calon dikehendaki membaca maklumat di halaman 2.

| Untuk Kegunaan Pemeriksa |              |                  |
|--------------------------|--------------|------------------|
| Soalan                   | Markah Penuh | Markah Diperoleh |
| 1                        | 21           |                  |
| 2                        | 12           |                  |
| 3                        | 17           |                  |
| JUMLAH                   | 50           |                  |

Kertas soalan ini mengandungi 9 halaman bercetak

### INFORMATION FOR CANDIDATES

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. *Show your working. It may help you to get marks.*
4. *If you wish to cancel any answer, neatly cross out the answer.*
5. *The diagrams in the questions are not drawn to scale unless stated.*
6. *Marks allocated for each question or part question are shown in brackets.*
7. *The time suggested to answer **Question 1** and **Question 2** is **45 minutes** and **Question 3** is **45 minutes**.*
8. *You may use a non-programmable scientific calculator.*
9. *Hand in this question paper 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 <u>or</u> wrong response |

1. Diagram 1.1 shows **three** sets, Set I, Set II and Set III, of the apparatus set-up for an experiment to compare the reactivity of alkali metals towards oxygen.

Rajah 1.1 menunjukkan **tiga** set, Set I, Set II, dan Set III, susunan radas bagi satu eksperimen untuk membandingkan reaktiviti logam alkali terhadap oksigen.

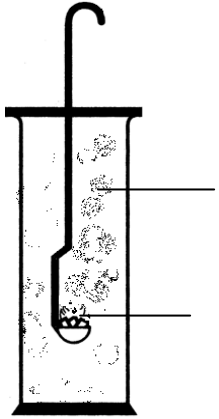
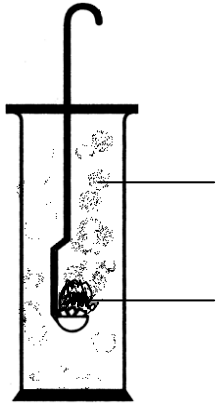
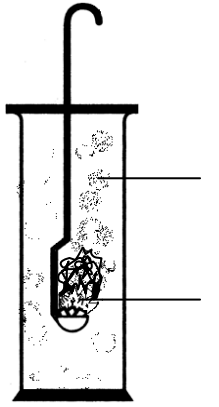
| Set | Set-up of apparatus                                                                                                                               | Observation                                                                                                                          |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| I   |  <p>White fumes<br/>Wasap putih</p> <p>Lithium<br/>Litium</p>    | <p>Lithium burns slowly and produces white fumes</p> <p><i>Litium terbakar dengan perlahan dan menghasilkan wasap putih</i></p>      |
| II  |  <p>White fumes<br/>Wasap putih</p> <p>Sodium<br/>Natrium</p>   | <p>Sodium burns vigorously and produces whites fumes.</p> <p><i>Natrium terbakar dengan cergas dan menghasilkan wasap putih.</i></p> |
| III |  <p>White fumes<br/>Wasap putih</p> <p>Metal X<br/>Logam X</p> |                                                                                                                                      |

Diagram 1.1  
Rajah 1.1

- (a) State **one** hypothesis for this experiment.  
*Nyatakan **satu** hipotesis bagi eksperimen ini.*

.....

.....

.....

[3 marks]  
[3 markah]

- (b) Record the observation for Set III in Diagram 1.1.  
*Rekodkan pemerhatian bagi Set III dalam Rajah 1.1.*

[3 marks]  
[3 markah]

- (c) Construct a table to record the observations for Set I, Set II and Set III.  
*Bina satu jadual untuk merekodkan pemerhatian bagi Set I, Set II dan Set III.*

[3 marks]  
[3 markah]

- (d) Based on the observation in Set III, predict metal X.  
*Berdasarkan pemerhatian dalam Set III, ramalkan logam X.*

.....

[3 marks]  
[3 markah]

- (e) Diagram 1.2 shows the pH meter readings when the metal oxides formed in Set I, Set II and Set III were dissolved in water.

*Rajah 1.2 menunjukkan bacaan meter pH apabila oksida logam yang terbentuk dalam Set I, Set II dan Set III dilarutkan dalam air.*

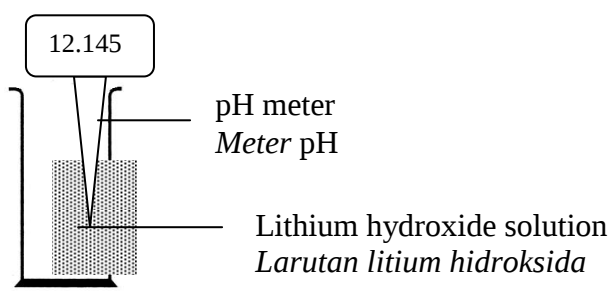
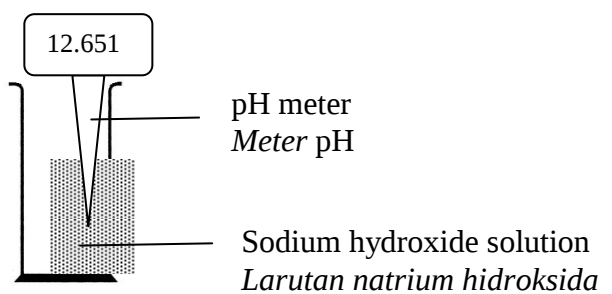
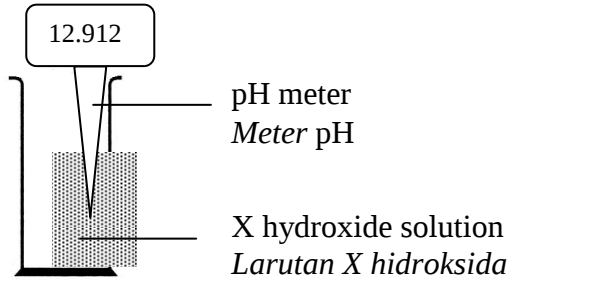
| Set<br>Set | Set-up of apparatus<br><i>Susunan Radas</i>                                          |
|------------|--------------------------------------------------------------------------------------|
| I          |    |
| II         |   |
| III        |  |

Diagram 1.2  
*Rajah 1.2*

- (f) Record the pH value to one decimal place for Set I, Set II and Set III.  
*Rekodkan nilai pH pada satu tempat perpuluhan bagi Set I, Set II dan Set III.*

Set I: .....

Set II: .....

Set III: .....

[3 marks]

- (g) Based on Diagram 1.2, complete the table below.  
 Berdasarkan Rajah 1.2, lengkapkan jadual di bawah.

|                                                                                                       |                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Manipulated variable:<br><i>Pemboleh ubah dimanipulasikan:</i><br><br>.....<br><br>.....<br><br>..... | Method to manipulate the variable:<br><i>Kaedah memanipulasikan pemboleh ubah:</i><br><br>.....<br><br>.....<br><br>.....           |
| Responding variable:<br><i>Pemboleh ubah bergerak balas:</i><br><br>.....<br><br>.....<br><br>.....   | How the variable is responding:<br><i>Bagaimana pemboleh ubah ini bergerak balas:</i><br><br>.....<br><br>.....<br><br>.....        |
| Fixed variable:<br><i>Pemboleh ubah yang dimalarkan:</i><br><br>.....<br><br>.....<br><br>.....       | Method to maintain the fixed variable:<br><i>Kaedah menetapkan pemboleh ubah dimalarkan:</i><br><br>.....<br><br>.....<br><br>..... |

[6 marks]

[6 markah]

2. Table 1 shows the set-up of apparatus and the observations of an experiment to investigate the effect of metal on rusting of iron, when it is in contact with other metals. Potassium hexacyanoferrate (III) is used to test the presence of iron (II) ion in the solution and change the colour to dark blue, while the phenolphthalein is to test the presence of hydroxide ion and the colour change to pink

*Jadual 1 menunjukkan susunan radas dan pemerhatian bagi eksperimen untuk mengkaji kesan logam lain terhadap pengaratn besi apabila bersentuh dengan logam lain. Kalium heksasianoferrat(III) digunakan untuk mengesan kehadiran ion ferum(II) dalam larutan dan warna berubah menjadi biru gelap, manakala fenolftalein mengesan kehadiran ion hidroksida dan warna menjadi merah jambu.*

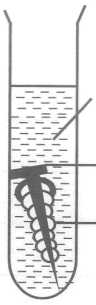
| Test Tube<br><i>Tabung uji</i> | Set-up of apparatus<br><i>Susunan radas</i>                                                                                                                                                                                                   | Observations<br><i>Pemerhatian</i>              |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| A                              |  <p>Gelatin containing potassium hexacyanoferrate (III) and phenolphthalein</p> <p>Iron nail<br/><i>Paku besi</i></p> <p>Magnesium<br/><i>Magnesium</i></p> | Pink colouration<br><i>Warna merah jambu</i>    |
| B                              |  <p>Gelatin containing potassium hexacyanoferrate (III) and phenolphthalein</p> <p>Iron nail<br/><i>Paku besi</i></p> <p>Copper<br/><i>Kuprum</i></p>      | Dark blue coloration<br><i>Warna biru gelap</i> |

Table 1  
*Jadual 1*

- (a) State **one** inference for this experiment.  
*Nyatakan **satu** inferens bagi eksperimen ini.*

.....

.....

[3 marks]  
[3 markah]

- (b) State the operational definition for the rusting of iron.

*Nyatakan definisi secara operasi bagi pengkaratan besi.*

.....

.....

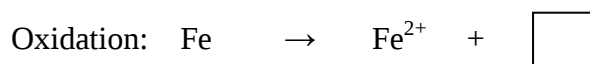
.....

[3 marks]

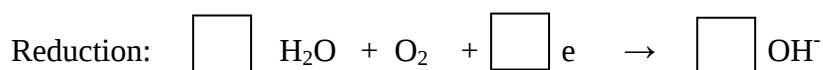
[3 markah]

- (c) Complete the following half-equations for oxidation and reduction processes that occur in this experiment.

*Lengkapkan persamaan setengah bagi proses pengoksidaan dan penurunan yang berlaku dalam eksperimen ini.*



*Pengoksidaan:*



*Penurunan:*

[3 marks]

[3 markah]

- (d) The following is the list of metals that can be used to coil the iron nail.

Zinc

*Zink*

Tin

*Stanum*

Silver

*Argentum*

Aluminium

*Aluminium*

Classify these metals into metals that can make iron nail to rust and metals that prevent iron nail to rust.

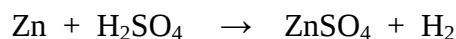
*Kelaskan logam-logam ini kepada logam yang boleh menyebabkan paku besi berkarat dan logam yang menghalang paku besi berkarat.*

[3 marks]

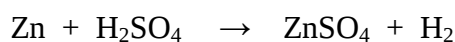
[3 markah]

3.

The reaction between zinc and sulphuric acid will produce zinc sulphate and hydrogen gas. The chemical equation for the reaction is shown below:



*Tindak balas antara zink dan asid sulfuric menghasilkan zink sulfat dan gas hydrogen. Persamaan kimia bagi tindak balas adalah seperti berikut:*



Referring to the information above, plan a laboratory experiment to investigate the effect of size of zinc on the rate of reaction.

Your planning should include the following aspects:

*Merujuk kepada maklumat di atas, rancang satu eksperimen makmal untuk menentukan kesan saiz zink ke atas kadar tindak balas.*

*Perancangan anda hendaklah mengandungi aspek-aspek berikut:*

- (a) Problem statement  
*Pernyataan masalah*
- (b) Hypothesis  
*Hipotesis*
- (c) All the variables  
*Semua pemboleh ubah*
- (d) List of materials and apparatus  
*Senarai bahan dan radas*
- (e) Procedure  
*Prosedur*
- (f) Tabulation of data  
*Penjadualan data*

[17 marks]

[17 markah]

**END OF QUESTION PAPER**  
**KERTAS SOALAN TAMAT**

Peraturan Permarkahan  
CHEMISTRY 4541  
Kertas 1,2 dan 3  
Ogos  
2010



**BAHAGIAN PENGURUSAN  
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KLUSTER  
KEMENTERIAN PELAJARAN MALAYSIA**

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**PERATURAN PERMARKAHAN**

**PEPERIKSAAN PERCUBAAN  
SIJIL PELAJARAN MALAYSIA 2010**

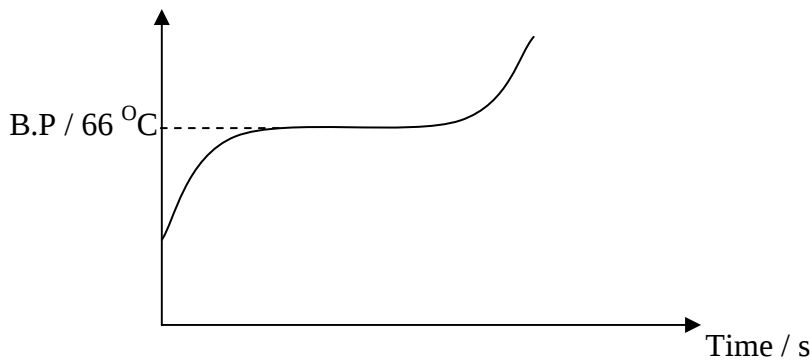
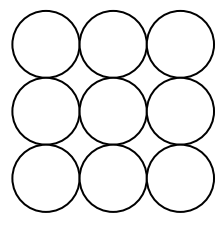
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**CHEMISTRY  
TRIAL-EXAM  
SPM 2010  
MARKING SCHEME  
PAPER 1  
PAPER 2  
PAPER 3**

**SKEMA KERTAS 1**  
**CHEMISTRY 4541/1**

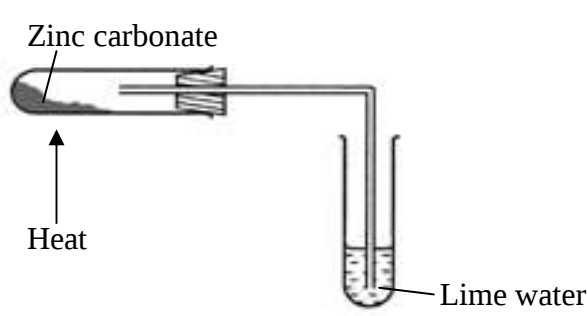
|    |   |    |   |
|----|---|----|---|
| 1  | C | 26 | C |
| 2  | A | 27 | B |
| 3  | A | 28 | D |
| 4  | B | 29 | C |
| 5  | C | 30 | B |
| 6  | B | 31 | D |
| 7  | A | 32 | C |
| 8  | C | 33 | D |
| 9  | D | 34 | C |
| 10 | C | 35 | B |
| 11 | A | 36 | C |
| 12 | A | 37 | C |
| 13 | C | 38 | D |
| 14 | A | 39 | A |
| 15 | D | 40 | D |
| 16 | C | 41 | C |
| 17 | A | 42 | D |
| 18 | D | 43 | C |
| 19 | D | 44 | B |
| 20 | B | 45 | C |
| 21 | C | 46 | A |
| 22 | B | 47 | A |
| 23 | B | 48 | A |
| 24 | B | 49 | B |
| 25 | D | 50 | C |

## MARKING SCHEME FOR CHEMISTRY PAPER 2

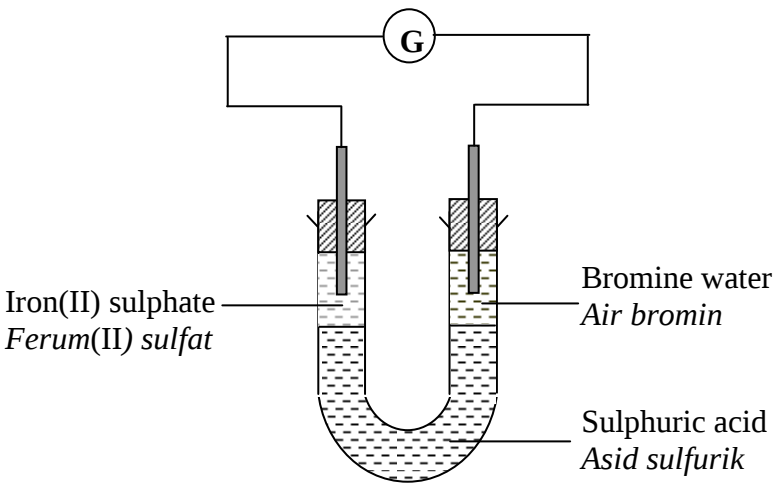
| No      | Rubric                                                                                                                                                                                              | Mark |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(a)(i) | Gas                                                                                                                                                                                                 | 1    |
| (ii)    | The melting point and boiling point of substance X is lower than room temperature                                                                                                                   | 1    |
| (b)(i)  | 1. - X and Y axes are labelled and have unit<br>- correct curve                                                                                                                                     | 1    |
|         | 2. Boiling point / $66^{\circ}\text{C}$ is marked on the graph.                                                                                                                                     | 1    |
|         | <p>Temperature / <math>^{\circ}\text{C}</math></p>  <p>B.P / <math>66^{\circ}\text{C}</math></p> <p>Time / s</p> |      |
| (ii)    | Liquid and gas                                                                                                                                                                                      | 1    |
| (c)     | 1. The attraction force between particle in Z is stronger than Y                                                                                                                                    | 1    |
|         | 2. More heat energy is needed to overcome the attraction force between the particle                                                                                                                 | 1    |
| (d)     | Melting point is the temperature at which solid change into liquid                                                                                                                                  | 1    |
| (e)     |                                                                                                                  | 1    |
|         | TOTAL                                                                                                                                                                                               | 9    |

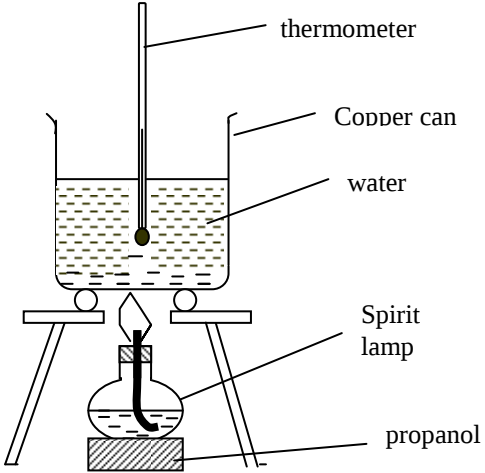
| No      | Rubric                                                                                                                                                                                                                                                                          | Mark       |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 2(a)(i) | Contact process                                                                                                                                                                                                                                                                 | 1          |
| (ii)    | sulphuric acid                                                                                                                                                                                                                                                                  | 1          |
| (iii)   | 1. Formula of reactant and product correct<br>2. Balanced<br>$2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$                                                                                                                                                               | 1<br>1     |
| (b)(i)  | 1. Sulphonation<br>2. Neutralisation                                                                                                                                                                                                                                            | 1<br>1     |
| (ii)    | $\begin{array}{c} \text{O} \\    \\ \text{CH}_3(\text{CH}_2)_{11} - \text{O} - \text{S} - \text{O}^- \\    \\ \text{O} \end{array}$ <p style="text-align: center;"> <span style="margin-right: 100px;">⏟</span> <span>⏟</span><br/> hydrophobic part      hydrophilic part </p> | 1          |
| (iii)   | 1. Hard water contains calcium ions and magnesium ions<br><br>2. React with soap to form scum //<br>React with detergent to form soluble substance/ do not form scum                                                                                                            | 1<br><br>1 |
|         | TOTAL                                                                                                                                                                                                                                                                           | 9          |

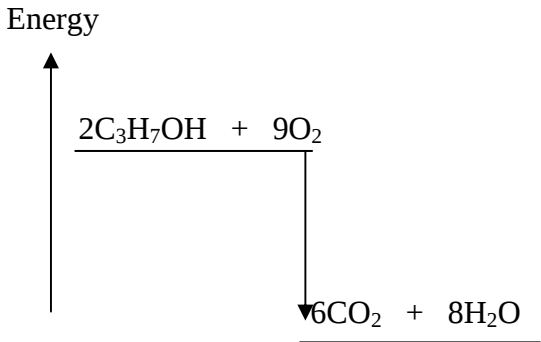
| No      | Rubric                                                                                                                                       | Mark        |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 3(a)(i) | Solvent P: Water<br>Solvent Q: methyl benzene / propanone / suitable organic solvent                                                         | 1<br>1      |
| (ii)    | Effervescence / gas released // magnesium ribbon dissolved                                                                                   | 1           |
| (iii)   | 1. Ethanoic acid is weak acid<br>2. Ethanoic acid dissociate / ionise partially in water<br>3. produce low concentration of $\text{H}^+$ ion | 1<br>1<br>1 |
| (b)(i)  | 1. pH value increase / bigger<br>2. The lower the concentration of acid the higher the pH value                                              | 1<br>1      |
| (ii)    | $(0.5)(V) = (0.04)(250) // \quad V = \frac{0.04 \times 250}{0.5}$ $V = 20 \text{ cm}^3$                                                      | 1           |
|         | TOTAL                                                                                                                                        | 10          |

| No     | Rubric                                                                                                                               | Mark        |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 4(a)   | Zinc sulphate / nitrate and sodium / potassium / ammonium carbonate // carbonic acid                                                 | 1<br>1      |
| (b)(i) | Zinc oxide                                                                                                                           | 1           |
| (ii)   | Yellow when hot, white when cold                                                                                                     | 1           |
| (iii)  | 1. Functional diagram<br>2. Label<br>               | 1<br>1      |
| (c)(i) | $\text{ZnO} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\text{O}$                                                            | 1           |
| (ii)   | 1. Heat the solution until saturated.<br>2. Cool the saturated solution.<br>3. Filter and dry by pressing between two filter papers. | 1<br>1<br>1 |
|        | TOTAL                                                                                                                                | 10          |

| No      | Rubric                                                                                                            | Mark   |
|---------|-------------------------------------------------------------------------------------------------------------------|--------|
| 5(a)(i) | Colourless solution of potassium bromide change to brown                                                          | 1      |
| (ii)    | Potassium bromide / bromide ion                                                                                   | 1      |
| (iii)   | 1. Correct formula of reactant and product<br>2. Balanced<br>$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$ | 1<br>1 |
| (b)     | Purple                                                                                                            | 1      |
| (c)     | 1. Chlorine water<br>2. Chlorine accept / receive electron                                                        | 1<br>1 |
| (d)     | 0 to -1                                                                                                           | 1      |
| (e)     | Acidified potassium manganate(VII) solution // any oxidising agent                                                | 1      |

|     |                                                                                                                           |        |
|-----|---------------------------------------------------------------------------------------------------------------------------|--------|
| (f) | 1. Functional apparatus<br>2. Label<br> | 1<br>1 |
|     | TOTAL                                                                                                                     | 11     |

| No     | Rubric                                                                                                                                                     | Mark   |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 6(a)   | 1. Functional apparatus<br>2. Label<br>                                | 1<br>1 |
| (b)    | 1. Correct formula of reactant and product<br>2. Balanced<br>$2\text{C}_3\text{H}_7\text{OH} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 8\text{H}_2\text{O}$ | 1<br>1 |
| (c)(i) | Heat release = $200 \times 4.2 \times 31 = 26040 \text{ J}$                                                                                                | 1      |

|       |                                                                                                                                                                                                                |        |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| (ii)  | Mole = $\frac{0.84}{0.060}$ // 0.014                                                                                                                                                                           | 1      |
| (iii) | $\Delta H = \frac{26040}{0.014}$<br>= - 1860 kJmol <sup>-1</sup>                                                                                                                                               | 1<br>1 |
| (iv)  | 1. arrow upward with energy label and two level<br>2. exothermic reaction and correct formula of reactant and product<br><br> | 1<br>1 |
| (d)   | Use wind shield // weight the spirit lamp right after the flame is put off // stir the water continuously                                                                                                      | 1      |
| TOTAL |                                                                                                                                                                                                                | 11     |

| Num.    | Answer                                                                                                                                                                                                                                                                                                                                                                                                                               | Mark                                           | Total Mark |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------|
| 7(a)(i) | 1. Electron arrangement 2.8.2<br><br>2. Group 2<br><br>3. Period 3                                                                                                                                                                                                                                                                                                                                                                   | 1<br><br>1<br><br>1                            | 3          |
| (a)(ii) | 1. Correct formula of reactants<br><br>2. Correct formula of product<br>$X + Y_2 \rightarrow XY_2$ 3. Electron arrangement of atom Y is 2.8.7<br>4. Atom X loses two electron to form X <sup>2+</sup> ion<br>5. Atom Y gains one electron to form Y <sup>-</sup> ion<br>6. to achieve octec electron arrangement<br>7. X <sup>2+</sup> ion and Y <sup>-</sup> ion attracted to each other by strong electrostatic force / ionic bond | 1<br><br>1<br><br>1<br><br>1<br><br>1<br><br>1 | 7          |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                        |    |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----|
| (b) | 1. Lead(II) bromide cannot conduct electricity in the solid state<br>2. Ions do not move freely<br>3. Lead(II) bromide can conduct electricity in molten state<br>4. Ions can move freely<br>5. Naphthalene cannot conduct electricity in solid and molten state<br>6. No free moving ions // exist as molecules<br><u>Catode</u><br>7. Formula of reactants and product correct<br>8. Balanced<br>$\text{Pb}^{2+} + 2\text{e} \rightarrow \text{Pb}$ <u>Anode</u><br>9. Formula of reactant and products correct<br>10. Balanced<br>$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}$ | 1<br>1<br>1<br>1<br>1<br>1<br><br>1<br>1<br><br>1<br>1 | 10 |
|     | TOTAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                        | 20 |

| Num. | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mark                                   | Total Mark |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------|
| 8(a) | <u>Compound X</u><br>$\begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{H} & \\ &   & &   & &   & \\ \text{H} & - \text{C} & = & \text{C} & - & \text{C} & - \text{H} \\ & & & & &   & \\ & & & & & \text{H} & \end{array}$ Propene<br><br><u>Compound Y</u><br>$\begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{O} & \\ &   & &   & & // & \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & \\ &   & &   & & \backslash & \\ & \text{H} & & \text{H} & & \text{OH} & \end{array}$ Propanoic acid | 1 + 1<br><br><br><br><br><br><br>1 + 1 |            |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |    |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----|
|     | <p><u>Compound Z</u></p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;"> <math display="block">  \begin{array}{c}  \text{H} \\    \\  \text{H} - \text{C} - \text{C} \begin{array}{l} \nearrow \text{O} \\ \searrow \text{O} \end{array} \\    \\  \text{H}  \end{array}  </math> </div> <div style="margin: 0 10px;"> <math>\text{O} - \text{C} - \text{C} - \text{C} - \text{H}</math> </div> <div style="text-align: center;"> <math display="block">  \begin{array}{ccc}  \text{H} &amp; \text{H} &amp; \text{H} \\    &amp;   &amp;   \\  \text{H} &amp; \text{H} &amp; \text{H}  \end{array}  </math> </div> <div style="margin-left: 20px;">           Propyl ethanoate         </div> </div> | 1 + 1            | 6  |
| (b) | 1. Dehydration reaction<br>2. Add bromine // potassium manganate (VII) solution<br>3. Brown colour of bromine decolourised // purple colour of $\text{KMnO}_4$ change to colourless                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1<br>1<br>1      | 3  |
| (c) | 1. Correct formula of reactant<br>2. Correct formula of product<br>$\text{C}_3\text{H}_6 + \text{H}_2\text{O} \rightarrow \text{C}_3\text{H}_7\text{OH}$ 3. Condition needed for the reaction: <ul style="list-style-type: none"> <li>- Phosphoric acid</li> <li>- Temperature <math>300^\circ\text{C}</math></li> <li>- Pressure 60 atm</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                               | 1<br>1<br>1      | 3  |
| (d) | 1. Pour $2\text{ cm}^3$ of glacial ethanoic acid in a boiling tube<br>2. Add $2\text{ cm}^3$ of propan-1-ol to the acid<br>3. Slowly and carefully add concentrated sulphuric acid<br>4. Heat the mixture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1<br>1<br>1<br>1 | 4  |
| (e) | 1. Functional group : carboxyl group / - COOH<br>2. General formula: $\text{C}_n\text{H}_{2n+1}\text{COOH}$<br>3. Correct formula of reactant and product<br>4. Balanced<br>$2\text{C}_2\text{H}_5\text{COOH} + \text{CaCO}_3 \rightarrow \text{Ca}(\text{C}_2\text{H}_5\text{COO})_2 + \text{CO}_2 + \text{H}_2\text{O}$                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1<br>1<br>1<br>1 | 4  |
|     | TOTAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  | 20 |

| Num.    | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mark                                                                             | Total Mark |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------|
| 9(a)(i) | <p>1. Clean the metals with sand paper.</p> <p>2. Pour copper(II) sulphate solution / any suitable electrolyte into a beaker.</p> <p>3. Dip a pair of Q and R strips into the beaker.</p> <p>4. Connect the metals by using connecting wires to a voltmeter.</p> <p>5. Record the voltmeter reading</p> <p>6. Determine the negative terminal of the cell.</p> <p>7. Repeat steps 1 – 6 by replacing the pair of Q and R strips with other pairs of metals as shown in the table.</p> <p>8. The negative terminal metal located higher than the other metal in the electrochemical series //</p> <p>Q is placed higher than R, R is placed higher than S and P is placed higher than S in the electrochemical series</p> <p>9. Pair of metals which produced the biggest potential difference located the furthest in electrochemical series //</p> <p>P and S has the biggest potential difference indicate the pair of metal located furthest apart in the Electrochemical series.</p> <p>10 <math>\xrightarrow{\text{P, Q, R, S}}</math><br/>Electropositivity decrease</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> | 10         |
| (a)(ii) | <p>1. Value of <math>x = 1.6 \text{ V}</math></p> <p>2. <math>y = \text{P}</math></p> <p>3. P is magnesium / metals that is higher than zinc in electrochemical series</p> <p>4. P / Mg is more electropositive than Q / Zn //</p> <p>P / Mg is higher than Q / Zn in electrochemical series</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>1</p> <p>1</p> <p>1</p> <p>1</p>                                              | 4          |
| (b)     | <p><u><math>1.0 \text{ mol dm}^{-3}</math> sodium chloride</u></p> <p>1. Chloride / <math>\text{Cl}^-</math> ions discharged at the anode</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>1</p>                                                                         |            |



|                                                                                                                                                                      |   |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|
| 2. The initial temperature of the solution is recorded                                                                                                               | 1 |    |
| 3. The conical flask is placed on top of white paper with mark 'X' at the centre                                                                                     | 1 |    |
| 4. 5cm <sup>3</sup> of 0.2mol dm <sup>-3</sup> hydrochloric acid is poured quickly into conical flask                                                                | 1 |    |
| 5. The stopwatch is started immediately                                                                                                                              | 1 |    |
| 6. The conical flask is swirled                                                                                                                                      | 1 |    |
| 7. The stopwatch is stopped immediately once the mark 'X' disappeared from sight and the time is recorded                                                            | 1 |    |
| 8. The experiment is repeated using 50cm <sup>3</sup> of 0.2mol dm <sup>-3</sup> sodium thiosulphate solution using different temperature, 35°C, 40°C, 45°C and 50°C | 1 |    |
| Observation:                                                                                                                                                         |   |    |
| 9. Yellow precipitate                                                                                                                                                | 1 |    |
| Ionic equation:                                                                                                                                                      |   |    |
| 10. $2\text{H}^+ + \text{S}_2\text{O}_3^{2-} \longrightarrow \text{SO}_2 + \text{S} + \text{H}_2\text{O}$                                                            | 1 | 10 |
| <b><u>OR</u></b>                                                                                                                                                     |   |    |
| Concentration Factor [Experiment III]                                                                                                                                |   |    |
| Procedure:                                                                                                                                                           |   |    |
| 1. 50cm <sup>3</sup> of 0.2mol dm <sup>-3</sup> sodium thiosulphate <b>solution</b> is poured into conical flask                                                     |   |    |
| 2. The conical flask is placed on top of white paper with mark 'X' at the centre                                                                                     |   |    |
| 3. 5cm <sup>3</sup> of 2.0 mol dm <sup>-3</sup> hydrochloric acid is poured quickly into conical flask                                                               |   |    |
| 4. The stopwatch is started immediately                                                                                                                              |   |    |
| 5. The conical flask is swirled                                                                                                                                      |   |    |
| 6. The stopwatch is stopped immediately once the mark 'X' disappeared from sight                                                                                     |   |    |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |    |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----|
|  | <p>7. The time required for mark 'X' disappeared from sight is recorded</p> <p>8. The experiment is repeated using different volume of <math>0.2\text{mol dm}^{-3}</math> sodium thiosulphate solution with different volume of distilled water</p> <p>Observation:</p> <p>9. Yellow precipitate</p> <p>Ionic equation:</p> <p>10. <math>2\text{H}^{+} + \text{S}_2\text{O}_3^{2-} \longrightarrow \text{SO}_2 + \text{S} + \text{H}_2\text{O}</math></p> |  |    |
|  | TOTAL                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  | 20 |

## Marking Scheme Paper 3

| Qn. No. | Marking Scheme                                                                                                                                                                                                                                                                                                                                                                                                             | Marks |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------|----|----------------------------------------------------|-----|-----------------------------------------------------|-----|-----------------------------------------------------|---|
| 1(a)    | Able to state the hypothesis accurately.<br>Sample answer.<br>Metal which is lower down in Group 1 is more reactive towards oxygen// X is more reactive than sodium and lithium towards oxygen.                                                                                                                                                                                                                            | 3     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Able to state the inference less accurately.<br>Sample answer.<br>Reactivity towards oxygen increases when going down Group 1<br>//Sodium is more reactive than lithium towards oxygen.                                                                                                                                                                                                                                    | 2     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Able to state the idea of inference.<br>Sample answer.<br>Metal can react with oxygen                                                                                                                                                                                                                                                                                                                                      | 1     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Wrong or no response                                                                                                                                                                                                                                                                                                                                                                                                       | 0     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| (b)     | Able to record the observation correctly.<br>Sample answer.<br>Metal X burns <b>more</b> vigorously and produces white fumes.                                                                                                                                                                                                                                                                                              | 3     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Able to record the observation less correctly.<br>Sample answer.<br>Metal X burns vigorously and produces white fumes.                                                                                                                                                                                                                                                                                                     | 2     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Able to state an idea of the observation.<br>Sample answer<br>Metal X burns in oxygen/produces white fumes.                                                                                                                                                                                                                                                                                                                | 1     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Wrong or no response                                                                                                                                                                                                                                                                                                                                                                                                       | 0     |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| (c)     | Able to construct a table with the following aspects correctly<br>1. Title<br>2. Observations<br><br>Sample answer:<br><table><tr><td>Set</td><td>Observations</td></tr><tr><td>I</td><td>Lithium burns slowly and produces white fumes.</td></tr><tr><td>II</td><td>Sodium burns vigorously and produces whites fumes.</td></tr><tr><td>III</td><td>Metal X burns vigorously and produces whites fumes.</td></tr></table> | Set   | Observations                                   | I  | Lithium burns slowly and produces white fumes.     | II  | Sodium burns vigorously and produces whites fumes.  | III | Metal X burns vigorously and produces whites fumes. | 3 |
| Set     | Observations                                                                                                                                                                                                                                                                                                                                                                                                               |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| I       | Lithium burns slowly and produces white fumes.                                                                                                                                                                                                                                                                                                                                                                             |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| II      | Sodium burns vigorously and produces whites fumes.                                                                                                                                                                                                                                                                                                                                                                         |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| III     | Metal X burns vigorously and produces whites fumes.                                                                                                                                                                                                                                                                                                                                                                        |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Able to construct a table less accurately<br>Sample answer:<br><table><tr><td>I</td><td>Lithium burns slowly and produces white fumes.</td></tr><tr><td>II</td><td>Sodium burns vigorously and produces whites fumes.</td></tr><tr><td>III</td><td>Metal X burns vigorously and produces whites fumes.</td></tr></table>                                                                                                   | I     | Lithium burns slowly and produces white fumes. | II | Sodium burns vigorously and produces whites fumes. | III | Metal X burns vigorously and produces whites fumes. | 2   |                                                     |   |
| I       | Lithium burns slowly and produces white fumes.                                                                                                                                                                                                                                                                                                                                                                             |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| II      | Sodium burns vigorously and produces whites fumes.                                                                                                                                                                                                                                                                                                                                                                         |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
| III     | Metal X burns vigorously and produces whites fumes.                                                                                                                                                                                                                                                                                                                                                                        |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         | Able to state an idea to construct a table.<br>Sample answer:<br><table><tr><td>Set</td><td>Observations</td></tr><tr><td></td><td></td></tr></table>                                                                                                                                                                                                                                                                      | Set   | Observations                                   |    |                                                    | 1   |                                                     |     |                                                     |   |
| Set     | Observations                                                                                                                                                                                                                                                                                                                                                                                                               |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                                |    |                                                    |     |                                                     |     |                                                     |   |

| Qn. No                                                                                                | Marking Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Marks                                                                                                 |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------|---|
| 1(d)                                                                                                  | Able to predict metal X accurately.<br>Potassium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to predict metal X less accurately<br>Rubidium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to give an idea to predict metal X.<br>Francium//Caesium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Wrong or no response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                       |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
| 1(e)                                                                                                  | Able to record the pH meter readings to one decimal place.<br>Set I: 12.1<br>Set II: 12.7<br>Set III: 12.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to record the pH meter readings <b>or</b> at least 2 pH readings accurately.<br>Set I: 12.145<br>Set II: 12.651<br>Set III: 12.912                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to record at least 2 pH meter readings accurately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Wrong or no response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                       |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
| 1(f)                                                                                                  | Able to give six statements correctly.<br>Sample answers <table border="1"><tr><td>Manipulated variable:<br/>Types of solution//Lithium hydroxide, Sodium hydroxide, Potassium hydroxide.</td><td>Method to manipulate the variable:<br/>Use different solution for each reading/experiment</td></tr><tr><td>Responding variable:<br/>pH meter readings//pH values</td><td>How the variable is responding:<br/>pH meter shows different readings with different solutions.</td></tr><tr><td>Fixed variable:<br/>pH meter</td><td>Method to maintain the fixed variable:<br/>Use same pH meter for each solution.</td></tr></table> | Manipulated variable:<br>Types of solution//Lithium hydroxide, Sodium hydroxide, Potassium hydroxide. | Method to manipulate the variable:<br>Use different solution for each reading/experiment | Responding variable:<br>pH meter readings//pH values | How the variable is responding:<br>pH meter shows different readings with different solutions. | Fixed variable:<br>pH meter | Method to maintain the fixed variable:<br>Use same pH meter for each solution. | 6 |
| Manipulated variable:<br>Types of solution//Lithium hydroxide, Sodium hydroxide, Potassium hydroxide. | Method to manipulate the variable:<br>Use different solution for each reading/experiment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                       |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
| Responding variable:<br>pH meter readings//pH values                                                  | How the variable is responding:<br>pH meter shows different readings with different solutions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                       |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
| Fixed variable:<br>pH meter                                                                           | Method to maintain the fixed variable:<br>Use same pH meter for each solution.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                       |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to give five statements correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to give four statements correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to give three statements correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to give two statements correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Able to give one statement correctly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |
|                                                                                                       | Wrong or no response.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                     |                                                                                          |                                                      |                                                                                                |                             |                                                                                |   |

| Qn No. | Marking Scheme                                                                                                                                                                                                                                                                                                                        | Marks |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2(a)   | Able to state the inference correctly.<br>Sample answer:<br>Iron nail coiled with magnesium does not rust//Iron nail coiled with copper will rust                                                                                                                                                                                     | 3     |
|        | Able to state the inference less accurately.<br>Sample answer<br>Metals in contact with iron nail caused rusting                                                                                                                                                                                                                      | 2     |
|        | Able to state an idea of inference.<br>Iron nail rusts/does not rust.                                                                                                                                                                                                                                                                 | 1     |
|        | Wrong or no response.                                                                                                                                                                                                                                                                                                                 | 0     |
| 2(b)   | Able to give the operational definition of rusting correctly.<br>Sample answer.<br>When iron nail coiled with a less electropositive metal /copper is dipped in gelatine added with potassium hexacyanoferrate(III) and phenolphthalein, dark colouration formed.                                                                     | 3     |
|        | Able to give the operational definition of rusting less accurately.<br>Sample answer.<br>Iron nail coiled with a less electropositive metal/copper gives blue coloration//<br>When iron nail coiled with a less electropositive metal is dipped in gelatine added with potassium hexacyanoferrate(III) and phenolphthalein will rust. | 2     |
|        | Able to give an idea of operational definition of rusting.<br>Sample answer.<br>Iron nail coiled with copper undergoes rusting.                                                                                                                                                                                                       | 1     |
|        | Wrong or no response.                                                                                                                                                                                                                                                                                                                 | 0     |
|        |                                                                                                                                                                                                                                                                                                                                       |       |
| 2(c)   | Able to give all four correct answers<br>Oxidation: 2<br>Reduction: 2, 4, 4                                                                                                                                                                                                                                                           | 3     |
|        | Able to give three correct answers                                                                                                                                                                                                                                                                                                    | 2     |
|        | Able to give two correct answers                                                                                                                                                                                                                                                                                                      | 1     |
|        | Wrong or no response.                                                                                                                                                                                                                                                                                                                 | 0     |
|        |                                                                                                                                                                                                                                                                                                                                       |       |
| 2(d)   | Able to classify the four metals correctly.<br>Metals that make iron to rust: Zinc, Aluminium<br>Metals that do not make/prevent iron to rust: Tin, silver                                                                                                                                                                            | 3     |
|        | Able to classify three metals correctly                                                                                                                                                                                                                                                                                               | 2     |
|        | Able to classify correctly but wrong headings// Able to classify two metals correctly.                                                                                                                                                                                                                                                | 1     |
|        | Wrong or no response.                                                                                                                                                                                                                                                                                                                 | 0     |

| Qn. No. | Marking Scheme                                                                                                                                                                                                                                                                                      | Marks |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 3 (a)   | Able to state the problem statement correctly.<br>Sample answer<br>Does size of zinc affects the rate of reaction with sulphuric acid?                                                                                                                                                              | 3     |
|         | Able to state the problem statement less accurately.<br>Sample answer<br>Does size of zinc affects rate of reaction?// To investigate the effect of size of zinc on the rate of reaction with sulphuric acid.                                                                                       | 2     |
|         | Able to give an idea of problem statement.<br>Sample answer.<br>Size affects rate of reaction                                                                                                                                                                                                       | 1     |
|         |                                                                                                                                                                                                                                                                                                     |       |
|         |                                                                                                                                                                                                                                                                                                     |       |
| 3(b)    | Able to make a hypothesis correctly.<br>Sample answer<br>When the size of zinc is smaller, the rate of reaction increases                                                                                                                                                                           | 3     |
|         | Able to make a hypothesis less accurately.<br>Sample answer<br>Rate of reaction increases when size of zinc decreases.//Smaller zinc particles affects rate of reaction                                                                                                                             | 2     |
|         | Able to give an idea of making a hypothesis.<br>Sample answer<br>Size affects rate of reaction                                                                                                                                                                                                      | 1     |
|         | Wrong or no response                                                                                                                                                                                                                                                                                | 0     |
|         |                                                                                                                                                                                                                                                                                                     |       |
| 3(c)    | Able to state all the three variables correctly<br>Manipulated variable: size of zinc //zinc granules and zinc powder<br>Responding variable: rate of reaction// time taken to collect a fixed volume of<br>hydrogen gas<br>Fixed variable: volume /concentration of sulphuric acid//sulphuric acid | 3     |
|         | Able to state two variables correctly                                                                                                                                                                                                                                                               | 2     |
|         | Able to state one variable correctly                                                                                                                                                                                                                                                                | 1     |
|         | Wrong or no response                                                                                                                                                                                                                                                                                | 0     |
|         |                                                                                                                                                                                                                                                                                                     |       |
| 3(d)    | Able to list the apparatus and materials completely<br>Apparatus: conical flask 250 ml, burette, basin, delivery tube with stopper,<br>stop watch, triple beam balance, measuring cylinder<br>Materials: zinc granules, zinc powder, $[0.1- 1.0] \text{ mol dm}^{-3}$ sulphuric acid                | 3     |
|         | Able to list the apparatus and materials less completely<br>Apparatus: conical flask, burette, basin, stop watch<br>Materials: zinc granules/powder, sulphuric acid                                                                                                                                 | 2     |
|         | Able to list an idea of the apparatus and materials<br>Sample answer<br>Zinc, [any container], sulphuric acid, stop watch                                                                                                                                                                           | 1     |
|         | Wrong or no response                                                                                                                                                                                                                                                                                | 0     |

| Qn. No.                                 | Marking Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Marks  |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|----|---------------|----|-----------------------------------------|---|--|--|--|-------------------------------|--|--|--|--|---|
| 3(e)                                    | <p>Able to list the steps of the procedures correctly</p> <p>Sample answers</p> <ol style="list-style-type: none"><li>1. 50 cm<sup>3</sup> of sulphuric acid is measured using a measuring cylinder and poured into a conical flask.</li><li>2. A burette filled with water is inverted over in a basin of water</li><li>3. Record the initial reading of the burette.</li><li>4. Put in 5 g of zinc granules into the conical flask</li><li>5. Attach the delivery tube with the end of the tube inserted into the burette.</li><li>6. Immediately start the stop watch.</li><li>7. Swirl the conical flask and record the burette reading at every 30 s intervals.</li><li>8. Repeat steps 1 – 6 by replacing the zinc granules with zinc powder</li></ol> | 3      |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
|                                         | <p>Able to list the steps of the procedures less accurately</p> <p>Sample answer</p> <p>Steps 1, 2,4,6,7,8</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2      |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
|                                         | <p>Able to list an idea of procedures</p> <p>Sample answer</p> <p>Steps 1</p> <ol style="list-style-type: none"><li>1. Sulphuric acid is poured into [any container]</li><li>2. Zinc is added into acid.</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1      |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
|                                         | Wrong or no response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0      |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
| 3(f)                                    | <p>Able to tabulate data correctly with the following aspects:</p> <ol style="list-style-type: none"><li>1. Title with correct units</li><li>2. At least 4 time intervals</li></ol> <p>Sample answer</p> <table><tr><td>Time/s</td><td>0</td><td>30</td><td>60</td><td>90</td></tr><tr><td>Initial burette reading/cm<sup>3</sup></td><td></td><td></td><td></td><td></td></tr><tr><td>Volume of gas/cm<sup>3</sup></td><td></td><td></td><td></td><td></td></tr></table>                                                                                                                                                                                                                                                                                    | Time/s | 0  | 30 | 60            | 90 | Initial burette reading/cm <sup>3</sup> |   |  |  |  | Volume of gas/cm <sup>3</sup> |  |  |  |  | 2 |
| Time/s                                  | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30     | 60 | 90 |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
| Initial burette reading/cm <sup>3</sup> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
| Volume of gas/cm <sup>3</sup>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
|                                         | <p>Able to tabulate data less accurately with the following aspects:</p> <p>Sample answer</p> <table><tr><td>Time</td><td></td><td></td></tr><tr><td>Volume of gas</td><td></td><td></td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time   |    |    | Volume of gas |    |                                         | 1 |  |  |  |                               |  |  |  |  |   |
| Time                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
| Volume of gas                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |
|                                         | Wrong or no response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0      |    |    |               |    |                                         |   |  |  |  |                               |  |  |  |  |   |

END OF MARKING SCHEME