

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.

| <i>Untuk Kegunaan Pemeriksa</i> | | | |
|---------------------------------|--------|--------------|-----------------|
| Bahagian | Soalan | Markah penuh | Markah diproleh |
| 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 <i>Bahan</i> | Melting point / °C <i>Takat lebur / °C</i> | Boiling point / °C <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°C ?

Apakah keadaan jirim bagi bahan Y pada 66°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]

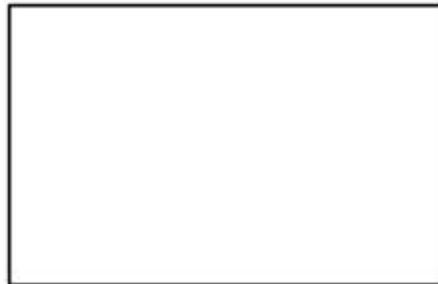
(d) What is meant by melting point?

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..

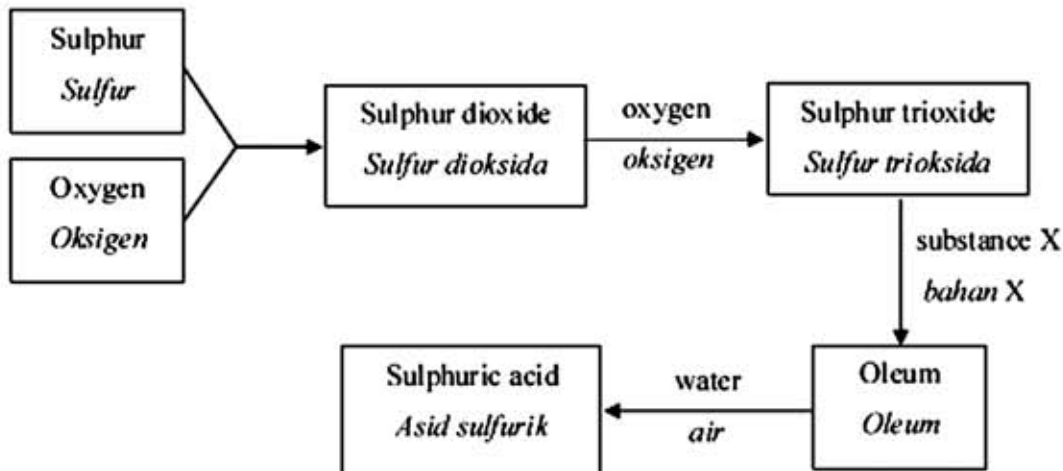


Diagram 2.1

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.

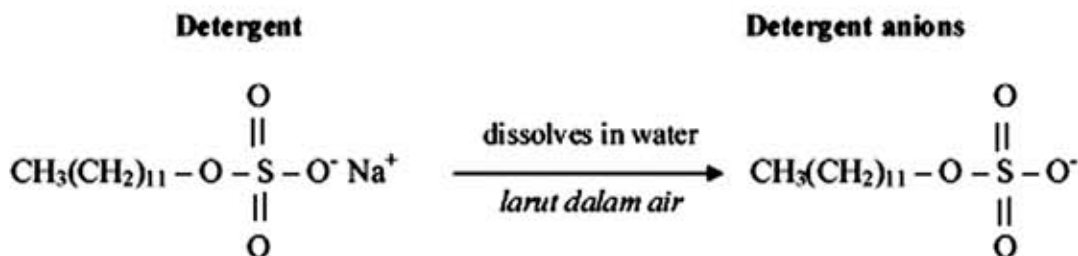


Diagram 2.2

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.

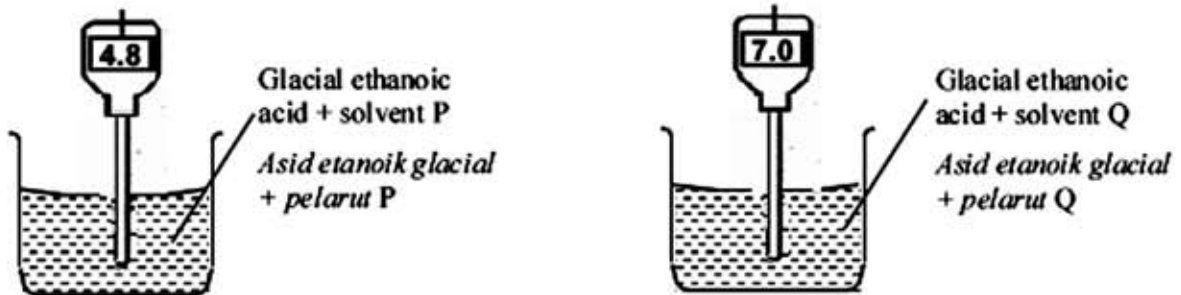


Diagram 3.1

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

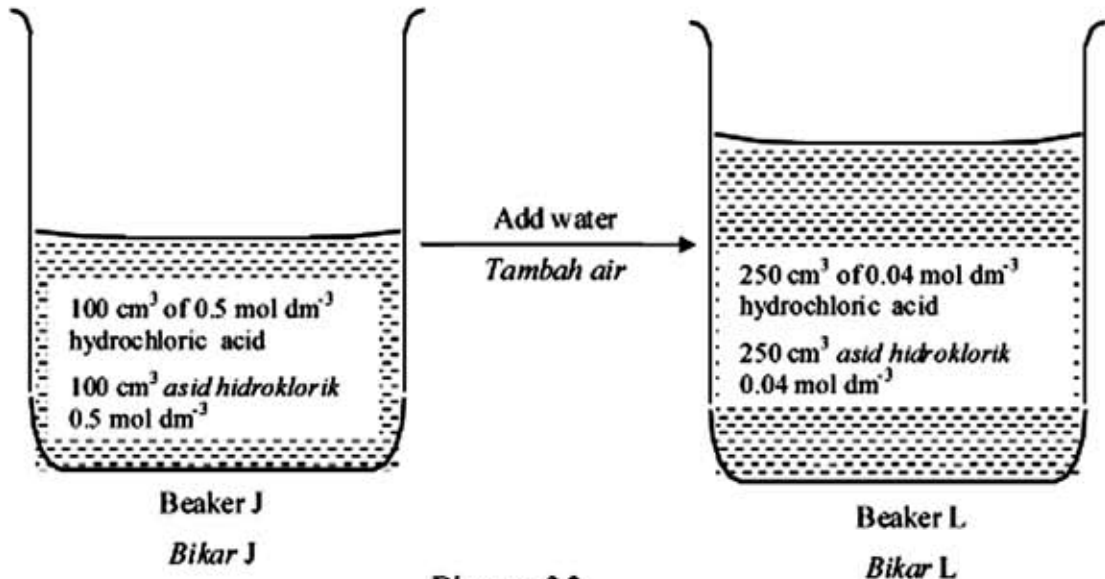


Diagram 3.2
Rajah 3.2

- (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

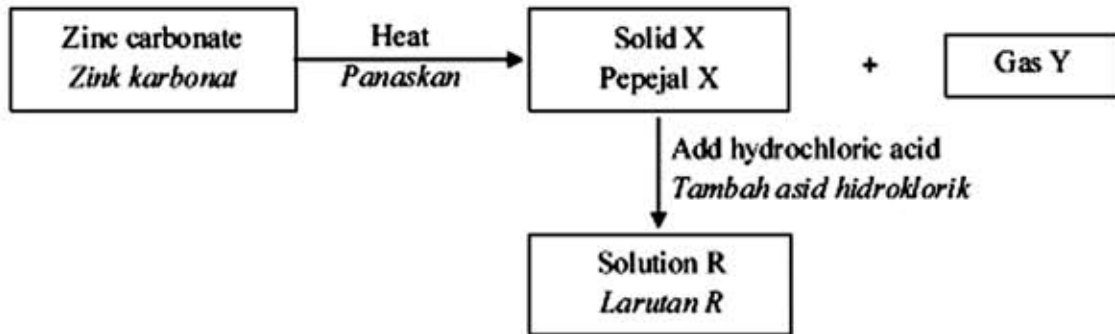


Diagram 4
Rajah 4

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

Zink karbonat adalah satu garam tak larut.

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 penyusunan halogen daripada larutan halidanya.

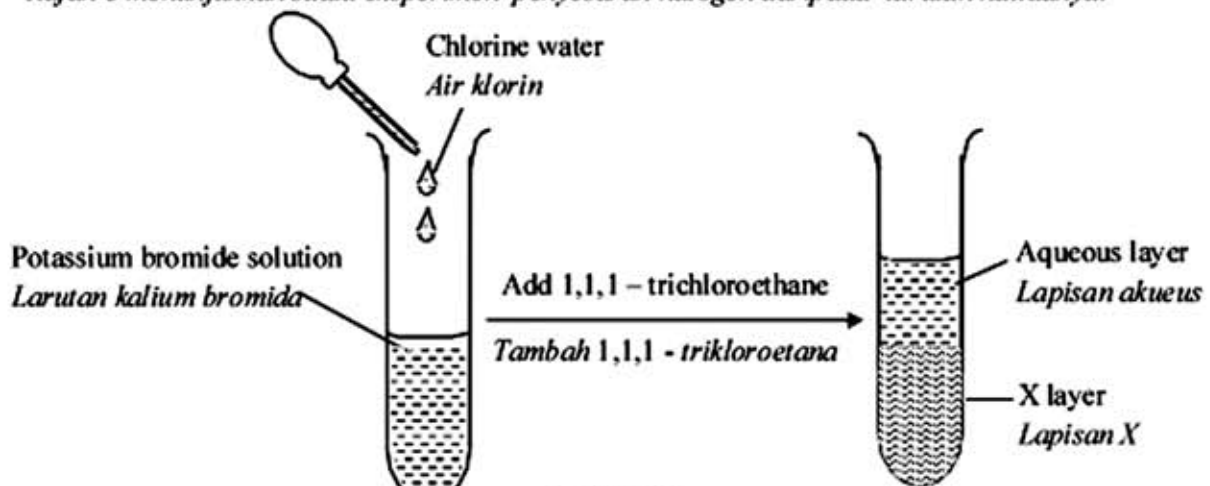


Diagram 5
Rajah 5

(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 kima 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 <i>Jisim lampu + propanol sebelum pembakaran / g</i> | 30.69 |
| Mass of lamp + propanol after combustion / g <i>Jisim lampu + propanol setelah pembakaran / g</i> | 29.85 |
| Volume of water / cm ³ <i>Isipadu air / cm³</i> | 200 |
| Initial temperature / °C <i>Suhu awal / °C</i> | 28.0 |
| Highest temperature / °C <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.

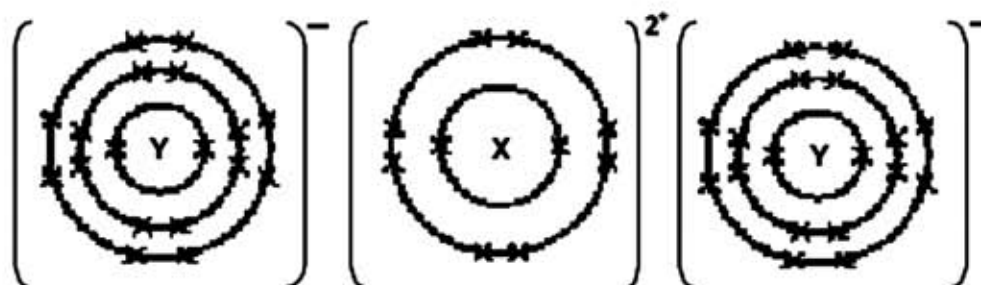


Diagram 7.1
Rajah 7.1

- (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.

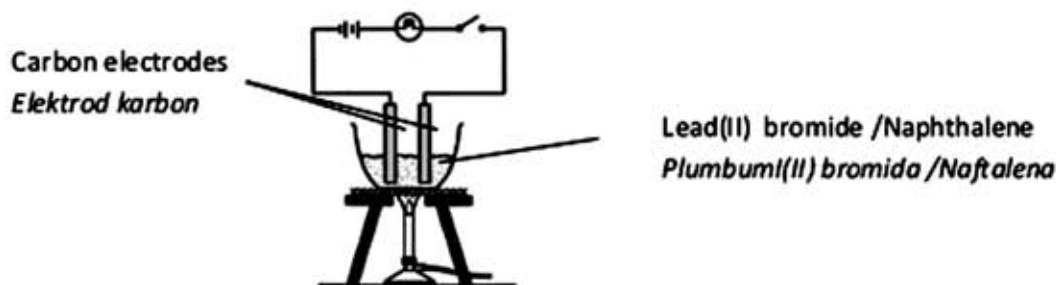


Diagram 7.2
Rajah 7.2

Table 7 shows the result obtained.

Jadual 7 menunjukkan keputusan yang diperolehi.

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

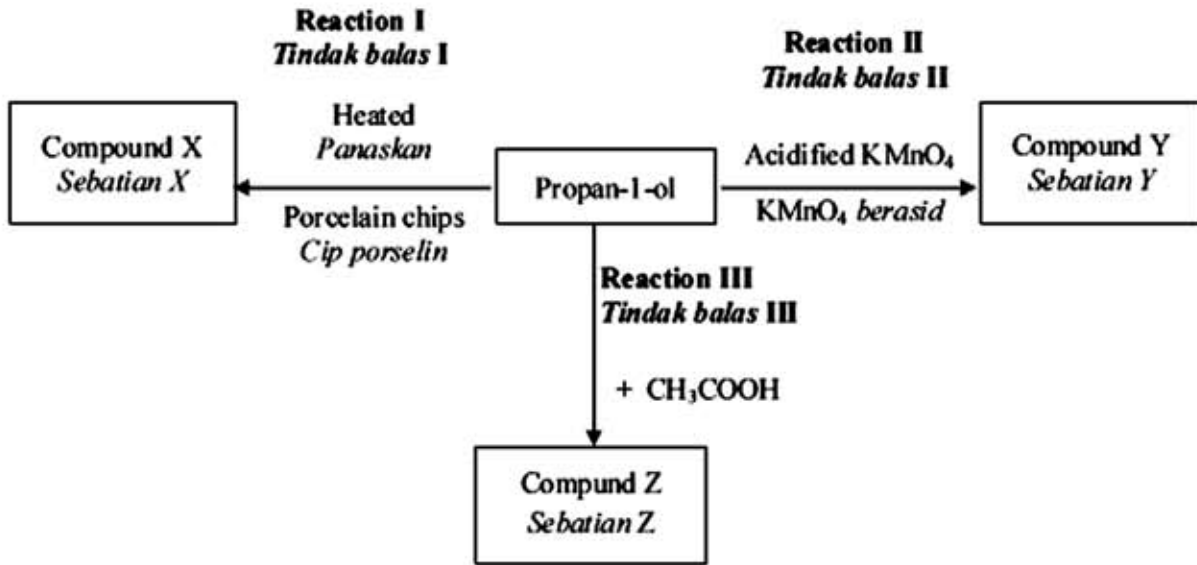


Diagram 8
Rajah 8

- (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 <i>Pasangan logam</i> | Potential difference / V <i>Beza upaya / V</i> | Negative terminal <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.

| Electrolyte <i>Elektrolit</i> | Observation at anode <i>Pemerhatian di anod</i> |
|---|---|
| 1.0 mol dm ⁻³ sodium chloride 1.0 mol dm ⁻³ <i>natrium klorida</i> | A yellowish gas is release <i>Gas kekuningan dibebaskan</i> |
| 0.0001 mol dm ⁻³ sodium chloride 0.0001 mol dm ⁻³ <i>natrium klorida</i> | A colourless gas is release <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 <i>Eksperimen</i> | Reactants <i>Bahan tindak balas</i> | Temperature/ $^{\circ}\text{C}$ <i>Suhu /$^{\circ}\text{C}$</i> | Time taken for mark 'X' disappears from sight/s <i>Masa untuk pangkah 'X' hilang dari penglihatan/s</i> |
|---------------------------------|---|---|--|
| I | 50 cm ³ of 0.2 mol dm ⁻³ sodium thiosulphate solution + 5 cm ³ of 1 mol dm ⁻³ hydrochloric acid <i>50 cm³ larutan natrium tiosulfat 0.2 mol dm⁻³ + 5 cm³ asid hidroklorik 1 mol dm⁻³</i> | 30.0 | 18.0 |
| II | 50 cm ³ of 0.2 mol dm ⁻³ sodium thiosulphate solution + 5 cm ³ of 1 mol dm ⁻³ hydrochloric acid <i>50 cm³ larutan natrium tiosulfat 0.2 mol dm⁻³ + 5 cm³ asid hidroklorik 1 mol dm⁻³</i> | 40.0 | 11.0 |
| III | 50 cm ³ of 0.2 mol dm ⁻³ sodium thiosulphate solution + 5 cm ³ of 2 mol dm ⁻³ hydrochloric acid <i>50 cm³ larutan natrium tiosulfat 0.2 mol dm⁻³ + 5 cm³ asid hidroklorik 2 mol dm⁻³</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 tiosulfat 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

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 1 H Hydrogen 1 | 2 He Helium 4 | 3 Li Lithium 7 | 4 Be Beryllium 9 | 5 B Boron 11 | 6 C Carbon 12 | 7 N Nitrogen 14 | 8 O Oxygen 16 | 9 F Fluorine 19 | 10 Ne Neon 20 | 11 Na Sodium 23 | 12 Mg Magnesium 24 | 13 Al Aluminum 27 | 14 Si Silicon 28 | 15 P Phosphorus 31 | 16 S Sulfur 32 | 17 Cl Chlorine 35.5 | 18 Ar Argon 40 | 19 K Potassium 39 | 20 Ca Calcium 40 | 21 Sc Scandium 45 | 22 Ti Titanium 48 | 23 V Vanadium 51 | 24 Cr Chromium 52 | 25 Mn Manganese 55 | 26 Fe Iron 56 | 27 Co Cobalt 59 | 28 Ni Nickel 59 | 29 Cu Copper 64 | 30 Zn Zinc 65 | 31 Ga Gallium 70 | 32 Ge Germanium 73 | 33 As Arsenic 75 | 34 Se Selenium 79 | 35 Br Bromine 80 | 36 Kr Krypton 84 | 37 Rb Rubidium 85 | 38 Sr Strontium 88 | 39 Y Yttrium 89 | 40 Zr Zirconium 91 | 41 Nb Niobium 93 | 42 Mo Molybdenum 96 | 43 Tc Technetium 98 | 44 Ru Ruthenium 101 | 45 Rh Rhodium 103 | 46 Pd Palladium 106 | 47 Ag Silver 108 | 48 Cd Cadmium 112 | 49 In Indium 115 | 50 Sn Tin 119 | 51 Sb Antimony 122 | 52 Te Tellurium 128 | 53 I Iodine 127 | 54 Xe Xenon 131 | 55 Cs Cesium 133 | 56 Ba Barium 137 | 57 La Lanthanum 139 | 58 Ce Cerium 140 | 59 Pr Praseodymium 141 | 60 Nd Neodymium 144 | 61 Pm Promethium 145 | 62 Sm Samarium 150 | 63 Eu Europium 152 | 64 Gd Gadolinium 157 | 65 Tb Terbium 159 | 66 Dy Dysprosium 163 | 67 Ho Holmium 165 | 68 Er Erbium 167 | 69 Tm Thulium 169 | 70 Yb Ytterbium 173 | 71 Lu Lutetium 175 | 72 Hf Hafnium 179 | 73 Ta Tantalum 181 | 74 W Tungsten 184 | 75 Re Rhenium 187 | 76 Os Osmium 193 | 77 Ir Iridium 193 | 78 Pt Platinum 195 | 79 Au Gold 197 | 80 Hg Mercury 201 | 81 Tl Thallium 204 | 82 Pb Lead 207 | 83 Bi Bismuth 209 | 84 Po Polonium 210 | 85 At Astatine 210 | 86 Rn Radon 222 | 87 Fr Francium 223 | 88 Ra Radium 226 | 89 Ac Actinium 227 | 90 Th Thorium 232 | 91 Pa Protactinium 231 | 92 U Uranium 238 | 93 Np Neptunium 237 | 94 Pu Plutonium 244 | 95 Am Americium 243 | 96 Cm Curium 247 | 97 Bk Berkelium 247 | 98 Cf Californium 251 | 99 Es Einsteinium 252 | 100 Fm Fermium 257 | 101 Md Mendelevium 258 | 102 No Nobelium 259 | 103 Lr Lawrencium 261 | 104 Uu Ununquadium 262 | 105 Uub Ununbium 263 | 106 Uuq Ununquadium 265 | 107 Uuh Ununhexium 267 | 108 Uuo Ununoctium 269 | 109 Uue Ununseptium 271 | 110 Uuq Ununquadium 272 | 111 Uuh Ununhexium 273 | 112 Uuo Ununoctium 277 | 113 Uuq Ununquadium 285 | 114 Uuh Ununhexium 285 | 115 Uuo Ununoctium 289 | 116 Uuh Ununhexium 289 | 117 Uuo Ununoctium 293 | 118 Uuo Ununoctium 293 |
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Agencies: Comp. Systems Appl. Chemistry, McGraw-Hill, Inc.