Section A
Bahagian A

[60 marks]
[60 *markah*]

Answer **all** the questions in this section
Jawab **semua** *soalan dalam bahagian ini*

1   Diagram 1.1 shows mothballs that we usually use in our daily life, while Diagram 1.2 shows the structure of naphthalene. The active ingredients in mothballs is naphthalene.
    Rajah 1.1 menunjukkan ubat gegat yang biasa digunakan dalam kehidupan harian, manakala Rajah 1.2 menunjukkan formula struktur bagi naftalena. Bahan aktif di dalam ubat gegat ialah naftalena.
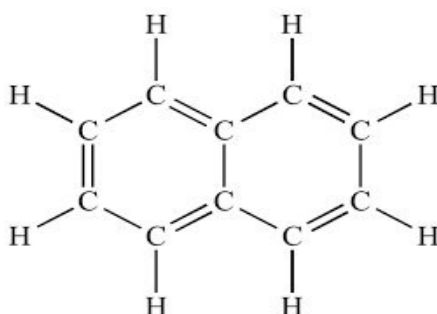

Diagram 1.1
Rajah 1.1

Diagram 1.2
Rajah 1.2

(a)   Based on Diagram 1.2,
      Berdasarkan Rajah 1.2,

      (i) What is the type of particles present in naphthalene?
           Apakah jenis zarah yang terdapat dalam naftalena?

      ………………………………………………………………………………………..

                                                                          [1 mark]

(ii)   What type of chemical bond found in the structure?
       Apakah jenis ikatan kimia yang terdapat pada struktur tersebut?

       ....
                                                                              [1 mark]

(iii) How many valence electrons found in the carbon atom?
       Berapakah bilangan elektron valens yang terdapat pada atom karbon?

       ....
                                                                              [1 mark]

(b) Mothballs is used to kill or repel insects in secluded areas such as cupboard and
     stores. Naphthalene fumes is released to air by natural diffusion process.
     *Wasap ubat gegap digunakan untuk menghalau atau membunuh serangga di dalam
     kawasan yang tertutup seperti almari dan stor. Wasap naftalena di bebaskan ke udara
     melalui proses resapan secara semulajadi.*

     (i)   What is the definition of diffusion process?
           Apakah definisi proses resapan?

           ....
                                                                              [1 mark]

(c) Solid mothballs melt into liquids when heated in water bath. Diagram 1.3 below shows
     the heating curve of solid mothballs.
     *Pepejal ubat gegat melebur kepada cecair apabila dipanaskan dalam kukus air. Rajah
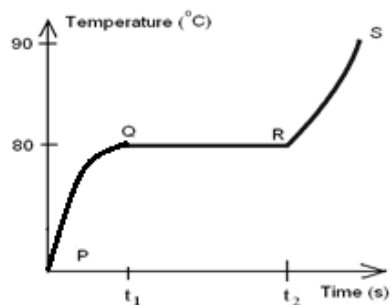   1.3 di bawah menunjukkan lengkung pemanasan ubat gegat.*

Diagram 1.3
Rajah 1.3

     (i)   Based on the graph, state the melting point of the mothballs.
           Berdasarkan graf di atas, nyatakan takat lebur bagi ubat gegat tersebut.

           ....
                                                                              [1 mark]

(ii) Why is the water bath used instead of direct heating to the mothballs?
Mengapakah kukus air digunakan berbanding dengan memanaskan ubat gegat secara terus?

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

(iii) Explain why the temperature between Q and R is constant at t_1 and t_2 second.
Terangkan mengapa suhu di antara Q dan R tidak berubah di antara t_1 dan t_2 saat.

……………………………………………………………………………………………

……………………………………………………………………………………………

……………………………………………………………………………………………
[2 marks]

(iv) Draw the arrangement of molecules exist between R and S.
Lukiskan susunan molekul yang wujud di antara R dan S.

[1 mark]

2   Diagram 2 shows the elements in the Periodic Table of Elements.
    Rajah 2 menunjukkan unsur-unsur dalam Jadual Berkala Unsur.

Diagram 2
Rajah 2

(a) (i)   Write chemical equation for the reaction between element P with oksigen.
           Tuliskan persamaan kimia untuk tindak balas antara unsur P dengan oksigen.

           ....
                                                                                                        [2 marks]

     (ii) Between element P and element R, which react more vigorously with oxygen?
           Antara unsur P dan R, manakah yang bertindak balas lebih cergas dengan oksigen?

           ....
                                                                                                        [1 mark]

     (iii) Explain your answer in (a)(ii).
           Terangkan jawapan anda dalam (a)(ii).

           ....

           ....

           ....

           ....

           ....

                                                                                                        [2 marks]

(b) (i)   Write the formula of the compound formed between atoms P and Q.
           Tuliskan formula bagi sebatian yang terbentuk antara atom P dan Q.

           ....
                                                                                                        [1 mark]

(ii) Draw the electron arrangement for the compound in (b)(i).
Lukiskan susunan elektron bagi sebatian itu di (b)(i).

[2 marks]

(c) Element Q can react with element S to form a compound. State **one** physical property of the compound.
Unsur Q bertindak balas dengan unsur S untuk membentuk satu sebatian. Nyatakan satu sifat fizik bagi sebatian itu.

………
[1 mark]

3 (a) Diagram 3.1 shows information obtained from an ice cream packaging.
Rajah 3.1 menunjukkan maklumat diperolehi daripada sampul pembungkusan ais krim.

INGREDIENTS: SUGAR; WHEAT FLOUR; SKIM MILK; COCOA BUTTER; CHOCOLATE; VEGETABLE OIL [PALM KERNEL OIL; PALM OIL]; MILK FAT; LACTOSE (MILK); CONTAINS 2% OR LESS OF: LECITHIN (SOY); PGPR; VANILLIN, ARTIFICIAL FLAVOR; SALT; YEAST; BAKING SODA. Ⓤ D
ALLERGY INFORMATION:
MANUFACTURED IN A FACILITY THAT ALSO PROCESSES **PEANUTS.**

KANDUNGAN : GULA, TEPUNG GANDUM, SUSU TANPA KRIM, MENTEGA KOKO, COKLAT, MINYAK SAYURAN (MINYAK BIJI SAWIT), LEMAK SUSU, LAKTOSA (SUSU), MENGANDUNGI 2% ATAU KURANG LESTITIN (SOYA), PGPR, VANILA, PERISA SINTETIK, GARAM, RAGI, SERBUK PENAIK, Ⓤ D
MAKLUMAT ALERGI :
DI HASILKAN DI DALAM KAWASAN YANG MEMPROSES **KACANG TANAH**

Diagram 3.1
Rajah 3.1

State two types of food additives that obtained in the ingredients in Diagram 3.1.
Nyatakan dua jenis bahan tambah dalam makanan yang terdapat dalam ramuan dalam Rajah 3.1.

....

....
[2 marks]

(b) (i) Diabetic patients are advised not to consume too much sugar. State the name of food additive that can replace the function of sugar?
Pesakit diabetis dinasihatkan untuk tidak mengambil gula secara berlebihan. Nyatakan nama bahan tambah makanan yang boleh menggantikan fungsi gula?

....
[1 mark]

(ii) What is the function of lecithin in this ingredient?
Apakah kegunaan lecitin dalam ramuan ini?

....
[1 mark]

(c) (i) According to the ingredients stated, some people have allergy to peanuts. One of the symptoms is itching or tingling in or around the mouth and throat. What is the **type** of medicine can be prescribed by a doctor?
*Berdasarkan ramuan yang diberikan, sesetengah orang alah kepada kacang. Salah satu simptomnya ialah gatal atau kebas di dalam atau sekitar mulut dan tekak. Apakah **jenis** ubat yang boleh disarankan oleh doktor?*

....
[1 mark]

(ii) What is your suggestion to overcome this allergy problem?
Apakah cadangan anda untuk mengatasi masalah allergi ini?

....

....
[1 mark]

(d) (i) Diagram 3.2 shows a vegetable where the oil produced can be used as traditional medicine.
Rajah 3.2 menunjukkan sejenis sayuran di mana minyak yang dihasilkan boleh digunakan sebagai ubat tradisional.

Diagram 3.2
Rajah 3.2

State two of its usages can be used traditionally to cure illness.
Nyatakan dua kegunaan yang boleh digunakan secara tradisional untuk menyembuhkan penyakit.

....

....
[2 marks]

(ii)   Faris got flu, headache and heavy cough after returned from Korea. He went for a swab test and the result for coronavirus was negative. The doctor prescribed him an antibiotic which he must complete them in a week. He was advised to quarantine himself 14 days at home also.
What is the function of antibiotics and why he must complete the course?

Faris mendapat demam, sakit kepala dan batuk yang kuat selepas pulang dari Korea. Dia pergi menjalani ujian 'swab' dan keputusan untuk virus korona adalah negatif. Doktor mencadangkan kepadanya satu antibiotik yang perlu dihabiskan dalam tempoh seminggu. Dia dinasihatkan juga untuk kuarantin dirinya selama 14 hari di rumah.
Apakah fungsi antibiotik dan mengapakah ia perlu dihabiskan dalam tempoh yang ditetapkan?

....

....

....

……………………………………………………………………………………
[2 marks]

4   Diagram 4.1 shows the structural formula of compound X.
    Rajah 4.1 menunjukkan formula struktur bagi sebatian X.
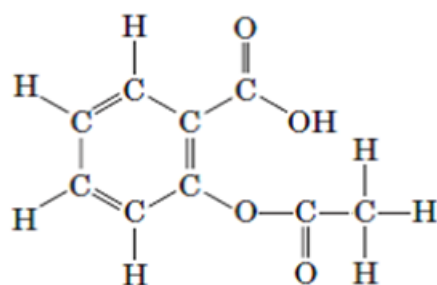
Acetylsalicylic acid (Aspirin)
Asid asetilsalisilik (Aspirin)

Diagram 4.1
Rajah 4.1

(a)   What is the meaning of molecular formula?
      Apakah yang dimaksudkan dengan formula molekul?

      ……………………………………………………………………………………………
      ……………………………………………………………………………………………
                                                                      [1 mark]

(b)   Write the molecular formula of compound X.
      Tuliskan formula molekul bagi sebatian X.

      ……………………………………………………………………………………………
                                                                      [1 mark]

(c)   The following equation represents the reaction between zinc carbonate and
      hydrochloric acid. In an experiment, 0.5 g of zinc carbonate is added into excess
      hydrochloric acid.

      *Persamaan berikut mewakili tindak balas antara zink karbonat dan asid hidroklorik.
      Dalam satu eksperimen, 0.5 g zink karbonat ditambahkan ke dalam asid hidroklorik
      berlebihan.*

      $ZnCO_3(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + CO_2(g) + H_2O(l)$
      $ZnCO_3(p) + 2HCl(ak) \rightarrow ZnCl_2(ak) + CO_2(g) + H_2O(c)$
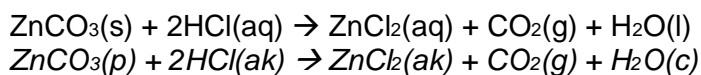
      [Relative atomic mass / *Jisim atom relatif*   : C = 12; O = 16; Cl = 35.5; Zn = 65]

(i) Calculate the number of moles of zinc carbonate used.
Hitungkan bilangan mol zink karbonat yang digunakan.

[1 mark]

(ii) Calculate the maximum mass of zinc chloride produced.
Hitung jisim maksimum zink klorida yang dihasilkan.

[2 marks]

(d) Diagram 4.2 shows the set-up of apparatus for an experiment to determine the empirical formula of magnesium oxide.
Rajah 4.2 menunjukkan susunan radas bagi satu eksperimen untuk menentukan formula empirik bagi magnesium oksida.
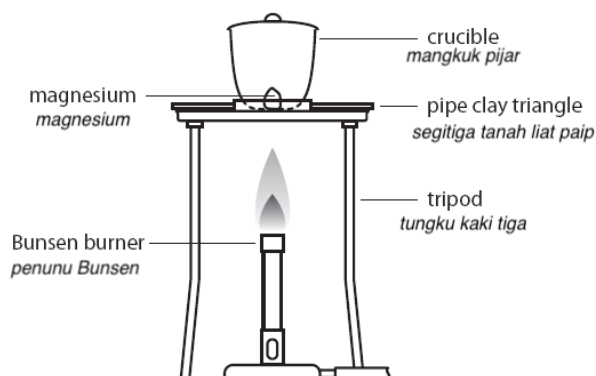
Diagram 4.2
Rajah 4.2

Description / Keterangan	Mass (g) / Jisim (g)
Mass of crucible + lid / Jisim mangkuk pijar + penutup	44.0
Mass of crucible + lid + magnesium ribbon / Jisim mangkuk pijar + penutup + pita magnesium	46.4
Mass of crucible + lid + magnesium oxide / Jisim mangkuk pijar + penutup + magnesium oksida	48.0

Table 4
Jadual 4

(i) Calculate the number of moles of:
Hitungkan bilangan mol bagi:
[Relative atomic mass / *Jisim atom relatif* : Mg = 24; O = 16]

Mol Magnesium / Magnesium:

Mol Oxygen / *Oksigen*:

[2 marks]

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

[1 mark]

(e) Can the empirical formula of copper (II) oxide be determined using this method? Explain your answer.
Bolehkah formula empirik kuprum (II) oksida ditentukan menggunakan kaedah yang sama? Terangkan jawapan anda.

………………………………………………………………………………………………..

………………………………………………………………………………………………..

………………………………………………………………………………………………..

[2 marks]

5 Diagram 5.1 shows the set-up of apparatus to prepare two solutions where hydrogen chloride gas is dissolved in solvent K and solvent L. A piece of red litmus paper is dipped into each beaker.
Rajah 5.1 di bawah menunjukkan susunan radas bagi menyediakan dua larutan di mana hidrogen klorida dalam pelarut K dan pelarut L. Sekeping kertas litmus merah dicelupkan ke dalam setiap bikar.
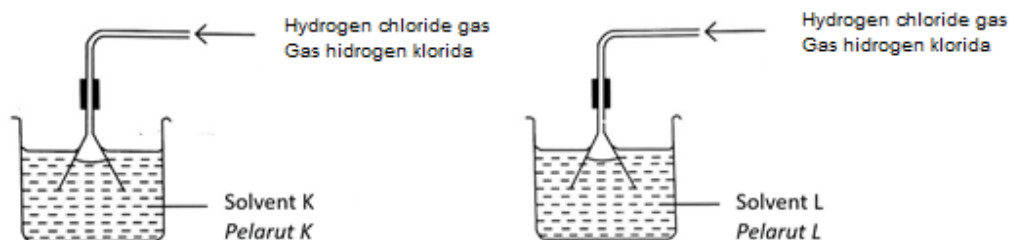
Diagram 5.1
Rajah 5.1

Table 5 shows the results of an experiment above.
Jadual 5 menunjukkan keputusan eksperimen di atas.

| Experiment *Eksperimen* | Hydrogen chloride in *Hidrogen klorida di dalam* | |
	Solvent K *Pelarut K*	Solvent L *Pelarut L*
Reaction with blue litmus paper *Tindak balas dengan kertas litmus biru*	No change *Tiada perubahan*	Blue litmus paper turns red *Kertas litmus biru berubah kepada merah*

Table 5
Jadual 5

(a) Suggest a substance for solvents K and L.
Cadangkan bahan untuk pelarut K dan L.

(i) Solvent K / *Pelarut K*

…………………………………………………………………………………………………..

(ii) Solvent L / *Pelarut L*

…………………………………………………………………………………………………

[2 marks]

(b) Explain why the moist blue litmus paper remains unchanged in experiment that used solvent K.
Terangkan mengapa kertas litmus biru lembap tidak berubah dalam eksperimen yang menggunakan pelarut K.

....

....
[1 mark]

(c) Diagram 5.2 shows two beakers S and T filled with sulphuric acids S and T, of different concentrations.
Rajah 5.2 menunjukkan dua bikar S dan T disi dengan asid sulfurik dengan kepekatan yang berbeza.

pH

0.1 mol dm^{-3} of sulphuric acid
Asid sulfurik 0.1 mol dm^{-3}

pH

0.001 mol dm^{-3} of sulphuric acid
Asid sulfurik 0.001 mol dm^{-3}

S   T
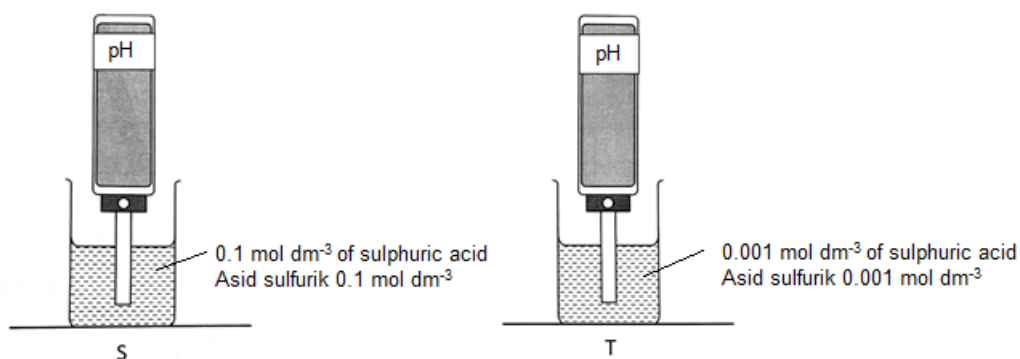
Diagram 5.2
Rajah 5.2

(i) What is meant by acid?
Apakah yang dimaksudkan dengan asid?

....

....

....
[1 mark]

(ii) Explain why suphuric acid is a strong acid?
Terangkan mengapakah asid sulfurik ialah asid kuat?

....

....

....
[1 mark]

(iii) Solutions S and T have different pH values. Which solution gives a lower pH value? Explain why
Larutan S dan T mempunyai nilai pH yang berbeza. Larutan yang manakah memberi nilai pH yang lebih rendah? Terangkan mengapa.

....

....

....

[2 marks]

(d) 25 cm³ of 0.1 mol dm⁻³ potassium hydroxide solution is put in a conical flask. Then a few drops of phenolphthalein are added and hence titrated with solution S.
25 cm³ larutan kalium hidroksida of 0.1 mol dm⁻³ dimasukkan ke dalam kelalang kon. Kemudian, beberapa titis fenolftalein ditambah dan seterusnya ditiratkan dengan larutan S.

(i) Write the chemical equation for the reaction.
Tulis persamaan kimia bagi tindak balas tersebut.

....

[2 marks]

(i) Calculate the volume of sulphuric acid used.
Hitung isi padu asid sulfurik yang digunakan.

[2 marks]

6   Table 6 shows the information of mixture of substances and time taken to collect 25 cm$_3$ of hydrogen gas liberated in each of experiment. The information obtained is used to study the factors that affect rate of reaction.
Jadual 6 menunjukkan maklumat-maklumat campuran bahan dan masa yang diambil untuk menggumpulkan 25 cm$_3$ gas hidrogen yang terbebas dalam setiap eksperimen. Maklumat yang diperolehi di gunakan untuk mengkaji faktor-faktor yang menpengaruhi kadar tindak balas.

Experiment Eksperimen	Mixture of substances in experiment Campuran bahan-bahan dalam eksperimen	Time to collect 25 cm$_3$ of gas / s Masa mengumpulkan 25 cm$_3$ gas / s
I	20.0 cm$_3$ of 1.0 mol dm$_{-3}$ hydrochloric acid + 2.0 g of zinc 20.0 cm$_3$ asid hidroklorik 1.0 mol dm$_{-3}$ + 2.0 g zink	50.0
II	20.0 cm$_3$ of 1.0 mol dm$_{-3}$ hydrochloric acid + 2.0 g of zinc + 5 drops of copper (II) sulphate solution 20.0 cm$_3$ asid hidroklorik 1.0 mol dm$_{-3}$ + 2.0 g zink + 5 titis larutan kuprum(II) sulfat	32.0
III	20.0 cm$_3$ of 1.0 mol dm$_{-3}$ sulphuric acid + 2.0 g of zinc 20.0 cm$_3$ asid sulfurik 1.0 mol dm$_{-3}$ + 2.0 g of zink	25.0

Table 6
Jadual 6

Based on the information above.
Berdasarkan maklumat di atas.

(a)   Give the meaning of rate of reaction in this experiment
Berikan maksud kadar tindak balas dalam tindak balas ini

…………………………………………………………………………………………….....

……………………………………………………………………………………………………

……………………………………………………………………………………………………
[1 mark]

(b) Find the average rate of reaction experiment I in the first 50 s?
Cari kadar tindak balas purata untuk eksperimen I pada 50 s yang pertama?

[1 mark]

(c) In experiment I, calculate the total maximum volume of gas liberated at room condition.
Dalam eksperimen 1, kirakan jumlah maksimum isipadu gas yang terbebas pada keadaan bilik.
[Molar volume / *Isipadu molar* : 24 dm_3 mol_{-1}]

[3 marks]

(d) Explain by using the collision theory why is the time taken for Experiment III is shorter than Experiment I.
Terangkan dengan menggunakan teori perlanggaran mengapa masa yang diambil bagi eksperimen III lebih pendek daripada eksperimen I.

………………………………………………………………………………………………......

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

[3 marks]

(e) Sketch the energy level diagram for experiment I and II. In your sketch label the activation energy for both experiments
Lakar rajah aras tenaga bagi experiment I dan II. Dalam lakaran anda, labelkan tenaga pengaktifan untuk kedua-dua eksperimen

[3 marks]

Section B
Bahagian **B**

[20 marks]
[20 *markah*]

Answer any **one** question.
Jawab mana-mana **satu** *soalan*

7   (a)   Sulphuric acid, H_2SO_4 is manufactured in industry through Contact Process.
This process consists of the following stages:
Asid sulfurik, H_2SO_4 dihasilkan dalam industri melalui Proses Sentuh.
Proses ini mengandungi peringkat-peringkat berikut:

Stage 1 *Peringkat 1*	Molten sulphur is burnt in dry air to produce sulphur dioxide. *Leburan sulfur dibakar dalam udara kering menghasilkan sulfur dioksida.*
Stage 2 *Peringkat 2*	Sulphur dioxide and excess oxygen gas are passed over vanadium (V) oxide catalyst at 450_oC to produce sulphur trioxide. *Sulfur dioksida dan gas oksigen berlebihan dilalukan ke atas mangkin vanadium(V) oksida pada $450°C$ untuk menghasilkan sulfur trioksida.*
Stage 3 *Peringkat 3*	Sulphur trioxide $\xrightarrow[\text{Langkah 1}]{\text{Step I}}$ Oleum $\xrightarrow[\text{Langkah 2}]{\text{Step II}}$ Dilute sulphuric acid *Sulfur trioksida* *Asid sulfurik cair*

Table 7.1
Jadual 7.1

   (i)   Describe Step I and Step II in Stage 3.
Huraikan Langkah I dan Langkah II pada Peringkat 3.

[2 marks]

   (ii)   Describe how the gas produced in Stage 1 can cause environmental pollution.
Terangkan bagaimana gas yang dihasilkan di Peringkat 1 boleh menyebabkan pencemaran alam sekitar.

[2 marks]

   (iii)   48 g of sulphur is burnt completely in oxygen gas in Stage 1.
Write a balanced chemical equation for this reaction. Calculate the maximum volume of sulphur dioxide gas produced.
[Relative atomic mass: S=32, O=16; molar volume of any gas is 24 dm_3 mol_{-1} at room conditions]
48 g sulfur terbakar dengan lengkap dalam gas oksigen pada Peringkat 1.
Tuliskan persamaan kimia seimbang bagi tindak balas ini. Hitungkan isi padu maksimum gas sulfur dioksida yang terhasil.
[Jisim atom relatif: S=32; O=16; isi padu molar gas adalah 24 dm_3 mol_{-1} pada keadaan bilik]

(iv) The sulphuric acid produced reacts with ammonia to form an important fertilizer in agriculture. Name this fertilizer and write its chemical formula.
Asid sulfurik yang terhasil bertindak balas dengan ammonia menghasilkan baja yang penting dalam bidang pertanian. Namakan baja ini dan tuliskan formula kimianya.

[2 marks]

(b) Table 7.2 shows two types of materials, P and Q and their arrangement of atoms.
Jadual 7.2 menunjukkan dua jenis bahan P dan Q serta susunan atom masing-masing.
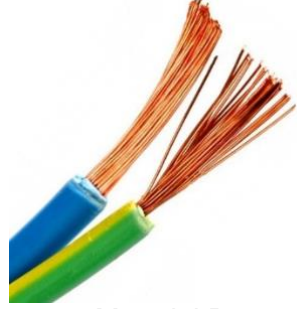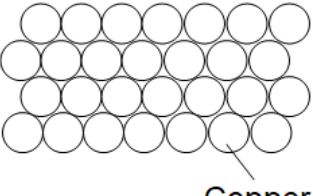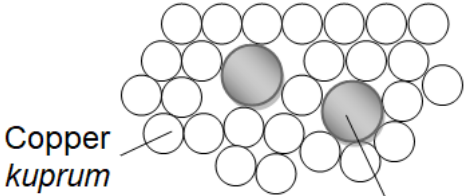
Table 7.2
Jadual 7.2

(i) State the types of material in P and Q.
Nyatakan jenis bahan dalam P dan Q.

[2 mark]

(ii) Name atom X.
Namakan atom X.

[1 mark]

(iii) Based on Table 7.2, compare the arrangement of atoms and e x p l a i n the hardness of materials P and Q.
Berdasarkan Jadual 7.2, bandingkan susunan atom dan terangkan sifat kekerasan bahan P dan Q.

[7 mark]

8 Three series of tests, I, II and III are carried out on a X chloride solution as shown in the following flow chart.
Tiga siri ujian I, II dan III telah dijalankan terhadap larutan klorida X seperti ditunjukkan dalam carta alir berikut.

Chloride Solution of X
Larutan Klorida X

NaOH solution
Larutan NaOH

NH₃ solution
Larutan NH₃

AgNO₃ solution
Larutan AgNO₃

I

II

III

White precipitate soluble in excess
Mendakan putih larut dalam berlebihan

White precipitate soluble in excess
Mendakan putih larut dalam berlebihan

precipitate
Mendakan ,
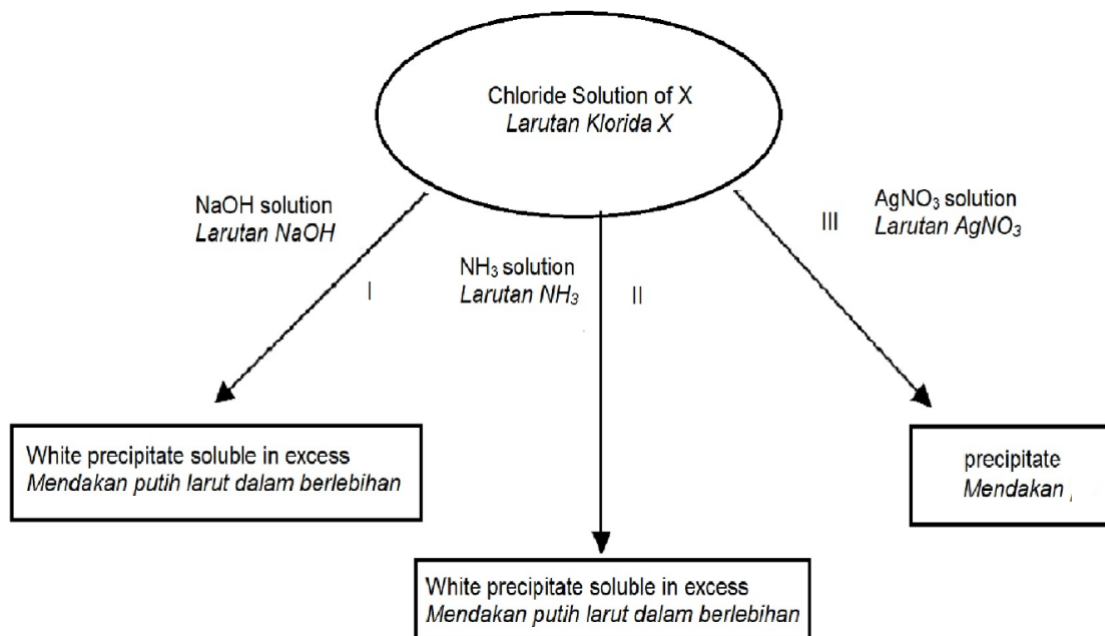
Diagram 8
Rajah 8

(a) (i) List all the ions that can be identified from test I
       Nyatakan semua ion yang boleh dikenalpasti di dalam ujian I

[3 marks]

(ii) Name the X chloride solution and write its chemical formula.
      Namakan larutan klorida X dan tuliskan formula kimianya.

[2 marks]

(b) Based on the test III
     Berdasarkan ujian III

(i) Name the type of reaction
     Namakan jenis tindakbalas

[1 mark]

(c) (i) Write the chemical equation when solution chloride X react with excess NaOH.
          Tuliskan persamaan kimia apabila larutan klorida X bertindakbalas dengan NaOH berlebihan.

[1 mark]

(ii) From the chemical equation in (c)(i), calculate mass of white solid formed when 10 cm$_3$ of 0.1 mol dm$_{-3}$ X chloride solution react with excess NaOH.
Daripada persamaan kimia dalam (c)(i), kirakan jisim pepejal putih yang terbentuk apabila 10 cm$_3$ larutan klorida X 0.1 mol dm$_{-3}$ bertindakbalas dengan larutan NaOH berlebihan.

[3 marks]

(d) X chloride solution is contaminated by sulphate ion, SO$_4{}^{2-}$. Compare both ions, in term of
Larutan X klorida telah di dicemari dengan ion sulfat, SO$_4{}^{2-}$. Bandingkan kedua-dua ion dari segi

- Steps to identify the ion in the lab
  Langkah-langkah untuk mengenalpasti ion ini di dalam makmal

- Observation
  Pemerhatian

- Name and chemical formula of precipitate that formed
  Nama dan formula kimia mendakan yang terhasil

- Ionic equation
  Persamaan ion

- Name of reaction
  Nama tindak balas

[10 marks]

Section C
Bahagian C

[20 marks]
[20 *markah*]

Answer any **one** question.
Jawab mana-mana **satu** *soalan*

9   Diagram 9 shows how ethanol is produced from alkene W.
    Rajah 9 menunjukkan bagaimana etanol dihasilkan daripada alkena W.

Alkene W + H_2O
Alkena W + H_2O

$\downarrow$ Phosphoric acid, 300°C, 60 atm
Asid fosforik, 300°C, 60 atm

Ethanol
Etanol

$\downarrow$ Porcelain chips, heat
Cip porselin, dipanaskan

Compound Q + H_2O
Sebatian Q + H_2O
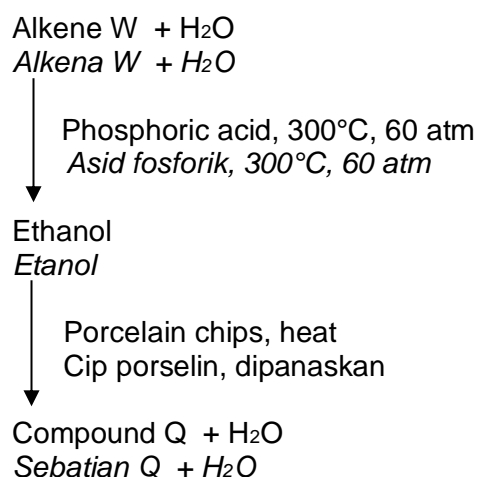
Diagram 9
Rajah 9

(a)   (i)   Name alkene W and state its molecular formula. Write the chemical equation
            when alkene W becomes ethanol.
            *Namakan alkena W dan nyatakan formula molekulnya. Tuliskan persamaan
            kimia apabila alkena W menjadi etanol.*

            [4 marks]

      (ii) State three chemical properties of ethanol and compound Q.
            Nyatakan tiga sifat kimia etanol dan sebatian Q.

            [6 marks]

(b)   Reaction of ethanol and carboxylic acid will produce an ester. The reaction is
      known as esterification. By naming a carboxylic acid, describe an experiment to
      produce corresponding ester. Include in your answer, the observation, structural
      formula and the name of ester formed.
      *Tindak balas antara etanol dan asid karboksilik akan menghasilkan ester. Tindak
      balas ini dikenali sebagai pengesteran. Dengan menamakan satu asid karboksilik,
      terangkan satu eksperimen untuk menghasilkan ester yang berkaitan. Pada
      jawapan anda, nyatakan pemerhatian, formula struktur dan nama ester yang
      terhasil.*

            [10 marks]

10   (a)

| Neutralisation is not a redox reaction |
| Peneutralan adalah bukan suatu tindak balas redoks |

By using suitable example, explain why neutralisation is not a redox reaction in terms of oxidation number. You are required to determine the oxidation number in your explanation.
Dengan menggunakan contoh yang sesuai, terangkan mengapa peneutralan bukan suatu tindak balas redoks dari segi nombor pengoksidaan. Anda dikehendaki menentukan nombor pengoksidaan dalam penerangan anda.

[4 marks]

(b)   Diagram 10 shows the setup of the apparatus to investigate the reactivity of metals J, K and magnesium towards oxygen. The different metals are heated consecutively.
Rajah 10 menunjukkan susunan radas untuk menyiasat kereaktifan logam J, K dan magnesium terhadap oksigen. Logam yang berbeza dipanaskan berturutan.
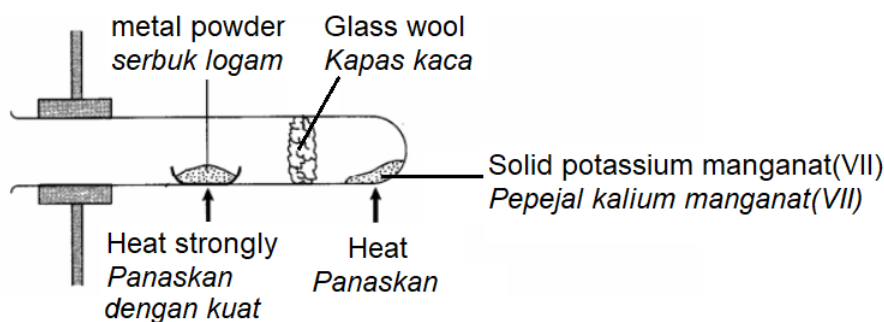
Diagram 10
Rajah 10

Table 10 shows the observation of the experiment.
Jadual 10 menunjukkan pemerhatian eksperimen.

Metal Logam	Observations Pemerhatian	Colour of residue Warna baki	
		Hot Panas	Cold Sejuk
J	Burns brightly *Terbakar dengan terang*	Yellow *Kuning*	White *putih*
K	Glows dimly *Membara malap*	Black *Hitam*	Black *Hitam*
Magnesium	Burns with a very bright flame *Terbakar dengan nyalaan sangat terang*	White *Putih*	White *Putih*

Table 10
Jadual 10

Based on Table 10,
Berdasarkan Jadual 10,

(i) Suggest metal J and metal K.
Cadangkan logam J dan logam K.

[2 marks]

(ii) Arrange J, K and magnesium in ascending order of their reactivity.
Susun J, K dan magnesium dalam susunan kereaktifan menaik.

[1 mark]

(iii) By using one of the reactions, explain the meaning of redox reaction.
Dengan menggunakan salah satu daripada tindak balas, terangkan maksud tindak balas redoks.

[3 marks]

(c)

| Iron (II) sulphate is good reducing agent |
| *Ferum(II) sulfat adalah agen penurunan yang baik* |

You are given the following apparatus:
U-tube, galvanometer, connecting wires, stopper, dropper, carbon electrodes and retort stand with clamps.
Suggest a suitable chemical substance and describe an experiment to verify the above statement using the given apparatus

Anda dibekalkan dengan radas berikut:
Tiub-U, galvanometer, wayar penyambung, penyumbat getah, penitis, elektrod karbon dan kaki retort bersama pengapit.
Cadangkan bahan kimia yang sesuai dan huraikan satu eksperimen untuk mengesahkan pernyataan di atas dengan menggunakan radas yang dibekalkan.
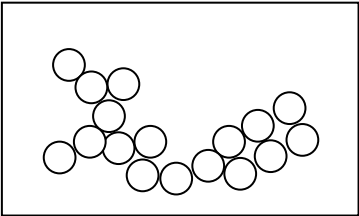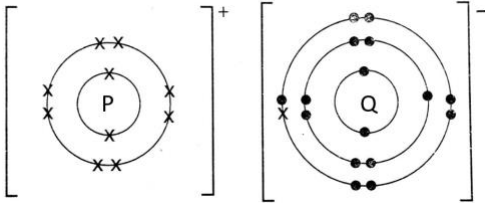
[10 marks]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

SKEMA PEMARKAHAN KIMIA KERTAS 2 SET 1

No			Answer	Marks
1	(a)	**(i)**	molecules	1
		(ii)	Covalent bond	1
		(iii)	4	1
	(b)		Process where the particles move from higher concentration region to lower concentration region	1
	(b)	**(i)**	80°C	1
		(ii)	To ensure a uniform heating // To ensure that the naphthalene is heated evenly // Naphthalene is flammable and easily burned in direct flame // To control the heating of naphthalene	1
		(iii)	The heat energy is absorbed by the molecules is used to overcome the forces between molecules // The heat absorbed during heating is same as heat used to weaken the forces of attraction between molecules	1 1
		(iv)	 Contains both solid and liquid.	1
			TOTAL	**9**

	No		Mark scheme	Sub mark	Total mark
2	a	i	$4P + O_2 \rightarrow 2P_2O$ // $4Na + O_2 \rightarrow 2Na_2O$	1	1
		ii	Element R is more reactive than P.	1	1
		iii	1. The size of atom R is larger than atom P // The valence electron of atom R is further away from the nucleus compared to atom P.	1	
			2. The attractive forces between proton in the nucleus to the valence electron of atom R is weaker than atom P.	1	
			3. It is easier for atom R to release the valence electron compared to atom P.	1	3
	b	i	PQ	1	1
		ii	 Correct number of shell – 1 M Correct number of electron – 1M	1 1	2

				1	1
	c	Low melting and boiling point Cannot conduct electricity in all state Insoluble in water		1	1
			TOTAL		**9**

3	(a)		Preservatives / Thickeners / Stabilisers / Flavouring / Antioxidant Any two of lecithin, vanillin, artificial flavour, salt, yeast, baking soda	1 + 1
	(b)	(i)	Acesulfame / Aspartame / stevia	1
		(ii)	To prevent water and oil from separating out // To mix water and oils	1
	(c)	(i)	Analgesic	1
		(ii)	See the doctor and seek for advice // avoid to consume any peanut product	1
	(d)	(i)	Mosquito repellent // candles // aromatherapy // juice to treat cough, headaches and stomach aches Any two	1 + 1
		(ii)	1. Antibiotics used to treat infections caused by bacteria but not to cure infections caused by viruses 2. To make sure that all the bacteria are killed. If not, one can become ill again. 3. The bacteria may become more resistant to the antibiotic. (The doctor has to prescribe a different and stronger antibiotic to fight the same infection).	1 1
			Total	10

Question			Answer	Mark
4	(a)		Chemical formula that gives the actual number of atoms of each element in a molecule. Formula Kimia yang menunjukkan bilangan sebenar atom setiap elemen dalam satu molekul.	[1]
	(b)		$C_9H_8O_4$	[1]
	(c)	(i)	Number of mole of $ZnCO_3$ = (0.5) / [65 + 12 + (3 x 16)] = 0.004 mol Bilangan mol $ZnCO_3$ = (0.5) / [65 + 12 + (3 x 16)] = 0.004 mol	[1]
		(ii)	Number of mole of $ZnCl_2$	

			= (0.004) x [65 + 35.5(2)]		[1]
			= 0.544 g		[1]
			Bilangan mol ZnCl$_2$		
			= (0.004) x [65 + 35.5(2)]		
			= 0.544 g		
	(d)	(i)	Number of mole of Mg = (46.4 – 44.0) / 24 = 0.1 mol		[1]
			Bilangan mol Mg = (46.4 – 44.0) / 24 = 0.1 mol		
			Number of mole of O = (48.0 – 46.4) / 16 = 0.1 mol		[1]
			Bilangan mol O = (48.0 – 46.4) / 16 = 0.1 mol		
		(ii)	Empirical formula: MgO		[1]
			Formula empirical: MgO		
	(e)		No		[1]
			Tidak		
			Copper does not react easily / readily with oxygen // copper cannot bunt completely in air		[1]
			Kuprum tidak mudah bertindak balas dengan oksigen // kuprum tidak boleh terbakar dengan lengkap dalam udara		

No			Mark scheme	Sub mark	Total mark
5	a	i	Methylbenzene // [any organic solvent]	1	
		ii	Water	1	2
	b		There is no water present. Therefore, no hydrogen ions present / hydrogen chloride remains as molecules	1	1
	c	i	A substance that ionises in water to produce hydrogen ion.	1	1
		ii	A substance that ionises completely in water to produce high concentration of hydrogen ion.	1	1
		iii	S.	1	
			It has a higher concentration of hidrogen ions.	1	2
	d	i	2KOH + H$_2$SO$_4$ → K$_2$SO$_4$ + 2H$_2$O		
			Chemical formula	1	
			Balance	1	2
		ii	Number of moles of KOH = 0.1 x 25/1000 = 0.0025 mole	1	
			From equation 2 mole KOH : 1 mole H$_2$SO$_4$ 0.0025 mole KOH : 0.00125 mole H$_2$SO$_4$ Volume of H$_2$SO$_4$ = $\frac{0.00125}{0.1}$ =0.0125 dm$_3$ =12.5 cm$_3$	1	2
			TOTAL		11

6	(a)	Changes in quantities of reactant or product per unit time (second) // Changes of volume of hydrogen gas against time // formula is given	1
	(b)	0.5 cm³ s⁻¹ With correct unit	1

	(c)	2 mol HCl: 1 mol H_2
		0.02 mol HCl : 0.01 mol H_2
		Volume of H_2 = 0.01 × 24
		            = 0.24 dm³
		            [Correct answer with unit]
			1
			1
			
			1

	(d)	1. Acid used in experiment III is diprotic, acid used in experiment I is monoprotic // Concentration of H+ in acid of experiment III is double than experiment I 2. Frequency of collision between Zinc and H+ ion in exp III is higher 3. The frequency of effective collision between particles in exp III is higher	1 1 1
	(e)	Label of energy diagram	1 1 1
		Total	11

No			Mark scheme	Marks
7	(a)	(i)	Step I: Sulphur trioxide reacts with concentrated sulphuric acid to produce oleum. *Langkah I: Sulfur trioksida bertindak balas dengan asid sulfurik pekat menghasilkan oleum.* Step II: Oleum is diluted with water to form sulphuric acid. *Langkah II: Oleum ditambahkan dengan air untuk membentuk asid sulfurik.*	1 1

		(ii) Sulphur dioxide gas released into the atmosphere and reacts with rain water to form acid rain. *Gas sulfur dioksida yang terbebas ke atmosfera bertindak balas dengan air hujan membentuk hujan asid.*	1
		The acid rain corrodes buildings/structures made of metal or calcium carbonate. *Hujan asid mengkakis bangunan / struktur yang diperbuat daripada logam atau kalsium karbonat. //* Sulphur dioxide gas released into the atmosphere and cause air pollution. *Gas sulfur dioksida terbebas ke atmosfera menyebabkan pencemaran udara.* The poisonous gas can cause respiratory problems to human. *Gas beracun ini menyebabkan masalah respirasi manusia.*	1
		(iii) Chemical equation: $S + O_2 \rightarrow SO_2$ *Persamaan kimia:*	1
		No of mol sulphur = $\dfrac{48}{32}$ = 1.5 mol *Bil mol sulfur*	1
		1 mol sulphur produce 1 mol SO_2 *1 mol sulfur menghasilkan 1 mol SO_2*	
		1.5 mol sulphur produce 1.5 mol SO_2 *1.5 mol sulfur menghasilkan 1.5 mol SO_2*	1
		Volume of SO_2 = 1.5 x 24 = 36 dm_3 *Isi padu SO_2*	1
		(iv) Name of fertilizer: Ammonium sulphate *Nama baja: ammonium sulfat*	1
		Chemical formula: $(NH_4)_2SO_4$ *Formula kimia:*	1
	(b)	(i) Material P: Pure metal *Bahan P: Logam tulen*	1
		Material Q: Alloy *Bahan Q: Aloi*	1
		(ii) Atom X: Tin *Atom X: Stanum*	1

(iii)

Material P *Bahan P*	Material Q *Bahan Q*	
Pure copper is made up of same type of atoms /copper atoms and are of the same size. *Kuprum tulen diperbuat daripada atom yang sama jenis dan sama saiz*	Bronze is made up of different types of atoms and are of different size. *Gangsa diperbuat daripada atom-atom berbeza dan berlainan saiz.*	1+1
Copper atoms are arranged in an orderly manner. *Atom-atom kuprum disusun padat dan teratur.*	Tin atoms of different size disrupt the orderly arrangement of copper atoms.	1+1

			Atom stanum yang berlainan saiz mengganggu susunan teratur atom-atom kuprum.	
		When force is applied, the layers of copper atoms easily slide over one another. *Apabila daya dikenakan, lapisan atom kuprum mudah menggelongsor di atas satu sama lain*	When force is applied, the layers of copper atoms not easily slide over one another. *Apabila daya dikenakan, lapisan atom kuprum tidak mudah menggelongsor di atas satu sama lain*	1+1
		Pure copper is softer/ easily change shape *Kuprum tulen lebih lembut / mudah bertukar bentuk*	Bronze is harder. *Gangsa lebih keras.*	1

8	(a)(i)	Lead ion, aluminium ion, zinc ion a: formula of ion	3
	(ii)	Zinc Chloride, $ZnCl_2$	1 1
	(b)(i)	Double decomposition reaction	1
	(c)(i)	$ZnCl_2 + 2NaOH \rightarrow Zn(OH)_2 + 2NaCl$ Correct chemical formulae of reactant and product and balanced	1
	(ii)	1 mol $ZnCl_2$: 1 mol $Zn(OH)_2$ 0.001 mol $ZnCl_2$: 0.001 mol $Zn(OH)_2$ Mass of $Zn(OH)_2$ = 0.001 × 99 $\qquad\qquad\qquad$ = 0.099 g // 0.01g Correct answer with unit	1 1 1
	(d)	<table><tr><td>chloride ion, Cl^-</td><td>sulphate ion, SO_4^{2-}</td></tr><tr><td>• Measure and pour 1 cm³ of anion solution into test tube • Measure and add 1 cm³ of silver nitrate solution into test tube • Shake well</td><td>• Measure and pour 1 cm³ of anion solution into test tube • Measure and add 1 cm³ of barium nitrate solution into test tube • Shake well</td></tr><tr><td>White precipitate</td><td>White precipitate</td></tr><tr><td>$Ag^+ + Cl^- \rightarrow AgCl$</td><td>$Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$</td></tr></table>	2 2 2 2 2
		Total	20

9	(a)	(i)	Alkene W = ethene Molecular formula = C_2H_4 Chemical equation : $C_2H_4 + H_2O \rightarrow C_2H_5OH$	1 1 1 + 1
		(ii)	<table><tr><th>Chemical properties ethanol</th><th>Chemical properties compound Q</th></tr><tr><td>Undergoes dehydration to produce ethene</td><td>Undergoes hydration / reacts with water to produce ethanol</td></tr><tr><td>Burns in air to produce carbon dioxide and water</td><td>Burns in air to produce carbon dioxide and water</td></tr><tr><td>Undergoes oxidation to produce ethanoic acid</td><td>Reacts with hydrogen to produce alkane</td></tr><tr><td></td><td>Reacts with halogen to produce hydrogen halide</td></tr><tr><td></td><td>Reacts with hydrogen halide to produce haloalkane</td></tr><tr><td></td><td>Reacts with acidified potassium manganate (VII) solution produce diol</td></tr></table> Any three // Answers in chemical equation is accepted	3 + 3

	(b)		• Name any carboxylic acid
			• Prodecure :
			  1. 50 cm³ of pure ethanol and 25 cm³ of glacial [named carboxylic acid] is added into a round-bottomed flask
			  2. 5cm³ of concentrated sulphuric acid is added
			  3. A Liebig condenser is fixed to the round-bottomed flask
			  4. The mixture is heated under reflux for 30 minutes
			  5. The ester is distilled out from the mixture
			  6. Chemical equation
			• Observation
			• Structural formula of ester formed
			• Name of ester formed
			
			OR
			
			• Name any carboxylic acid
			• Procedure :
			  1. 2cm³ of glacial ethanoic acid is poured into a boiling tube
			  2. 4cm³ of absolute ethanol is added to the acid
			  3. Using a dropper, add a few drops of concentrated sulphuric acid slowly to the mixture and shake well
			  4. The mixture is heated slowly until it boils about 2 minutes
			  5. The content in the boiling tube is poured into beaker half filled with water
			  6. Chemical equation
			• Observation
				1
				
				6
				1
				1
				1
				
				1
				
				6
				1

No		Mark scheme	Marks
		• Structural formula of ester formed • Name of ester formed	1
		Total	20

No		Mark scheme	Marks
10	(a)	Neutralisation: $\quad$ NaOH $\quad+\quad$ HCl $\quad\rightarrow\quad$ NaCl $\quad+\quad$ H$_2$O *Peneutralan:*	1
			1
		Oxidation number: $+1\ -2\ +1\quad\quad +1\ -1\quad\quad +1\ -1\quad\quad +1\ -2$ *Nombor pengoksidaan:*	
			1
		The oxidation number of each atom is the same // remain unchange. *Nombor pengoksidaan setiap atom adalah sama // kekal tidak berubah.*	
			1
		Therefore, oxidation and reduction does not occur. *Maka, pengoksidaan dan penurunan tidak berlaku.*	
	(b)	(i) Metal J / *Logam J* : Zinc / *zink* $\quad\quad$ Metal K / *Logam K*: Copper / *Kuprum*	1 1
		(ii) Arrangement: K → J → magnesium $\quad\quad$ *Susunan:*	1
		Reaction: $\quad\quad$ 2Mg $\quad+\quad$ O$_2$ $\quad\rightarrow\quad$ 2MgO *Tindak balas:* Oxidation number: $\quad 0\quad\quad\quad 0\quad\quad +2\ -2$ *Nombor pengoksidaan:* Oxidation number of magnesium increase from 0 to +2. Oxidation occur. *Nombor pengoksidaan magnesium bertambah daripada 0 kpada +2. Pengoksidaan berlaku.* Oxidation number of oxygen decrease from 0 to -2. Reduction occur. *Nombor pengoksidaan oksigen berkurang daripada 0 kepada -2. Penurunan berlaku.* Redox reaction is the reaction in which oxidation and reduction occur simultaneously. *Tindak balas redoks adalah tindak balas di mana pengoksidaan dan penurunan berlaku serentak.*	1 1 1
	(c)	Set up of apparatus: *Susunan radas:*	

Chemical: Acidified potassium manganate (VII) //bromine water
Bahan kimia: Kalium mangganat (VII) berasid // air bromin

Procedure:
Prosedur:
1. Clamp a U-tube to a retort stand.
   Tiub-U diapitkan kepada kaki retort.
2. Pour dilute sulphuric acid into the U-tube until its level are 6 cm away from the mouths of the U-tube.
   Tuangkan asid sulfurik cair ke dalam tiub-U sehingga parasnya 6 cm dari mulut tiub-U.
3. Add iron(II) sulphate solution carefully into the left arm of the U-tube by using a dropper until the layer of the solution reaches the height of 3 cm.
   Tambah ferum (II) sulfat dengan berhati-hati ke dalam lengan kiri tiub-U dengan menggunakan penitis sehingga lapisan larutan mencapai ketinggian 3 cm.
4. Add acidified potassium manganate(VII) solution carefully into the right arm of the U-tube by using a dropper until the layer of the solution reaches the height of 3 cm.
   Tambah larutan kalium manganat (VII) berasid dengan berhati-hati ke dalam lengan kanan tiub-U dengan menggunakan penitis sehingga lapisan larutan mencapai ketinggian 3 cm.
5. Immerse carbon electrodes into each arms of the U-tube.
   Rendam elektrod karbon ke dalam setiap lengan tiub-U
6. Connect the carbon electrodes to a galvanometer using connecting wires.
   Sambungkan elektrod karbon kepada galvanometer dengan menggunakan wayar penyambung.
7. Determine the negative and positive terminals based on the deflection of galvanometer pointer.
   Terminal negatif dan positif ditentukan berdasarkan pesongan jarum galvanometer.
8. Left the apparatus aside for 30 minutes and record the observation at both electrodes.
   Biarkan radas untuk 30 minit dan rekodkan pemerhatian di kedua-dua elektrod.

1+1

Max 5

1

1

| | | Verification of statement:
Pengesahan pernyataan:

At negative electrode, green solution turns brown.
Di terminal negatif, larutan hijau bertukar perang.

Because Fe^{2+} ion released electron to formed Fe^{3+} ion.
Kerana ion Fe^{2+} menderma elektron membentuk ion Fe^{3+}

$Fe^{2+} \rightarrow Fe^{3+} + e$.

Oxidation occur and Fe^{2+} ion is reducing agent.
Pengoksidaan berlaku dan ion Fe^{2+} adalah agen penurunan. | 1 |