

Section A
Bahagian A

[60 marks]
[60 markah]

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

- 1 Diagram shows a set up apparatus for experiment to investigate the movement of particles in water.
Rajah menunjukkan penyediaan radas bagi eksperimen untuk mengkaji pergerakan zarah-zarah dalam air.

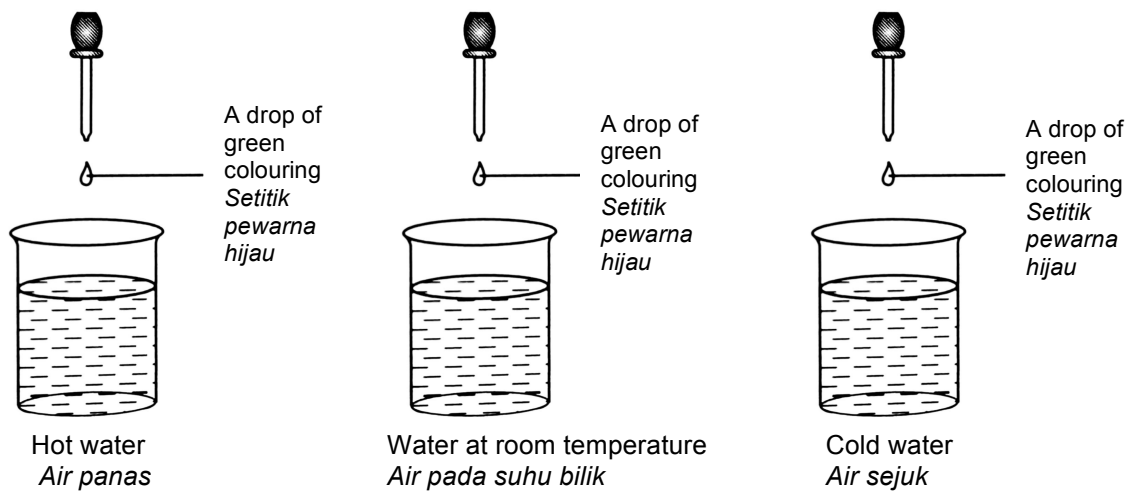


Diagram 1
Rajah 1

- (a) (i) Name the process involved in the experiment.
Namakan proses yang terlibat dalam eksperimen ini.

.....
[1 mark/ 1 markah]

- (ii) State the type of particles contained in the green colouring.
Nyatakan jenis zarah yang terdapat dalam pewarna hijau itu.

.....
[1 mark/ 1 markah]

- (iii) Explain your observation for each of this experiment.
Terangkan pemerhatian anda bagi setiap eksperimen ini.

.....
.....
.....

[3 marks/ 3 markah]

- (b) The following information is about an organic compound, X.
Maklumat yang berikut adalah mengenai suatu sebatian organik, X.

- Has an empirical formula of CH_2
Mempunyai formula empirik CH_2
- Has a relative molecular mass of 28
Mempunyai jisim molekul relative 28
- Decolorized the brown colour of bromine
Melunturkan warna perana bromin

Based on the given information,

Berdasarkan maklumat yang diberikan,

- i. Determine the molecular formula of X.

Tentukan formula molekul bagi X.

[Relative atomic mass: C = 12; H = 1; O = 16]

[*Jisim atom relatif: C = 12; H = 1; O = 16*]

[2 marks/ 2 markah]

- ii. Write a balanced chemical equation for the reaction of compound X with bromine.

Tuliskan persamaan kimia yang seimbang bagi tindak balas sebatian X dengan bromin.

.....

[2 marks/ 2 markah]

- (e) When a small piece of element Y is burnt in Q gas, a reaction occurred to produce a certain compound.

Apabila seketul kecil unsur Y dibakar dalam gas Q, suatu tindak balas berlaku menghasilkan satu sebatian.

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

*Tuliskan **satu** persamaan kimia bagi tindak balas itu.*

.....
[2 mark / 2 markah]

- (ii) Draw the diagram of electron arrangement for compound that formed.

Lukiskan gambarajah susunan elektron bagi sebatian yang terbentuk.

[2 marks / 2 markah]

- 3 Diagram 3 shows the formation of ammonium sulphate.
Rajah 3 menunjukkan pembentukan bagi ammonium sulfat.

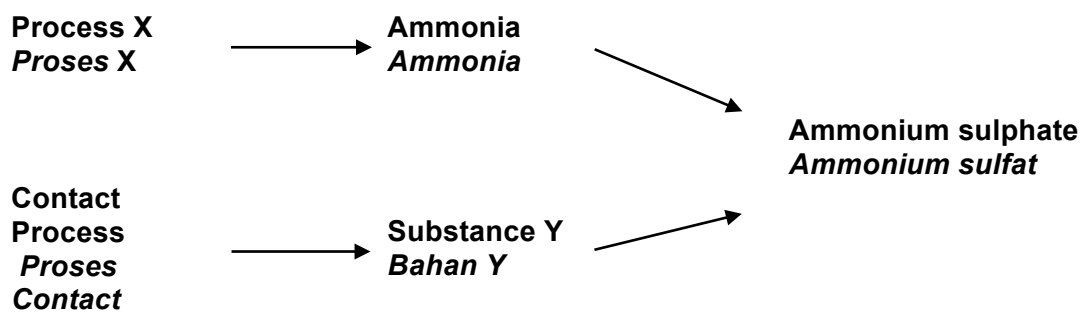


Diagram 3
Rajah 3

- (a) State the names of Process X and Substance Y.
Nyatakan nama bagi Proses X dan Bahan Y.

Process X

Proses X :

Substance Y:

Bahan Y :

[2 marks / 2 markah]

- (b) Write a balanced chemical equation for the reaction between ammonia and sulphuric acid.
Tuliskan satu persamaan kimia yang seimbang bagi tindak balas antara ammonia dan asid sulfurik.

.....

[2 marks / 2 markah]

- (c) Calculate the percentage of nitrogen by mass in ammonium sulphate $(\text{NH}_4)_2\text{SO}_4$.
Hitung peratus nitrogen mengikut jisim bagi ammonium sulfat $(\text{NH}_4)_2\text{SO}_4$.
[Relative atomic mass/Jisim atom relatif: N,14;O,16;S,32;H;1]

[2 marks / 2 markah]

- (d) State one use of ammonium sulphate.
State one use of ammonium sulphate.

.....

[1 mark / 1 markah]

- (e) Describe how sulphur dioxide gas can cause environmental pollution and state two effects of pollution cause by sulphur dioxide gas.
Huraikan bagaimana gas sulfur dioksida boleh menyebabkan pencemaran alam sekitar dan nyatakan dua kesan pencemaran yang disebabkan oleh gas sulfur dioksida.

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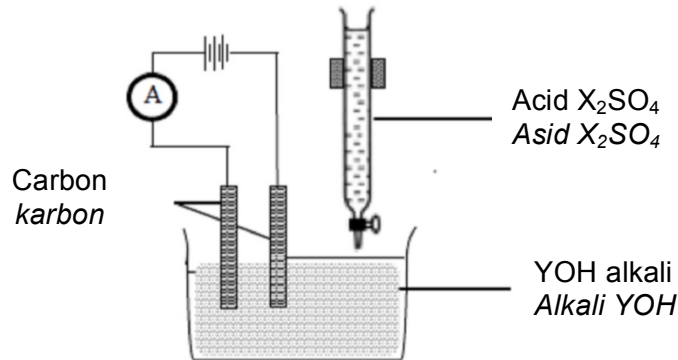
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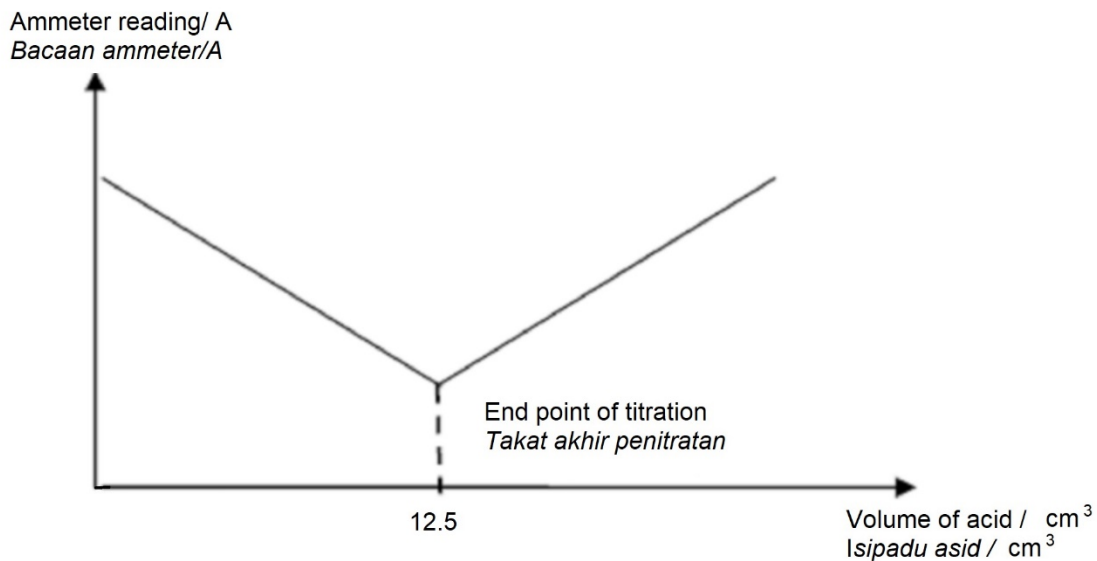
[3 marks / 3 markah]

- 4 Diagram 4 shows an apparatus set-up to determine the end titration through electrical conductivity method 25 cm^3 1.0 mol dm^{-3} of strong alkali YOH is neutralises by acid H_2SO_4 .
Rajah 4 menunjukkan susunan alat radas untuk menentukan takat akhir menggunakan kaedah kekonduksian elektrik bagi 25 cm^3 berkepekatan 1 mol dm^{-3} alkali kuat YOH yang dineutralkan oleh asid H_2SO_4 .



A graph of electrical conductivity, ammeter reading against the volume of acid H_2SO_4 (cm^3) is then plotted. The end point of titration during neutralisation can be determine when the electrical conductivity is at the lowest.

Graf kekonduksian elektrik, bacaan ammeter(A) melawan isi padu asid H_2SO_4 (cm^3) kemudian diplotkan. Takat akhir pentitratan boleh ditentukan apabila kekonduksian elektrik berada pada takat paling rendah.



- (a) H_2SO_4 is a strong acid. What is meant by a strong acid?
 H_2SO_4 adalah asid kuat. Apakah maksud asid kuat?

.....

.....

[1 mark / 1 markah]

- (b) H_2SO_4 is also diprotic acid. What is meant by a diprotic acid?
 H_2SO_4 adalah asid diprotik. Apakah maksud asid diprotik?

.....

.....

[1 mark/ 1 markah]

- (c) At the end point of titration, ammeter still gives the reading. Explain why?
Pada takat akhir penitratan, ammeter masih memberikan bacaan. Terangkan mengapa?

.....

.....

[2 marks / 2 markah]

- (d) (i) Write the chemical equation for the reaction
Tuliskan persamaan kimia bagi tindak balas tersebut

.....

[2 marks/ 2 markah]

- (ii) Calculate number of mole YOH alkali.
Kirakan bilangan mol alkali YOH

.....

[1 mark/ 1 markah]

- (iii) Molarity of acid H_2SO_4 used in this titration reaction.
Kemolaran asid H_2SO_4 yang telah digunakan dalam tindak balas penitratan ini.

[3 marks/ 3 markah]

- 5 Diagram 5.1 shows a series of reaction of salt X.
Rajah 5.1 menunjukkan satu siri tindak balas bagi garam X.

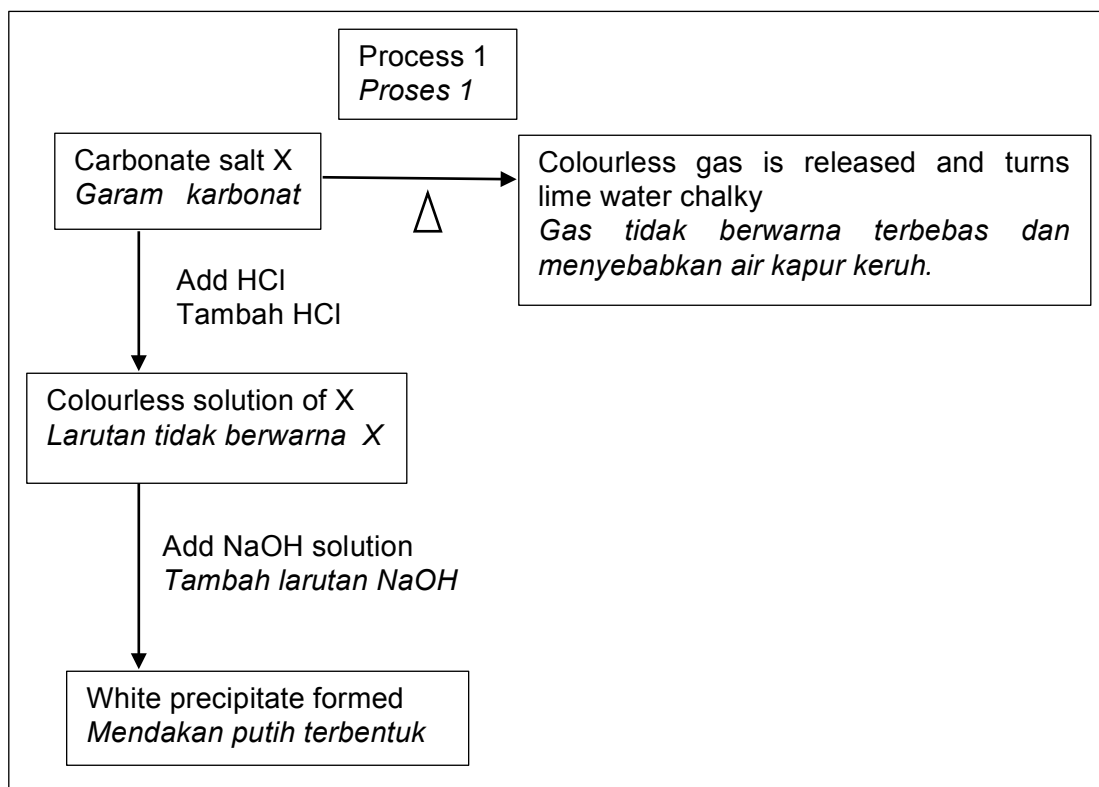


Diagram 5.1
Rajah 5.1

- (a) Based on Diagram 5.1
Berdasarkan Rajah 5.1

- (i) Name the colourless gas released.
Namakan gas tidak berwarna yang terbebas.

.....
 [1 mark / 1 markah]

- (ii) State process I
Nyatakan proses I

.....
 [1 mark / 1 markah]

- (iii) Suggest salt X.
Cadangkan garam X.

.....
 [1 mark / 1 markah]

- (iv) State the chemical formula of salt X in (a) (iii).
Nyatakan formula kimia garam X di (a)(iii).

.....
[1 mark/ 1 markah]

- (v) Suggest another solution can replace sodium hydroxide, NaOH solution to detect the cation presence.
Cadangkan satu larutan lain yang boleh menggantikan larutan natrium hidroksida untuk mengesan kehadiran kation.

.....
[1 mark / 1 markah]

- (b) Diagram 5.2 shows the apparatus set-up of an experiment for the heating of zinc nitrate salt.
Rajah 5.2 menunjukkan susunan radas bagi satu eksperimen untuk pemanasan garam zink nitrat.

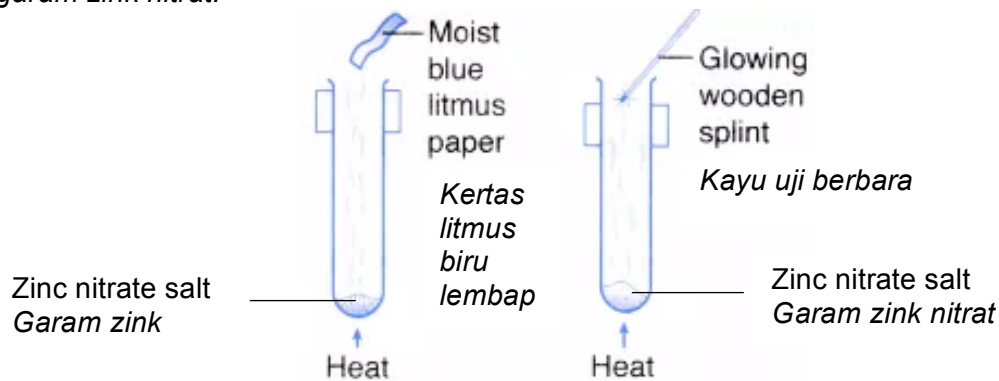


Diagram 5.2
Rajah 5.2

Based on Diagram 5.2,
Berdasarkan Rajah 5.2,

- (i) State the colour of zinc nitrate during heating.
Nyatakan warna zink nitrat semasa pemanasan.

.....
[1 mark / 1 markah]

- (ii) Name the gas that change the colour of moist blue litmus paper.
Namakan gas yang menukarkan warna kertas litmus biru lembap.

.....
[1 mark / 1 markah]

- (iii) Write chemical equation for the heating process.
Tuliskan persamaan kimia bagi proses pemanasan tersebut.

.....
 [2 marks/ 2 markah]

- (c) Lead (II) chloride is an insoluble salt. Lead (II) nitrate is one of the substance used to prepare the salt.
Plumbum(II) bromide ialah garam tak terlarutkan. Plumbum (II) nitrat ialah salah satu bahan yang digunakan untuk menyediakan garam ini.

- (i) Name other substance to prepare lead (II) chloride
Namakan bahan lain yang digunakan untuk menyediakan plumbum (II) bromide.

.....
 [1 mark/ 1 markah]

- (ii) Write ionic equation for the reaction.
Tuliskan persamaan ion untuk tindak balas ini.

.....
 [1 mark/ 1 markah]

- 6 Diagram 6 shows the apparatus set-up to determine the heat of neutralisation between nitric acid and sodium hydroxide solution.
Rajah 6 menunjukkan susunan radas untuk menentukan haba peneutralan di antara larutan asid nitrik dan natrium hidroksida.

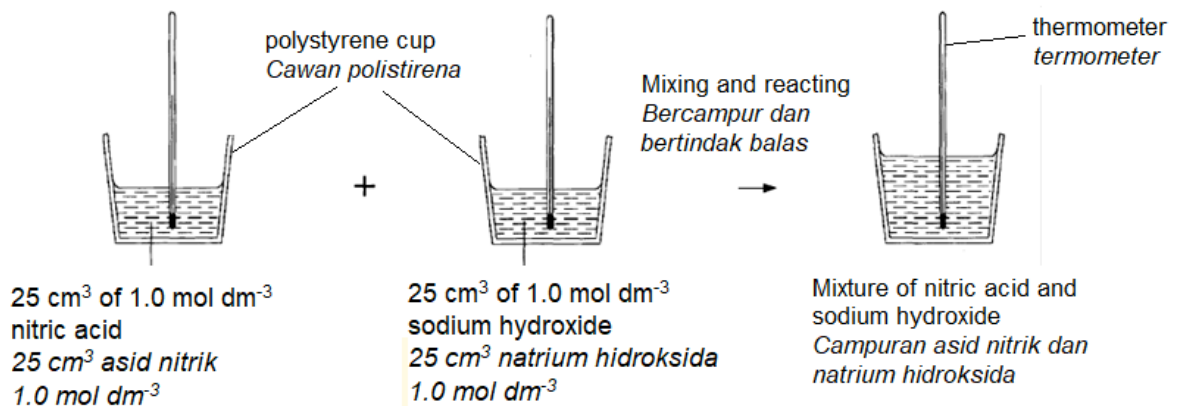


Diagram 6
 Rajah 6

Table 6 shows the result of this experiment.
Jadual 6 menunjukkan keputusan eksperimen.

Description <i>Deskripsi</i>	Temperature (°C) <i>Suhu</i>
Initial temperature of nitric acid <i>Suhu awal asid nitrik</i>	30.0
Initial temperature of sodium hydroxide <i>Suhu awal natrium hidroksida</i>	30.0
Highest temperature of the mixture <i>Suhu tertinggi campuran</i>	36.8

Table 6
Jadual 6

- (a) What is the meaning of heat of neutralisation?
Apakah maksud haba peneutralan?

.....

[1 mark/ 1 markah]

- (b) Calculate
Hitungkan

- (i) The heat released during the reaction.
 [Specific heat capacity of solution, $c = 4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}$, Density of solution = 1 g cm^{-3}]
Haba terbebas semasa tindak balas.
[Muatan haba tentu larutan, $c = 4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}$; Ketumpatan larutan = 1 g cm^{-3}]

[1 mark/ 1 markah]

- (ii) The number of moles of nitric acid reacting
Bilangan mol asid nitrik yang bertindak balas

[1 mark/ 1 markah]

- (iii) The heat of neutralisation
Haba peneutralan

[1 mark / 1 markah]

- (c) Draw an energy level diagram for this reaction.

Lukiskan rajah aras tenaga bagi tindak balas ini.

[2 marks/ 2

markah]

- (d) The experiment is repeated using 25 cm^3 of 1.0 mol dm^{-3} ethanoic acid to replace the nitric acid. The heat of neutralisation using ethanoic acid is 55.0 kJ mol^{-1} .

Explain the difference of the heat of neutralisation.

Eksperimen ini diulangi dengan menggunakan 25 cm^3 asid etanoik 1.0 mol dm^{-3} untuk menggantikan asid nitrik. Haba peneutralan menggunakan asid etanoik adalah 55.0 kJ mol^{-1} . Huraikan perbezaan haba peneutralan ini.

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.....
.....

[3 marks/ 3 markah]

- (e) (i) The heat of neutralization obtained from the experiment is less than the standard value. Explain.

Haba peneutralan yang diperoleh daripada eksperimen ini lebih rendah daripada nilai piawai. Terangkan.

.....
.....

[1 mark/ 1 markah]

- (ii) Suggest a way to improve the results obtained in this experiment.

Cadangkan satu cara untuk memperbaiki keputusan eksperimen ini.

.....
.....

[1 mark/ 1 markah]

Section B
Bahagian B

[20 marks]
[20 markah]

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

- 7 Diagram 7 shows a simple chemical cell
Rajah 7 menunjukkan suatu sel kimia

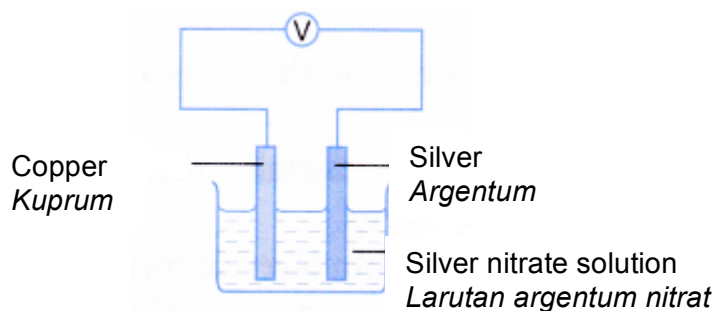


Diagram 7
Rajah 7

- (a) (i) Describe briefly how the above cell works. Include in your answer related half equations and observations.
Terangkan secara ringaks bagaimana sel di atas berfungsi. Masukkan dalam jawapan anda persamaan setengah dan pemerhatian yang berkaitan.
[10 marks/ 10 markah]

- (ii) Table 8 shows the information about another two cells.
Jadual 8 menunjukkan maklumat tentang dua sel yang lain.

Cell <i>Sel</i>	Pair of metal <i>Pasangan logam</i>	Cell voltage <i>Voltan sel</i>	Negative terminal <i>Terminal negatif</i>
I	Zinc and copper <i>Zink dan kuprum</i>	1.10V	Zinc <i>Zink</i>
II	Zinc and silver <i>Zink dan argentum</i>	1.56V	Zinc <i>Zink</i>

Table 7
Jadual 7

Use the information shown in Table 7 to calculate the voltage of the cell shown in Diagram 7.

Gunakan maklumat yang ditunjukkan dalam Jadual 7 untuk mengira voltan bagi sel yang ditunjukkan.

[2 marks / 2 markah]

- (b) You are given the necessary chemicals and the apparatus as shown below.
Anda dibekalkan dengan bahan kimia dan radas seperti yang ditunjukkan di bawah.

Aluminium plate, copper plate, salt bridge, voltmeter, beakers and connecting wires and crocodile clips
Kepingan aluminium, kepingan kuprum, jambatan garam, voltmeter, bikar, wayar penyambung dan klip buaya

- (i) Name two suitable electrolytes used to set up the apparatus.
Namakan dua elektrolit yang sesuai digunakan untuk menyediakan susunan radas tersebut.

[2 marks / 2 markah]

- (ii) Draw a labelled diagram of a voltaic cell used to convert chemical energy into electrical energy. Show the movement of electrons in your diagram.
Lukis gambarajah berlabel sel voltan yang digunakan untuk menukarkan tenaga kimia kepada tenaga elektrik. Tunjukkan pergerakan electron di dalam rajah anda.

[6 marks/ 6 markah]

- 8 (a) Diagram 8.1 shows the flow chart for the reactions of butan-1-ol.
Rajah 8.1 menunjukkan satu carta alir bagi tindak balas butan-1-ol.

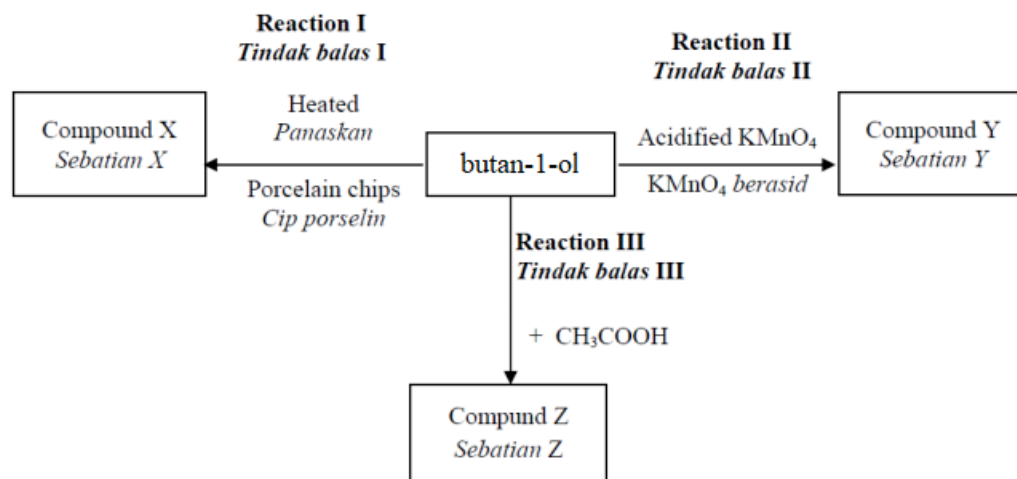


Diagram 8.1
Rajah 8.1

- (i) Draw the structural formula of compound X, Y and Z.
Lukiskan formula struktur sebatian X, Y dan Z. [3 marks / 3 markah]
- (ii) In Reaction I, draw the set up of apparatus that can be used in the conversion and explain a chemical test to identify compound X.
Dalam Tindak balas I, lukiskan rajah susunan radas yang boleh digunakan dalam pertukaran ini dan terangkan satu ujian kimia untuk mengenal pasti sebatian X. [4 marks / 4 markah]
- (iii) State the name of Reaction III. Write a balanced chemical equation for this reaction and state one physical property of compound Z.
Nyatakan nama Tindak Balas III. Tuliskan persamaan kimia seimbang bagi tindak balas ini dan nyatakan satu sifat fizik sebatian Z. [4 marks / 4 markah]
- (iv) Compound X burnt completely in oxygen to produce water and carbon dioxide gas. Write a balanced chemical equation for the complete combustion of compound X. Calculate the volume of carbon dioxide gas produced when 0.02 mol of compound X is completely burnt.
 [Molar volume at room conditions = 24.0 dm³ per mol]
Sebatian X terbakar lengkap dalam oksigen menghasilkan air dan gas karbon dioksida. Tuliskan persamaan kimia seimbang bagi pembakaran lengkap sebatian X. Hitungkan isi padu gas karbon dioksida yang terhasil apabila 0.02 mol sebatian X terbakar lengkap. [4 marks/ 4 markah]

- (b) Diagram 8.2 shows the structural formula of natural polymer, polyisoprene.
Rajah 8.2 menunjukkan formula struktur bagi polimer asli, poliisoprena.

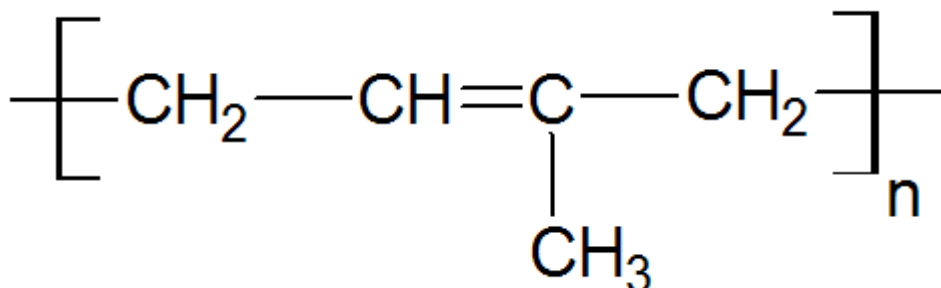


Diagram 8.2
Rajah 8.2

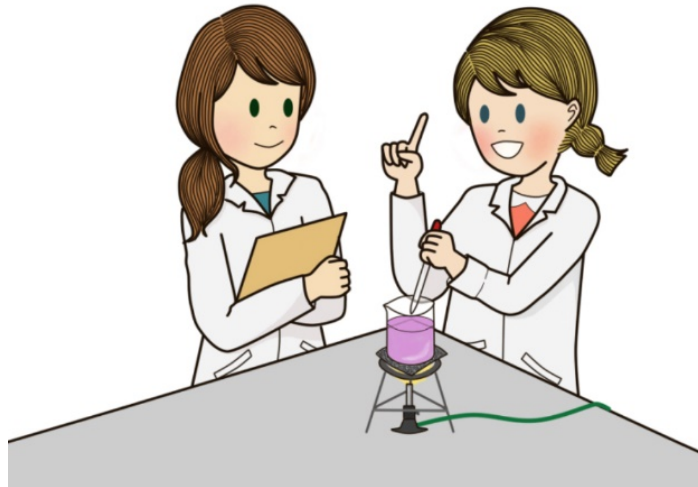
- (i) Draw the structural formula of monomer of this polymer and name the monomer using IUPAC nomenclature.
Lukiskan formula struktur bagi monomer polimer ini dan namakan monomer ini menggunakan penamaan IUPAC.
- [2 marks / 2 markah]
- (ii) Ahmad is a rubber tapper. Everyday he collects the latex that turn into solid. By using a suitable chemical, explain how Ahmad can prevent the latex from becoming solid.
Ahmad adalah seorang penoreh getah. Setiap hari dia mengutip lateks tersebut yang bertukar menjadi pepejal. Dengan menggunakan bahan kimia yang sesuai, terangkan bagaimana Ahmad boleh mengelakkan lateks bertukar kepada bentuk pepejal.
- [3 marks / 3 markah]

Section C
Bahagian C

[20 marks]
[20 markah]

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

9



Two students carried out three sets of experiment to investigate the factors that affect the rate of reaction. Table below shows the reactants and the conditions of the reaction involved.

Dua orang pelajar menjalankan tiga set eksperimen untuk mengkaji faktor yang mempengaruhi kadar tindak balas. Jadual di bawah menunjukkan bahan tindak balas dan keadaan tindak balas yang terlibat.

Set Set	I	II	III
Reactants <i>Bahan tindak balas</i>	25 cm ³ of 0.2 mol dm ⁻³ hydrochloric acid <i>25 cm³ asid hidroklorik 0.2 mol dm⁻³</i> + excess zinc powder <i>serbuk zink berlebihan</i>	25 cm ³ of 0.4 mol dm ⁻³ hydrochloric acid <i>25 cm³ asid hidroklorik 0.4 mol dm⁻³</i> + excess zinc powder <i>serbuk zink berlebihan</i>	25 cm ³ of 0.2 mol dm ⁻³ hydrochloric acid <i>25 cm³ asid hidroklorik 0.2 mol dm⁻³</i> + excess zinc powder <i>serbuk zink berlebihan</i>
Temperature of the mixture <i>Suhu campuran</i>	30°C	30°C	40°C
Time taken to collect 50 cm ³ gas <i>Masa yang diambil untuk mengumpul gas</i>	90 s	55 s	30 s

- a) Zinc, Zn reacts with hydrochloric acid, HCl to produce zinc chloride, ZnCl₂ and hydrogen gas, H₂.
Write a balanced chemical equation for the reaction and calculate the maximum volume of hydrogen gas produced in set I
[Relative atomic mass: Zn = 65; 1 mol of any gas occupies 24 dm³ mol⁻¹ at room conditions]
Zink, Zn bertindak balas dengan asid hidroklorik, HCl menghasilkan zink klorida, ZnCl₂ dan gas hidrogen, H₂.
Tulis persamaan kimia yang seimbang bagi tindak balas itu dan hitung isi padu maksimum gas hidrogen yang dihasilkan dalam set I
[Jisim atom relatif: Zn = 65; 1 mol bagi sebarang gas menempati 24 dm³ mol⁻¹ pada keadaan bilik]

[4 marks /4 markah]

- b) Based on table, compare the rates of reaction
Berdasarkan jadual, bandingkan kadar tindak balas
- i) between set I dan set II
antara set I dengan set II
- ii) between set I dan set III
antara set I dengan set III
By referring to collision theory, explain your answer in b(i) or b(ii)
Dengan merujuk kepada teori perlanggaran jawapan anda di b(i) atau b(ii)

[6 marks/ 6 markah]

- c) Diagram shows the production of fuel during the launching of a space shuttle by using a catalyst.
Rajah menunjukkan pengeluaran bahan api semasa pelancaran sebuah kapal angkasa dengan menggunakan mangkin.

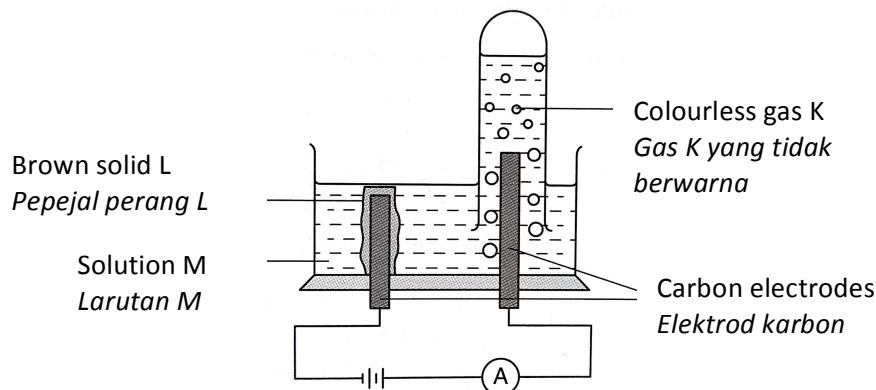


The catalyst is used to speed up the production of fuel. Based on this idea, describe an experiment to show how this factor affects the rate of reaction between acid and zinc.

Mangkin itu digunakan untuk mempercepatkan pengeluaran bahan api. Berdasarkan idea ini, huraikan satu eksperimen untuk menunjukkan bagaimana faktor ini dapat mempengaruhi kadar tindak balas antara asid dengan zink.

[10 marks/10 markah]

- 10 (a) Diagram 10 shows the set-up of apparatus and observation for electrolysis of solution M.
Rajah 10 menunjukkan susunan radas dan pemerhatian untuk elektrolisis larutan M.



- (i) Based on the observation Diagram 10, suggest a suitable electrolyte of solution M.
 Name the colourless gas K produced and describe a chemical test for gas K.
Berdasarkan pemerhatian pada Rajah 10, cadangkan elektrolit larutan M yang sesuai.
Namakan gas K tanpa warna yang terhasil dan terangkan suatu ujian kimia untuk gas K.
- [4 marks/ 4 markah]
- (ii) Explain how gas K and metal L are produced in terms of selective discharge of ion and in terms of oxidation and reduction.
Terangkan bagaimana gas K dan logam L yang terhasil berdasarkan pemilihan ion untuk dinyahcas dari segi pengoksidaan and penurunan.
- [6 marks/ 6 markah]
- (b) The following statement shows the information of an experiment.
Penyataan berikut menunjukkan maklumat suatu eksperimen.

Different pair of metals in an electrolyte produced different potential difference.

By using suitable metals and copper(II) sulphate solution as electrolyte, describe an experiment to verify the statement above.
Dengan menggunakan logam yang sesuai dan larutan kuprum(II) sulfat sebagai elektrolit, huraikan satu eksperimen untuk mengesahkan pernyataan di atas.

[10 marks/ 10 markah]

**END OF QUESTION PAPER
 KERTAS SOALAN TAMAT**

PERIODIC TABLE OF THE ELEMENTS

<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1 H Hydrogen 1 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 150px;"> 10 Ne Neon 20 </div>										<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 2 He Helium 4 </div>																							
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 3 Li Lithium 7 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 4 Be Beryllium 9 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 11 Na Sodium 23 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 12 Mg Magnesium 24 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 13 Al Aluminium 27 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 14 Si Silicon 28 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 15 P Phosphorus 31 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 16 S Sulfur 32 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 17 Cl Chlorine 35.5 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 18 Ar Argon 40 </div>																	
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 19 K Potassium 39 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 20 Ca Calcium 40 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 21 Sc Scandium 45 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 22 Ti Titanium 48 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 23 V Vanadium 51 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 24 Cr Chromium 52 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 25 Mn Manganese 55 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 26 Fe Iron 56 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 27 Co Cobalt 59 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 28 Ni Nickel 59 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 29 Cu Copper 64 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 30 Zn Zinc 65 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 31 Ga Gallium 70 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 32 Ge Germanium 73 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 33 As Arsenic 75 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 34 Se Selenium 79 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 35 Br Bromine 80 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 36 Kr Krypton 84 </div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 37 Rb Rubidium 86 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 38 Sr Strontium 88 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 39 Y Yttrium 89 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 40 Zr Zirconium 91 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 41 Nb Niobium 93 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 42 Mo Molybdenum 96 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 43 Tc Technetium 98 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 44 Ru Ruthenium 101 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 45 Rh Rhodium 103 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 46 Pd Palladium 106 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 47 Ag Silver 108 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 48 Cd Cadmium 112 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 49 In Indium 115 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 50 Sn Tin 119 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 51 Sb Antimony 122 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 52 Te Tellurium 128 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 53 I Iodine 127 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 54 Xe Xenon 131 </div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 55 Cs Cesium 133 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 56 Ba Barium 137 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 57 La Lanthanum 139 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 72 Hf Hafnium 179 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 73 Ta Tantalum 181 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 74 W Tungsten 184 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 75 Re Rhenium 186 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 76 Os Osmium 190 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 77 Ir Iridium 192 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 78 Pt Platinum 195 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 79 Au Gold 197 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 80 Hg Mercury 201 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 81 Tl Thallium 204 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 82 Pb Lead 207 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 83 Bi Bismuth 209 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 84 Po Polonium 210 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 85 At Astatine 210 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 86 Rn Radon 222 </div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 87 Fr Francium 223 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 88 Ra Radium 226 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 89 Ac Actinium 227 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 104 Unq Unnilquadium 257 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 105 Unp Unnilpentium 260 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 106 Unh Unnilhexium 263 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 107 Uns Unnilseptium 262 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 108 Uno Unniloctium 265 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 109 Une Unnilennium 266 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 67 Ho Holmium 165 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 68 Er Erbium 167 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 69 Tm Thulium 169 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 70 Yb Ytterbium 173 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 71 Lu Lutetium 175 </div>									
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 90 Th Thorium 232 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 91 Pa Protactinium 231 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 92 U Uranium 238 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 93 Np Neptunium 237 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 94 Pu Plutonium 244 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 95 Am Americium 243 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 96 Cm Curium 247 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 97 Bk Berkelium 247 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 98 Cf Californium 249 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 99 Es Einsteinium 254 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 100 Fm Fermium 253 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 101 Md Mendelevium 256 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 102 No Nobelium 254 </div>		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 103 Lr Lawrencium 257 </div>									

