

Nama:

Kelas:

SULIT
4541/2
Kimia
Kertas 2
September
2005

4541/2



2½ jam

MAKTAB RENDAH SAINS MARA

**PEPERIKSAAN PERCUBAAN
SIJIL PELAJARAN MALAYSIA 2005**

KIMIA

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tuliskan nama dan kelas anda pada ruang yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa.*
3. *Soalan di halaman kiri adalah dalam bahasa Melayu. Soalan di halaman kanan adalah yang sepadan dalam bahasa Inggeris.*
4. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Melayu atau bahasa Inggeris.*
5. *Calon dikehendaki membaca maklumat di halaman 2 atau halaman 3.*

<i>Untuk Kegunaan Pemeriksa</i>			
Bahagian	Soalan	Markah Penuh	Markah Diperoleh
A	1	10	
	2	10	
	3	10	
	4	10	
	5	10	
	6	10	
B	1	20	
	2	20	
C	3	20	
	4	20	
Jumlah			

Kertas soalan ini mengandungi 47 halaman bercetak dan 1 halaman tidak bercetak

INFORMATION FOR CANDIDATES

1. *This question paper consists of **three** sections: **Section A**, **Section B** and **Section C**.*
2. *Answer **all** questions in **Section A**. Write your answers for **Section A** in the spaces provided in the question paper.*
3. *Answer one question from **Section B** and one question from **Section C**. Write your answers for **Section B** and **Section C** on the lined pages at the end of the question paper. Answer questions in **Section B** and **Section C** in detail. You may use equations, diagrams, tables, graphs and other suitable methods to explain your answer.*
4. *Show your working, it may help you to get marks.*
5. *If you wish to cancel any answer, neatly cross out the answer.*
6. *The diagrams in the questions are not drawn to scale unless stated.*
7. *Marks allocated for each question or part question are shown in brackets.*
8. *The time suggested to complete **Section A** is 90 minutes, **Section B** is 30 minutes and **Section C** is 30 minutes*
9. *You may use a non – programmable scientific calculator.*
10. *Hand in all your answer sheets at the end of the examination.*

Section A

[60 marks]

Answer **all** questions in this section.
The time suggested to complete **Section A** is 90 minutes

- 1 Figure 1 shows the set-up of apparatus for an experiment to determine the empirical formula of Y oxide.

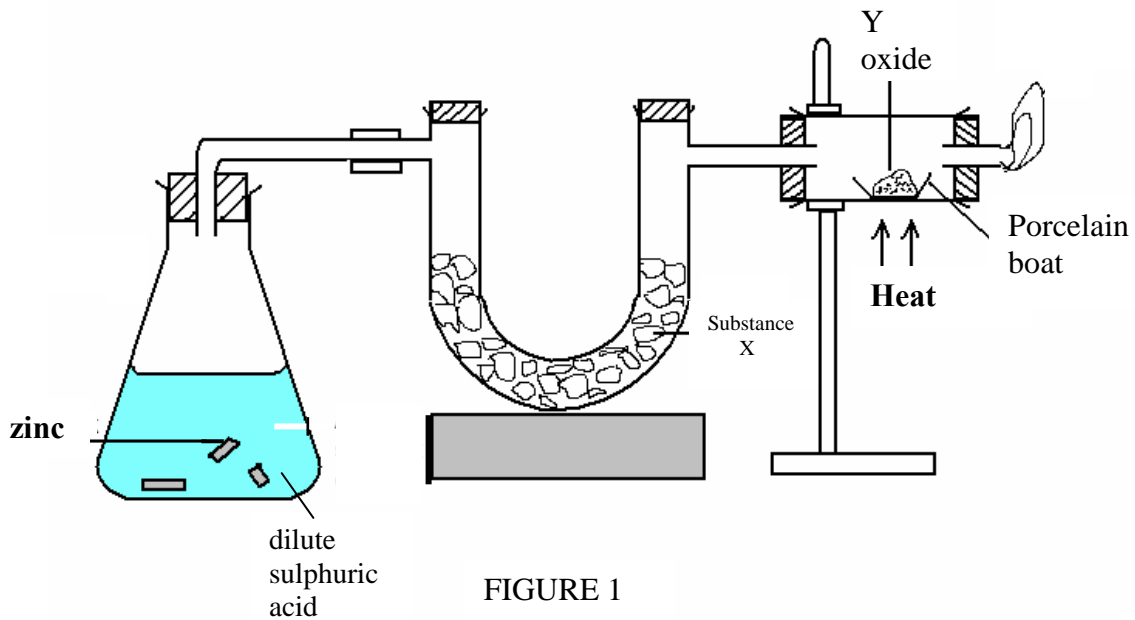


FIGURE 1

- (a) Name the substance X used to dry the hydrogen gas.

1(a)

_____ [1 mark]

- (b) Why is it necessary to dry the hydrogen gas?

1(b)

_____ [1 mark]

[Lihat sebelah

- (c) State **two** observations at the combustion tube in this experiment.

[2 marks]

1(c)

- (d) Table 1 shows the results obtained when a sample of Y oxide reacts with hydrogen gas.

Mass of empty porcelain boat	105.8 g
Mass of porcelain boat + Y oxide	111.2 g
Mass of porcelain + Y	110.6 g

TABLE 1

- (i) Calculate the number of moles of Y atoms in the sample.
Use the information that the relative atomic mass Y = 64

[2 marks]

1(d)(i)

- (ii) Calculate the number of moles of oxygen atoms in the sample.
Use the information that the relative atomic mass O = 16

[2 marks]

1(d)(ii)

- (iii) Determine the empirical formula of Y oxide.

[2 marks]

1(d)(iii)

[Lihat sebelah

Total

2 Figure 2 shows part of the Periodic Table of Elements.

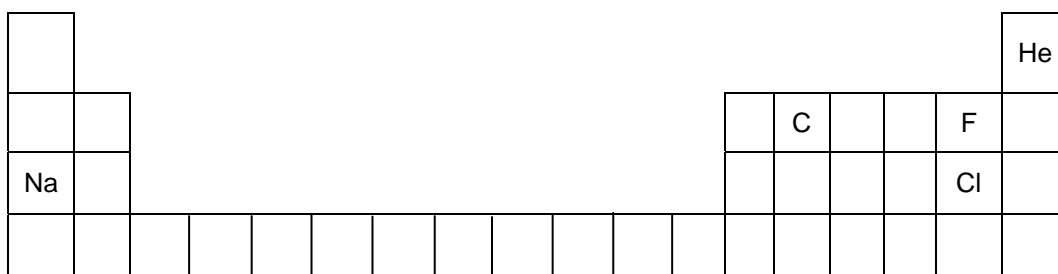


FIGURE 2

Based on Figure 2, answer the following questions.

(a) Determine the group and period for element C in the Periodic Table.

_____ [1 mark]

2(a)

(b) Draw the electron arrangement of the compound formed between the atoms of Na and Cl. [2 marks]

2(b)

(c) (i) The atoms of C and Cl can react with each other to form a compound X. Draw the electron arrangement of the compound X formed. [2 marks]

2(c)(i)

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- (ii) Figure 3 shows the set – up of apparatus to investigate the conductivity of liquid compound X.

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Examiner's
Use*

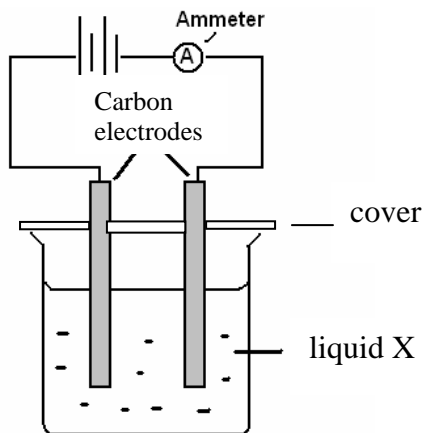


FIGURE 3

State **one** observation and give a reason for it.

[2 marks]

2c(ii)

- (d) F atom is more reactive than Cl atom. Explain why.

[3 marks]

2(d)

[Lihat sebelah

Total

3. Figure 4 shows the set-up of apparatus for the Thermit reaction between aluminium and iron(III) oxide to produce iron metal and aluminium oxide.

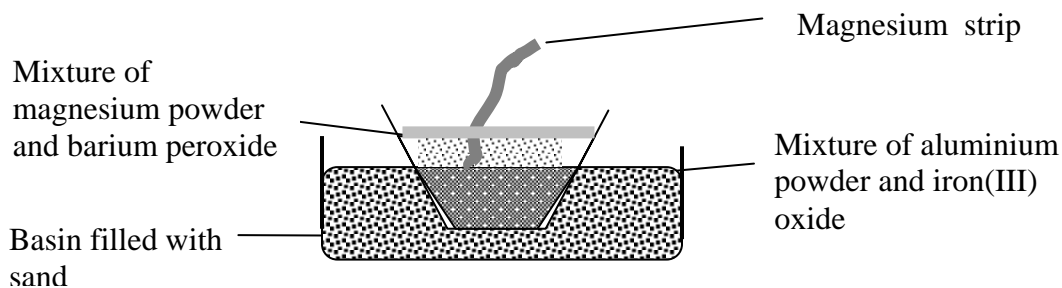


FIGURE 4

Based on this Thermit reaction,

- (a) Name the types of reaction that occurs.

_____ [1 mark]

- (b) (i) State the function of aluminium powder.

_____ [1 mark]

- (ii) Explain your answer in b(i)

_____ [1 mark]

- (c) (i) Write the chemical equation for the reaction between aluminium and iron(III) oxide.

_____ [1 mark]

*For
Examiner's
Use*

3(a)

3(b)(i)

3(b)(ii)

3(c)(i)

- (ii) Calculate the maximum mass of iron produced if 4.0 g of iron(III) oxide react with excess aluminium powder.

Use the information that the relative atomic mass Fe = 56, Al = 27, and O = 16.

[3 marks]

*For
Examiner's
Use*

3(c)(ii)

- (d) In industry, iron is extracted from its ore using carbon or hydrogen gas.

- (i) Give **one** reason why Thermit reaction is not used in industry for the extraction of iron from its ore.

[1 mark]

3d(i)

- (ii) Explain why carbon **or** hydrogen is suitable to be used extensively for the extraction of iron in industry.

[2 marks]

3d(ii)

Total

[Lihat sebelah

- 4 Three experiments were carried out to investigate the effect of the factors influencing the rates of reactions. Table 2 shows the mixture of substances used and the time taken to accumulate 25 cm³ of gas evolved from each experiment.

Experiment	Mixture of substances	Time/s
I	25.0 cm ³ of hydrochloric acid 1.0 mole dm ⁻³ + 2.0 g of magnesium strip.	50
II	25.0 cm ³ of hydrochloric acid 1.0 mole dm ⁻³ + 2.0 g of magnesium strip + 3 drops of copper (II) sulphate solution.	30
III	12.5 cm ³ of sulphuric acid 1.0 mole dm ⁻³ + 2.0 g of magnesium strip.	20

TABLE 2

- (a) Sketch the graphs for the three experiments that show the liberation of 25.0 cm³ of gas on the axes given.



[2 marks]

- (b) Why is the time taken to collect 25.0 cm³ of gas in Experiment II is shorter than in Experiment I?

[1 mark]

[Lihat sebelah

*For
Examiner's
Use*

4(a)

4(b)

- (c) Based on the collision theory, explain why the time taken to collect 25 cm³ in Experiment III is shorter than in Experiment I.

[3 marks]

- (d) Calculate the mass of magnesium that reacts with sulphuric acid to produce 25.0 cm³ of gas in Experiment III. Use the information that 1 mole of gas occupies a volume of 24 dm³ at room temperature and pressure, relative atomic mass Mg = 24, H = 1, S = 32 and O = 16 .

[4 marks]

*For
Examiner's
Use*

4(c)

4(d)

Total

[Lihat sebelah

- 5 Figure 5 shows the flow chart of a series of conversions related to alcohol Z .

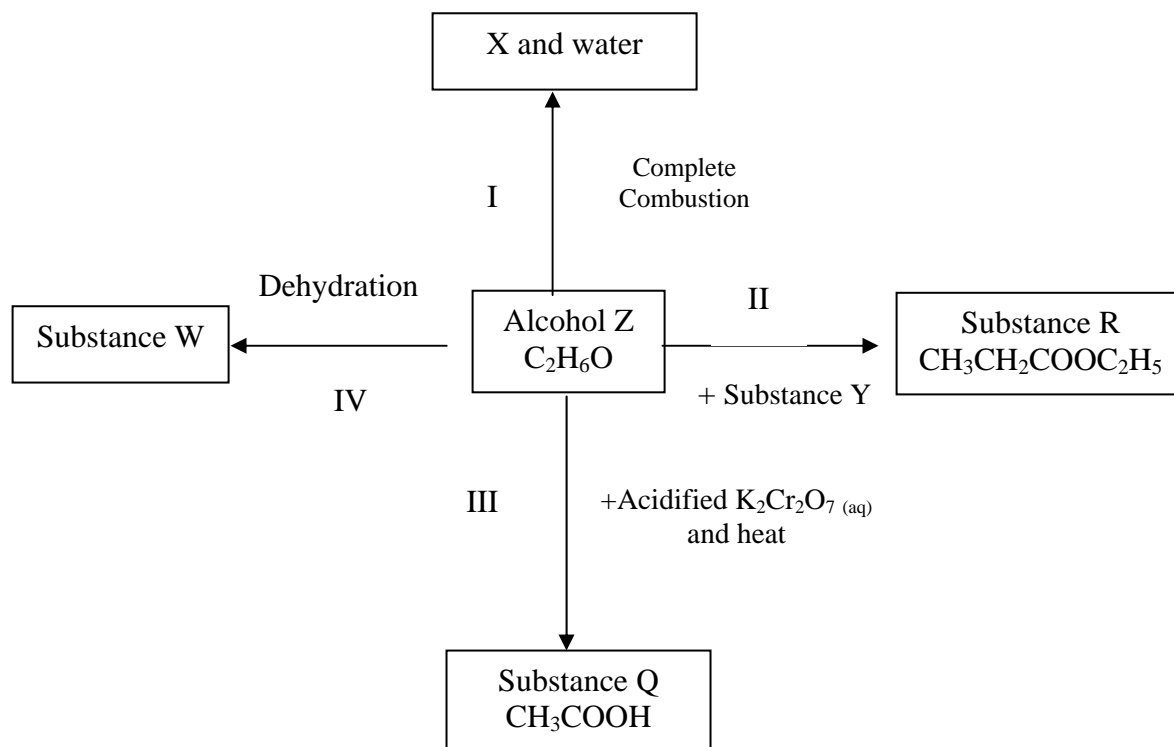


FIGURE 5

Based on Figure 5, answer the following questions :

- (a) Name substance X?

_____ [1 mark]

- (b) Describe briefly the method of preparing substance R from alcohol Z in the laboratory.

[3 marks]

[Lihat sebelah

5(a)

5(b)

(c) (i) What is observed in conversion III ?

_____ [1 mark]

5(c)(i)

(ii) Write a chemical equation for the reaction in conversion III.

_____ [1 mark]

5(c)(ii)

(d) (i) Draw the structural formula of substance W and name it.

[2 marks]

5(d)(i)

(ii) Draw the set- up of apparatus that can be used to obtain substance W from alcohol Z.

[2 marks]

5(d)(ii)

Total

- 6 Figure 6 shows the set-up of apparatus to investigate the reactions that occur in cell A and cell B

*For
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Use*

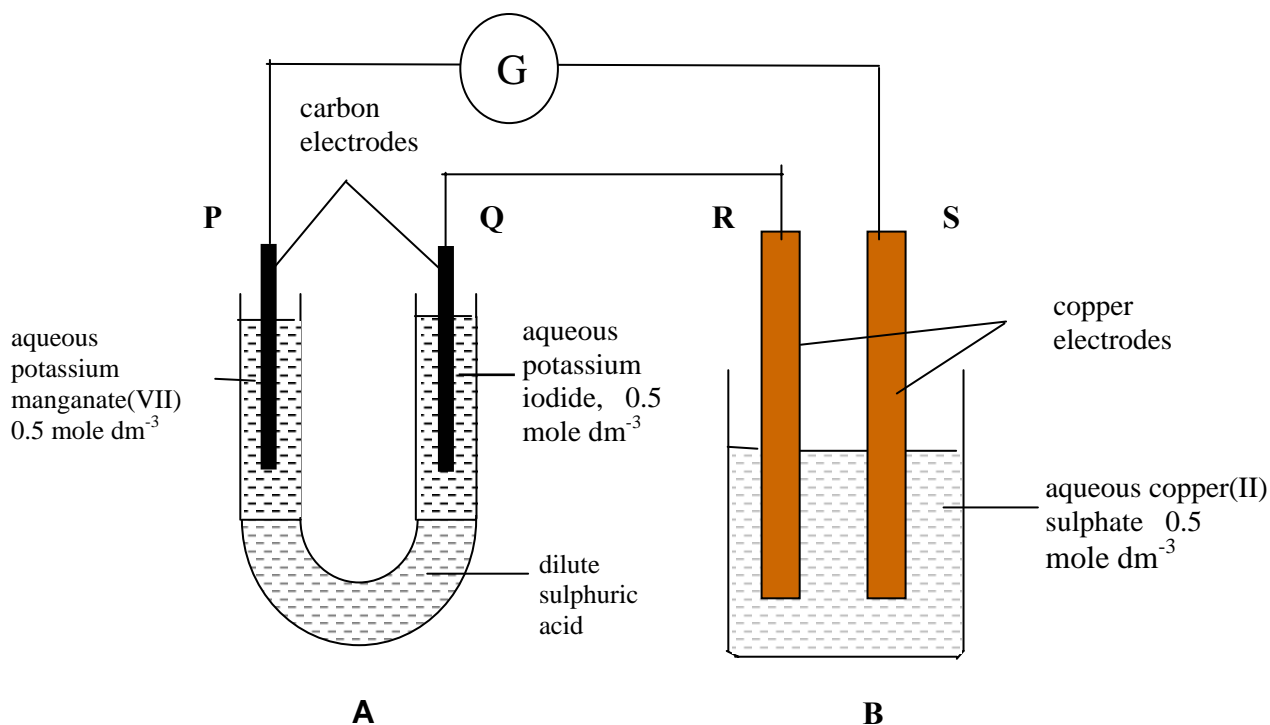


FIGURE 6

- (a) Half-cell reaction in cell A is represented by a half-equation,



- (i) State the energy change that occurs in cell A

[1 mark]

6(a)(i)

- (ii) State **one** observation at Q electrode.

[1 mark]

6(a)(ii)

- (iii) Write the half equation for the reaction at Q electrode.

[1 mark]

6(a)(iii)

		<i>For Examiner's Use</i>
(b) Referring to cell B;		
(i) State one observation at R electrode		6(b)(i)
<hr/>	[1 mark]	<input type="text"/>
(ii) What was observed in the change of intensity of blue aqueous copper(II) sulphate? Explain your answer.		6(b)(ii)
<hr/>		<input type="text"/>
<hr/>		
<hr/>	[2 marks]	
(iii) Write the overall equation for the reaction in cell B		6(b)(iii)
<hr/>	[1 mark]	<input type="text"/>
(c) On Figure 6, mark the direction of electron flow between cells A and B		6(c)
	[1 mark]	<input type="text"/>
(d) (i) What would be observed on the reading of the galvanometer if the experiment is repeated by replacing dilute sulphuric acid in cell A with tetrachloromethane?		6(d)(i)
<hr/>	[1 mark]	<input type="text"/>
(ii) Give your reason for the answer given in d(i)		6(d)(ii)
<hr/>		<input type="text"/>
<hr/>	[1 mark]	
(e) If copper electrodes R and S were replaced with carbon (graphite) electrodes, what could be observed at S electrode?		6(e)
<hr/>	[1 mark]	<input type="text"/>
	[Lihat sebelah	Total
		<input type="text"/>

Section B

[20 marks]

Answer any **one** question from this section.
The time suggested to complete this **section** is 30 minutes

- 1 Table 1 shows the pH values of two different types of acid.

Types of acid	Concentration of acid	pH value
Hydrochloric acid	0.1 mole dm ⁻³	1.0
Sulphuric acid	0.1 mole dm ⁻³	0.7

TABLE 1

- (a) Explain why the pH value of both acids are different. [4 marks]

- (b)

5 g of zinc sulphate salt is required to be prepared from the reaction between zinc metal with sulphuric acid of 0.5 mole dm ⁻³
--

- (i) Write a chemical equation for the formation of zinc sulphate salt. [1 mark]
- (ii) Calculate the minimum volume of sulphuric acid 0.5 mole dm⁻³ required to prepare the salt if excess zinc is used.
Use the information that the relative atomic mass of Zn = 65, S = 32, and O = 16 [3 marks]
- (iii) Explain briefly how zinc sulphate crystals can be separated from the salt solution. [2 marks]

[Lihat sebelah

- (c) Figure 1 shows 3 beakers containing three different salt solutions labeled X, Y and Z

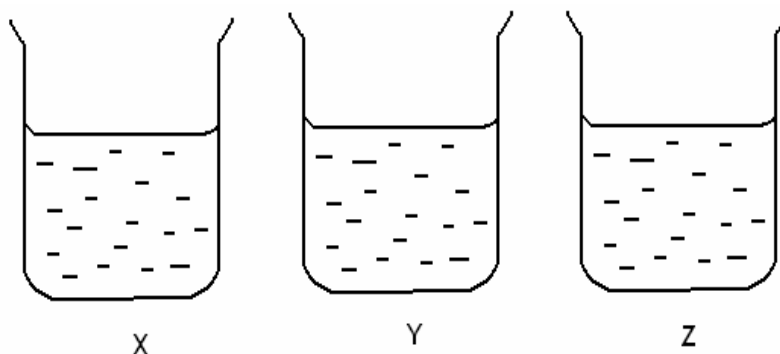


FIGURE 1

Three beakers labeled X, Y and Z may contain the following salt solutions

- Calcium nitrate
- Magnesium nitrate
- Magnesium chloride

You are provided only with ammonia and silver nitrate solutions.

Describe how you could differentiate between the 3 salt solutions by using the two provided reagents. Include your observations and conclusions.

[10 marks]

[Lihat sebelah

- 2 (a) Figure 2 shows the label found on an ice cream wrapper.

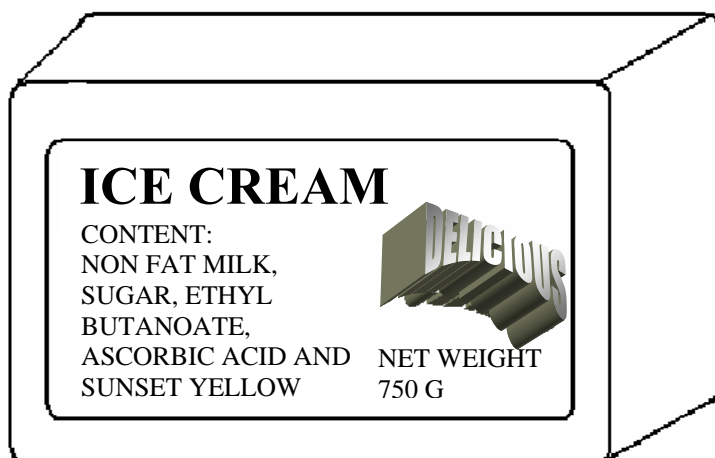
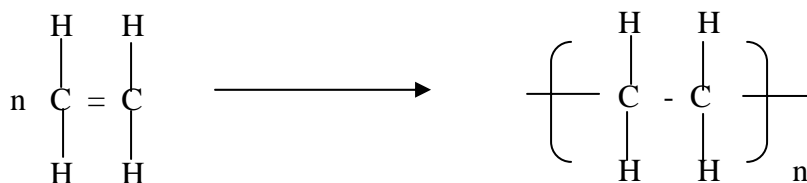


FIGURE 2

- (i) Based on the label, explain briefly the function of ascorbic acid, sunset yellow and ethyl butanoate. [3 marks]
- (ii) Draw the structural formula for ethyl butanoate found in the ice – cream. [1 mark]
- (b) Polythene and polypropene are synthetic polymers widely used in daily life. The following chemical equation shows the polymerisation of ethene to polyethene



- (i) Write the chemical equation for the polymerisation of propene to polyethene. [1 mark]
- (ii) Explain the usage of synthetic polymer substances that can contribute towards the problems of environmental pollution. [3 marks]
- (iii) Suggest **two** ways how the problems in b(ii) could be reduced. [2 marks]

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- (c) The flow chart in Figure 3 shows how the production of four compounds derived from nitrogen that can be used as fertilizers.

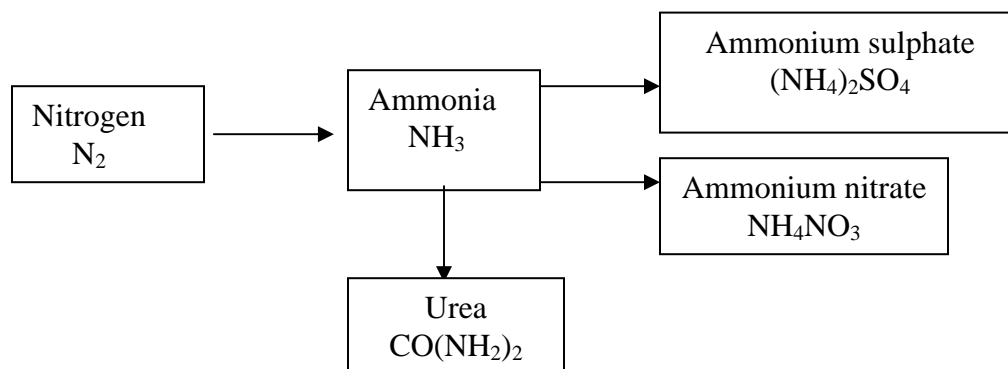


FIGURE 3

- (i) State **two** reasons why ammonia is not suitable to be used directly as fertilizer. [2 marks]
- (ii) Compare the nitrogen content in ammonium sulphate , ammonium nitrate and urea.
Use the information that relative atomic mass N = 14, H = 1, O = 16, C=12, and S = 32 [3 marks]
- (iii) Farmers neutralise the acidity of their agricultural soil by adding the alkaline calcium hydroxide. Why do calcium hydroxide and ammonium fertiliser are not suitable to be added to the soil at the same time? [2 marks]
- (iv) Explain briefly how to confirm the presence of ammonium ions in a solution of ammonium fertilizer. [3 marks]

[Lihat sebelah

Section C

[20 marks]

*Answer any **one** question from this section.
The time suggested to complete this **section** is 30 minutes.*

- 3 (a) Figure 4 shows a tyre of a vehicle developed from vulcanized natural rubber.

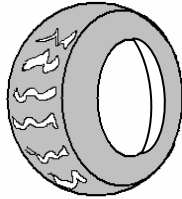


FIGURE 4

- (i) Explain why vulcanization process can change the structure of natural rubber.

[2 marks]

- (ii) Compare the characteristics of nonvulcanized natural rubber with vulcanized natural rubber.

[2 marks]

[Lihat sebelah

- (b) Table 2 shows the result of 2 experiments to differentiate between oil A and oil B

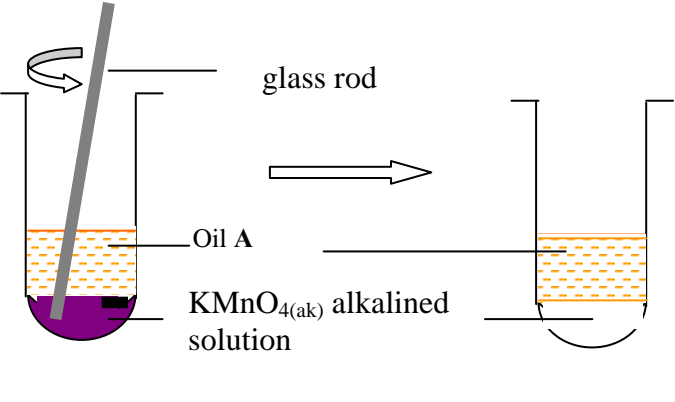
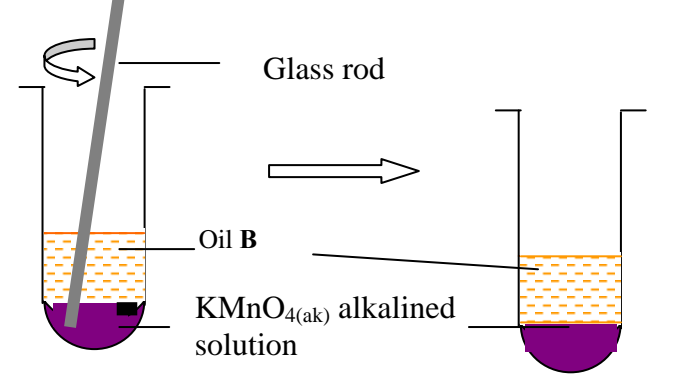
Experiment	Observation
 <p>Diagram illustrating Experiment 1: A test tube containing Oil A and a purple $\text{KMnO}_{4(\text{ak})}$ alkalined solution. A glass rod is used to stir the mixture. After stirring, the purple color has disappeared, leaving a colorless solution.</p>	<p>Purple colour decolourised to become colourless</p>
 <p>Diagram illustrating Experiment 2: A test tube containing Oil B and a purple $\text{KMnO}_{4(\text{ak})}$ alkalined solution. A glass rod is used to stir the mixture. After stirring, the purple color remains unchanged.</p>	<p>Purple colour doesn't change</p>

TABLE 2

- (b) (i) Name the types of oil present in oil A and oil B. [1 mark]
- (ii) Based on the observation above, compare and contrast between oil A and oil B. In your answer include the possible example for each of the oil. [5 marks]
- (c) Sugar cane juice can be processed to produce fuel that is renewable and nature friendly. Describe an experiment to produce the fuel. In your description include
- Substance required
 - Procedure to carry out the experiment
 - Confirmation test on the yield formed
- [10 marks]

[Lihat sebelah

4 Table 3 shows examples of chemical reactions.

	Reaction	ΔH value
I	Combustion of ethanol in excess oxygen	-1376 kJ/mole
II	Combustion of propanol in excess oxygen	- 2015 kJ/mole
III	Dissociation of calcium carbonate	+ 570 kJ/mole

TABLE 3

- (a) (i) Write the thermochemical equations of reaction I and III. [2 marks]
- (ii) Explain why does the heat of combustion of ethanol is different compared to propanol [2 marks]
- (b) State the differences between reaction I and reaction III based on the information above. [6 marks]
- (c) Describe an experiment to determine the heat of combustion of ethanol, in your explanation include the following. [10 marks]
- Diagram of the apparatus
 - List of reagents and apparatus used
 - Procedure
 - Precautionary steps taken.

END OF QUESTION PAPER

