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Name _____ () Class: _____



SERANGOON SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2017

SECONDARY 4 EXPRESS/ 5 NORMAL ACADEMIC

SCIENCE (CHEMISTRY)

5078/01

Paper 1 Multiple Choice

28 August 2017

Additional Materials: Multiple Choice Answer Sheet

1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction liquid.

Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

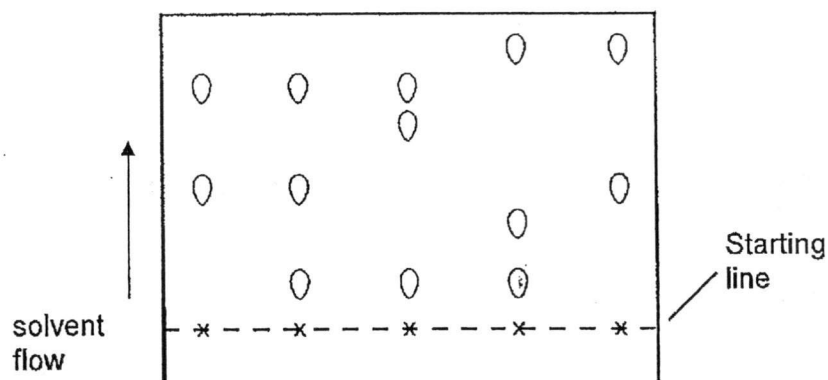
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on the last page.

This document consists of ____ printed pages and ____ blank page.

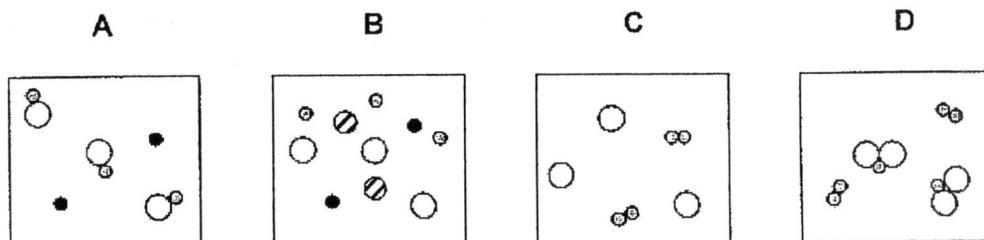
Turn over

- 1 The diagram shows a chromatogram which was prepared using spots of five different inks.

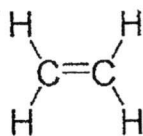


How many different dyes were used to make the five inks?

- A 5
B 6
C 7
D 13
- 2 Which of the following is a mixture of two elements?

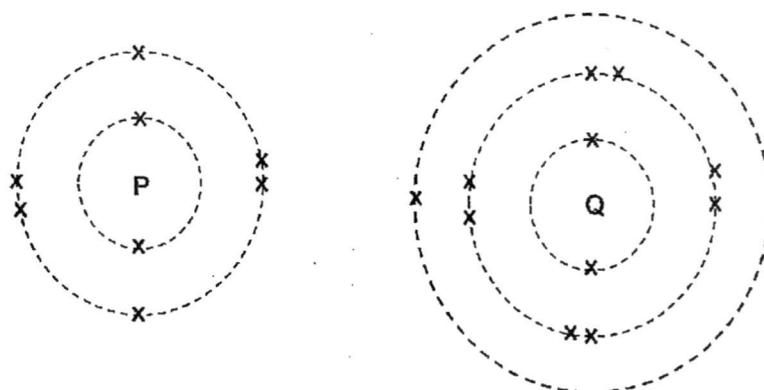


- 3 How many electrons are shared in the covalent bonds in an ethene molecule?



- A 5
B 6
C 10
D 12

- 4 The electronic structures of two atoms **P** and **Q** are shown.

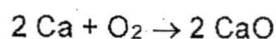


P and **Q** combine together to form a compound.

Which of the following describes the type of particles formed after bonding and the chemical formula of the compound?

	type of bonding	chemical formula
A	ionic	Q₂P
B	ionic	QP₂
C	covalent	P₂Q
D	covalent	PQ₂

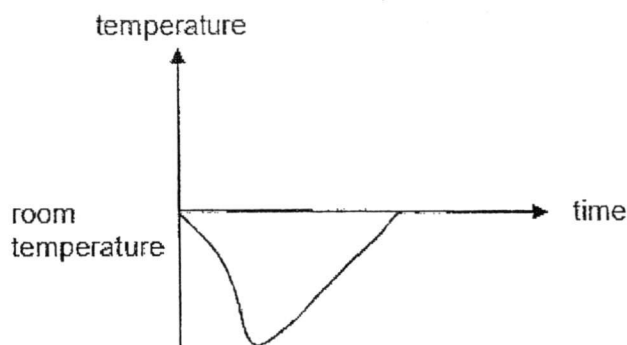
- 5 Why does molten sodium chloride conduct electricity?
- A** An electron is completely transferred from sodium to chlorine.
 - B** Sodium ions are strongly attracted to the chloride ions.
 - C** Electrons in the sodium chloride are free to move.
 - D** Sodium ions and chloride ions are free to move.
- 6 4.0 g of calcium is completely burnt in pure oxygen.



Which volume of oxygen is used in this reaction at room temperature and pressure?

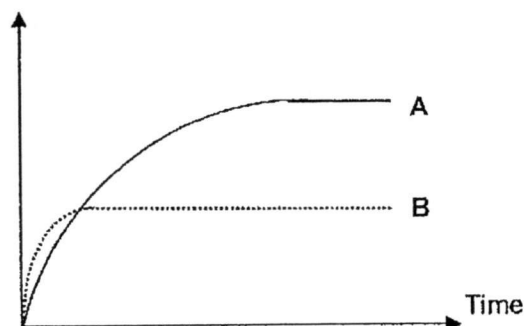
- A** 0.05 dm³
- B** 0.10 dm³
- C** 1.20 dm³
- D** 2.40 dm³

- 7 The following graph was obtained when potassium fluoride was dissolved in water.



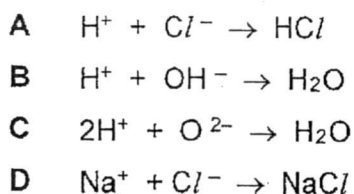
- Which of the following statements about the reaction is correct?
- A The change is endothermic.
 - B The change is exothermic.
 - C Ice is formed and has melted.
 - D A redox reaction has taken place.
- 8 In the graph, curve A represents the result of the reaction between 1.0 g of granulated zinc and an excess of acid at 30°C.

Volume of gas produced



- Which change could produce curve B?
- A 1.0 g of powdered zinc at 20 °C
 - B 1.0 g of granulated zinc at 20 °C
 - C 0.5 g of granulated zinc at 40 °C
 - D 0.5 g of granulated zinc at 20 °C

- 9 What is the ionic equation for the reaction between hydrochloric acid and sodium hydroxide?



- 10 Distilled water contains dissolved carbon dioxide.

What is the pH value of this distilled water?

- A 11
B 9
C 7
D 5

- 11 The table below shows the solubility in water of some copper compounds.

compound	solubility
copper(II) oxide	X
copper(II) hydroxide	X
copper(II) chloride	✓
copper(II) carbonate	X

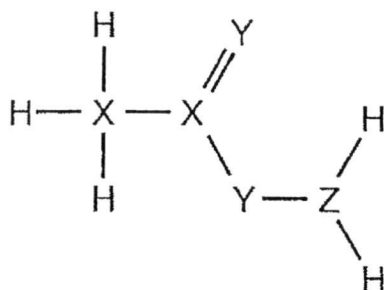
Which method is used to prepare copper(II) chloride?

- A warming copper(II) oxide with dilute hydrochloric acid
B titrating copper(II) hydroxide with dilute hydrochloric acid
C adding copper to dilute hydrochloric acid at room temperature
D precipitating the salt by adding copper(II) sulfate solution to dilute hydrochloric acid
- 12 Which statement about the trends in Group VII of the Periodic Table is correct?

On descending Group VII, the elements have _____.

- A decreasing boiling point
B increasing reactivity
C lower density
D darker colour

- 13 The diagram shows the structure of a covalent compound containing the element hydrogen, H, and the unknown elements X, Y and Z.



To which groups of the Periodic Table do these three elements, X, Y and Z, belong?

	X	Y	Z
A	IV	II	III
B	IV	VI	V
C	V	II	VI
D	V	VI	IV

- 14 When iron(III) oxide reacts with carbon monoxide in the blast furnace, a gas is released.

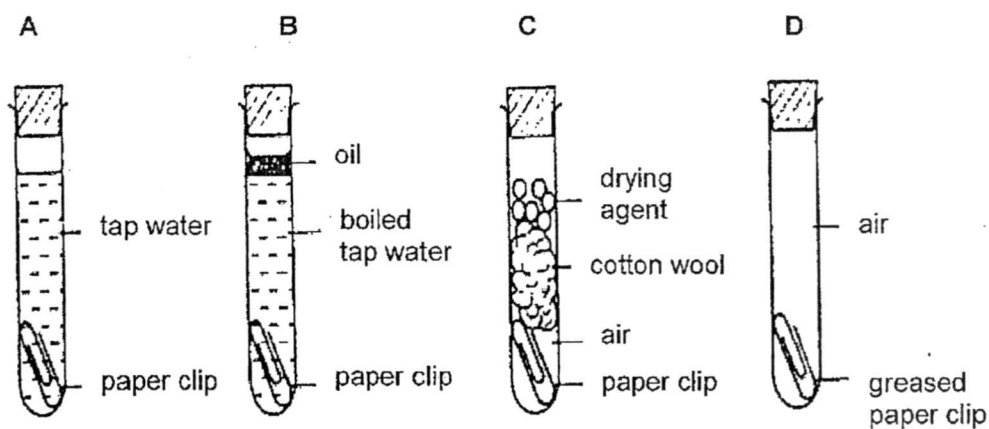
What happen to the iron ions and what is the gas released?

	The iron(III) ions are _____.	The gas is _____.
A	Reduced	carbon dioxide
B	Reduced	oxygen
C	Oxidised	carbon dioxide
D	Oxidised	oxygen

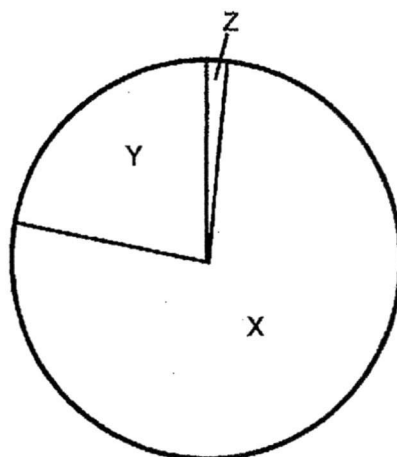
- 15 Which is **not** a reason for recycling metals such as aluminium?

- A To conserve the ores of aluminium.
- B To prevent aluminium from losing its metallic properties.
- C Recycling aluminium is less costly than extracting aluminium.
- D To reduce the amount of aluminium waste so as to reduce land pollution.

16 In which test tube is the paper-clip made of iron most likely to rust?



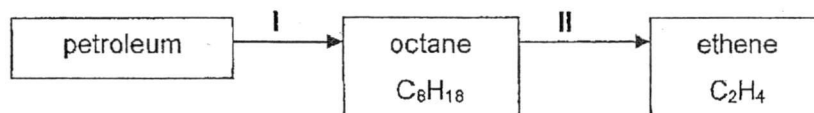
17 The pie-chart shows the composition of pure air.



Which of the following correctly identifies gases X, Y and Z?

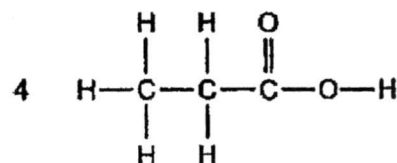
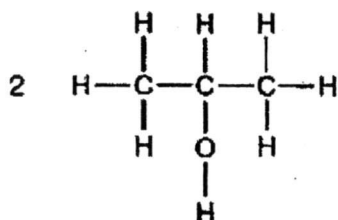
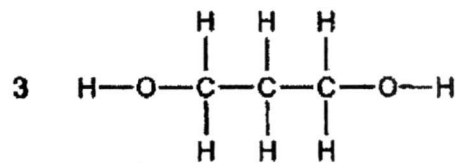
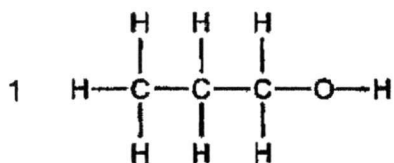
	gas X	gas Y	gas Z
A	oxygen	nitrogen	carbon dioxide
B	nitrogen	carbon dioxide	oxygen
C	nitrogen	oxygen	argon
D	water vapour	oxygen	hydrogen

- 18 The diagram shows two stages in a reaction scheme.



What is the name of stage II?

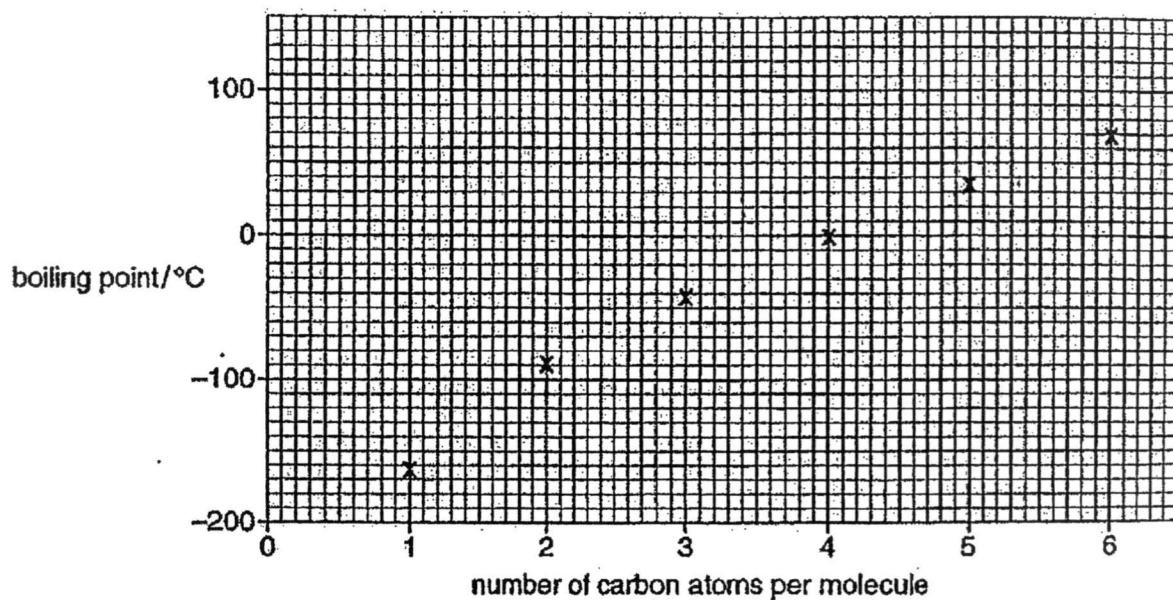
- A Substitution
 - B Fractional Distillation
 - C Hydrogenation
 - D Cracking
- 19 The structural formulae of some organic compounds are shown below.



Which compounds are alcohols?

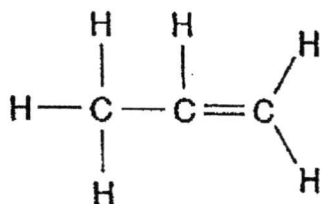
- A 1 only
- B 4 only
- C 1 and 2 only
- D 1, 2 and 3

- 20 The graph shows how the boiling point of some hydrocarbon depends on the number of carbon atoms in their molecules.

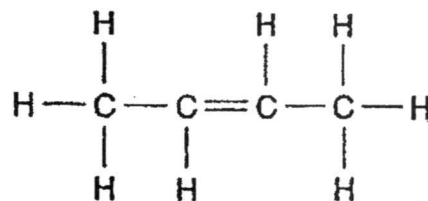


Which hydrocarbon is an alkane with a boiling point close to 0 °C?

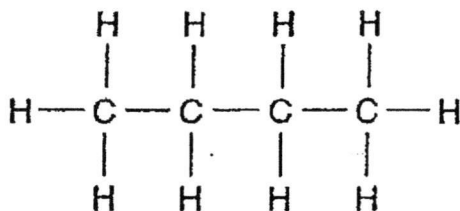
A



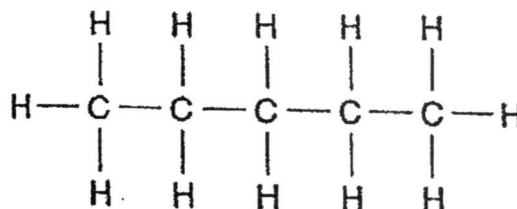
C



B



D



Data Sheet

Colours of Some Common Metal Hydroxides

calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
lead(II) hydroxide	white
zinc hydroxide	white

[illegible]

Name _____ () Class: Sec _____



SERANGOON SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2017

SECONDARY 4 EXPRESS/ 5 NORMAL (ACADEMIC)

SCIENCE (CHEMISTRY)

5076/03

5078/03

Paper 3

28 AUGUST 2017

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name and index number on the cover page.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams or graphs or rough working.
Do not use highlighters, glue or correction fluid.

Section A

Answer **all** the questions in the spaces provided.

Section B

Answer any **two** questions.
Write your answers on the spaces provided.

The number of marks is given in brackets [] at the end of each question or part of question.

A copy of the Periodic Table is printed on page 14.

For Examiner's Use	
Section A	
Total	

This paper consists of **14** printed pages and **0** blank page

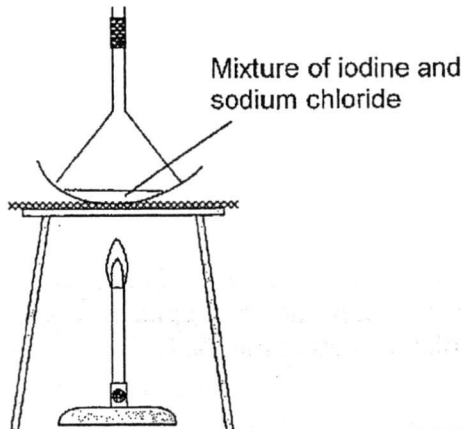
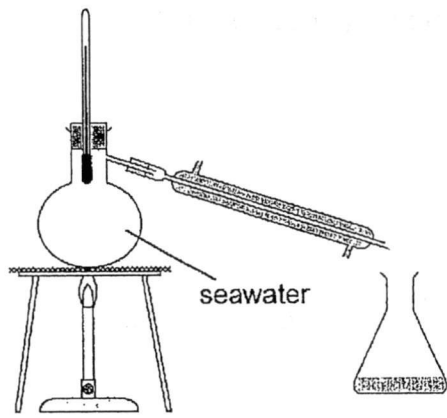
Turn over

Section A [45 marks]
Answer all questions.

A1 The table below shows some setup that is used to separate mixtures. Fill in the blanks with appropriate word or phrases.

For (c), draw a **labelled** setup to separate sand from water.

(a) has been done for you.

	Method of separation	Setup	Purpose
(a)	Sublimation		To obtain iodine
(b)			
(c)			To separate sand from water

[2]

[3]

- A2 Table 2.1 shows a list of particles with their respective number of protons, neutrons and electrons.

Particle	Number of protons	Number of neutrons	Number of electrons
P	1	0	1
Q	2	3	2
R	5	6	5
S	7	7	10
T	9	10	9

Table 2.1

Which particle(s) P, Q, R, S or T in table 2.1 fit each of the following descriptions?

- (a) An atom with mass number of 5? [1]

- (b) An atom with one valence electron? [1]

- (c) An ion of a non-metal? [1]

- (d) An atom from Group 0? [1]

- (e)(i) Draw the dot-and-cross diagram of the compound formed between P and T. [2]

- (ii) Describe in terms of bonding and structure whether the compound formed in (e)(i) would have a high or low boiling point. [2]

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A3 Lithium, sodium and potassium belongs to the same group in the Periodic Table.

- (a) Which group are they placed in in the Periodic Table? [2]
Why are they placed in this group in the Periodic Table?

.....

.....

.....

(b) These metals could react with water to form a gas.

- (i) Write a balanced chemical equation for the reaction between sodium and water. [2]

.....

- (ii) Determine the mass of sodium metal that is needed to react with water to produce 200 cm³ of gas. [2]

- (iii) What will be the observation made when a blue and red litmus paper is dipped into the products formed after the reaction? [1]

.....

.....

- (iv) What is the ion present that caused this change observed in (b)(iii)? [1]

.....

- A4 Figure 4.1 shows the setup where the beaker contains powder magnesium chloride and Figure 4.2 shows the setup where the beaker contains magnesium chloride solution.

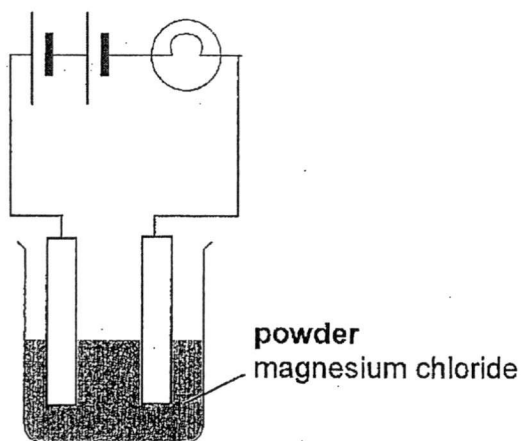


Figure 4.1

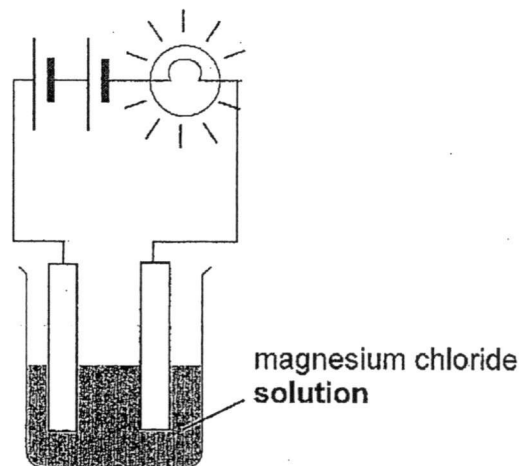


Figure 4.2

- (a) Explain why the light bulb in figure 4.1 did not light up whereas the light bulb in figure 4.2 is lighted up. [3]

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- (b) Draw the dot-and-cross diagram of magnesium chloride. [2]

A5 Figure 5.1 describes reactions involving white solid P.

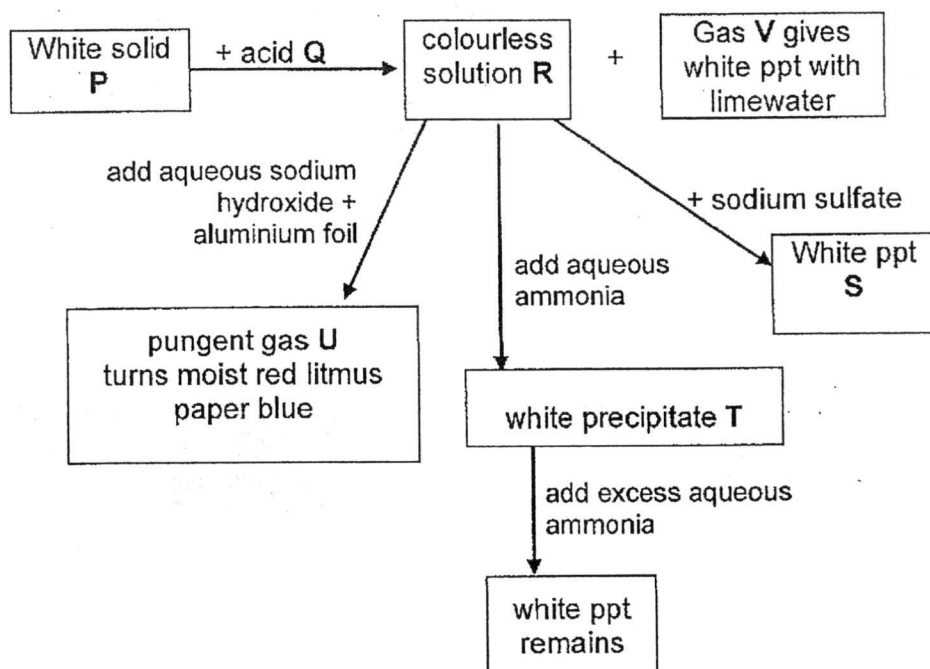


Figure 5.1

(a) Identify the following substances:

[7]

- (i) White solid P
- (ii) Acid Q
- (iii) Colourless solution R
- (iv) White precipitate S
- (v) White precipitate T
- (vi) Gas U
- (vii) Gas V

(b) Describe the observations that would be made when aqueous sodium hydroxide is added dropwise to **colourless solution R** till no further change. [1]

.....

- A6 Figure 6.1 shows metal X and metal Y are dipped into beakers containing copper (II) sulfate solution and their respective observations made.

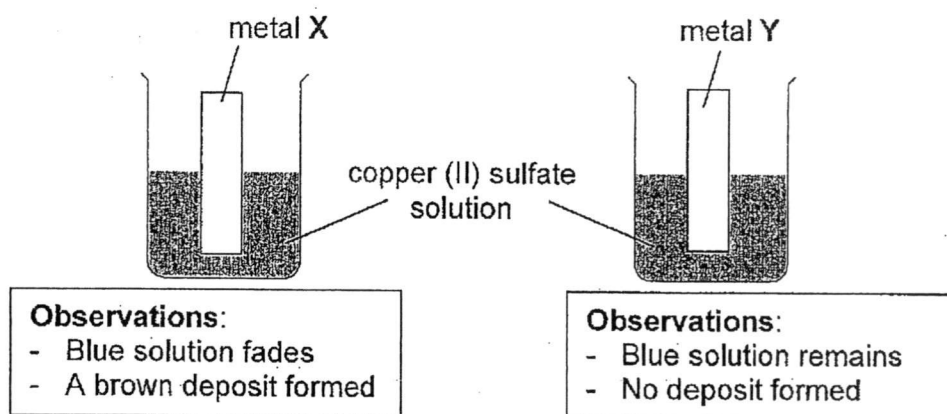


Figure 6.1

- (a)(i) Arrange the metal X, Y and copper in increasing order of their reactivity. [1]

.....

- (ii) Explain why a brown deposit is formed when metal X is dipped into copper (II) sulfate solution. [3]

.....
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- (b) Describe the observation that would be made when metal X and Y are placed in a beaker containing hydrochloric acid. [2]

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A7 Figure 7.1 shows some of reaction involving unsaturated hydrocarbon V.

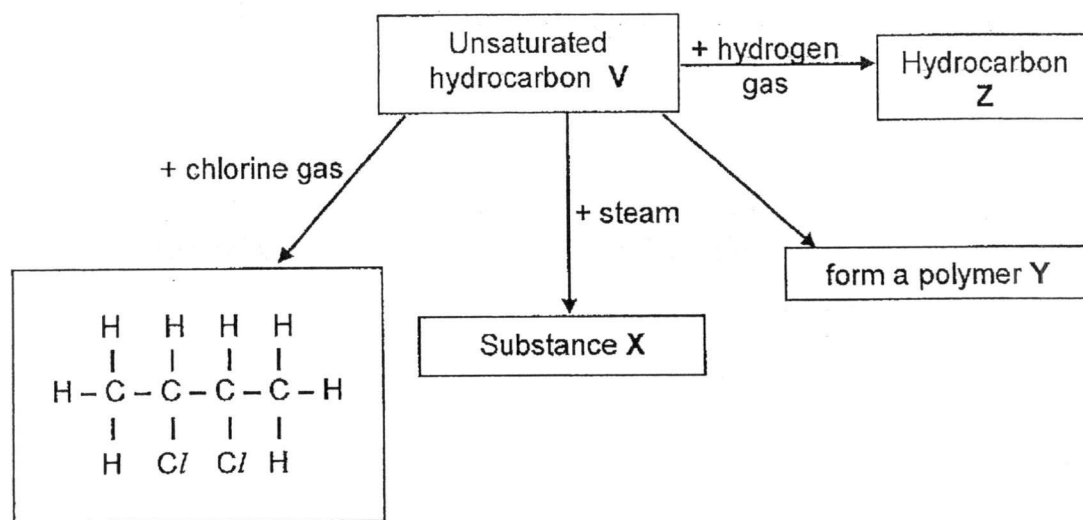
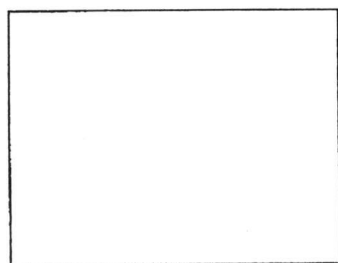
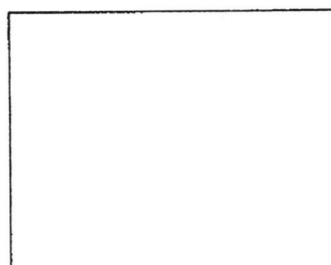


Figure 7.1

- (a) Draw the structural formula of substance X and the repeating unit of polymer Y. [2]



Substance X



repeating unit of polymer Y

- (b) Describe an experiment to differentiate V from Z. [3]

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.....

.....

Name: _____ ()

Class: _____

Section B [20 marks]

Answer **two** questions from this section.
Write your answers in the space provided.

B8 Three beakers containing three different colourless solutions had their labels removed. The three solutions are said to be hydrochloric acid, sodium carbonate and sodium chloride.

- (a) Given **only litmus papers and the three beakers of colourless solutions**, [5]
describe how the identity of solutions in each beaker can be identified.

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There are mainly three sources of fuel found on Earth. They are crude oil, coal and natural gas.

- (b) Describe how crude oil is separated to obtain useful fractions. [3]

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- (c) When coal is burnt in power stations, sulfur dioxide gas is often produced.

- (i) Describe a harmful effect of sulfur dioxide gas. [1]

.....
.....

- (ii) Describe how the emission of sulfur dioxide from power stations can be reduced. [1]

.....
.....

- B9** A student wants to investigate the effect of temperature on rate of reaction. Table 9.1 shows the list of experiments that he carried out with the reaction between excess lumps of copper (II) carbonate with 10 cm³ of 0.75 mol/dm³ of hydrochloric acid.

Experiment No.	Temperature (°C)	Time taken to collect the maximum volume of gas produced (min)
1	25	8
2	30	7
3	35	6
4	40	4.5
5	45	2

Table 9.1

- (a)(i) Write the balanced chemical equation between copper (II) carbonate and hydrochloric acid. [2]

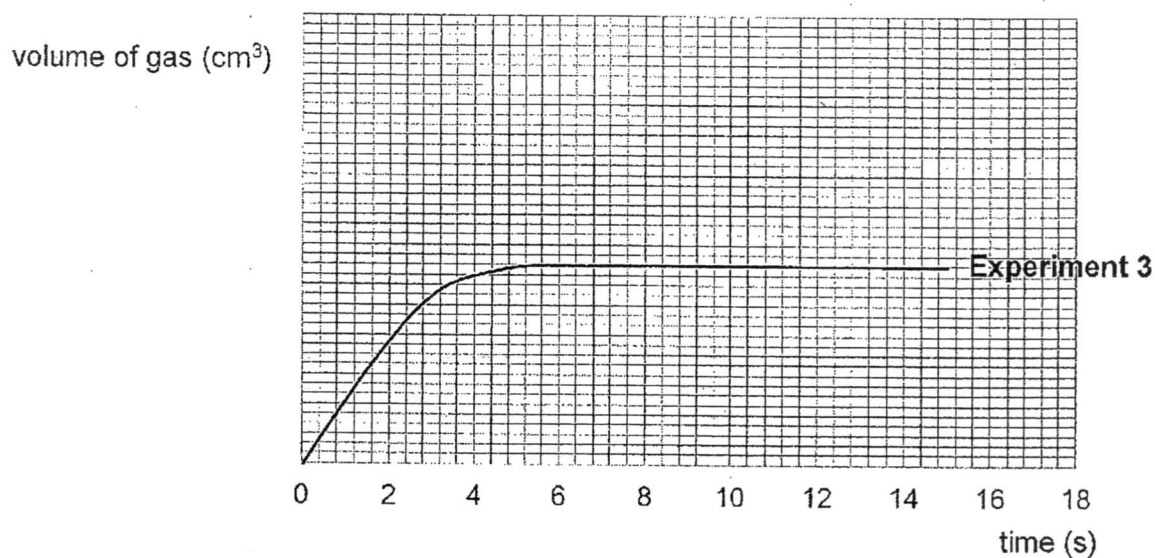
.....

- (ii) Determine the maximum volume of gas that can be produced from this reaction. [3]

- (b) Explain in terms of collision of particles, how an increase in temperature from experiment 1 to 5 affects the time taken to collect the maximum volume of gas produced. [3]

.....

The graph below is obtained based on the data collected from **experiment 3**.



- (c) Sketch, on the axes above, the graph that would be obtained when [2]
- (i) Powder of copper (II) carbonate is added to 10 cm^3 of 0.75 mol/dm^3 of hydrochloric acid at 35°C . Label the graph clearly with '(c)(i)'.
- (ii) 20 cm^3 of 0.75 mol/dm^3 of hydrochloric acid is used at 35°C . Label the graph clearly with '(c)(ii)'.

B10 Ethanol can be produced from sugar.

(a)(i) Describe the process to produce ethanol from sugar.

[3]

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The temperature of the process used to produce ethanol from sugar is monitored. Figure 10.1 shows the temperature readings taken in the first three days of the process.

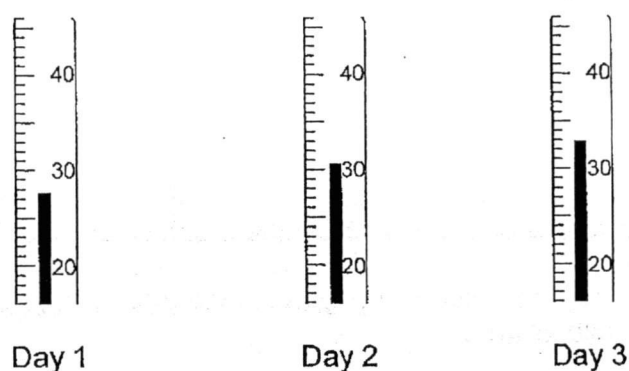


Figure 10.1

(ii) State and explain whether the process to produce ethanol from sugar is an exothermic or endothermic reaction. [2]

.....

.....

.....

(iii) Explain whether the temperature recorded will ever reach 50°C.

[1]

.....

.....

- (b) When the ethanol produced in (a) is exposed to air, the taste of the ethanol turned sour.
- (i) Explain with appropriate equation why the ethanol turned sour when exposed to air. [2]

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.....

.....

- (ii) Suggest a chemical that can be used in the laboratory to achieve the same effect observed in (b)(i). Describe the observation that will be made when this chemical is added to ethanol. [2]

.....

.....

.....

END OF PAPER

The Periodic Table of the Elements

Group																			
I	II	III										IV	V	VI	VII	0			
1 H hydrogen 1																			
Key relative atomic mass atomic symbol name atomic number																			
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10		
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18		
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36		
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	98 Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54		
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	222 Rn radon 86		
87 Fr francium	88 Ra radium	89 Ac actinium																	
*58-71 Lanthanoid series																			
†90-103 Actinoid series																			

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Name _____ () Class: Sec _____



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PRELIMINARY EXAMINATION 2017

SECONDARY 4 EXPRESS/ 5 NORMAL (ACADEMIC)

SCIENCE (CHEMISTRY)

5076/03

5078/03

Paper 3

28 AUGUST 2017

1 hour 15 minutes

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Section B

Answer any **two** questions.
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A copy of the Periodic Table is printed on page 14.

For Examiner's Use	
Section A	
Total	

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Turn over

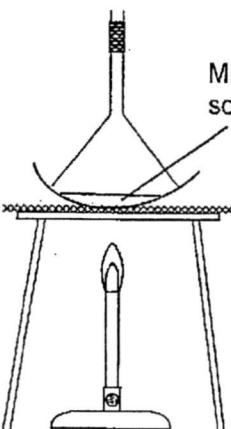
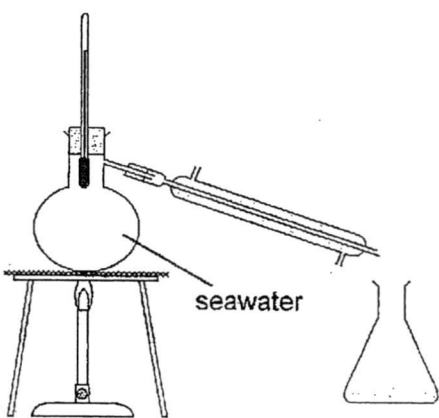
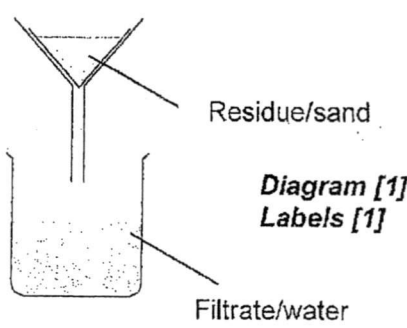
Section A [45 marks]

Answer all questions.

A1 The table below shows some setup that is used to separate mixtures. Fill in the blanks with appropriate word or phrases.

For (c), draw a **labelled** setup to separate sand from water.

(a) has been done for you.

	Method of separation	Setup	Purpose
(a)	Sublimation		To obtain iodine
(b)	Simple distillation		To obtain water
(c)	Filtration	 Diagram [1] Labels [1]	To separate sand from water

[2]

[3]

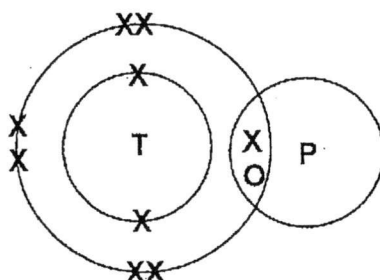
- A2 Table 2.1 shows a list of particles with their respective number of protons, neutrons and electrons.

Particle	Number of protons	Number of neutrons	Number of electrons
P	1	0	1
Q	2	3	2
R	5	6	5
S	7	7	10
T	9	10	9

Table 2.1

Which particle(s) P, Q, R, S or T in table 2.1 fit each of the following descriptions?

- (a) An atom with mass number of 5? [1]
 Q.....
- (b) An atom with one valence electron? [1]
 P.....
- (c) An ion of a non-metal? [1]
 S.....
- (d) An atom from Group 0? [1]
 Q.....
- (e)(i) Draw the dot-and-cross diagram of the compound formed between P and T. [2]



[1]: correct ratio of P to T
 [1]: sharing of 1 pair of electrons

- (ii) Describe in terms of bonding and structure whether the compound formed in (e)(i) would have a high or low boiling point. [2]

Has a simple molecular structure with weak attraction forces between the molecules [1]

As a result low amount of energy is needed to break these forces leading to a low boiling point. [1]

- A3 Lithium, sodium and potassium belongs to the same group in the Periodic Table.

- (a) Which group are they placed in in the Periodic Table? [2]
Why are they placed in this group in the Periodic Table?

Group 1 [1]

They have one valence electrons. [1]

- (b) These metals could react with water to form a gas.
(i) Write a balanced chemical equation for the reaction between sodium and water. [2]



- (ii) Determine the mass of sodium metal that is needed to react with water to produce 200 cm³ of gas. [2]

$$\text{No. of moles of H}_2 = 200/1000 \div 24 = 0.008333 \text{ mols}$$

$$\text{No. of moles of Na} = 0.008333 \times 2 = 0.016666 \text{ mols}$$

$$\text{Mass of Na} = 0.016666 \times 23 = 0.383318$$

$$= 0.383 \text{ g (3 s.f.)}$$

- (iii) What will be the observation made when a blue and red litmus paper is dipped into the products formed after the reaction? [1]

The litmus paper will turn from red to blue

- (iv) What is the ion present that caused this change observed in (b)(iii)? [1]
OH⁻

- A4 Figure 4.1 shows the setup where the beaker contains powder magnesium chloride and Figure 4.2 shows the setup where the beaker contains magnesium chloride solution.

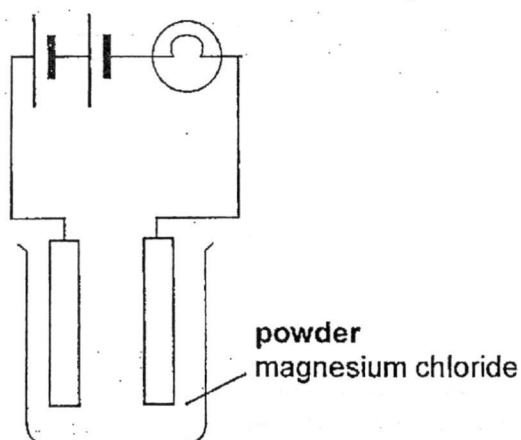


Figure 4.1

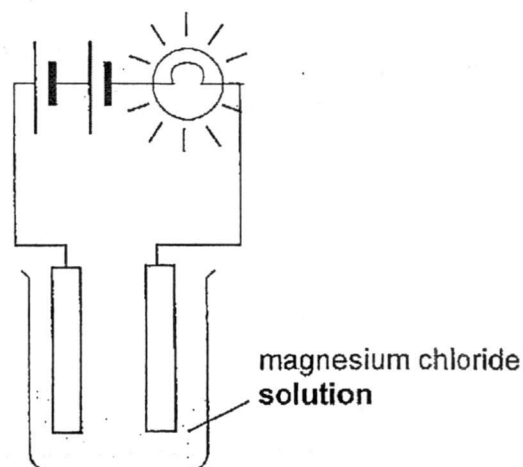


Figure 4.2

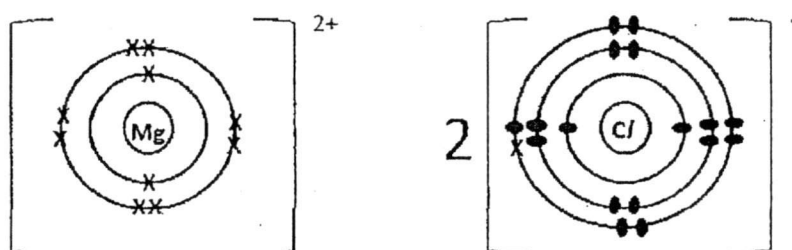
- (a) Explain why the light bulb in figure 4.1 did not light up whereas the light bulb in figure 4.2 is lighted up. [3]

Powder magnesium chloride does not have free moving ions [1]

To carry electrical charges and hence light bulb did not light up. [1]

However in magnesium chloride solution, there are free moving ions [1]

- (b) Draw the dot-and-cross diagram of magnesium chloride. [2]



Symbol

X: electron of Mg

●: electron of Cl

[1]: correct drawing for magnesium ion

[1]: correct drawing for the chloride ion

A5 Figure 5.1 describes reactions involving white solid P.

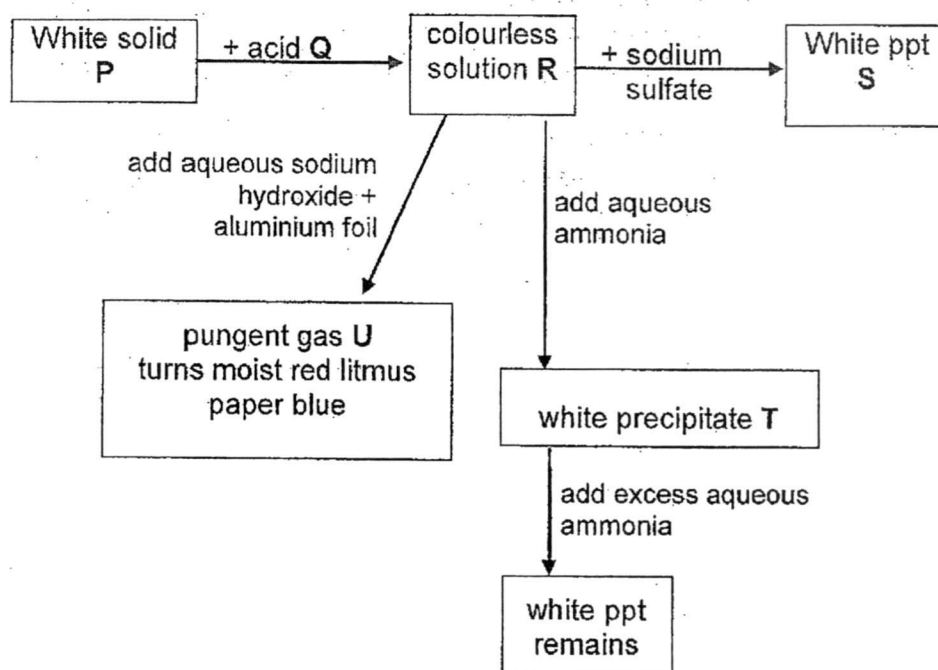


Figure 5.1

(a) Identify the following substances:

[6]

- | | |
|-----------------------------|----------------------------|
| (i) White solid P | <i>Lead (II) oxide</i> |
| (ii) Acid Q | <i>Nitric acid</i> |
| (iii) Colourless solution R | <i>Lead (II) nitrate</i> |
| (iv) White precipitate S | <i>Lead (II) sulfate</i> |
| (v) White precipitate T | <i>Lead (II) hydroxide</i> |
| (vi) Gas U | <i>Ammonia gas</i> |

(b) Describe the observations that would be made when aqueous sodium hydroxide is added dropwise to colourless solution R till no further change. [2]

A white ppt is formed [1]

Soluble in excess sodium hydroxide to form a colourless solution [1]

- A6 Figure 6.1 shows metal X and metal Y are dipped into beakers containing copper (II) sulfate solution and their respective observations made.

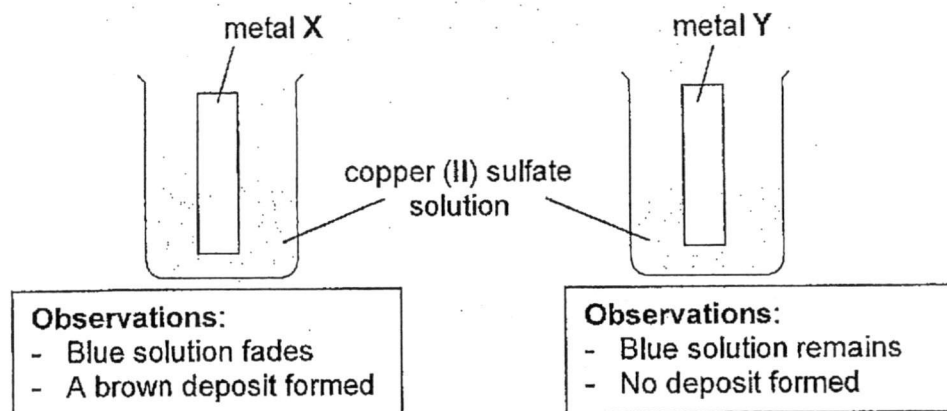


Figure 6.1

- (a)(i) Arrange the metal X, Y and copper in increasing order of their reactivity. [1]

...Y, Copper, X.....

- (ii) Explain why a brown deposit is formed when metal X is dipped into copper (II) sulfate solution. [3]

Metal X is more reactive than copper metal. [1]

Hence it is able to displace copper from copper (II) sulfate [1]

To form copper metal which is the brown deposit. [1]

- (b) Describe the observation that would be made when metal X and Y are placed in a beaker containing hydrochloric acid. [2]

With metal X, there will be bubbles formed. [1]

With metal Y, there will be no visible change. [1]

A7 Figure 7.1 shows some of reaction involving unsaturated hydrocarbon V.

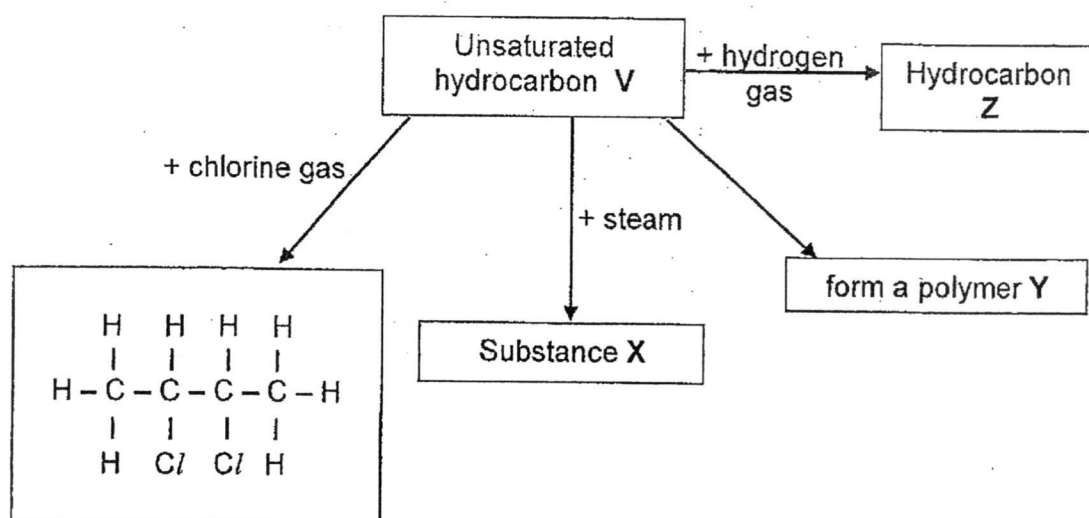
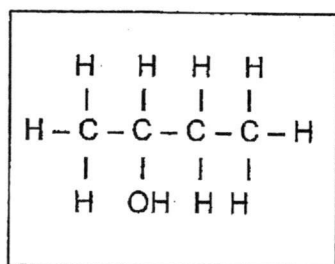
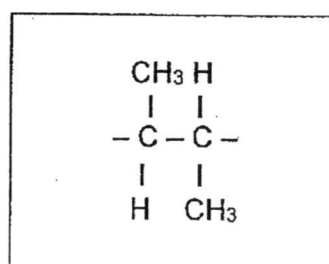


Figure 7.1

- (a) Draw the structural formula of substance X and the repeating unit of polymer Y. [2]



Substance X



repeating unit of polymer Y

- (b) Describe an experiment to differentiate V from Z. [3]

Add aqueous bromine [1]

With V, brown bromine decolourises [1]

With Z, there will be no visible change. [1]

Name: _____ ()

Class: _____

Section B [20 marks]

Answer **two** questions from this section.
Write your answers in the space provided.

B8 Three beakers containing three different colourless solutions had their labels removed. The three solutions are said to be hydrochloric acid, sodium carbonate and sodium chloride.

- (a)(i) Given only litmus papers and the three beakers of colourless solutions, [5]
describe how the identity of solutions in each beaker can be identified.

Dip litmus paper into the three solutions. [1]

The solution that turns blue litmus paper red contains hydrochloric acid [1]

Add the hydrochloric acid identified into the other two beakers [1]

The beaker that shows bubbles forming contains sodium carbonate solution [1]

The beaker with no visible change is sodium chloride solution. [1]

There are mainly three sources of fuel found on Earth. They are crude oil, coal and natural gas.

- (b) Describe how crude oil is separated to obtain useful fractions. [3]

The crude oil is first heated and the vapour formed is passed into the fractionating column. [1]

The fractions with smaller hydrocarbons has a lower boiling point is cooled and collected at the top of the column. [1]

The fractions with larger hydrocarbons has a higher boiling point is cooled and collected at the bottom of the column. [1]

- (c) When coal is burnt in power stations, sulfur dioxide gas is often produced.

- (i) Describe a harmful effect of sulfur dioxide gas. [1]

Breathing difficulties/ forms acid rain that damages buildings or kills aquatic lives.

- (ii) Describe how the emission of sulfur dioxide from power stations can be reduced. [1]

Pass the sulfur dioxide gas through calcium carbonate. It will form solid calcium sulfite and removed.

- B9** A student wants to investigate the effect of temperature on rate of reaction. Table 9.1 shows the list of experiments that he carried out with the reaction between excess lumps of copper (II) carbonate with 10 cm³ of 0.75 mol/dm³ of hydrochloric acid.

Experiment No.	Temperature (°C)	Time taken to collect the maximum volume of gas produced (min)
1	25	8
2	30	7
3	35	6
4	40	4.5
5	45	2

Table 9.1

- (a)(i) Write the balanced chemical equation between copper (II) carbonate and hydrochloric acid. [2]



- (ii) Determine the maximum volume of gas that can be produced from this reaction. [3]

$$\text{No. of moles of HCl} = 10/1000 \times 0.75 = 0.0075 \text{ mols} \quad [1]$$

$$\text{No. of moles of CO}_2 = 0.0075/2 = 0.00375 \text{ mols} \quad [1]$$

$$\text{Vol. of CO}_2 = 0.00375 \times 24 = 0.09 \text{ dm}^3 \quad [1]$$

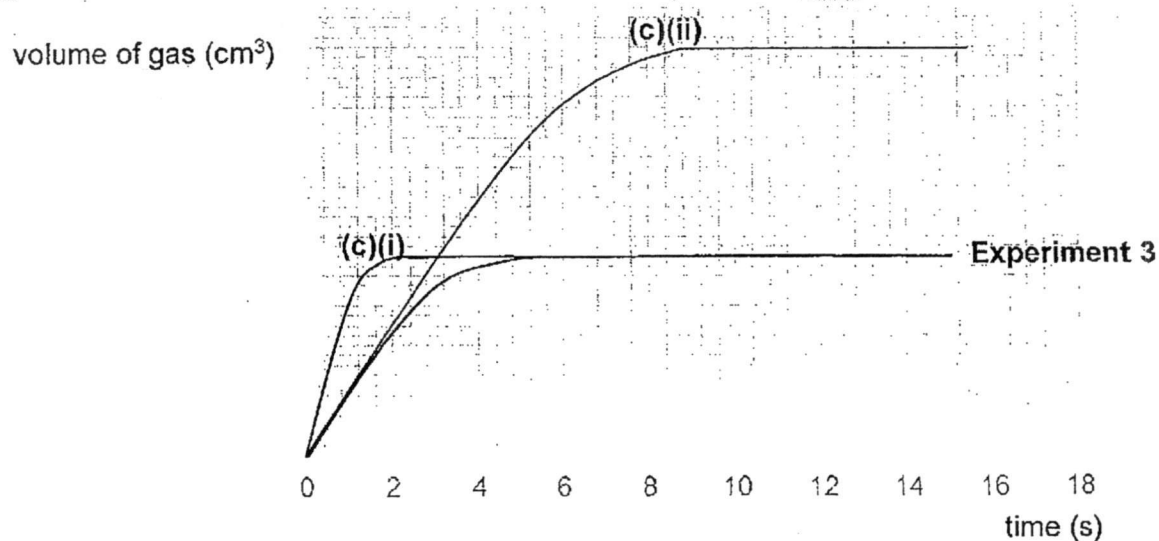
- (b) Explain in terms of collision of particles, how an increase in temperature from experiment 1 to 5 affects the time taken to collect the maximum volume of gas produced. [3]

An increase in temperature leads to an increase in kinetic energy of the reacting particles. [1]

This lead to an increase in frequency of effective collision between the reacting particles. [1]

As a result, the rate of reaction increases and the time taken decreases. [1]

The graph below is obtained based on the data collected from **experiment 3**.



- (c) Sketch, on the axes above, the graph that would be obtained when [2]
- (i) Powder of copper (II) carbonate is added to 10 cm^3 of 0.75 mol/dm^3 of hydrochloric acid at 35°C . Label the graph clearly with '(c)(i)'.
- (ii) 20 cm^3 of 0.75 mol/dm^3 of hydrochloric acid is used at 35°C . Label the graph clearly with '(c)(ii)'.

B10 Ethanol can be produced from sugar.

(a)(i) Describe the process to produce ethanol from sugar.

[3]

Sugar and yeast are added into a container to carry out fermentation. [1]

The process is carried out 37 °C in the absence of air. [1]

The ethanol formed is then separated from the mixture using fractional distillation. [1]

The temperature of the process used to produce ethanol from sugar is monitored. Figure 10.1 shows the temperature readings taken in the first three days of the process.

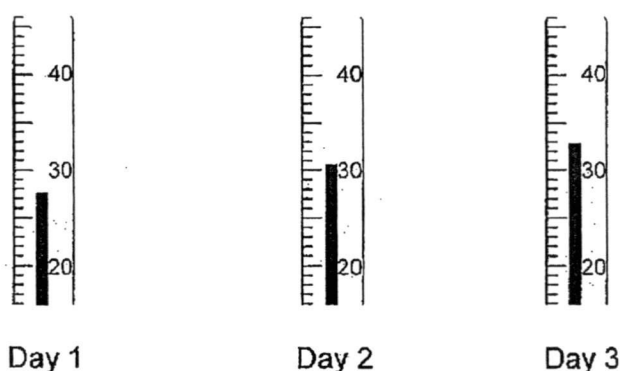


Figure 10.1

(ii) State and explain whether the process to produce ethanol from sugar is an exothermic or endothermic reaction. [2]

Exothermic reaction [1]

The temperature increases during the fermentation process. [1]

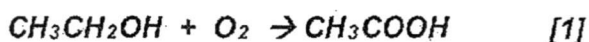
(iii) Explain whether the temperature recorded will ever reach 50°C. [1]

No. This is because the yeast would be denatured at temperature above 40°C and the fermentation process would have stopped.

(b) When the ethanol produced in (a) is exposed to air, the taste of the ethanol turned sour.

(i) Explain with appropriate equation why the ethanol turned sour when exposed to air. [2]

The ethanol produced would be oxidised by the oxygen in the air. [1]



- (ii) Suggest a chemical that can be used in the laboratory to achieve the same effect [2]
observed in (b)(i). Describe the observation that will be made when this
chemical is added to ethanol.

Acidified KMnO_4 [1]

It will turn from purple to colourless [1]

END OF PAPER