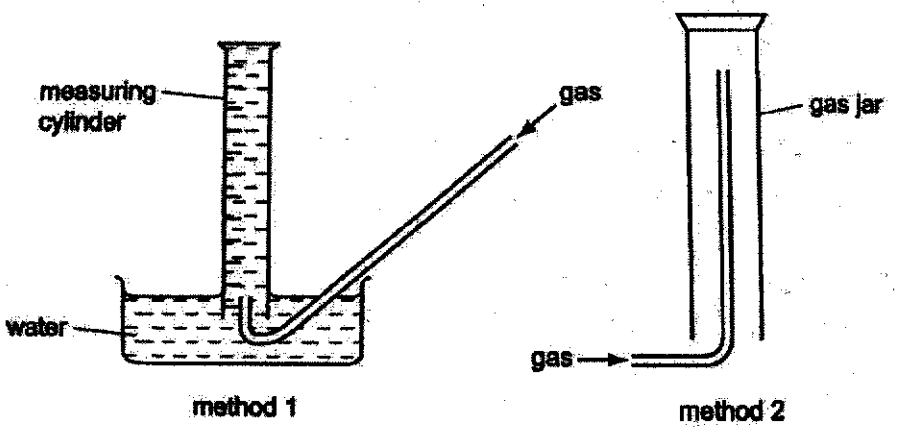
1 The diagrams show two methods of collecting gases.




Which row gives the properties of a gas which can be collected by both methods?

| | property 1 | property 2 |
|---|---|---|
| **A** | insoluble in water | denser than air |
| **B** | insoluble in water | less dense than air |
| **C** | soluble in water | denser than air |
| **D** | soluble in water | less dense than air |

2 A liquid boils at a temperature of 100°C.

Which other property of the liquid proves that it is pure water?

**A** It does not leave a residue when boiled.

**B** It freezes at 0°C.

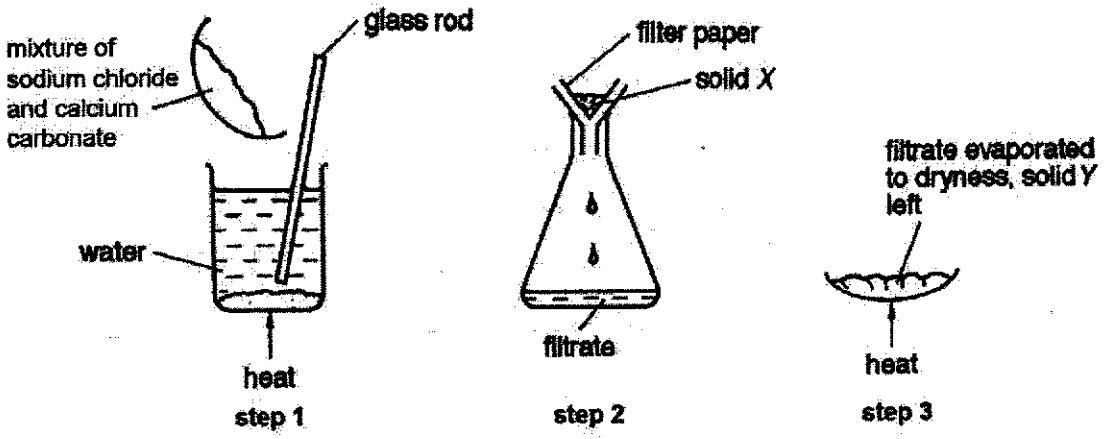
**C** It is neither acidic nor alkaline.

**D** It turns white anhydrous copper(II) sulfate blue.



Downloaded from SingaKids.com

3 The apparatus shown below can be used in the order 1, 2 and 3 to separate a mixture of sodium chloride and calcium carbonate.




Which one of the following would be X and Y in the diagram?

| | residue X | solid Y |
|---|---|---|
| **A** | calcium carbonate | sodium chloride |
| **B** | calcium carbonate | calcium chloride |
| **C** | sodium chloride | sodium carbonate |
| **D** | sodium chloride | calcium carbonate |

4 Which of the following cations does not give a precipitate with either aqueous ammonia or sodium hydroxide solution?

**A** $Ca^{2+}$

**B** $Zn^{2+}$

**C** $Fe^{2+}$

**D** $NH_4^+$


More papers at www.testpapersfree.com

Downloaded from SingaKids.com

5 A white crystalline solid, X, is heated with aqueous sodium hydroxide and aluminium.

A piece of red litmus paper, held near the mouth of the test-tube, turns blue while the mixture is heated for several minutes.

Which salt **cannot** be X?

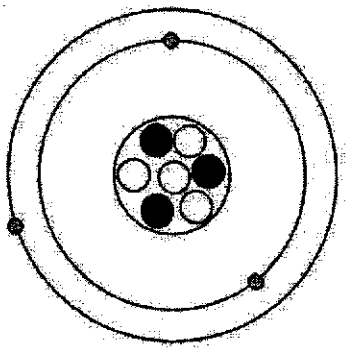
**A** ammonium chloride

**B** ammonium nitrate

**C** iron(III) chloride

**D** iron(III) nitrate

6 The diagram represents an atom of element X.



Which of the following represents the symbol of this element?

**A** $^{7}_{4}X$

**B** $^{7}_{3}X$

**C** $^{3}_{7}X$

**D** $^{4}_{7}X$



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

7 The structure of five particles are given in the following table.

| atom | number of neutrons | number of electrons | number of protons |
|---|---|---|---|
| P | 16 | 15 | 15 |
| Q | 18 | 16 | 16 |
| R | 17 | 15 | 15 |
| S | 17 | 18 | 17 |
| T | 18 | 18 | 16 |

Which pair of particles are isotopes?

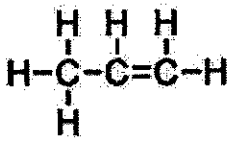
**A** P and R

**B** Q and T

**C** R and S

**D** S and T

8 The diagram shows the molecule of propene.



How many electrons are involved in bonding in this molecule?

**A** 8

**B** 9

**C** 16

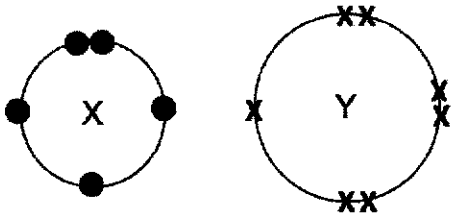
**D** 18



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

9 The diagram below shows the arrangement of outer shell electrons in atoms X and Y.




What is the formula of the compound between X and Y?

**A** $XY_2$

**B** $XY_3$

**C** $X_2Y$

**D** $X_3Y$

10 20 $cm^3$ of ethene, $C_2H_4$, was reacted with oxygen.

The equation for the reaction is shown.

$$C_2H_4\,(g) + 3O_2\,(g) \rightarrow 2CO_2\,(g) + 2H_2O\,(l)$$

All volumes are measured at r.t.p.

What is the volume of gas produced at the end of the reaction?

**A** 40 $cm^3$

**B** 60 $cm^3$

**C** 70 $cm^3$

**D** 80 $cm^3$



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

**11** Which of the following statements about endothermic reactions are correct?

1 Energy is released to the surroundings.

2 Energy is absorbed from the surroundings.

3 The temperature of the surroundings rises.

4 The temperature of the surroundings falls.

**A** 1 and 3

**B** 2 and 3

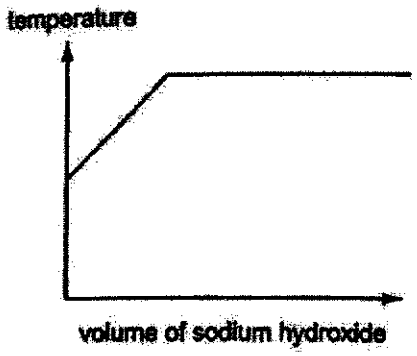
**C** 1 and 4

**D** 2 and 4

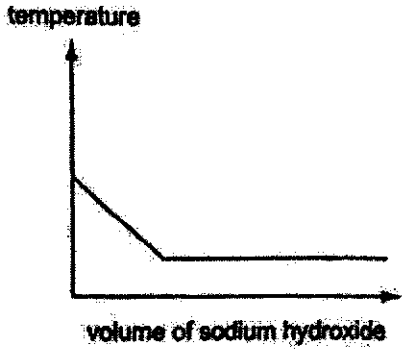
**12** The reaction between aqueous sodium hydroxide and hydrochloric acid is known as neutralisation.

Which graph shows the change in temperature when aqueous sodium hydroxide is added to hydrochloric acid until the alkali is present in excess?

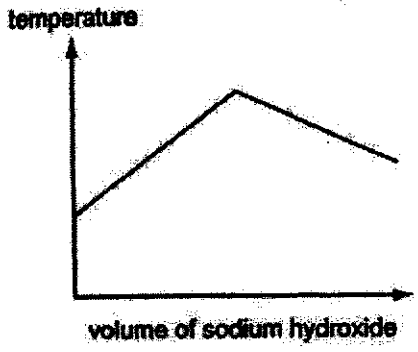
**A**



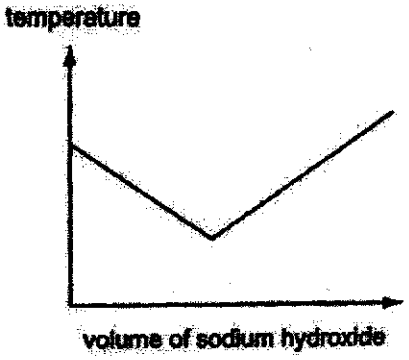

**B**




**C**




**D**






More papers at www.testpapersfree.com

Downloaded from SingaKids.com

13 Which of the following represents oxidation?

A $Cl_2$ (g) → 2$Cl^-$ (aq)

B CuO (s) → Cu (s)

C $Fe^{2+}$ (aq) → $Fe^{3+}$ (aq)

D $N_2$ (g) → $NH_3$ (g)

14 Oxides of elements may be classified as acidic, basic, amphoteric and neutral.

Which of the following oxides shows the correct classification?

| | acidic | basic | neutral |
|---|---|---|---|
| A | carbon dioxide | copper(II) oxide | carbon monoxide |
| B | copper(II) oxide | carbon dioxide | nitrogen monoxide |
| C | carbon monoxide | copper(II) oxide | carbon dioxide |
| D | nitrogen monoxide | copper(II) oxide | carbon dioxide |

15 Which of the following substances will produce a precipitate when mixed together?

A barium nitrate and potassium chloride

B calcium chloride and sodium sulfate

C sodium carbonate and ammonium chloride

D silver sulfate and nitric acid

16 What property of an element decreases as we move across a Period in the Periodic Table?

A number of electron shells

B metallic character

C proton number

D number of valence electrons



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

17 What property of a Group VII element decreases as we move down Group VII in the Periodic Table?

**A** boiling point

**B** melting point

**C** reactivity

**D** colour intensity

18 An element P has the following properties.

- It does not react with cold water.
- It reacts slowly with acids.

What could P be?

**A** copper

**B** iron

**C** magnesium

**D** zinc

19 Rubidium, Rb, is an element in the same group of the Periodic Table as lithium, sodium and potassium.

Which statement about rubidium is likely to be correct?

**A** It forms a sulfate, $Rb_2SO_4$.

**B** It forms an insoluble hydroxide.

**C** It can be extracted from its ore by reduction with carbon.

**D** It reacts slowly with water at 20°C.


More papers at www.testpapersfree.com

Downloaded from SingaKids.com

20 Carbon monoxide, sulfur dioxide and carbon dioxide are gases which affect the atmosphere and the environment.

In what ways do these gases affect the environment?

| | carbon monoxide | sulfur dioxide | carbon dioxide |
|---|---|---|---|
| **A** | acid rain | global warming | acid rain |
| **B** | global warming | depletion of the ozone layer | acid rain |
| **C** | poisonous to humans | global warming | depletion of the ozone layer |
| **D** | poisonous to humans | acid rain | global warming |

**END OF PAPER 1**



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

## 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 |



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

# The Periodic Table of Elements

| Group I | Group II | | | | | | | | | | | Group III | Group IV | Group V | Group VI | Group VII | Group 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium - | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57 – 71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium – | 85 At astatine – | 86 Rn radon – |
| 87 Fr francium – | 88 Ra radium – | 89 – 103 actinoids | 104 Rf Rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**Key**

proton (atomic) number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium – | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium – | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium – | 94 Pu plutonium – | 95 Am americium – | 96 Cm curium – | 97 Bk berkelium – | 98 Cf californium – | 99 Es einsteinium – | 100 Fm fermium – | 101 Md mendelevium – | 102 No nobelium – | 103 Lr lawrencium – |

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).



PartnerInLearning
More papers at w97.testpapersfree.com
Downloaded from SingaKids.com

## Section A

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

**1** Name the substances below:

**(a)** a green – yellow gas which reacts with sodium to produce a white crystalline solid,

..... [1]

**(b)** an element **X** which forms an amphoteric oxide with a chemical formula XO.

..... [1]

[Total : 2 m]

**2** The pie chart illustrates the composition by volume of dry, unpolluted air.

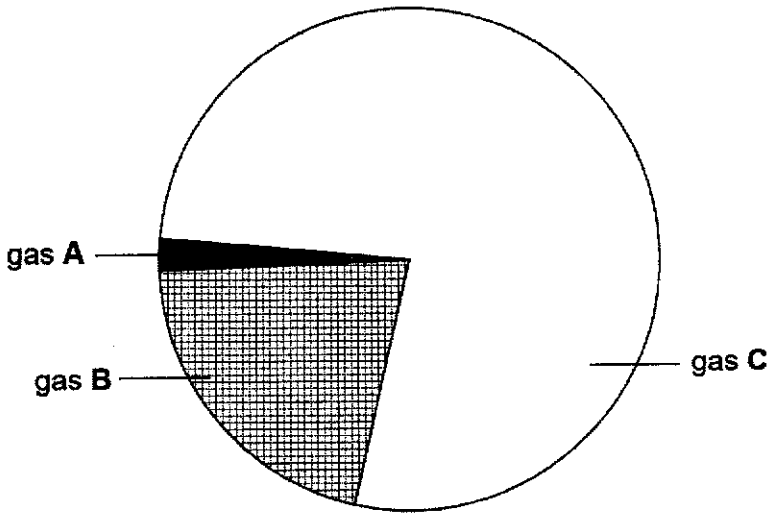



**Fig. 2.1**

**(a)** What are the names of gases **B** and **C**?

**(i)** gas **B** ..... [1]

**(ii)** gas **C** ..... [1]

**(b)** Two gases that cause air pollution are nitrogen dioxide and carbon monoxide.

Give the source of these pollutants.

**(i)** name of pollutant – carbon monoxide

source of pollutant .....

**(ii)** name of pollutant – nitrogen dioxide

source of pollutant ..... [2]

[Total: 4 m]


More papers at www.testpapersfree.com
Downloaded from SingaKids.com

3 The apparatus shown below is used to separate a miscible mixture of two colourless, volatile and flammable liquids **X** (boiling point of 55 °C) and **Y** (boiling point of 68 °C). Substance **Y** was coloured with a blue dye.

The mixture was heated in a hot water bath.

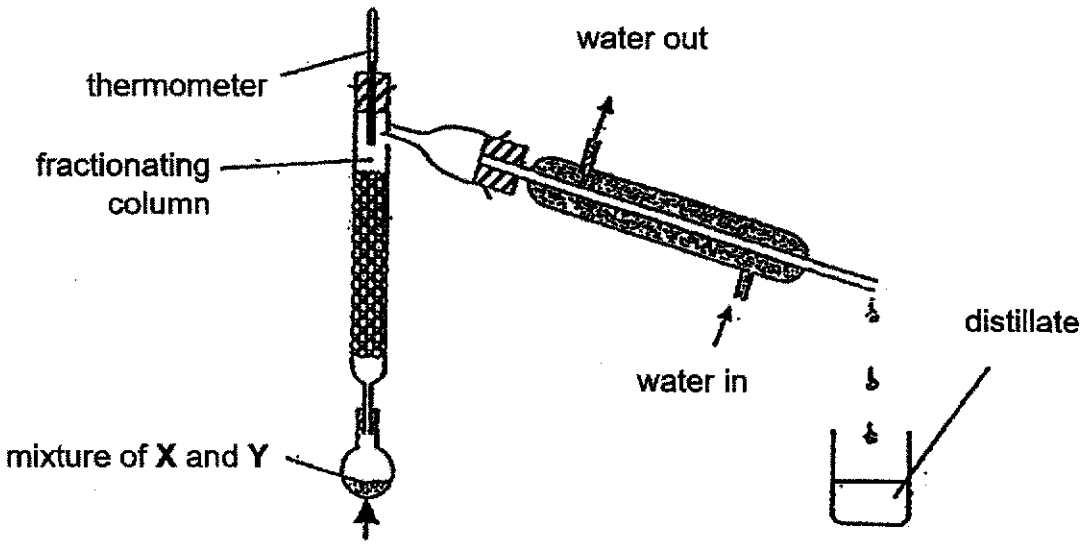



**Fig. 3.1**

**(a)** Which of the above two substances will be collected as distillate first?

Explain your answer.

.....

..... [1]

**(b)** When the first substance is completely collected, state the colour of the distillate collected.

..... [1]

**(c)** Suggest a reason for placing the water inlet at the bottom of the condenser.

.....

..... [1]

[Total: 3 m]

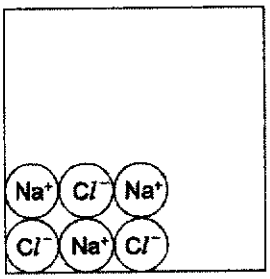


More papers at www.testpapersfree.com

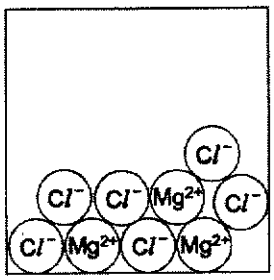
Downloaded from SingaKids.com

4 The diagrams below (**A**, **B**, **C**, **D**, **E** and **F**) represent the particles in several substances.

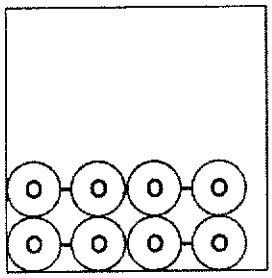
**A**



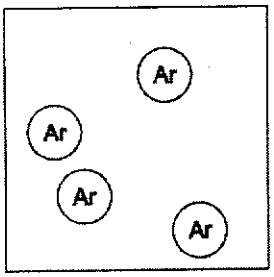

**B**



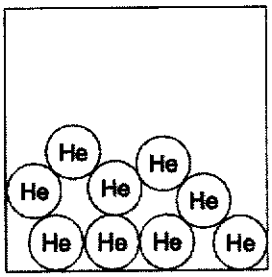

**C**



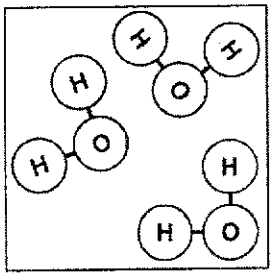

**D**




**E**




**F**




**(a)** Which diagram (**A**, **B**, **C**, **D**, **E** or **F**) best represents the following description?

**(i)** a solid element ..... [1]

**(ii)** a liquid ionic compound ..... [1]

**(iii)** a gaseous molecule ..... [1]

**(b)** Comparing substances **A** and **B**, only one substance can conduct electricity.

Identify which substance is the electrical conductor and explain the difference in electrical conductivity.

.....

.....

..... [2]

**(c)** Potassium oxide shares the same type of bonding as substances **A** and **B**.

Draw a 'dot and cross' diagram to show the arrangement of electrons in potassium oxide. Only the outer shells of electrons need to be shown.

[2]

[Total: 7 m]



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

5 A student wanted to test the rate of corrosion of metals with acid rain. He decided to react some zinc sheets with nitric acid.

**(a)** **(i)** In order to mimic acid rain, he dissolved 12.6 g of nitric acid in water and made the volume up to 250 $cm^3$.

Calculate the concentration, in $g/dm^3$, of this solution.

concentration = ..... $g/dm^3$ [1]

**(ii)** Calculate the concentration, in $mol/dm^3$, of this solution.

[Relative atomic masses: $A_r$: H, 1; N, 14; O, 16]

concentration = ..... $mol/dm^3$ [1]

**(b)** Describe the measurements that the student needs to make in order to determine the average speed of reaction between zinc and nitric acid.

.....

.....

..... [2]

[Total : 4 m]



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

6 Describe how you would prepare a pure, dry sample of magnesium sulfate using dilute sulfuric acid as one reagent.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 4 m]



www.KPartnerInLearning.com
More papers at www.bestpapersfree.com
Downloaded from SingaKids.com

7 Fig. 7.1 describes some of the substances that result from the chemical reactions of metal **R**.

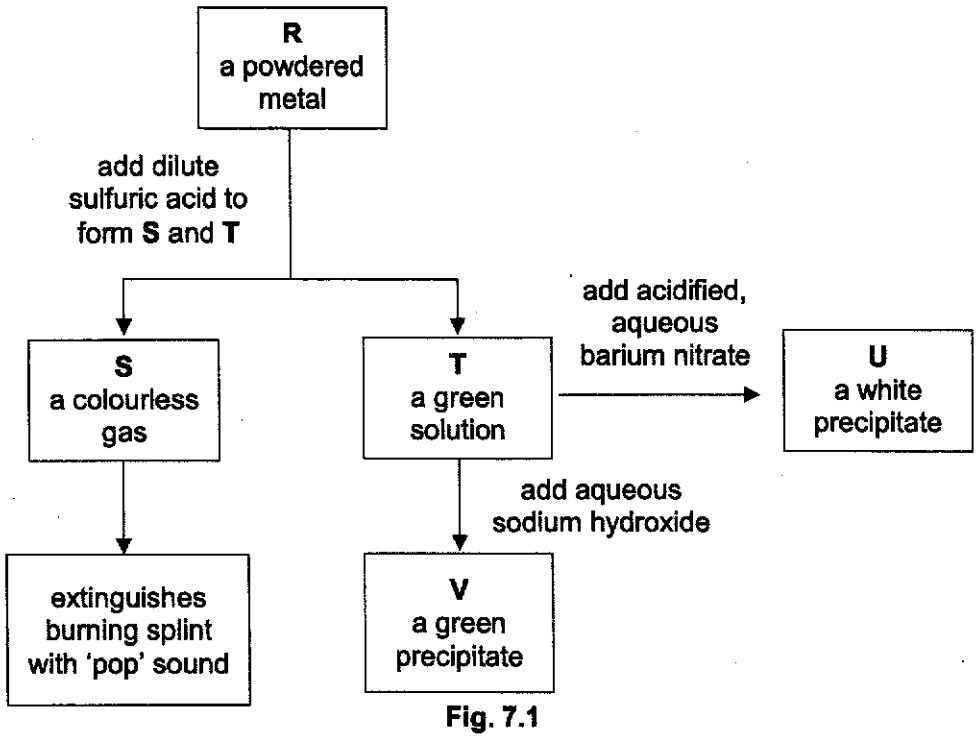



**Fig. 7.1**

**(a)** Identify **R**, **S**, **T**, **U** and **V**.

**R** ..... [1]

**S** ..... [1]

**T** ..... [1]

**U** ..... [1]

**V** ..... [1]

**(b)** Write a balanced equation for any one of the reactions in Fig. 7.1

..... [1]

[Total : 6 m]



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

8 Lithium is a Group I metal. Lithium is the essential element in the making of rechargeable batteries which are present in almost all personal electronics and electric vehicles. Its production has greatly increased since the end of World War II, the largest producer being South America.

**(a)** In the table below, circle the words that would best describe the physical properties of lithium.

| melting point | density | electrical conductivity |
|---|---|---|
| high / low | high / low | conductor / non-conductor |

[1]

**(b)** Lithium, magnesium and copper metals were added to a beaker of cold water. Fig.8.1 shows the observations from the experiment.

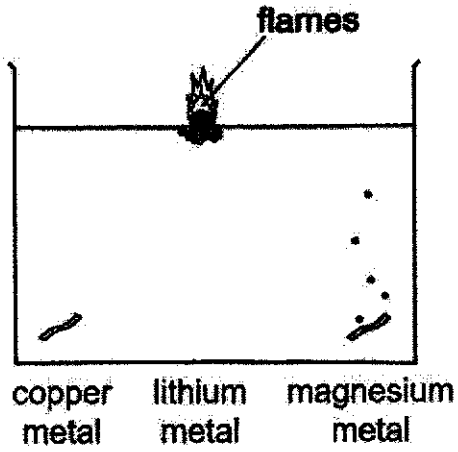



**Fig. 8.1**

**(i)** Identify the products formed when lithium metal reacts with cold water.

..... [1]

**(ii)** With reference to the diagram, arrange the three metals in increasing reactivity.

**least reactive** ⟶ **most reactive**

....., ....., ..... [1]

**(iii)** Suggest a method for the extraction of lithium metal from lithium ore.

..... [1]



www.KPartnerInLearning.com

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

**(c)** Lithium is usually recycled from lithium batteries. Lithium batteries usually contain many other useful metals like iron, aluminium and copper.

An old method of recycling lithium from lithium batteries is to first crush the lithium batteries into smaller pieces. An excess of concentrated sulfuric acid is then added to the crushed batteries. The lithium sulfate is then separated from the mixture.

$$2Li + H_2SO_4 \rightarrow Li_2SO_4 + H_2$$

1000 kg of crushed batteries were recycled based on the method described above. Through this method, 1.32 kg of lithium sulfate was formed.

**(i)** Calculate the relative formula mass of lithium sulfate.

[Relative atomic masses: $A_r$: H, 1; Li, 7; O, 16; S, 32]

relative formula mass = ..... [1]

**(ii)** Calculate the mass of lithium present in the crushed batteries.

mass = ..... kg [2]

**(d)** Currently, lithium recycling from batteries is not common and nearly 95 % of all lithium are mined. If lithium is continuously mined, the finite quantities of lithium ore will be depleted.

Suggest another issue that may arise when lithium metal is not recycled but mined instead.

.....

..... [1]

[Total : 8 m]



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

9 Iodine is an important element for medical and agricultural application. Most of the iodine compounds can be found in ocean water as sodium iodide but it is difficult to extract due to the extremely low concentration. Iodine production from ocean water occurs in two main steps.

**Step 1** – Ocean water is heated to increase the concentration of sodium iodide.

**Step 2** – Chlorine gas is passed through the concentrated solution of sodium iodide to produce solid iodine crystals. The solid iodine crystals are then separated from the rest of the mixture.

**(a) (i)** The equation below shows the chemical equation for the reaction in **Step 2**.

Complete the equation by filling in the missing state symbols.

$Cl_2$ (.....) + 2NaI (.....) → $I_2$ (.....) + 2NaC*l* (.....) [1]

**(ii)** Suggest with reasons if chlorine gas in **Step 2** can be used to extract fluorine from sodium fluoride.

.....

..... [1]

**(iii)** State a method to separate the solid iodine crystals from the rest of the mixture.

..... [1]

**(b) (i)** Draw a 'dot and cross' diagram to show the arrangement of electrons in a chlorine molecule. Only the outer shells of electrons need to be shown.

[2]

**(ii)** Explain, in terms of bonding, why Group VII elements have low boiling points.

.....

.....

..... [2]

[Total : 7 m]



www.KPartnerInLearning.com
More papers at www.bestpapersfree.com
Downloaded from SingaKids.com

## Section B

Answer any **two** questions in this section.

Write your answers in the spaces provided.

**10** Iron is usually produced in a blast furnace from iron ore.

**(a)** Explain, including chemical equations, how the following processes occur in a blast furnace:

**(i)** iron is extracted from the ore,

.....

.....

.....

.....

.....

..... [4]

**(ii)** impurities are removed.

.....

.....

.....

.....

..... [3]

**(b)** Iron is usually not used directly as a pure metal. One reason is that pure iron is prone to corrosion.

**(i)** Explain why coating iron with grease prevents iron from rusting.

.....

..... [1]

**(ii)** Another way to prevent rusting is to combine iron with another element to form an alloy.

Give an example of an alloy and provide **another** reason why alloys are preferred to pure metals.

.....

..... [2]

[Total: 10 m]



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

**11** A student investigated the rate of reaction when dilute hydrochloric acid reacts with excess copper(II) carbonate powder.

$$2HCl + CuCO_3 \rightarrow CuCl_2 + CO_2 + H_2O$$

He used the same volume of acid each time. He measured the time taken to collect 10 $cm^3$ of gas at room temperature and pressure. He also measured the total volume of gas at the end of the experiment at room temperature and pressure.

Table 11.1 shows his results.

**Table 11.1**

| experiment | concentration of HCl in $mol/dm^3$ | time taken to collect 10 $cm^3$ of gas / s | total volume of gas / $cm^3$ |
|---|---|---|---|
| 1 | 0.5 | 15 | 150 |
| 2 | 1.0 | 6 | 300 |
| 3 | 0.5 | 7 | 150 |

**(a) (i)** Out of the above three experiments, the student carried out two experiments using acid at room temperature and one experiment using acid at a higher temperature.

Which experiment was carried out at a higher temperature?

Explain your reasoning.

.....

.....

.....

..... [2]

**(ii)** Explain, in terms of collisions between reacting particles, how a higher temperature affects the rate of reaction.

.....

.....

.....

..... [2]



www.KPartnerInLearning.com
More papers at www.bestpapersfree.com
108
Downloaded from SingaKids.com

**(b)** **(i)** With reference to the data from experiment 1, calculate the number of moles of carbon dioxide produced.

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure.

number of moles = ..... mol [1]

**(ii)** Hence or otherwise, calculate the volume of hydrochloric acid that was added in experiment 1.

volume of hydrochloric acid = ..... $dm^3$ [2]

**(c)** The student carried out a further experiment at room temperature using the same volume of 0.5 mol/$dm^3$ hydrochloric acid as experiments 1, 2 and 3. However, in this experiment, he used excess copper(II) carbonate **granules** instead of powder.

Complete the table to predict what results he should expect and explain how you arrived at your answers.

| **experiment** | **concentration of HCl in mol/$dm^3$** | **time taken to collect 10 $cm^3$ of gas / s** | **total volume of gas / $cm^3$** |
|---|---|---|---|
| 4 | 0.5 | | |

.....

.....

.....

.....

.....

..... [3]

[Total : 10 m]



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

**12** This is a dummy question.

*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*

**(a)** **(i)** *Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*

.....

.....

.....

..... [3]

**(ii)** *Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*

.....

.....

.....

..... [3]

**(b)** *Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*
*Chua Chu Kang Secondary School Chua Chu Kang Secondary School*

.....

.....

.....

.....

.....

..... [4]

[Total : 10 m]

**END OF PAPER 3**



www.KPartnerInLearning.com
More papers at www.testpapersfree.com
Downloaded from SingaKids.com

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

## 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 |


More papers at www.testpapersfree.com

Downloaded from SingaKids.com

# The Periodic Table of Elements

| Group I | Group II | | | | | | | | | | | Group III | Group IV | Group V | Group VI | Group VII | Group 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium - | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57 – 71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium – | 85 At astatine – | 86 Rn radon – |
| 87 Fr francium – | 88 Ra radium – | 89 – 103 actinoids | 104 Rf Rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**Key**

proton (atomic) number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium – | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium – | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium – | 94 Pu plutonium – | 95 Am americium – | 96 Cm curium – | 97 Bk berkelium – | 98 Cf californium – | 99 Es einsteinium – | 100 Fm fermium – | 101 Md mendelevium – | 102 No nobelium – | 103 Lr lawrencium – |

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).

www.KPartnerLearning.com
More papers at www.testpapersfree.com
Downloaded from SingaKids.com

PartnerInLearning

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

**Secondary 4E5N**
**Science (Chemistry)**
**Preliminary Examination 2020**

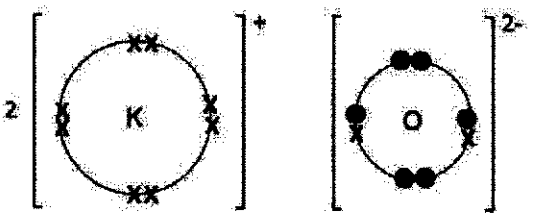
**Mark Scheme**

**Paper 1 (20 marks)**

| | | | |
|---|---|---|---|
| **1** | B | **11** | D |
| **2** | B | **12** | C |
| **3** | A | **13** | C |
| **4** | D | **14** | A |
| **5** | C | **15** | B |
| **6** | B | **16** | B |
| **7** | A | **17** | C |
| **8** | D | **18** | B |
| **9** | B | **19** | A |
| **10** | A | **20** | D |

**A – 5, B – 7, C – 4, D - 4**

**Paper 3**
**Section A (45 marks)**

| | | |
|---|---|---|
| **1(a)** | chlorine | 1 |
| **(b)** | lead or zinc (reject lead(II), lead(II) oxide, zinc oxide) | 1 |
| | | Total: 2 |
| **2(a)(i)** | oxygen (reject chemical formula) | 1 |
| **(ii)** | nitrogen | 1 |
| **(b)(i)** | incomplete combustion of fuels | 1 |
| **(ii)** | lightning activity/internal combustion engine/overheated engines | 1 |
| | | Total: 4 |
| **3(a)** | X<br>Lower boiling point | 1 |
| **(b)** | colourless | 1 |
| **(c)** | ensure that the condenser is fully filled with water/effective cooling of the condenser | 1 |
| | | Total: 3 |
| **4(a)(i)** | C | 1 |
| **(ii)** | B | 1 |
| **(iii)** | F | 1 |
| **(b)** | B conducts electricity.<br>Ions in A are held in fixed positions, no mobile ions. (reject mobile electrons)<br>Ions in B are mobile and move throughout the liquid. | 1<br>1 |
| **(c)** | <br><br>1 m for each ion | 2 |
| | | Total: 7 |
| **5(a)(i)** | $250cm^3 = 0.25dm^3$<br>12.6 / 0.25 = **50.4 g/dm$^3$** | 1 |

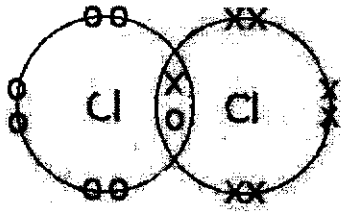

More papers at www.testpapersfree.com
Downloaded from SingaKids.com

| | | |
|---|---|---|
| | | |
| (ii) | allow for ecf from (a)(i)<br><br>$Mr(HNO_3) = 1 + 14 + 3(16)$<br>$= 63$<br><br>$50.4g/dm^3 / 63$<br>$= \mathbf{0.8mol/dm^3}$ | 1 |
| (b) | time taken for<br>total volume of gas to be produced / total mass to be loss | 1<br>1 |
| | | Total: 4 |
| 6 | 1. Add magnesium/magnesium carbonate/magnesium oxide to sulfuric acid<br>2. Add until no more can dissolve/until excess/until no more bubbles are formed (for $Mg/MgCO_3$ but not MgO)<br>3. Filter undissolved solids<br>4. Heat filtrate and leave to crystallise<br>5. Filter, Wash crystals with cold water and dry between filter paper.<br><br>5 pts – 4 m, 4,3 pts – 3m, 2 pts – 2m, 1pt – 1m | 4 |
| | | Total: 4 |

| | | | |
|---|---|---|---|
| 7 (a) | R | Iron or Fe | 1 |
| | S | Hydrogen or $H_2$ | 1 |
| | T | Iron(II) sulfate or $FeSO_4$ | 1 |
| | U | barium sulfate or $BaSO_4$ | 1 |
| | V | Iron (II) hydroxide $Fe(OH)_{2+}$ | 1 |
| (b) | Any ONE | | |
| | $Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$ | | 1 |
| | $FeSO_4 + Ba(NO_3)_2 \rightarrow BaSO_4 + Fe(NO_3)_2$ | | |
| | $FeSO_4 + 2NaOH \rightarrow Fe(OH)_2 + 2NaCl$ | | |
| | $Fe^{2+}(aq) + 2OH^-(aq) \rightarrow Fe(OH)_2(s)$<br>$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$ | | |
| | | | Total: 6 |

| | | | | |
|---|---|---|---|---|
| 8(a) | **melting point** | **density** | **electrical conductivity** | 1 |
| | high / **low** | high / **low** | **conductor** / non-conductor | |
| | All 3 for 1m | | | |
| (b)(i) | lithium hydroxide and hydrogen | | | 1 |
| (ii) | copper, magnesium, lithium | | | 1 |
| (iii) | electrolysis | | | 1 |


More papers at www.testpapersfree.com
Downloaded from SingaKids.com

| | | |
|---|---|---|
| (c)(i) | 2(7) + 32 + 4(16)<br>= 110 (reject if student adds units) | 1 |
| (ii) | allow ecf from (c)(i)<br>mol($Li_2SO_4$) = 1320 / 110 (accept even if student did not convert)<br>**= 12 mol**<br>1$Li_2SO_4$: 2Li → 12mol:24mol<br>mass(Li)<br>=24x7<br>= 168g<br>**=0.168kg** | 1<br>1 |
| (d) | 1. mining for metal ore leads to clearing of forest and damage to habitats<br>2. Extraction of metal ores require a lot of energy that cause more fossil fuels to be burnt which leads to the release of greenhouse gases<br>3. Extraction of metal ores may involve the use of toxic chemicals/release harmful air pollutants | 1 |
| | | Total: 6 |
| 9(a)(i) | $Cl_2$ (g) + 2NaI (aq) → $I_2$ (s) + 2NaCl (aq) | 1 |
| (ii) | fluorine is more reactive than chlorine, chlorine is unable to displace fluorine | 1 |
| (iii) | filtration | 1 |
| (b)(i) | <br><br>1m- bonding electron, 1m – non-bonding electron | 2 |
| (ii) | weak intermolecular forces of attraction (reject if there is factual error)<br>small amount of energy required to overcome (reject: easy to overcome, force to overcome, break) | 1<br>1 |
| | | Total: 7 |

**Section B (10 marks)**

| | | |
|---|---|---|
| 10(a)(i) | coke reacts with oxygen to form carbon dioxide.<br>carbon dioxide reacts with more coke to form carbon monoxide.<br>carbon monoxide reduces iron ore/iron(III) oxide to form iron.<br>$C + O_2 \rightarrow CO_2$<br>$CO_2 + C \rightarrow 2CO$<br>$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$<br>6pts – 4 m,<br>5,4 pts – 3m,<br>3 pts – 2m,<br>2,1 pts – 1m | 4 |


More papers at www.testpapersfree.com
Downloaded from SingaKids.com

| | | |
|---|---|---|
| (ii) | limestone decomposes to form calcium oxide<br>calcium oxide combines with silicon dioxide to form slag<br>$CaCO_3 \rightarrow CaO + CO_2$<br>$CaO + SiO_2 \rightarrow CaSiO_3$<br>4 pts – 3m<br>3, 2 pts – 2m<br>1 pts – 1m | 3 |
| (b)(i) | prevents contact with water/moisture and air/oxygen | 1 |
| (ii) | steel/brass/bronze/pewter<br>stronger and harder/appearance/lower melting point (reject corrosion) | 1<br>1 |
| | | Total: 10 |
| 11(a)(i) | Experiment 3<br><br>Experiment 3 takes the shortest time to collect 10cm$^3$ of gas although it has a lower concentration than experiment 2. | 1<br><br>1 |
| (ii) | increase in kinetic energy of the particles<br>increase frequency of effective collisions<br>increase in rate of reaction<br>3 points – 2 m, 2,1 points – 1 m | 2 |
| (b)(i) | 150 cm$^3$ = 0.15 dm$^3$<br>mol($CO_2$) = 0.15 /24<br>= **0.00625 mol** | 1 |
| (ii) | allow for ecf from (b)(i)<br>1$CO_2$:2HCl<br>0.00625mol:**0.0125mol**<br>vol(HCl) = 0.0125/0.5<br>=0.025dm$^3$ | 1<br><br>1 |
| (c) | <table><tr><th>experiment</th><th>concentration of HCl in mol/dm$^3$</th><th>time taken to collect 10 cm$^3$ of gas / s</th><th>total volume of gas / cm$^3$</th></tr><tr><td>4</td><td>0.5</td><td>more than 15 (1)</td><td>150 (2)</td></tr></table><br>(3) same number of moles/amount of hydrochloric acid used, total volume of gas remain the same.<br><br>(4) granule smaller surface area to volume ratio, lower frequency of effective collisions, slower speed of reaction<br><br>4 – 3 m, 3,2 – 2m, 1 – 1m | 3 |
| | | Total: 10 |


More papers at www.testpapersfree.com
Downloaded from SingaKids.com