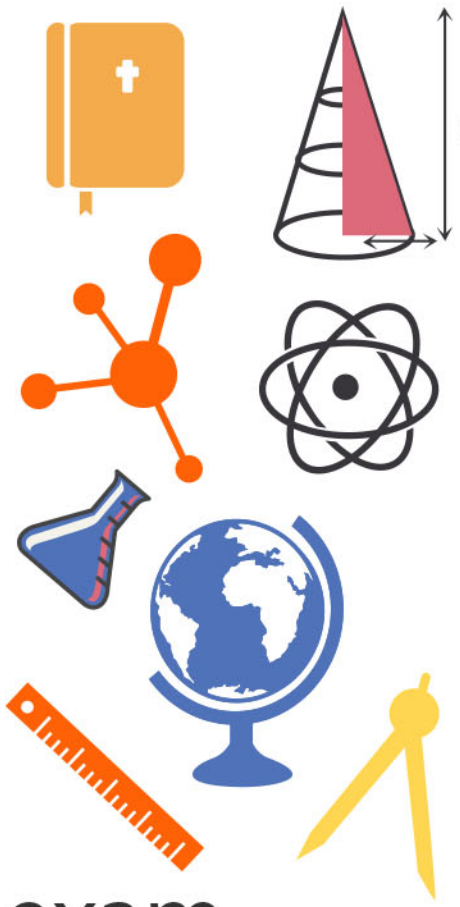

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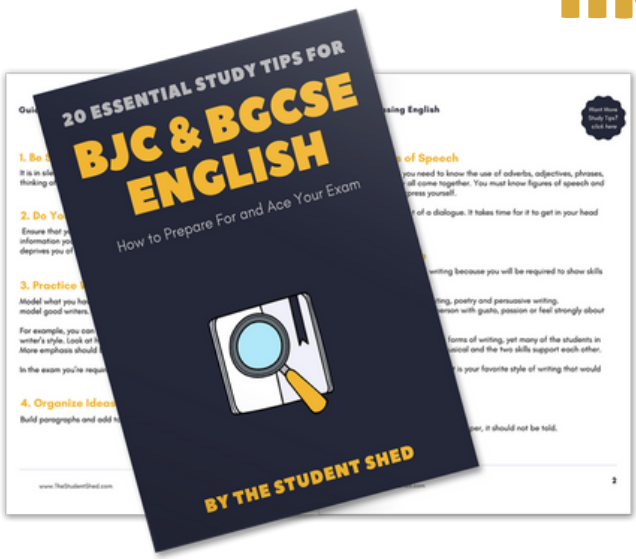

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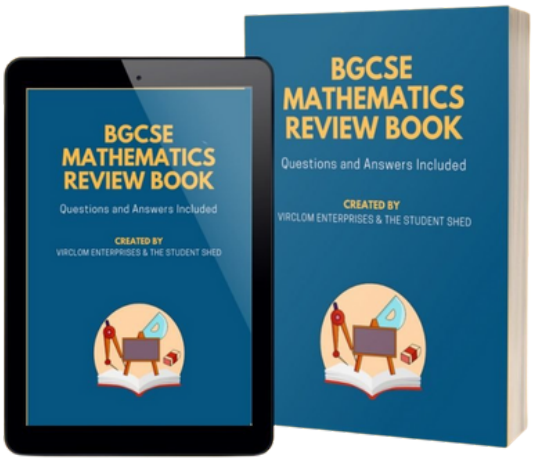

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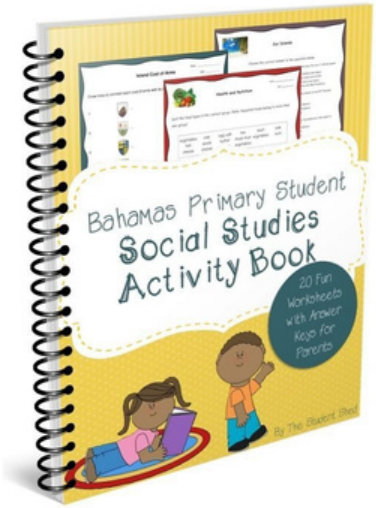

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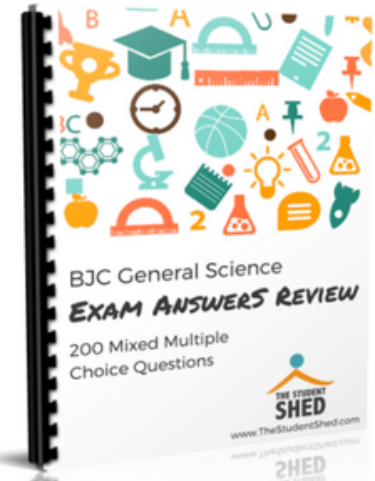

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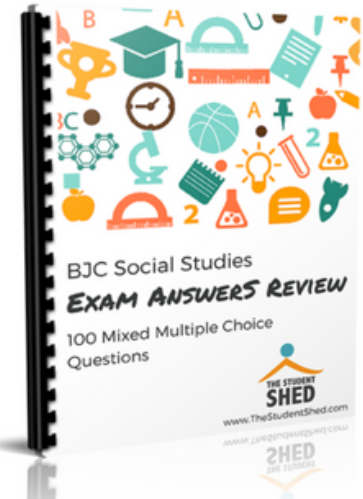

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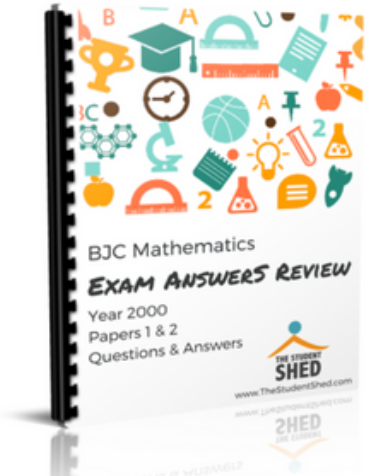

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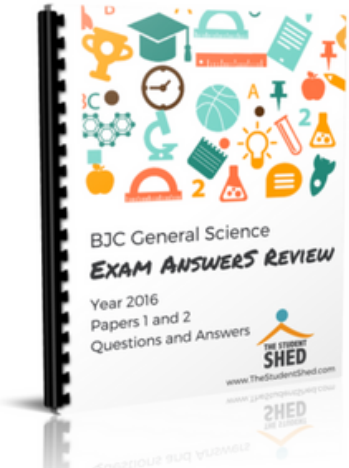

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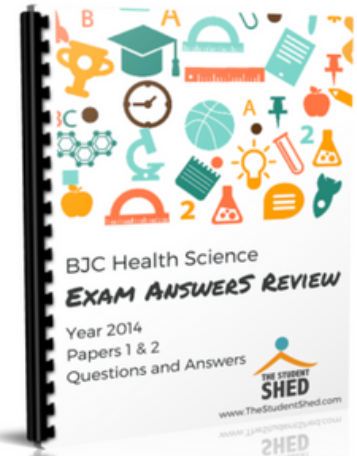

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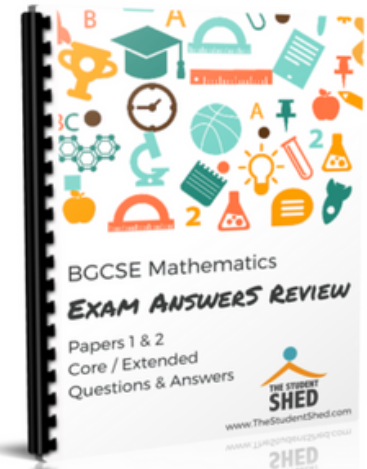

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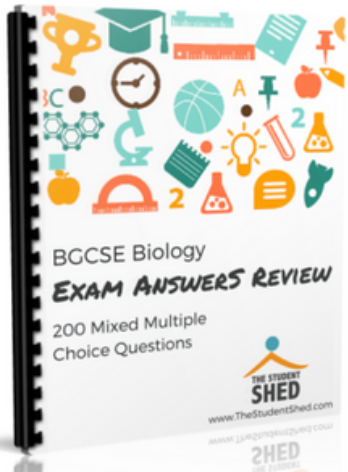

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Paper 5

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CHEMISTRY

PAPER 5

ALTERNATIVE TO COURSEWORK

Wednesday **14 JUNE 2006** 2:05 p.m. – 3:20 p.m.

Additional materials:
Calculators

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS
BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** the questions on this paper in the spaces provided. The number of marks is given in [ ] brackets at the end of each question or part question.

Show **ALL** your working when answering numerical questions.

A copy of the Periodic Table is printed on page 16.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
TOTAL	

This question paper consists of **16** printed pages.

1. Sketch the apparatus that could be used to separate a sand and seawater mixture.

   Labels must go along with any equipment that appear in the sketch. The residue and filtrate must also be clearly labelled.

[4]

2. **FASTGROW FERTILISER**

Fertilisers are used to increase the growth of plants. Fertilisers have to dissolve in water if they are to be used by plants.

A student carried out an experiment to find the solubility of Fastgrow. The student measures out 50 cm^3 of water. The student then warmed the water to a temperature of 40 °C and added Fastgrow crystals. The mixture was stirred. Some of the crystals had not dissolved.

The mixture was allowed to cool until the temperature was 30 °C. The student quickly filtered the mixture.

The student weighed an evaporating dish.

Then the student evaporated the water over a boiling water bath until dry crystals remained. The student reweighed the dish.

(a) List four pieces of apparatus that the student must have used.

1 _____

2 _____

3 _____

4 _____ [2]

(b) Explain why it was important that some crystals remained undissolved.

_____

_____ [1]

(c) Suggest why the water was evaporated over a boiling water bath and not over a flame.

_____

_____ [1]

[4]

(d) Here are the student's results

mass of evaporating dish containing dry crystals .....132 g
mass of evaporating dish ..... 79 g

(i) find the mass of the crystals left in the dish

[1]

(ii) This mass of crystals was originally dissolved in 50 g water.

State the solubility of Fastgrow.

[1]

Total marks [6]

3. A student carried out tests on two white powders, potassium carbonate and potassium hydrogencarbonate.
He recorded the results in the table, Fig. 3. 1.

Study the table and answer the questions which follow.

test	result for potassium carbonate	result for potassium hydrogen carbonate
1 (a) Add a portion of the powder to cold water and shake.	*a colourless liquid*	*white powder below a colourless liquid*
(b) Add a portion of the powder to hot water and shake.	*a colourless liquid*	*a colourles liquid*
2 (a) Add a few drops of Universal Indicator to some of the solution from **1 (b)**.	*dark blue*	*green/blue*
(b) Boil the mixture from **2 (a)**.	*stays dark blue*	*gradually turn dark blue*
3 (a) Heat a portion of the dry white powder.	*stays white, no gas given off.*	*stays white, a gas is given off.*
(b) Test the gas from **3 (a)** with lime water.	*no reaction (no gas)*	*limewater turns milky,*
(c) Dissolve the residue from **3 (a)** in water, add solid ammonium chloride and heat the mixture.	*a gas is given off which has a pungent smell and turns damp red litmus blue*	*a gas is given off which has a pungent smell and turns damp red litmus blue*
4 (a) Add dilute nitric acid to some of the solution from **1 (b)**.	*Bubbles of a gas are given off.*	*bubbles of a gas are given off.*
(b) Add aqueous barium nitrate to the mixture from **4 (a)**.	*A colourless solution*	*A colourless solution*

Fig. 3.1

(a) State which is more soluble in water, potassium carbonate or potassium hydrogen carbonate. Explain your answer.

_____

_____ [1]

(b) (i) Suggest the pH value of potassium carbonate solution.

_____ [1]

(ii) State what happens to the pH value when potassium hydrogen carbonate solution is boiled.

_____ [1]

(c) Name the gas given off when potassium hydrogen carbonate is heated.

_____ [1]

(d) Name the gas given off in test **3 (c)**.

_____ [1]

(e) Explain how the two observations in tests **4 (a)** and **4 (b)** differ from the results of a test for a sulphate.

_____

_____ [2]

(f) The reaction of potassium carbonate with hydrochloric acid is exothermic. The reaction of potassium hydrogen carbonate with hydrochloric acid is endothermic.

Using this information, describe an experiment to decide if a sample of a white powder is potassium carbonate or potassium hydrogen carbonate.

Briefly describe what you would do and state what measurement you would make.

_____

_____

_____

_____

_____ [3]

Total marks[10]

4. A student wants to find out if flower petals contain one coloured substance or two. He follows the procedure shown in Fig. 5.1.

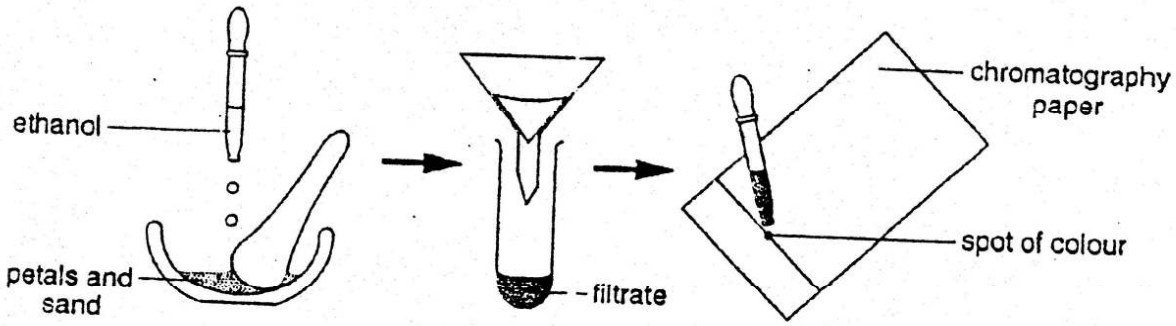


Fig. 4.1.

- He grinds the petals with sand and adds a few cm^3 of ethanol. The ethanol dissolves the coloured substance in the petal.
- He filters the mixture and collets the filtrate in a test-tube.
- He places a drop of the filtrate on a piece of chromatography paper and allows it to dry. He repeats this to make a spot of colour on the paper.

(a) State the advantage, to the flower, of coloured petals.

_____

_____ [2]

(b) Suggest a reason why ethanol is better than water for this experiment.

_____ [1]

(c) (i) The student uses the chromatography paper to find out if the colour contains one substance or two.
Draw a diagram showing how he does this experiment.

[3]

(ii) The student concludes that there are two substances in the petal colour.

On the diagram, Fig. 5. 2, show what the chromatography paper looks like after the experiment. [2]

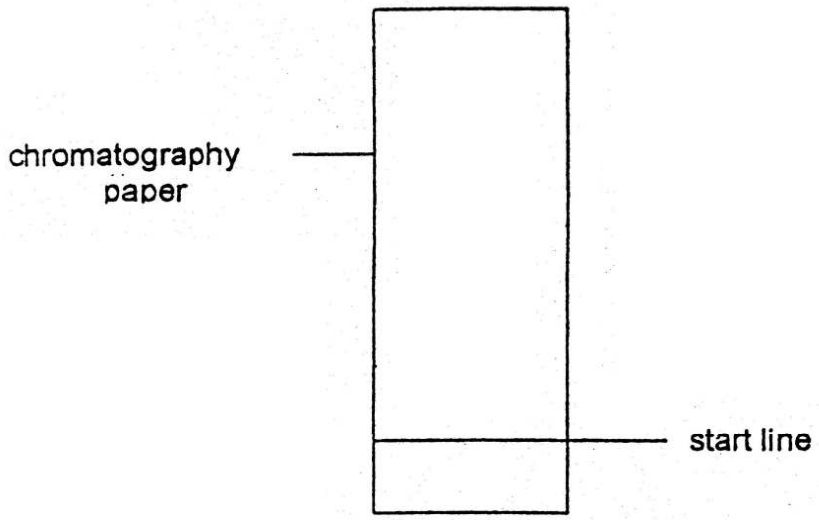


Fig. 4.2

(d) Describe how the student can find out if the filtrate will act as an acid-base indicator.

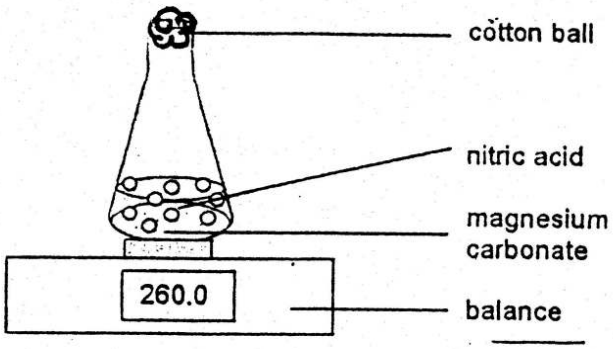
_____

_____

_____ [2]

Total marks [10]

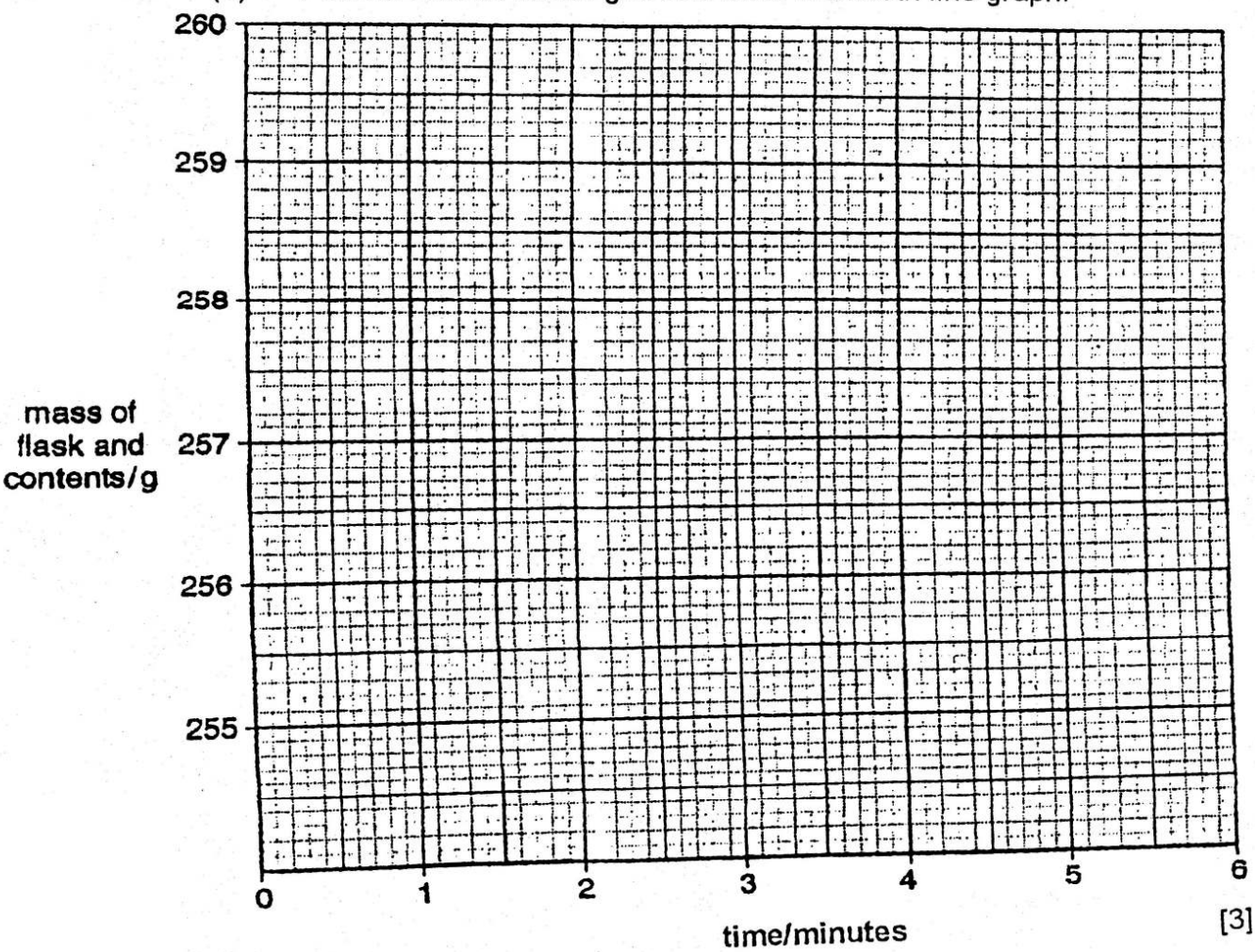
5. Dilute nitric acid was added to a large amount of magnesium carbonate in a conical flask as shown.



The flask was placed on a balance and the mass of the flask and contents recorded every minute. The results are shown in the table.

time/min	0	1	2	3	4	5	6
mass of flask and contents/g	260.0	257.9	256.8	256.6	255.8	255.6	255.6

(a) Plot the results on the grid and draw a smooth line graph.



[3]

(b) State which result appears to be inaccurate. State why you have selected this result.

_____

_____ [2]

(c) Give **one** reason why the mass of the flask and contents decrease.

_____ [1]

(d) Suggest the purpose of the cotton wool.

_____ [1]

(e) State the time that the reaction finished.

_____ [1]

(f) On the grid, sketch the graph you would expect if the experiment were repeated using nitric acid at a higher temperature.

Total marks [10]

6. An investigation was carried out on the reactions of four different metals. Equal masses of copper, magnesium, iron and zinc were used.

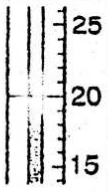
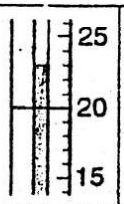
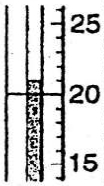
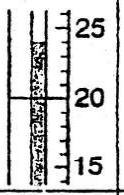
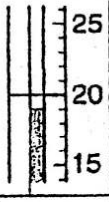
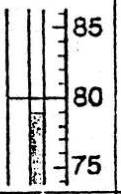
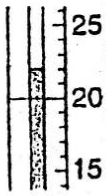
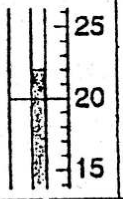
Experiment 1

A 15 cm^3 sample of dilute sulphuric acid was added to each of four boiling tubes. The initial temperature of the acid was measured.Zinc was added to the first tube, iron to the second tube, magnesium to the third tube and copper to the fourth tube.

The maximum temperature reached in each tube was measured and any observations were recorded in the table.

(a) Use the thermometer diagrams to complete the results table.

Table of results

metal added	temperature of acid/°C		temperature difference/°C	observations
	initial	maximum		
zinc				gas given off slowly
iron				gas given off very slowly
magnesium				gas given off rapidly: lighted splint pops
copper				no visible reaction

[6]

Use your results and observations to answer the following questions.

(i) Name the metal which is most reactive with sulphuric acid.

[1]

_____

(ii) Give two reasons why you chose this metal.

1 _____

2 _____ [2]

(iii) Name the gas given off.

_____ [1]

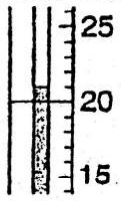
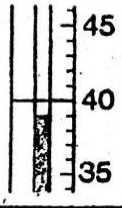
The reaction between magnesium and aqueous copper(II) sulphate was then investigated.

Experiment 2

A 5 cm^3 sample of aqueous copper(II) sulphate was measured into a test-tube. The initial temperature of the solution was measured.

Magnesium powder was added to the test-tube and the maximum temperature reached was measured. Use the thermometer diagrams to complete the results table. Write the temperatures in the third column of the table.

Table of results

initial temperature of aqueous copper(II) sulphate		
maximum temperature reached after magnesium added		

[2]

(b) State how your observations show that the reaction of magnesium with aqueous copper(II) sulphate is exothermic.

_____ [1]

(c) Name the type of exothermic reaction which occurs when magnesium is added to aqueous copper(II) sulphate.

_____

(d) Use your results from **Experiment 1** and **Experiment 2** to put the four metals in order of reactivity.

From **least reactive** to **most reactive.**

_____ [2]

Total marks [15]

7. The following paragraph was taken from a student's notebook.

Making potassium chloride

25.0 cm^3 of aqueous potassium hydroxide was placed in a flask and a few drops of indicator were added. Dilute hydrochloric acid was added to the flask until the indicator changed colour. The volume of acid used was 19.0 cm^3.

(a) Name the piece of apparatus that should be used to measure the aqueous potassium hydroxide.

_____ [1]

(b) (i) Name an indicator that could be used, other than Universal Indicator.

_____ [1]

(ii) The indicator colour would change

from _____

to _____. [2]

(c) Name the solution which was more concentrated. Explain your answer.

_____

_____ [2]

(d) Explain how **pure** crystals of potassium chloride could be obtained from this experiment.

_____

_____

_____

_____ [3]

Total marks [9]

End]

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