| Centre No. | | | | | | Paper Reference (complete below) | | | | | | | Surname | Initial(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Candidate No. | | | | | | | | | | / | | | Signature | |

Paper Reference(s)

**4335/03 4437/08**

Examiner's use only

| | | |
|---|---|---|
| | | |

Team Leader's use only

| | | |
|---|---|---|
| | | |

# London Examinations IGCSE

## Chemistry – 4335

Paper 3

## Science (Double Award) – 4437

Paper 8

## Foundation and Higher Tiers

Thursday 4 June 2009 – Morning

Time: 1 hour 15 minutes

| Question Number | Leave Blank |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
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| | |
| Total | |

**Materials required for examination**
Ruler, pencil and calculator

**Items included with question papers**
Nil

### Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname and initial(s), the paper reference and your signature.
The paper references are shown above. Write the one for which you have been entered. Check that you have the correct question paper.
Answer ALL the questions. Writer your answers in the spaces provided in this question paper.
Show all stages in any calculations and state the units. Calculators may be used.
Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (~~☒~~) and then mark your new answer with a cross (☒).

### Information for Candidates

The total mark for this paper is 50. The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 4 questions in this question paper.
There are 16 pages in this question paper. Any blank pages are indicated.

### Advice to Candidates

Write your answers neatly and in good English.



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***Turn over***

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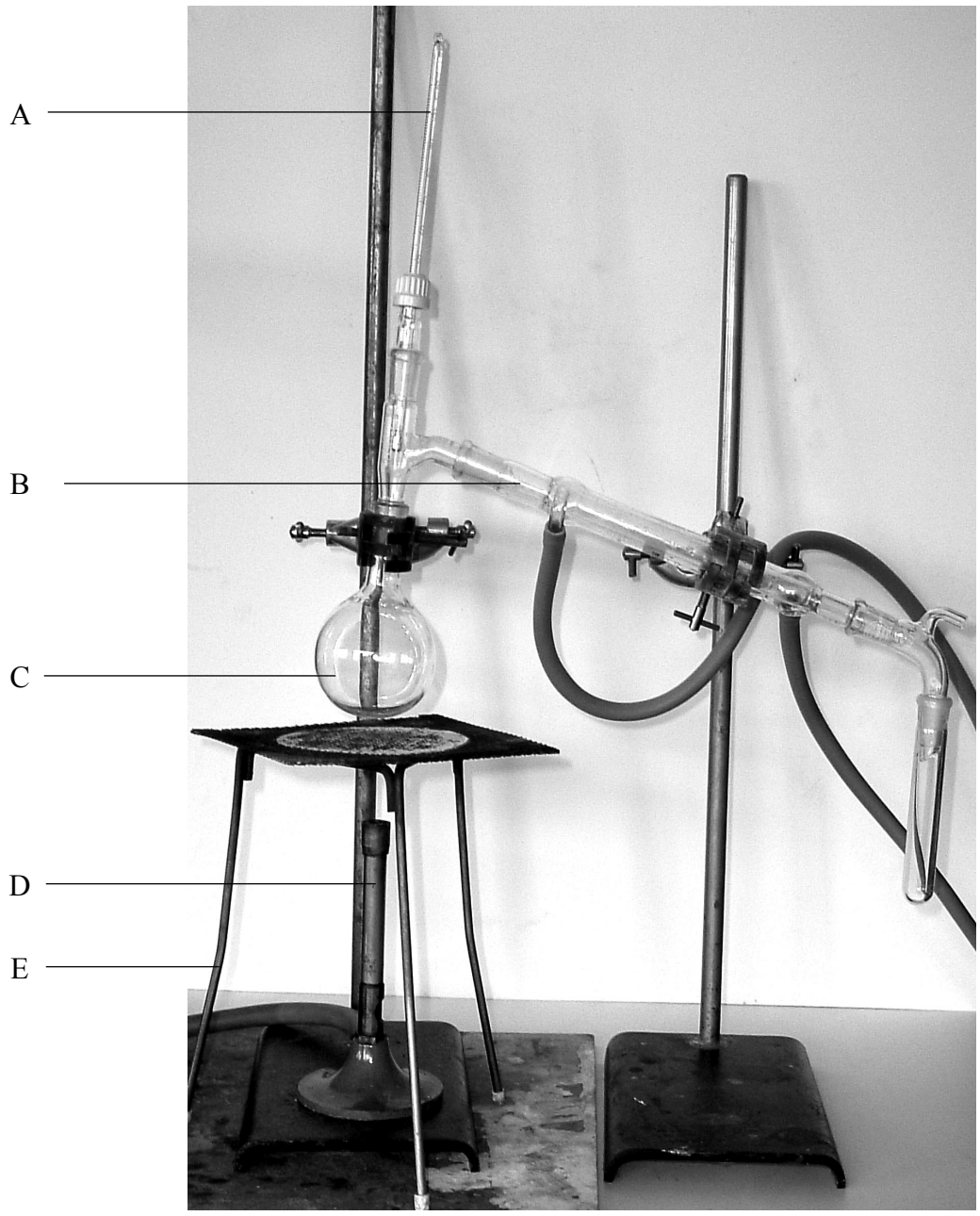
**1.** The picture shows apparatus used to carry out distillation.



Leave blank

(a) Use words from the box to name the items of equipment labelled **A** to **E**.

| | | |
|---|---|---|
| **beaker** | **Bunsen burner** | **clamp stand** |
| **condenser** | **conical flask** | **funnel** |
| **round bottomed flask** | **thermometer** | **tripod** |

A .....

B .....

C .....

D .....

E .....

**(5)**

(b) Name one item of equipment shown in the picture which can be used to make a measurement.

.....

**(1)**

(c) Place a cross (☒) in the box to show which mixture the apparatus in the picture could be used to separate.

ethanol and water ☐

iron filings and sulphur ☐

sodium chloride and sugar ☐

**(1)**

**Q1**

**(Total 7 marks)**

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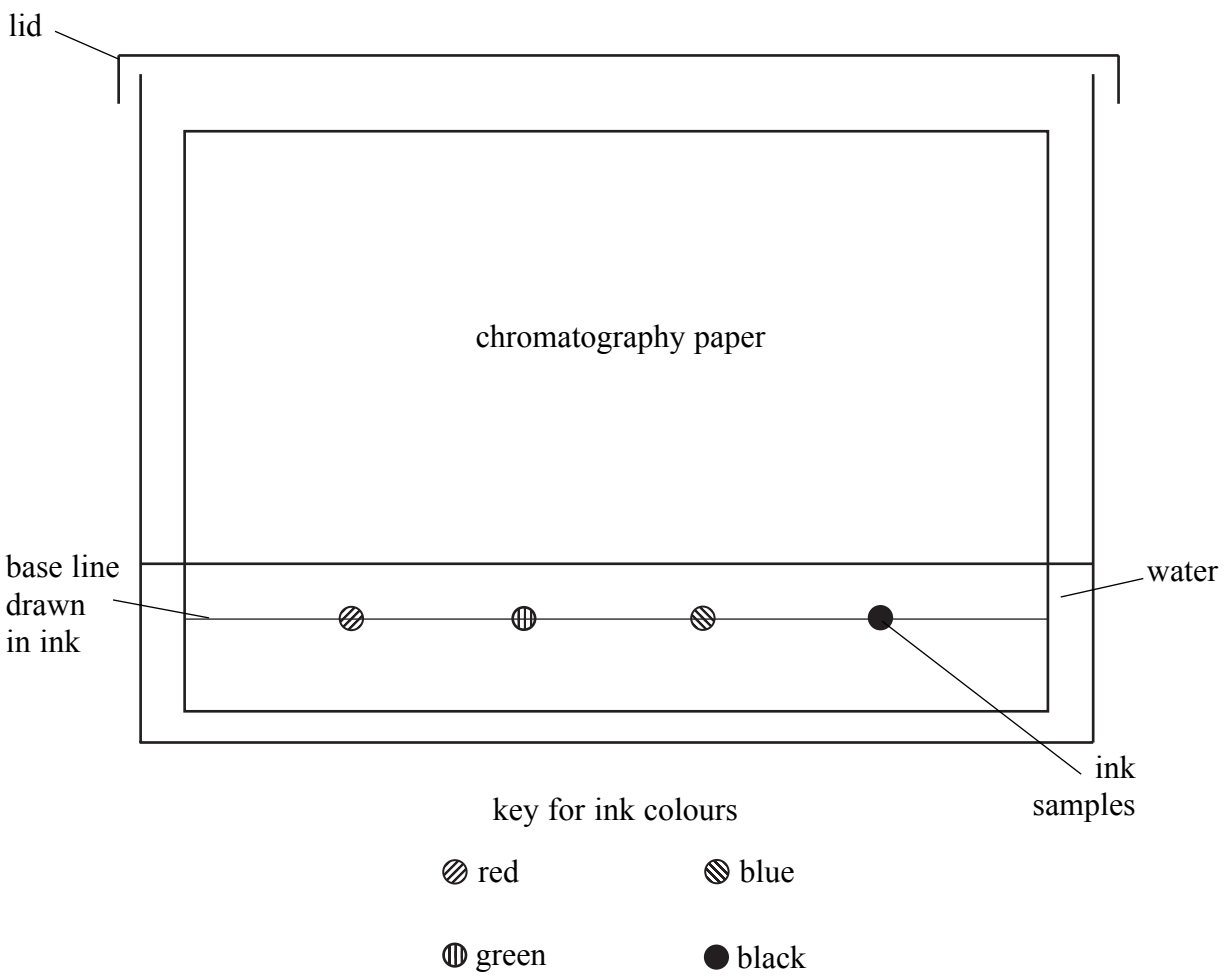
**2.** A student investigates the colours contained in inks from felt-tip pens. He uses chromatography and sets up his experiment as shown:




(a) Identify **two** mistakes in the way he sets up the experiment. For each mistake state what problem it would cause.

First mistake .....

.....

Problem .....

.....

Second mistake .....

.....

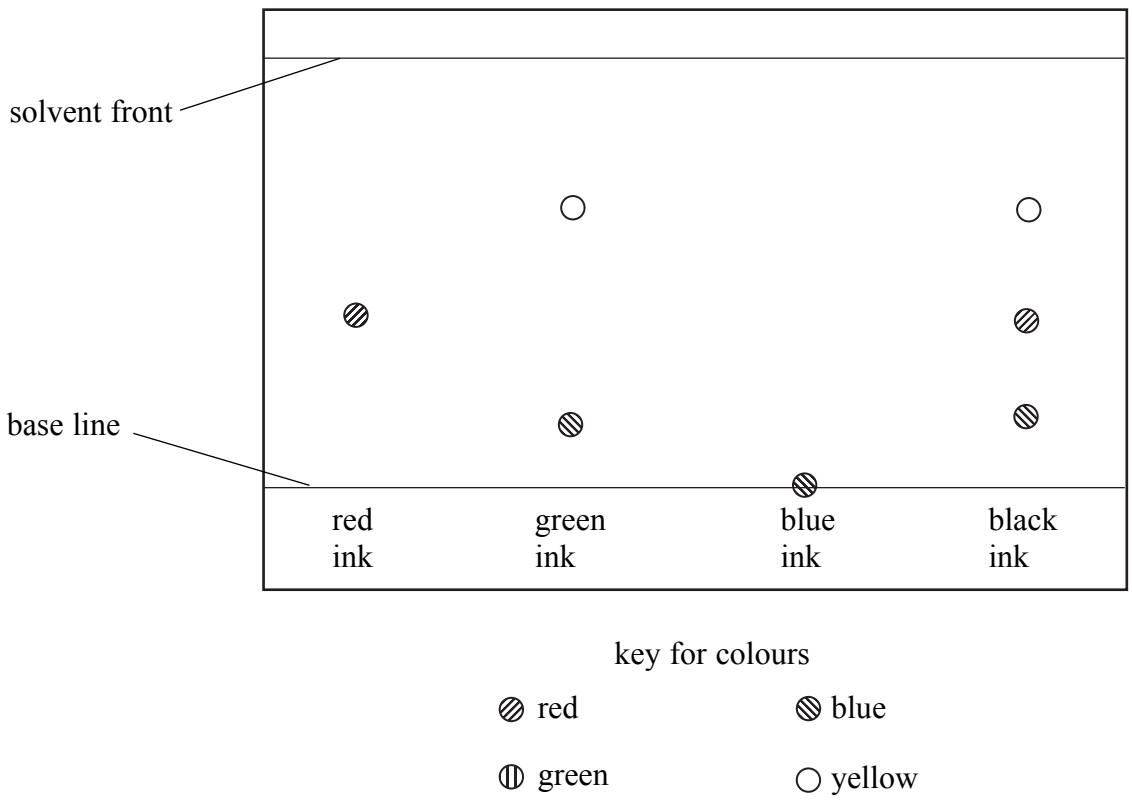
Problem .....

.....

**(4)**

Leave blank

Another student repeats the experiment, but does not make any mistakes. She uses inks from four different felt tip pens. The diagram shows her results.




(b) (i) How many different colours does the black ink contain?

.....

**(1)**

(ii) Which of the inks tested could be mixed together to make the black ink?

.....

**(1)**

(iii) Which of the inks tested is insoluble in water? Explain your answer.

Ink .....

Explanation .....

.....

**(2)**

Leave blank

(c) $R_f$ values can be calculated for spots obtained by chromatography. The $R_f$ value of a spot is calculated using the equation

$$\mathbf{R_f = \frac{distance\ moved\ by\ spot\ from\ base\ line}{distance\ moved\ by\ solvent\ front\ from\ base\ line}}$$

(i) Use the diagram of the results to help you complete the table. Include units.

| | |
|---|---|
| distance moved by red spot from the base line | |
| distance moved by solvent from the base line | |

**(3)**

(ii) Using the values you have recorded in the table, calculate the $R_f$ value for the red spot.

**(1)**

**Q2**

**(Total 12 marks)**

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**3.** A student investigated how the temperature changed when different masses of magnesium hydroxide were reacted with dilute hydrochloric acid.

This is the method she followed.

- Place the acid in a glass beaker
- Measure the temperature of the acid
- Add a known mass of magnesium hydroxide to the acid
- Stir the mixture and record the highest temperature reached
- Repeat the experiment

(a) State two things that the student must have kept constant to make this a fair test.

1 .....

2 .....

**(2)**

(b) State one change to the **apparatus** used that will improve the accuracy of the results. Explain your answer.

Change to apparatus .....

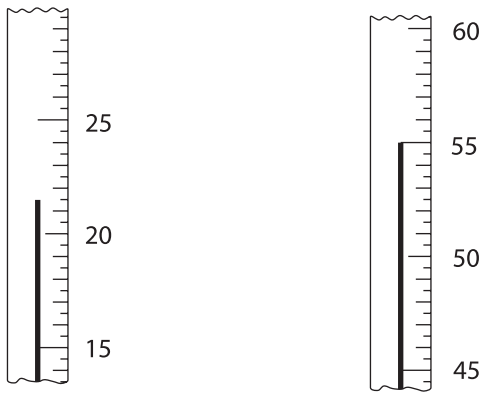
.....

Explanation .....

.....

**(2)**

(c) These are the thermometer readings in one experiment.




Write down the temperatures shown and work out the temperature change.

Temperature of acid before reaction ..... °C

Temperature of mixture after reaction ..... °C

Temperature change ..... °C

**(3)**

Leave blank

The results obtained by another student are shown in the table.

| Mass of magnesium hydroxide (g) | Temperature change (°C) | | | Mean temperature change (°C) |
|---|---|---|---|---|
| | run 1 | run 2 | run 3 | |
| 0.5 | 7.4 | 7.4 | 7.8 | |
| 1.0 | 15.2 | 15.0 | 14.8 | 15.0 |
| 1.5 | 22.6 | 22.2 | 33.0 | 22.4 |
| 2.0 | 29.4 | 29.4 | 31.2 | 30.0 |
| 2.5 | 31.9 | 32.1 | 32.0 | 32.0 |
| 3.0 | 31.6 | 32.1 | 30.2 | 31.5 |
| 3.5 | 31.4 | 30.8 | 30.8 | 31.0 |

(d) Calculate the mean temperature change for the experiments using 0.5 g of magnesium hydroxide. Give your answer to one decimal place.

**(2)**

(e) The temperature change circled is anomalous. It has not been used to calculate the mean temperature change. Suggest what may have been done wrongly in the experiment to produce this anomalous result.

.....

.....

**(1)**

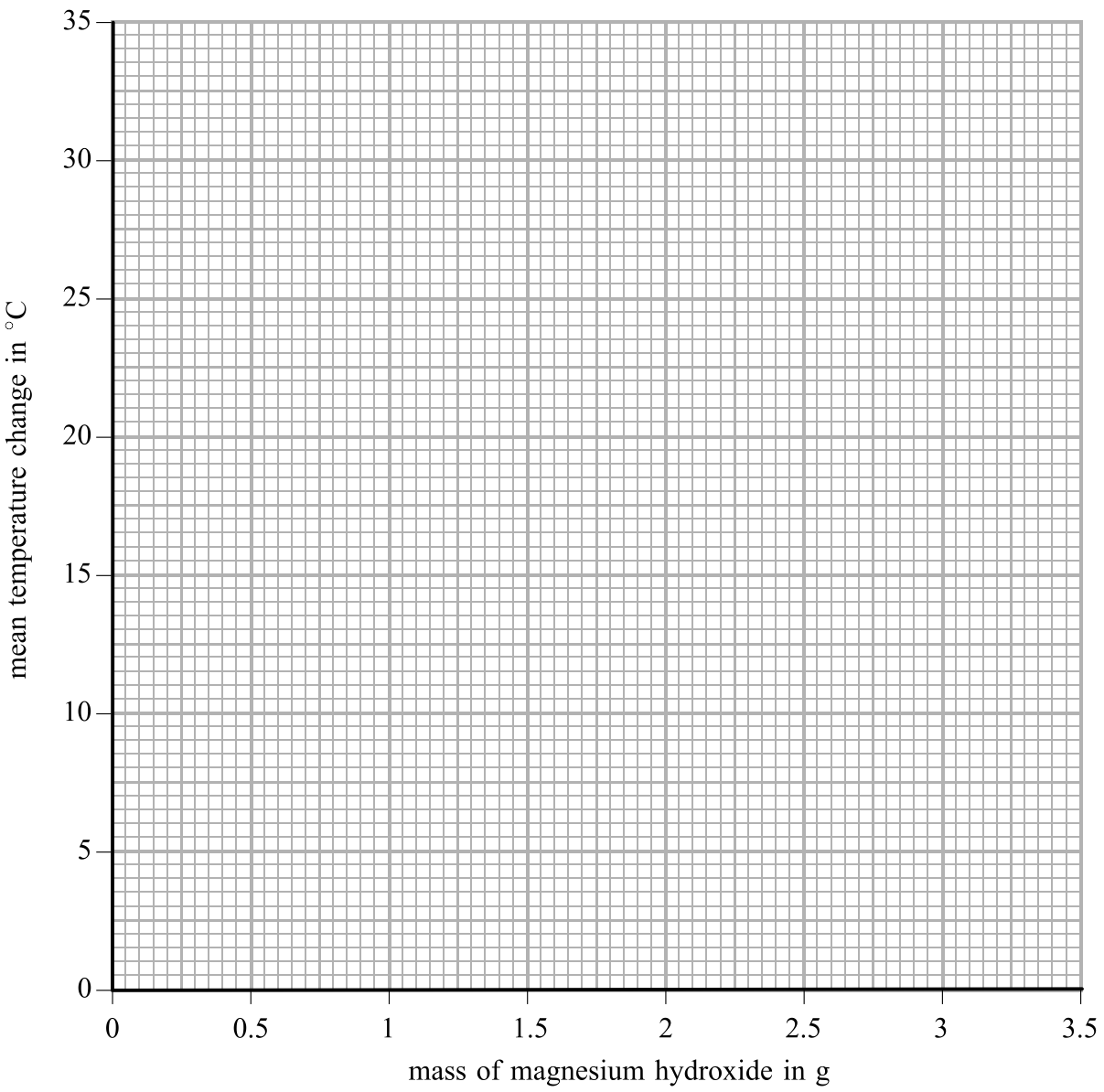
(f) For which mass of magnesium hydroxide are the results most reliable?

.....

**(1)**

Leave blank

(g) (i) Plot a graph of **mean temperature change** against **mass of magnesium hydroxide**. Complete the graph by drawing two straight lines of best fit through the points.




**(4)**

(ii) Describe how the mean temperature change alters as the mass of magnesium hydroxide used is increased.

.....

.....

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.....

.....

**(3)**

**Q3**

**(Total 18 marks)**

Leave blank

**4.** When sodium hydroxide solution is added a drop at a time to a solution of aluminium sulphate, a white precipitate of aluminium hydroxide is formed. If excess sodium hydroxide is added the precipitate reacts to form a colourless solution.

A teacher uses the following method to investigate how the mass of precipitate formed changes as the volume of sodium hydroxide used is changed.

- Place 25 $cm^3$ of aluminium sulphate solution into a conical flask
- Add a known volume of sodium hydroxide solution to the conical flask
- Swirl the conical flask to mix the reagents together
- Measure the mass of the precipitate formed

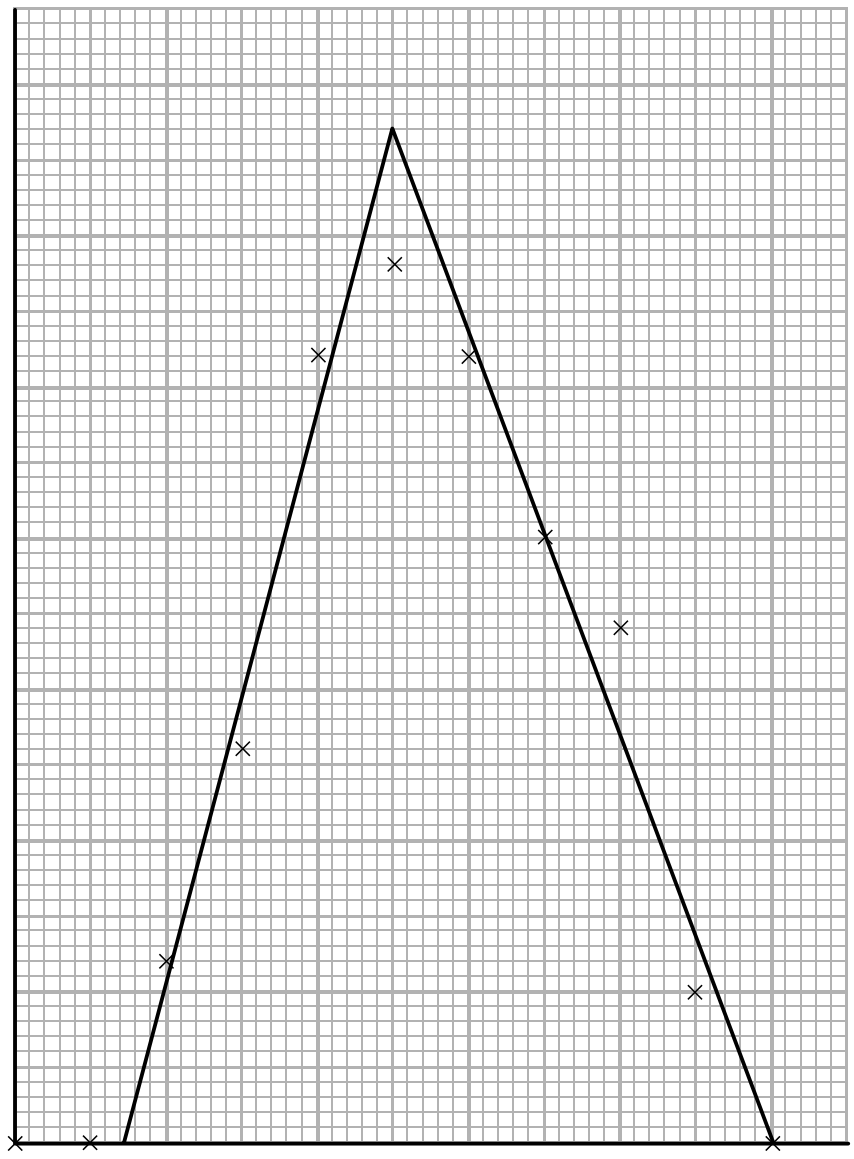
(a) The table shows the teacher's results.

| **Volume of sodium hydroxide solution ($cm^3$)** | **Mass of precipitate (g)** |
|---|---|
| 0 | 0.00 |
| 1 | 0.00 |
| 2 | 0.06 |
| 3 | 0.13 |
| 4 | 0.26 |
| 5 | 0.29 |
| 6 | 0.26 |
| 7 | 0.20 |
| 8 | 0.17 |
| 9 | 0.05 |
| 10 | 0.00 |

Leave blank

These results were plotted on a graph.

(i) Complete the graph by labelling the axes and writing suitable scales on them.



**(2)**

(ii) Use the graph to find the volume of sodium hydroxide that would produce 0.10 g of precipitate. Show your working clearly on the graph.

.....

.....

**(3)**

Leave blank

(iii) The teacher said he could not be sure exactly what volume of sodium hydroxide would produce the greatest mass of precipitate. What could he do to be more certain?

.....

.....

**(1)**

(b) Describe how the teacher could find the mass of precipitate formed after he had mixed the two solutions together.

.....

.....

.....

.....

.....

.....

.....

.....

**(4)**

Leave blank

(c) Sodium hydroxide solution or ammonia solution can be added to salt solutions to help identify the positive ion present in the salt. The table shows the results of adding sodium hydroxide solution and ammonia solution to solutions containing different positive ions.

| **Positive ion in salt** | **Effect of adding sodium hydroxide solution** | | **Effect of adding ammonia solution** | |
|---|---|---|---|---|
| | **a few drops** | **to excess** | **a few drops** | **to excess** |
| aluminium | white precipitate | colourless solution | white precipitate | white precipitate |
| calcium | white precipitate | white precipitate | colourless solution | colourless solution |
| copper | blue precipitate | blue precipitate | blue precipitate | dark blue solution |
| zinc | white precipitate | colourless solution | white precipitate | colourless solution |

A student adds a few drops of sodium hydroxide solution to a solution of a salt. A white precipitate forms. After adding sodium hydroxide solution to excess a colourless solution is obtained. The student concludes that the positive ion in the salt is aluminium.

(i) Explain why this conclusion may not be correct.

.....

.....

**(1)**

(ii) Describe what the student could do to confirm his conclusion. State the result he should obtain if his conclusion is correct.

.....

.....

.....

.....

**(2)**

**(Total 13 marks)**

Q4

**TOTAL FOR PAPER: 50 MARKS**

**END**

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