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

Paper Reference(s)

4335/03 4437/08

London Examinations IGCSE

Chemistry – 4335

Paper 3

Science (Double Award) – 4437

Paper 8

Foundation and Higher Tiers

Wednesday 14 May 2008 – Morning

Time: 1 hour 15 minutes

Materials required for examination	**Items included with question papers**
Ruler, pencil and calculator	Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, 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 in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

Information for Candidates

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

Advice to Candidates

Write your answers neatly and in good English.

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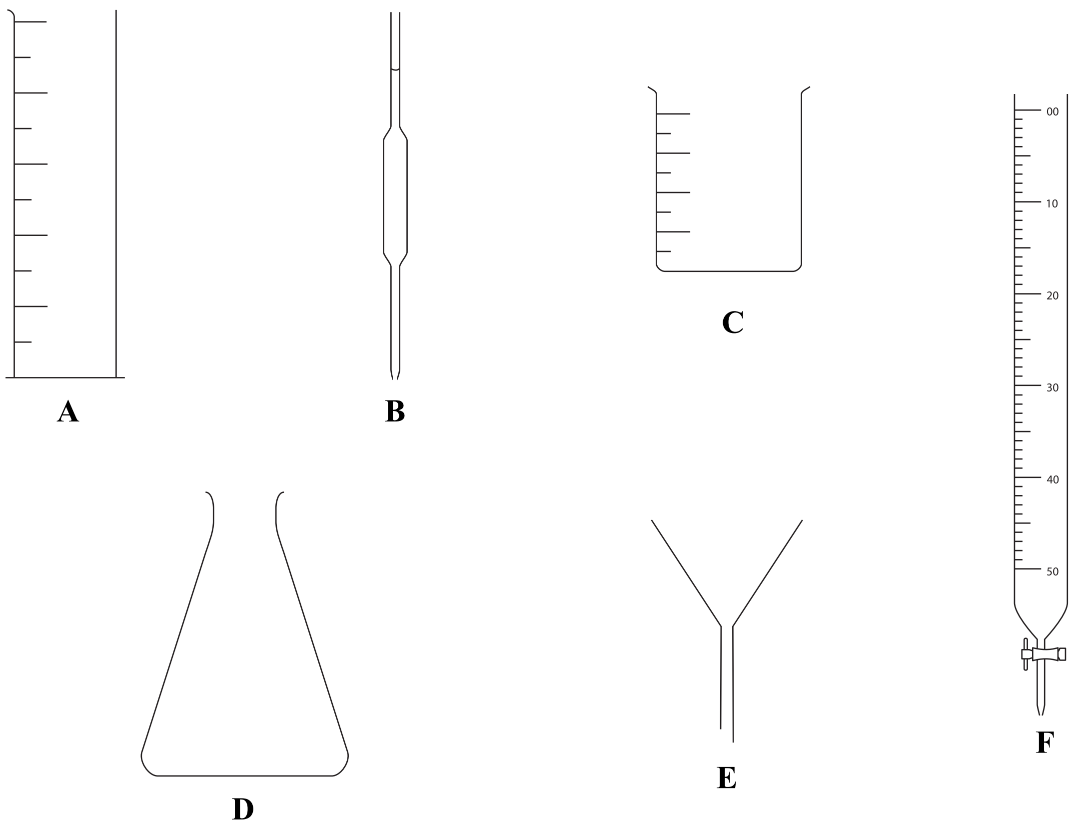
1. The diagram shows some pieces of apparatus.



(a) Choose from the letters **A**, **B**, **C**, **D**, **E** and **F** to identify the apparatus in the table below.

Name of apparatus	**Letter**
pipette	
funnel	
conical flask	
burette	

(4)

Leave blank

(b) The pieces of apparatus labelled **A**, **C** and **F** can all be used to measure the volume of a liquid.

List these pieces of apparatus in order of accuracy, with the most accurate first.

Accuracy	**Letter**
most accurate	
↓	
least accurate	

(1) **Q1**

(Total 5 marks)

N 3 1 3 6 6 A 0 3 1 6

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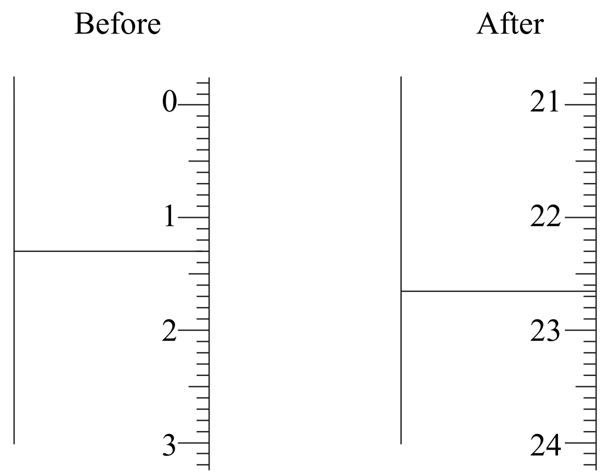
2. (a) The diagrams show the readings on the burette before and after one student added alkali to an acid in a conical flask until neutralisation was complete.



The student recorded the readings to the nearest 0.05 cm^3.

Use the diagrams to help you complete the table.

Burette reading after adding alkali (cm^3)	
Burette reading before adding alkali (cm^3)	
Volume of alkali added (cm^3)	

(3)

Leave blank

(b) A second student did the titration four times.
The table shows the results.

Burette reading after adding alkali (cm^3)	25.55	25.85	25.05	26.00
Burette reading before adding alkali (cm^3)	1.60	2.75	1.85	2.35
Volume of alkali added (cm^3)	23.95	23.10	23.20	23.65
Titration results to be used (✓)				

(i) Which titration results should be used to calculate the average volume of alkali added? Place ticks (✓) in the table.

(1)

(ii) Use your ticked results to calculate the average volume of alkali added.

(2) **Q2**

(Total 6 marks)

N 3 1 3 6 6 A 0 5 1 6

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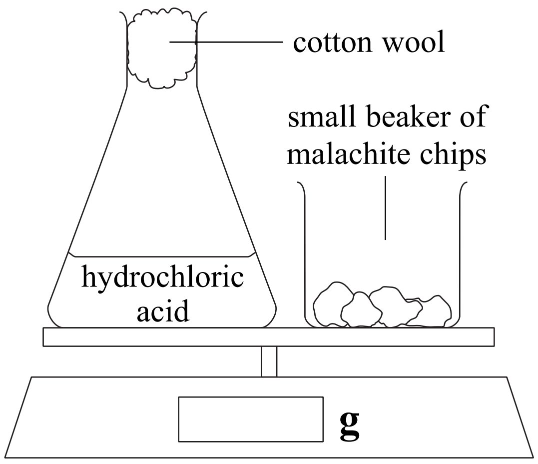
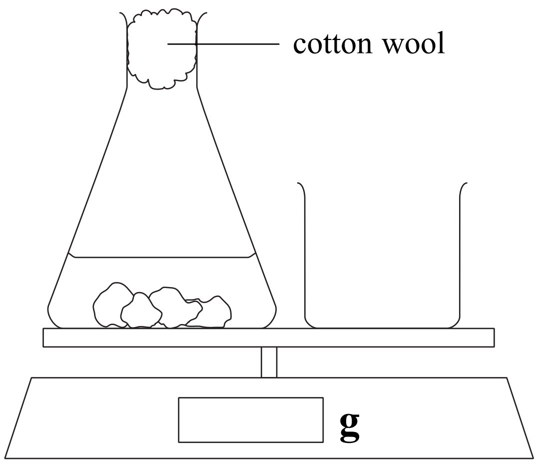
3. Malachite chips, containing copper(II) carbonate, react with hydrochloric acid.

$$CuCO_3(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l) + CO_2(g)$$

Some students investigate the effect of changing the concentration of acid on the rate of the reaction. They use this method.

<table>
<tr><td>
</td><td>Pour some hydrochloric acid into a flask and place it on a balance.

Place a beaker of malachite chips (an excess) on the balance.

Set the balance to zero.</td></tr>
<tr><td>
</td><td>Add the malachite chips to the flask and replace the cotton wool.

At the same time start a stopwatch.</td></tr>
</table>

The balance shows the loss in mass as carbon dioxide gas is given off.

After 1 minute the reading on the balance is recorded.

Some students repeat the experiment at the same temperature using acid with the same volume but a different concentration.

(a) Suggest **two** features of the malachite chips that need to be the same to ensure that the experiment is a fair test.

1 ....

2 ....

(2)

Leave blank

(b) The teacher gave four students some dilute hydrochloric acid that was labelled 100%. They did some experiments using different dilutions of this acid. They wrote down these results.

Student 1 When the concentration of acid was 100% the reading on the balance was –1.12 grams after 1 minute

Student 2 The flask lost 0.87 g in one minute when I used 75% hydrochloric acid

Student 3 The mass of gas given off was 0.62 g when there were no more bubbles coming from the malachite chips and the acid was 50%

Student 4 0.24 grams of carbon dioxide were given off in 60 seconds when the acid concentration was 25%

(i) Which student wrote down results that cannot be compared with the other three? Explain your choice.

Student ....

Explanation ....

....
(2)

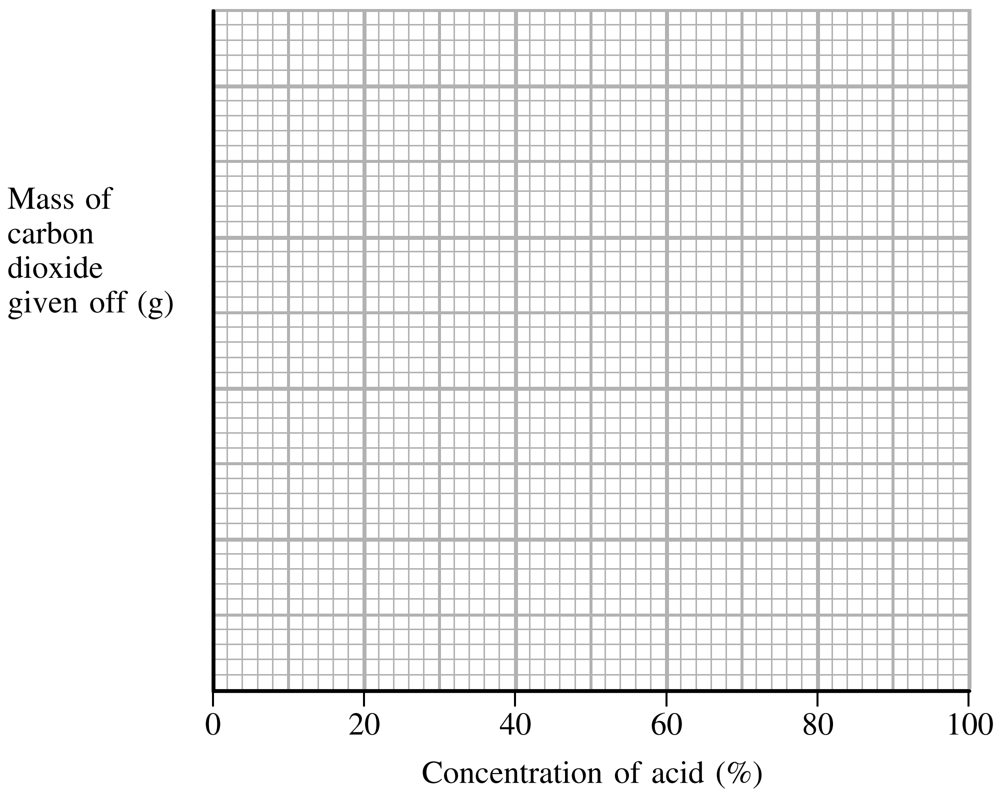
(ii) Draw a suitable table using column headings that show what was recorded, with units. Enter the three results that can be used.
(4)

Leave blank

(c) Another group of students repeated the experiment, but using a mixture of sulphuric acid and water instead of hydrochloric acid.
The table shows the results obtained by the students.

Mass of carbon dioxide given off (g)	0.20	0.27	0.44	0.54	0.60	0.67
Volume of sulphuric acid (cm^3)	30	40	50	80	90	100
Volume of water (cm^3)	70	60	50	20	10	0
Concentration of acid (%)	30	40	50	80	90	100

(i) Choose a suitable scale for the mass of carbon dioxide given off.
Plot these results on the grid below and draw the line of best fit.



(4)

(ii) Circle on the graph one result that is anomalous.

(1)

(iii) Suggest **two** errors in the experiment that may have caused this anomalous result.

1 ....

....

2 ....

....

(2)

N 3 1 3 6 6 A 0 8 1 6

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(iv) Use your graph to estimate the mass of carbon dioxide given off when the acid concentration is 70%. Show on your graph how you have obtained your answer.

....

....
(2)

(d) (i) Describe the relationship between the mass of carbon dioxide given off in one minute and the concentration of the acid.

....

....
(2)

(ii) Give an explanation for this relationship.

....

....

....

....
(2)

Q3

(Total 21 marks)

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4. Many solids dissolve in water. Some solids are more soluble than others.

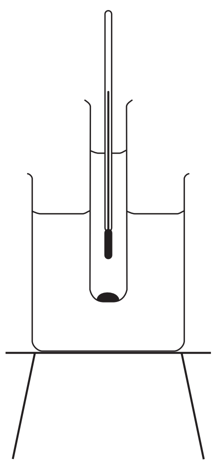
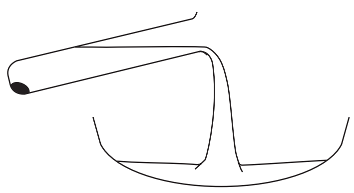
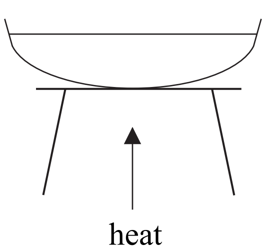
The solubility of a solid is the maximum mass of solid (in g) which will dissolve in 100 g of water at a particular temperature.

When the water contains this maximum mass of solid, the solution is described as a saturated solution.

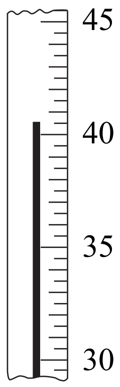
Here is one way to measure the solubility of a solid in water:

- make a saturated solution of the solid at a chosen temperature
- weigh an empty evaporating basin
- add some saturated solution to the evaporating basin and reweigh
- heat the evaporating basin to remove the water
- weigh the evaporating basin and remaining solid.

The diagrams show the apparatus used.

	1. Make a saturated solution of the solid at a chosen temperature.
	2. Weigh an empty evaporating basin. Add some saturated solution to the evaporating basin and reweigh.
	3. Heat the basin to remove the water. Weigh the evaporating basin and remaining solid.

(a) (i) In an experiment to measure the solubility of potassium nitrate, the water in the beaker is heated and its temperature measured.



Write down the temperature shown.

Temperature...............................°C

(1)

(ii) The table shows the results of this experiment.

Mass of evaporating basin empty (g)	98.5
Mass of evaporating basin + saturated solution (g)	125.8
Mass of evaporating basin + solid (g)	109.0

Use these results to calculate

the mass of solid obtained

.... g

the mass of water removed.

.... g

(2)

(iii) The solubility is calculated using the formula:

$$\text{solubility} = \frac{100 \times \text{mass of solid obtained}}{\text{mass of water removed}}$$

Calculate the solubility using this formula.

Solubility = ... grams per 100 g water

(2)

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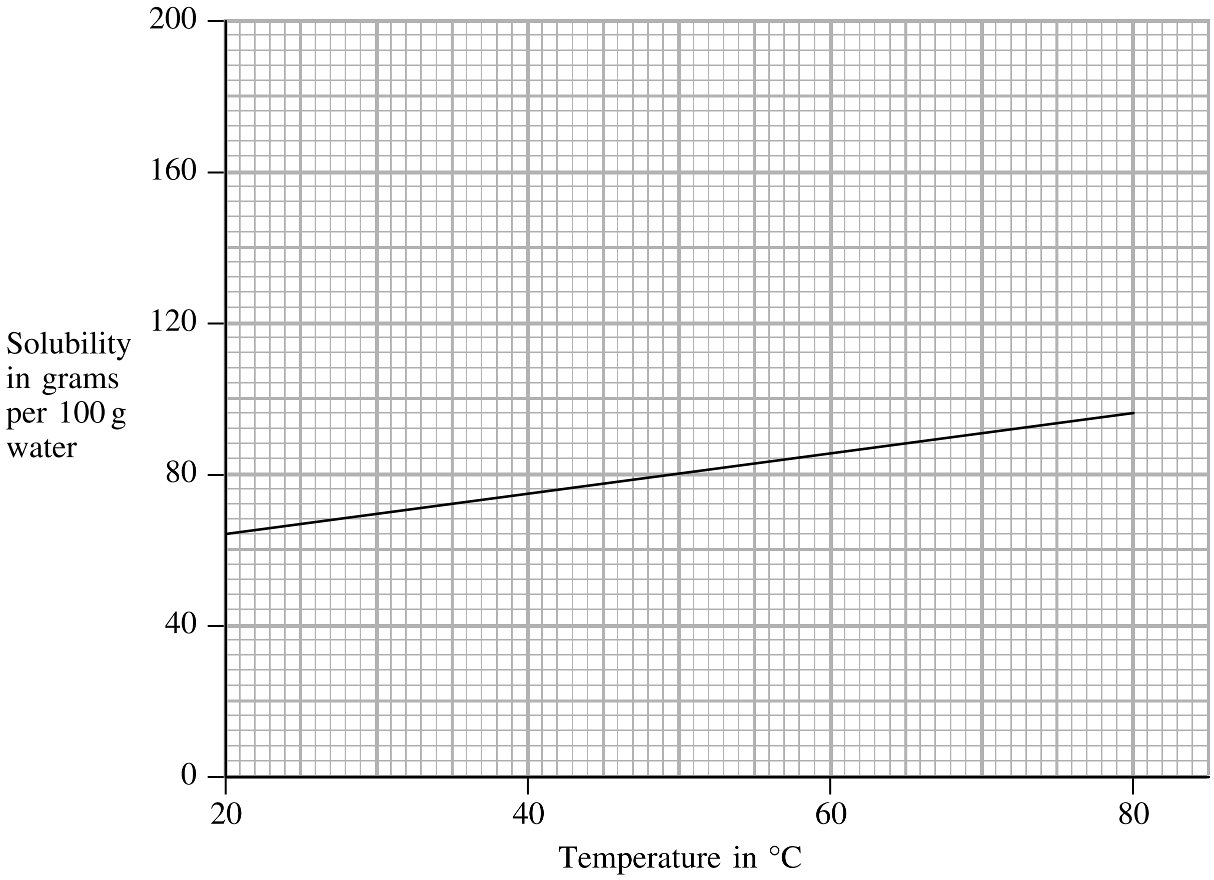
(b) Most solids are more soluble in hot water than in cold water. The graph shows how the solubility of potassium bromide changes with temperature.



The results of a set of experiments using potassium nitrate are shown in the table.

Temperature (°C)	20	30	40	60	70	80
Solubility of potassium nitrate (grams per 100 g water)	32	46	64	104	132	170

(i) Plot these results on the grid above and draw the line of best fit.

(3)

(ii) At what temperature do potassium bromide and potassium nitrate have the same solubility?

.... °C

(1)

N 3 1 3 6 6 A 0 1 2 1 6

Leave blank

(c) The teacher discussed with some students why the method might not give accurate or reliable results. The students identified possible experimental errors that might be made.

Complete the table to show how the calculated solubility would be affected by the error – choose from **increased**, **decreased** or **stays the same**.

Experimental error	Calculated solubility
Adding a large excess of solid to the boiling tube.	
Pouring some solid as well as solution into the evaporating basin.	
Heating the evaporating basin too strongly so that the solid decomposes.	

(3)

(d) One student said that the temperature range was too narrow and suggested repeating the experiment at lower and higher temperatures.

(i) Suggest how the experiment could be done at about 5 °C.

....

....

(1)

(ii) Why would it be impossible to do the experiment at 120 °C?

....

....

(1)

Q4

(Total 14 marks)

N 3 1 3 6 6 A 0 1 3 1 6

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5. Damp litmus paper is used to test for some gases.

Gas	Damp blue litmus paper	Damp red litmus paper
ammonia	stays blue	turns blue
carbon dioxide	turns red	stays red
chlorine	turns white	turns white
hydrogen	stays blue	stays red
sulphur dioxide	turns red	stays red

A student is given five gas jars, labelled **P**, **Q**, **R**, **S** and **T**, each containing one of the gases in the table above. Each gas was tested with damp litmus paper.

The student was told to use the information in the table above to write a conclusion. The results and conclusions are shown below.

Gas	Result	Conclusion
P	blue litmus turns red red litmus stays red	P must be carbon dioxide
Q	blue litmus turns white	Q has to be chlorine
R	blue litmus turns red red litmus stays red	R is sulphur dioxide
S	blue litmus stays blue red litmus turns blue	S can only be ammonia
T	blue litmus stays blue red litmus stays red	T must be hydrogen

(a) Identify **two** gases for which the conclusions are **definitely** correct.

....

(2)

(b) Identify **two** gases for which the conclusions are **possibly** correct.

....

(2)

Q5

(Total 4 marks)

TOTAL FOR PAPER: 50 MARKS

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