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

Thursday 17 May 2007 – Afternoon

Time: 1 hour 15 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
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, 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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Turn over

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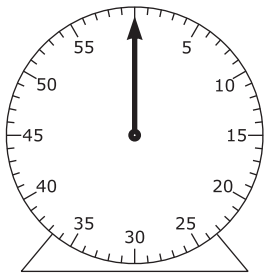
Leave blank

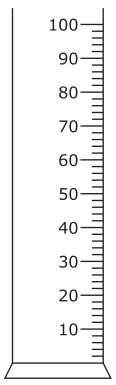
1. The diagrams show some pieces of apparatus you can find in a chemistry laboratory.

A

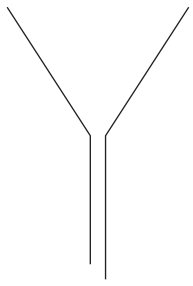


B

C



D



E

(a) Give the name of each piece of apparatus. Use only names from the box.

beaker	burette	funnel	measuring cylinder
pipette	stop clock	test tube	thermometer

A .....

B .....

C .....

D .....

E .....

(5)

Leave blank

(b) **Two** of the pieces shown can be used to measure the volume of a liquid. Give the letters of these two pieces.

..... and .....

(2)

(c) **One** of the pieces shown cannot be used to make a measurement. Give the letter of this piece.

.....

(1)

Q1

(Total 8 marks)

Leave blank

2. When a metal is added to copper(II) sulphate solution, a displacement reaction can take place.

metal + copper(II) sulphate → metal sulphate + copper

This reaction only takes place if the metal used is more reactive than copper.
Displacement reactions are exothermic. The more reactive the metal used, the greater the temperature increase.

A student adds different metals to copper sulphate(II) solution. He measures the temperature of the copper(II) sulphate solution before adding the metal and again two minutes after adding the metal. The experiment is carried out so that it is a fair test.

(a) State **three** variables that should be kept the same to make the experiment a fair test.

Variable 1 .....

Variable 2 .....

Variable 3 .....

(3)

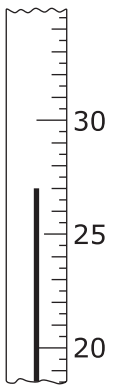
He carries out the procedure three times for each metal. The table shows the results he obtains.

Metal	**Temperature change (°C)**			**Mean temperature change (°C)**
	Run 1	**Run 2**	**Run 3**	
copper	0.0	0.0	0.0	0.0
iron	7.0	4.0	9.5	6.8
gold	0.0	0.0	0.0	0.0
lead	3.5	3.0	3.5	3.3
nickel		5.0	5.0	
silver	0.0	0.0	0.0	0.0
zinc	12.5	13.0	13.5	

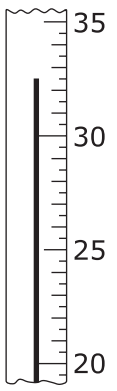
Leave blank

(b) (i) The diagrams show the thermometer readings before and after the addition of nickel in Run 1. Read the temperatures shown in the diagrams.

Before



After



Temperature before ..... °C Temperature after ..... °C

(2)

(ii) Calculate the temperature change for this run. Write your answer in the correct place in the table.

(1)

(c) Calculate the mean temperature changes for nickel and zinc. Write your answers in the correct places in the table.

(2)

(d) Which of the metals has the least reliable results? Explain your answer.

Metal with least reliable results .....

Explanation .....

.....

(2)

QUESTION 2 CONTINUES OVERLEAF

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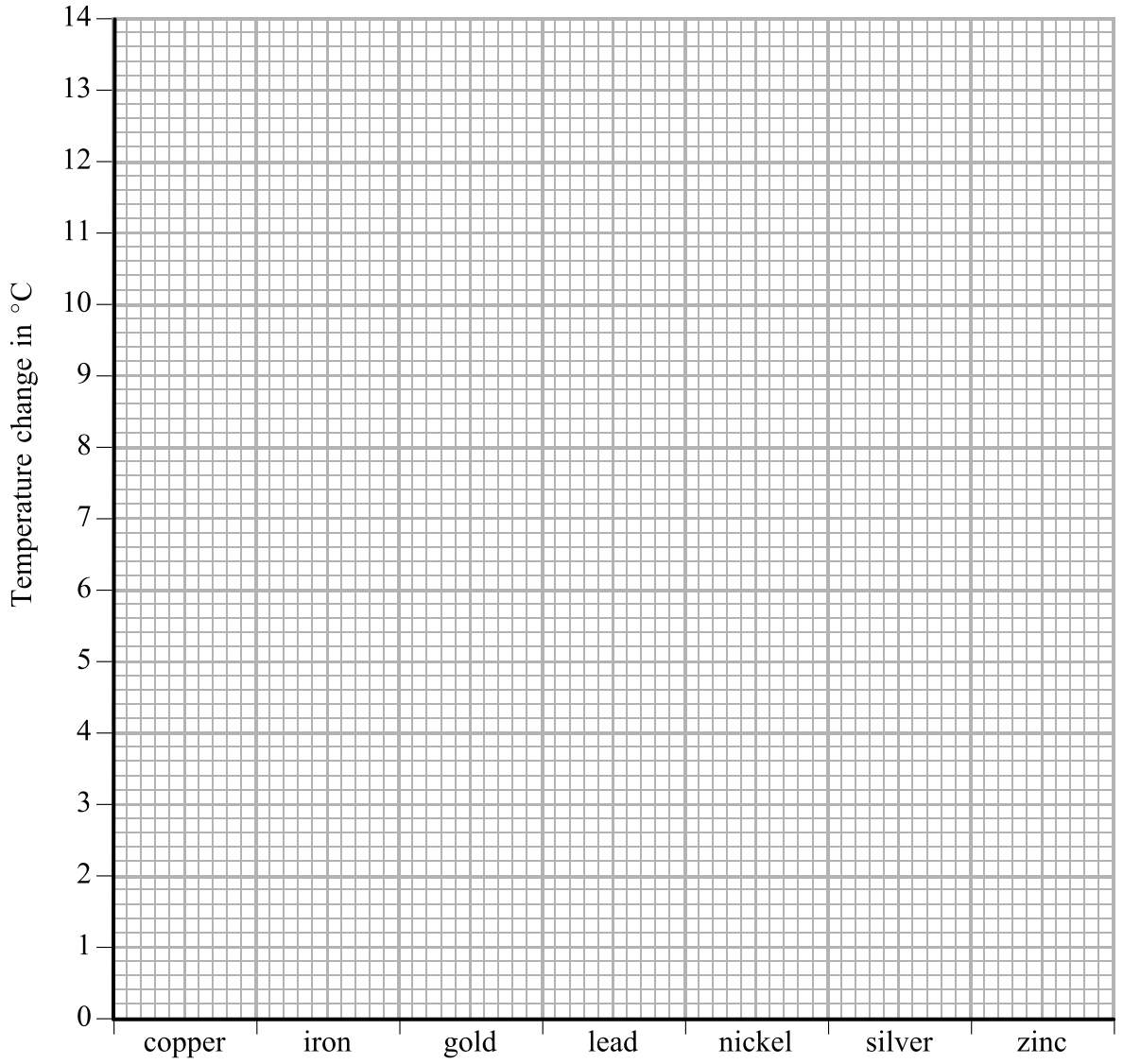
(e) On the grid draw a bar chart to show the mean temperature change for each metal.



(3)

Leave blank

(f) (i) Give the name of the most reactive metal used. Explain how the results show you this is the most reactive metal.

Most reactive metal .....

Explanation .....

.....

(2)

(ii) Why is there no temperature change when silver is used?

.....

.....

(1)

(iii) Explain why it is not possible to use these results to find out which of the metals used is least reactive.

.....

.....

(1)

(iv) Suggest a salt that could be used in place of copper(II) sulphate to find out which of the metals used is least reactive.

.....

(1)

Q2

(Total 18 marks)

Leave blank

3. Hydrochloric acid reacts with solid calcium carbonate.

$$2HCl(aq) + CaCO_3(s) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Some students investigate the effect on the rate of the reaction of changing the temperature of the hydrochloric acid. The method is:

- use a measuring cylinder to pour 50 cm^3 of dilute hydrochloric acid into a conical flask
- heat the acid to the required temperature
- place the flask on a balance
- add 10 g (an excess) of calcium carbonate chips to the flask
- time how long it takes for the mass to decrease by 1.00 g.

The experiment is repeated at different temperatures.

The table shows the students' results.

Temperature of acid (°C)	Time to lose 1.00 g (s)
22	93
35	68
46	65
57	40
65	33
78	26

(a) (i) On the grid opposite, draw a graph of these results. The axes and scales have been provided for you.

(3)

(ii) One of the points is anomalous. Circle this point on your graph.

(1)

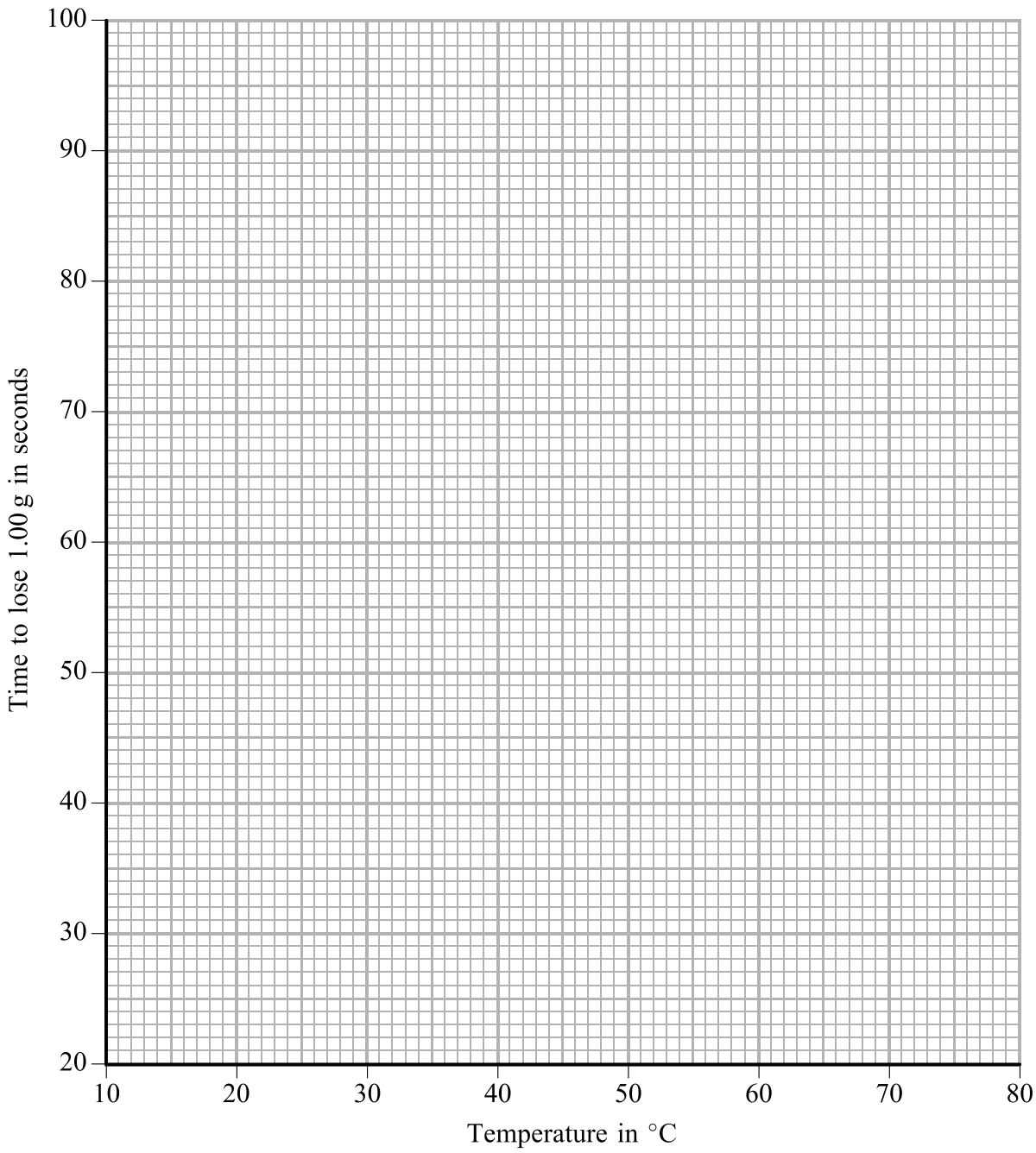
(iii) The students did not make an error in reading the stopwatch. Suggest a possible cause of this anomalous result.

.....

.....

(1)

Leave blank



QUESTION 3 CONTINUES OVERLEAF

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(b) (i) Use your graph to find the time taken to lose 1.00 g at 30 °C and at 52 °C.

Time at 30 °C ..... s

Time at 52 °C ..... s

(2)

(ii) The rate of the reaction can be found using the equation:

$$\textbf{rate of reaction} = \frac{\textbf{mass lost}}{\textbf{time taken to lose this mass}}$$

Use this equation and your results from b(i) to find the rate of reaction at 30 °C and at 52 °C.

Rate at 30 °C ..... g/s

Rate at 52 °C ..... g/s

(2)

(iii) How does the rate of reaction change when the temperature increases?

.....

.....

(1)

(iv) Give an explanation for this change in terms of particles and collisions.

.....

.....

.....

.....

.....

(3)

(c) One student suggests that the results would be more accurate if they insulate the conical flask before adding the calcium carbonate. Explain how insulating the conical flask would make the results more accurate.

.....

.....

.....

(2)

Leave blank

(d) The students did not obtain any results at temperatures below room temperature, 22 °C. Describe how the method could be changed to obtain results below room temperature.

.....

.....

.....

(1)

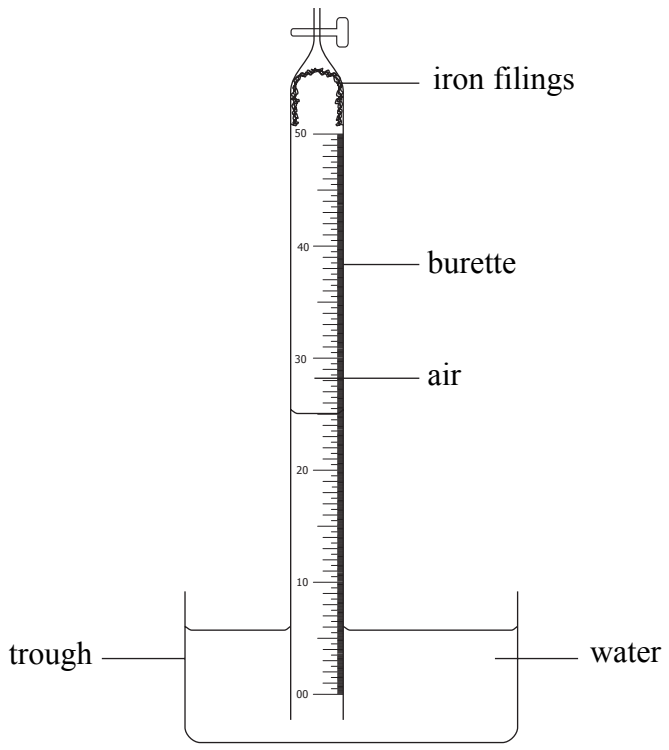
Q3

(Total 16 marks)

Leave blank

4. Iron reacts slowly with oxygen and water to form hydrated iron(III) oxide.

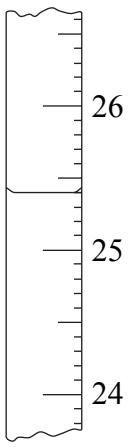
A student placed a known mass of wet iron filings in the end of a burette and set it up as shown in the diagram.



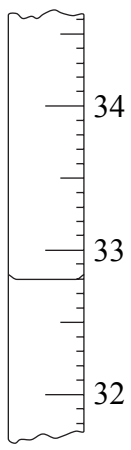
Over several days the water rose up the burette and reached a constant level. This is because the iron reacted with the oxygen in the air. Other students repeated the experiment using different starting levels of water in the burette and different masses of iron filings.

(a) The diagrams show the level of water in the burette at the start and at the end of one of the experiments. Record the volumes shown on the burette.

Start



End



Burette reading at start

..... cm^3

Burette reading at end

..... cm^3

(2)

Leave blank

(b) The students wrote down these results:

With 1.23 g of iron the start level was 23.4 cm^3 and the end level was 31.2 cm^3

The reading on the burette changes from 11.0 cm^3 to 20.2 cm^3 when 0.65 g of iron is used

With a start level of 0.0 cm^3 and 1.40 g of iron the final level was 12.6 cm^3

Complete the table by

- putting suitable headings (including units) at the top of the first three columns
- recording the data the students wrote down
- calculating the volume of oxygen used in each experiment

			volume of oxygen used (cm^3)

(3)

(c) One student found that the water level in the burette remained the same as the water level in the trough throughout his experiment. Suggest an explanation for this.

.....

.....

(1)

QUESTION 4 CONTINUES OVERLEAF

Leave blank

(d) (i) The percentage of oxygen in air can be calculated using the equation:

$$\textbf{percentage of oxygen} = \frac{\textbf{volume of oxygen used}}{\textbf{volume of air at start}} \times \textbf{100}$$

A student said that he could use the results of this experiment to calculate the percentage of oxygen in air. Explain why this is not possible.

.....

.....

.....

(1)

(ii) What change could be made to the apparatus so that the percentage of oxygen in air can be found?

.....

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.....

(1) **Q4**

(Total 8 marks)

TOTAL FOR PAPER: 50 MARKS

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