Centre No.						Paper Reference							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 12 November 2009 – Morning

Time: 1 hour 15 minutes

Question Number	Leave Blank
1	
2	
3	
Total	

Materials required for examination
Nil

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. Write 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 3 questions in this question paper.
There are 20 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. Rock salt is a naturally occurring mineral containing sodium chloride, clay and sand. Some properties of the components of rock salt are shown in the table.

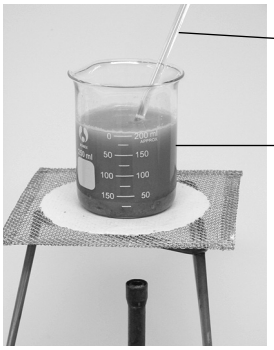
Component	Colour	Solubility in water
sodium chloride	white	soluble
clay	brown	insoluble
sand	yellow	insoluble

Pure sodium chloride can be obtained using the following method.

Picture 1

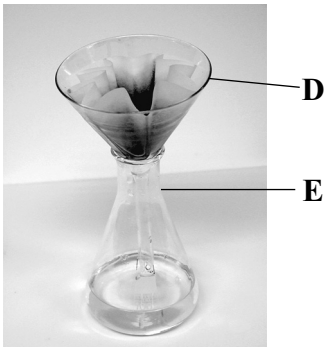
The rock salt is ground into smaller pieces.

Picture 2



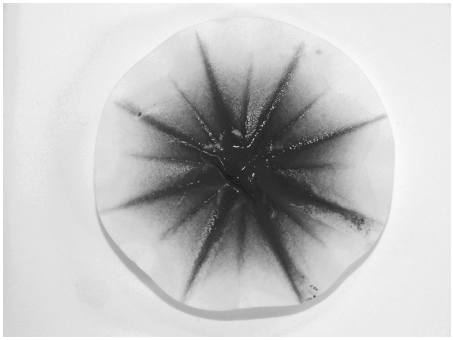
The rock salt is added to water, heated and stirred.

Picture 3



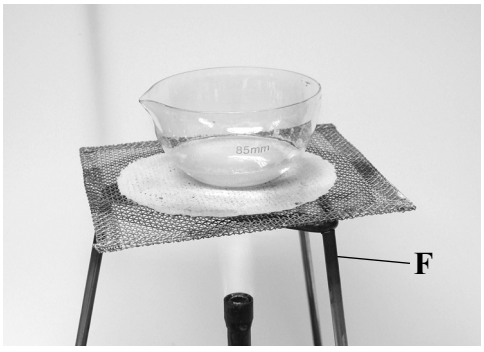
The solids are removed from the mixture.

Picture 4



The solids remain on the filter paper.

Picture 5



The solution obtained is heated in an evaporating basin.

Picture 6

A white solid is left in the evaporating basin.

Leave blank

(a) Give the names of the pieces of apparatus labelled **A** to **F** in the pictures.
Use only the names given in the box.

basin	**beaker**	**Bunsen burner**	**conical flask**	**funnel**
gauze	**glass rod**	**mortar**	**pipette**	**tripod**

A .....

B .....

C .....

D .....

E .....

F .....

(6)

(b) Suggest a reason why the mixture was heated and stirred in Picture 2.

.....

.....

(1)

(c) Name the process shown in Picture 3.

.....

(1)

(d) What are the solids left on the paper shown in Picture 4?

.....

(1)

(e) Name the white solid left in the evaporating basin in Picture 6.

.....

(1)

Q1

(Total 10 marks)

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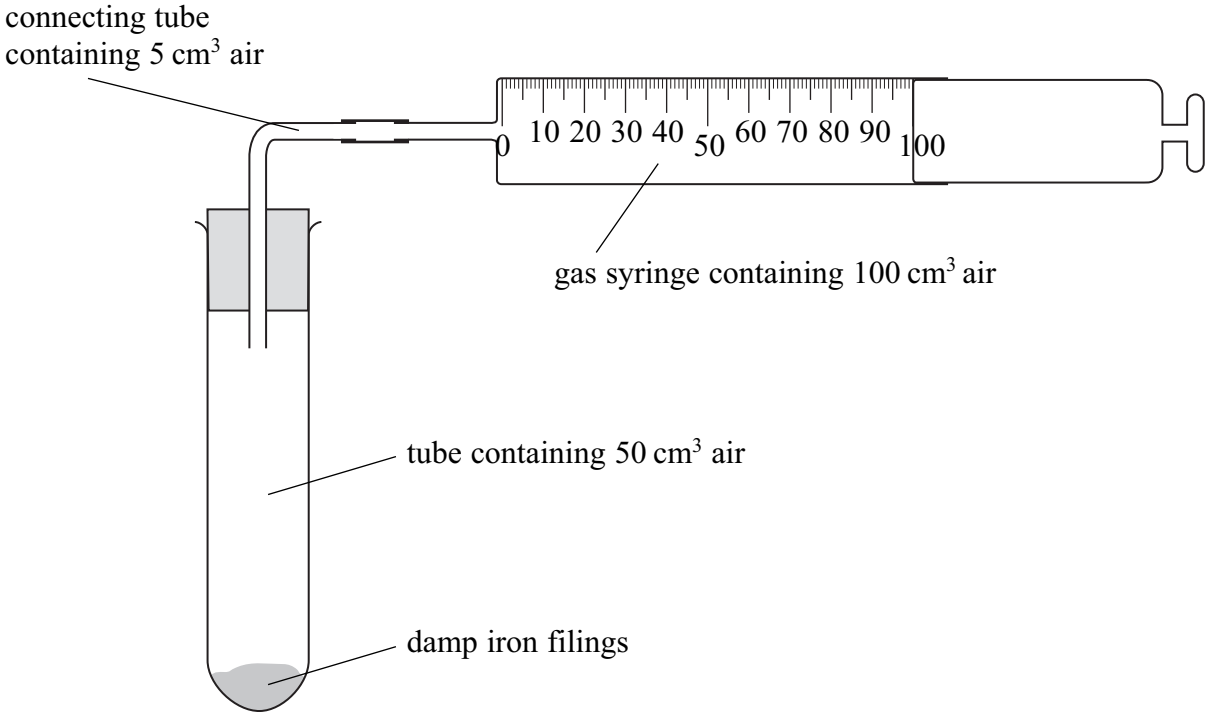
2. Iron rusts when it is exposed to both air and water.
This reaction can be represented by the word equation:

iron + oxygen + water → hydrated iron(III) oxide

(a) A teacher used the following apparatus to find the percentage of oxygen in air.

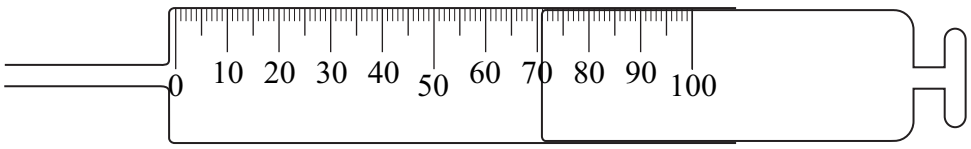


(i) Calculate the total volume of air in the apparatus at the start of the experiment.

.....

(1)

(ii) The diagram shows the plunger of the syringe after a few days.



What is the volume of gas in the syringe?

.....

(1)

(iii) Why has the volume of gas in the apparatus decreased?

.....

(1)

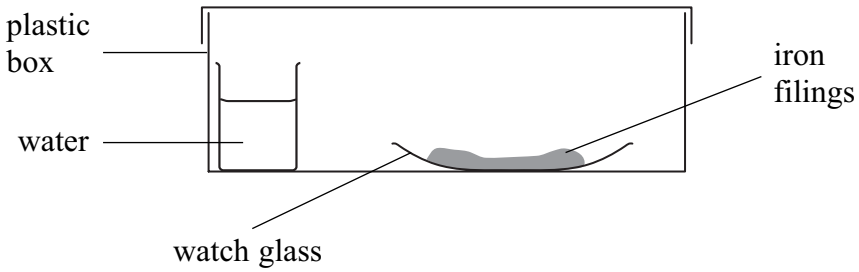
Leave blank

(iv) Use the data obtained by the teacher to calculate the percentage of oxygen in the air.

(2)

(b) Some students followed these instructions to investigate how changing the temperature alters the rate of rusting.

- Weigh an empty watch glass
- place some iron filings on the watch glass
- reweigh the watch glass with iron filings
- set up the apparatus as shown in the diagram



- leave the apparatus at a known temperature
- after three weeks reweigh the watch glass with its contents
- repeat each step at different temperatures.

Leave blank

(i) Three of the students described their results as follows:

Temperature in fridge was 5°C, in this run the empty watch glass weighed 19.23 g, it weighed 28.34 g with the iron filings and at the end it weighed 28.42 g

The one that I left in a warm room weighed 29.76 g at the end, the empty watch glass was 20.12 g and with the iron it weighed 29.52 g. The temperature of the warm room was 26°C.

I used an oven to heat the last one. The watch glass with iron went up from 27.34 g to 27.84 g. The temperature of the oven was 60°C and the empty watch glass weighed 16.24

Complete the following table by adding suitable column headings and then entering the data obtained by the students.

	Mass of empty watch-glass (g)	**Mass of watch-glass with iron filings at start of experiment (g)**		**Change in mass (g)**

(3)

(ii) Suggest why the students' experiments may not have been a fair test.

.....

.....

(1)

Leave blank

(c) Another group of students repeated the experiment so that it was a fair test.
The apparatus was left in different places.
They recorded the masses every week for 6 weeks.
Their results are shown in the table.

Place left	Temperature range (°C)	Mass increase (g) after					
		1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks
freezer	–18 to –16	0.00	0.00	0.00	0.00	0.00	0.00
fridge	3 to 6	0.02	0.05	0.08	0.11	0.13	0.16
room	14 to 25	0.04	0.11	0.14	0.20	0.25	0.31
oven	47 to 48	0.08	0.15	0.24	0.32	0.41	0.41

(i) What do the results for the iron placed in the freezer suggest?

.....

(1)

(ii) One of the students said that the mass increase after 6 weeks for the one left in the oven must be wrong.
Comment on this mass increase and suggest what could have happened during the experiment to cause this.

.....

.....

.....

.....

(2)

(iii) In which place are the results the least reliable?
Explain your answer.

Place .....

Explanation .....

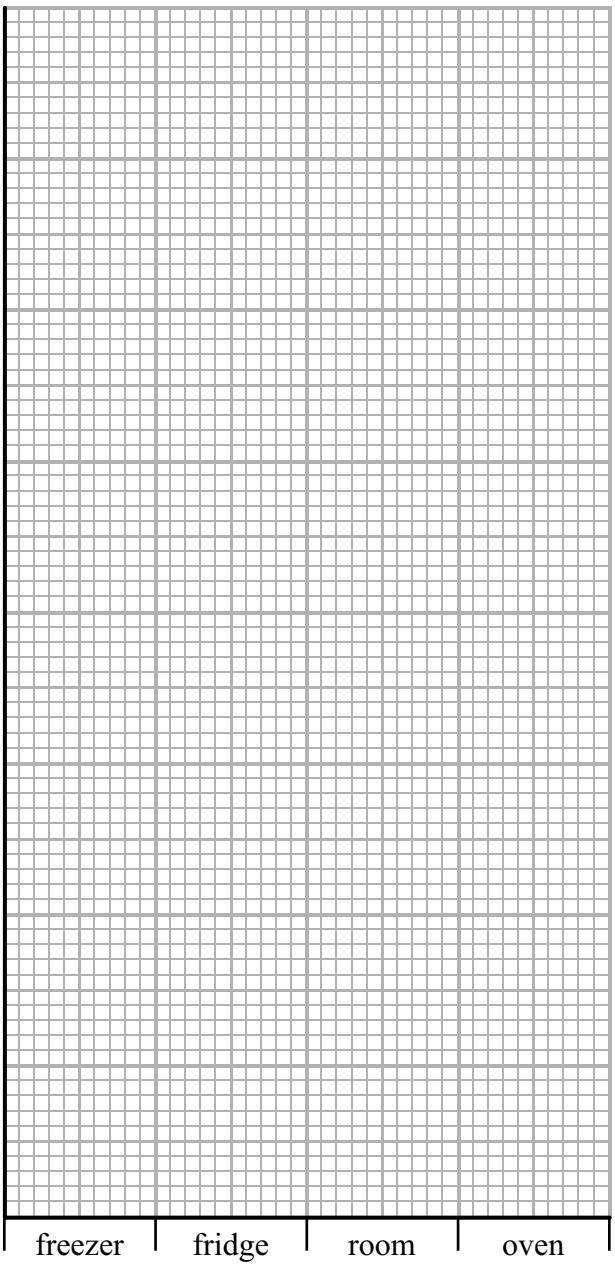
.....

(2)

Leave blank

(iv) Draw a bar chart to show the mass increase after 4 weeks in each place.

mass increase, in grams, after four weeks



(3) **Q2**

(Total 17 marks)

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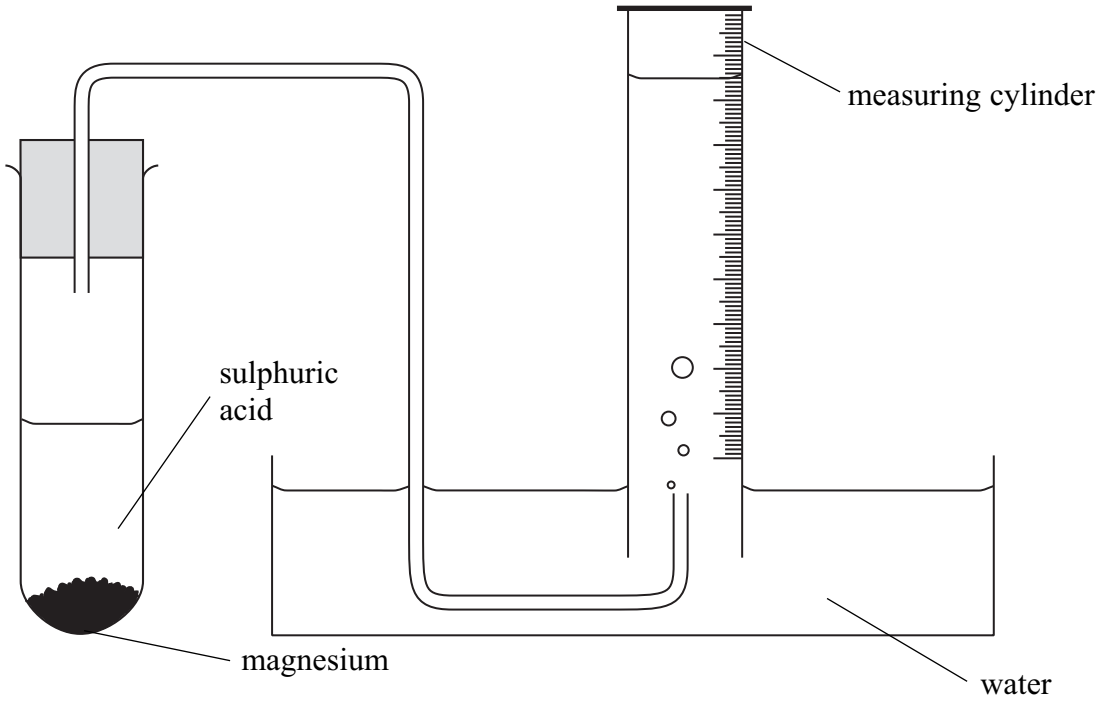
3. A teacher investigates how the rate of reaction between magnesium and excess sulphuric acid changes as the concentration of the acid changes.
The word equation for the reaction is:

magnesium + sulphuric acid → magnesium sulphate + hydrogen

The method she follows is:

- add concentrated sulphuric acid to water to make acid of the required concentration
- use a measuring cylinder to pour 25cm^3 of the diluted acid into a boiling-tube
- add magnesium to the boiling-tube and collect the gas produced as shown
- measure the volume of gas collected after 20 seconds.



(a) State one change that could be made to the apparatus that would give more accurate results.

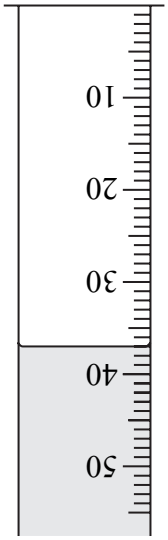
.....

.....

(1)

Leave blank

(b) The diagram shows the level of water in the measuring cylinder after one run.



What volume of gas has been collected?

.....

(1)

(c) On what property of hydrogen does this method of gas collection depend?

.....

.....

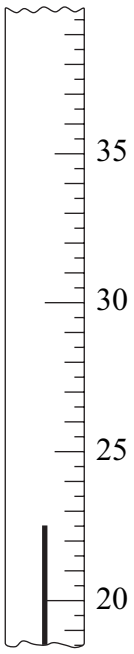
(1)

Leave blank

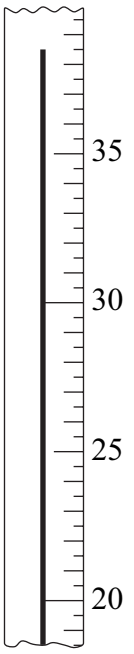
(d) The teacher notices that the boiling-tube felt hot after the reaction.
She repeats the experiment and uses a thermometer to measure the temperature change of the reaction mixture.

(i) The diagrams show the thermometer readings before and after the reaction.
Record the temperatures shown in the diagrams.

Before



After



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

(2)

(ii) Calculate the temperature change.

.....

(1)

(iii) What could be done to keep the temperature of the reaction mixture more constant?

.....

.....

(1)

Leave blank

(e) State two variables, other than temperature, that must be kept constant to make the investigation a fair test.

Variable 1 .....

Variable 2 .....

(2)

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

Concentration of sulphuric acid (%)	**Volume of gas (cm^3) collected in 20 seconds**		
	Run 1	**Run 2**	**Run 3**
10	46	48	47
15	62	63	62
20	75	74	71
30	65	63	67
40	50	33	46
50	33	34	35
60	27	23	22

(i) For which concentration of acid are the results most reliable?

.....

(1)

(ii) One of the results is anomalous.

Circle this result and explain what may have happened to cause this anomaly.

.....

.....

(2)

(iii) Calculate the mean volume of gas collected in 20 seconds when the acid had a concentration of 60%.

(1)

Leave blank

(g) The rate of the reaction can be calculated using the equation:

$$\text{rate} = \frac{\text{total volume of gas collected}}{\text{total time taken to collect gas}}$$

The rate of reaction at each concentration is:

Concentration (%)	Rate
0	0.00
10	2.35
15	3.12
20	3.67
30	3.25
40	2.40
50	1.70
60	1.20

(i) Place a cross (☒) in one box to show the correct units for the rate in this experiment.

cm / s ☐

cm^3 / s ☐

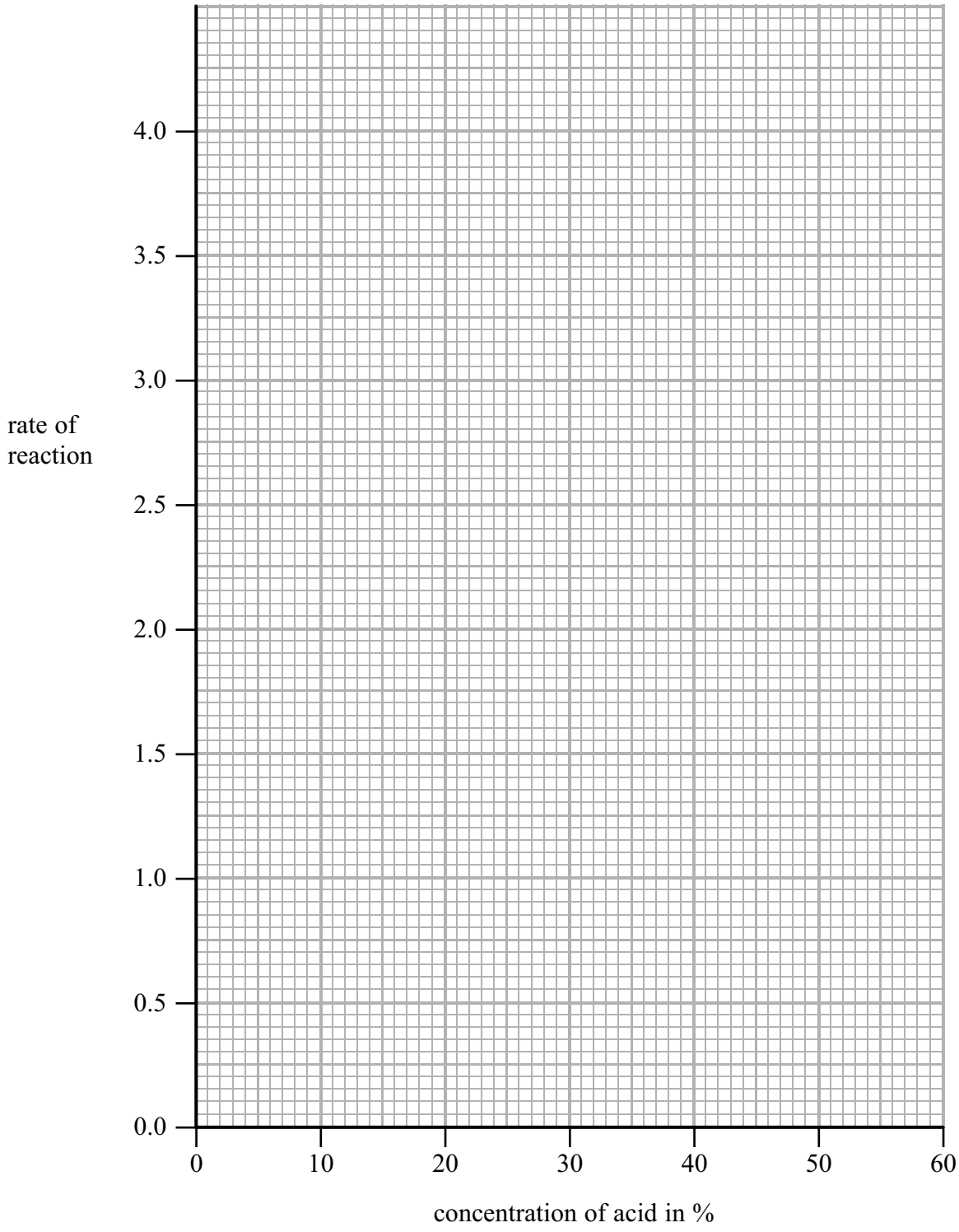
s / cm^3 ☐

s^3 / cm ☐

(1)

Leave blank

(ii) Plot a graph of rate of reaction against concentration.
Draw two curved lines of best fit, one for the points from 0% to 20% and one for the points from 30% to 60%.
Extend the curved lines so that they cross.



(4)

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(h) (i) Use your graph to determine the highest rate, and the concentration of acid that will give this rate.

Highest rate .....

Concentration .....

(2)

(ii) Use your answers to (h)(i) to calculate the volume of gas that would be collected in 20 seconds at this concentration.

.....

.....

(1)

(iii) What further practical work would you do to check the accuracy of your calculated volume in (h)(ii)?

.....

.....

(2)

Q3

(Total 23 marks)

TOTAL FOR PAPER: 50 MARKS

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