Centre No.						Surname	Initial(s)
Candidate No.						Signature	

Paper Reference(s)

4335/03

London Examinations IGCSE

Chemistry

Paper 3

Foundation and Higher Tiers

Monday 7 November 2005 – 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.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. 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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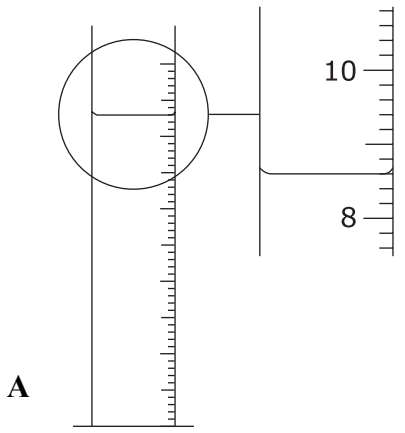
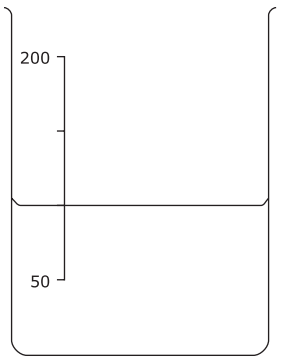
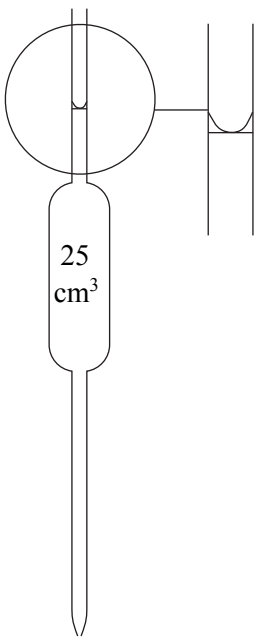
1. The diagram shows pieces of apparatus used to measure the volume of a liquid.



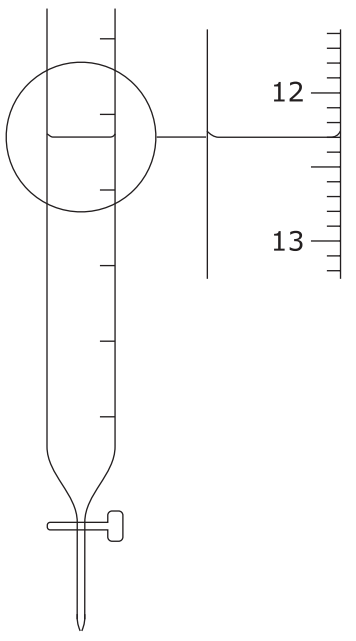
A



B



C



D

(a) In the table write the name of each piece of apparatus and the volume of liquid it contains.

	Name of apparatus	**Volume of liquid (cm^3)**
A		
B		
C		
D		

(8)

Leave blank

(b) (i) Give the letter of the apparatus that is the **least** accurate.

.....

(1)

(ii) Give the letter of the apparatus that is the **most** accurate for measuring 20 cm^3 of a liquid.

.....

(1)

Q1

(Total 10 marks)

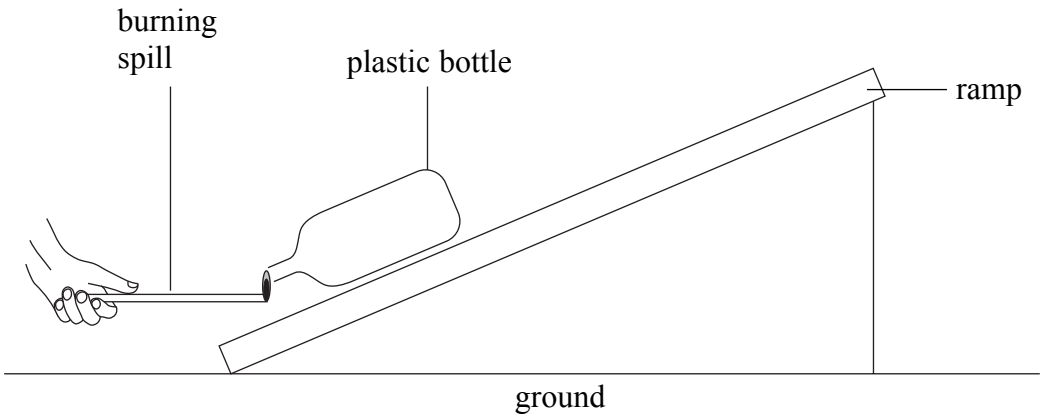
Leave blank

2. Hydrogen reacts with oxygen in a highly exothermic reaction.

$$2H_2 + O_2 \rightarrow 2H_2O$$

If a burning spill is placed near a mixture of hydrogen and oxygen there is an explosion.

- A teacher filled a plastic bottle with different volumes of hydrogen and oxygen.
- He placed the bottle on a sloping ramp and placed a burning spill near the open end of the bottle.



- The explosion caused the bottle to shoot up the ramp.
- The teacher measured the distance the bottle travelled before it hit the ground.

The teacher wanted to find the volumes of hydrogen and oxygen that sent the bottle the greatest distance. He repeated the experiment using the same bottle, but changing the volumes of hydrogen and oxygen used.
The volume of the bottle was 1000 cm^3.

The table shows the results.

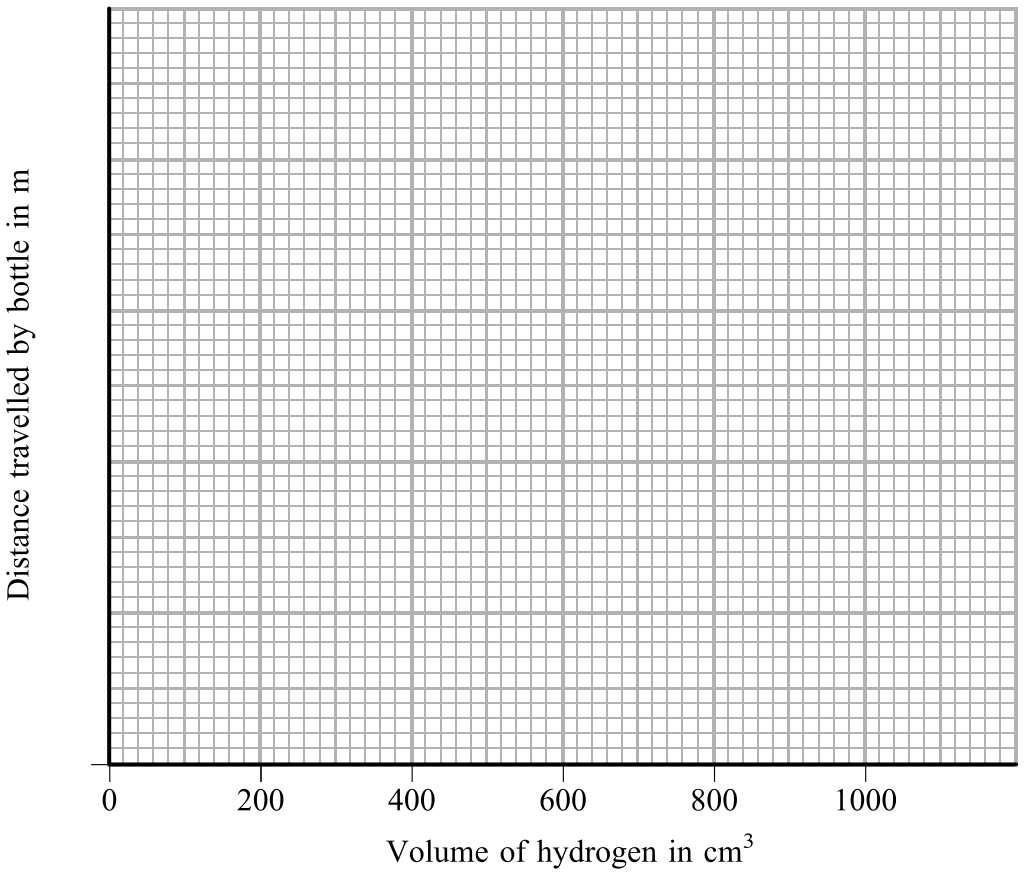
Volume of hydrogen used (cm^3)	Volume of oxygen used (cm^3)	Distance travelled by bottle (m)
0	1000	0.00
200		2.00
400		3.50
600		4.75
800		3.75
1000		0.00

(a) Complete the table to show the volume of oxygen used in each experiment.

(2)

Leave blank

(b) Draw a graph of the results obtained.



(4)

(c) The teacher needed to obtain more results between 400 cm^3 and 800 cm^3 of hydrogen. Explain why it is a good idea to obtain more results in this range.

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.....

(2)

(d) What could the teacher do to check the reliability of the results?

.....

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(2)

Question 2 continues on page 7

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(e) After the teacher obtained the extra results between 400 cm^3 and 800 cm^3 a student made the following conclusion:

"The bottle travels the greatest distance when the hydrogen and oxygen are in the ratio 2:1."

(i) Why does the bottle not move when it contains 1000 cm^3 of hydrogen?

.....

(1)

(ii) Use the equation for the reaction (given on page 4) to explain why the bottle should travel the greatest distance when it contains hydrogen and oxygen in the ratio of 2:1.

.....

.....

(2)

(iii) Methane also reacts with oxygen in an exothermic reaction.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

The experiment was repeated using methane and oxygen in a 1000 cm^3 bottle. Predict the volume of methane that would make the bottle travel the greatest distance.

.....

(1)

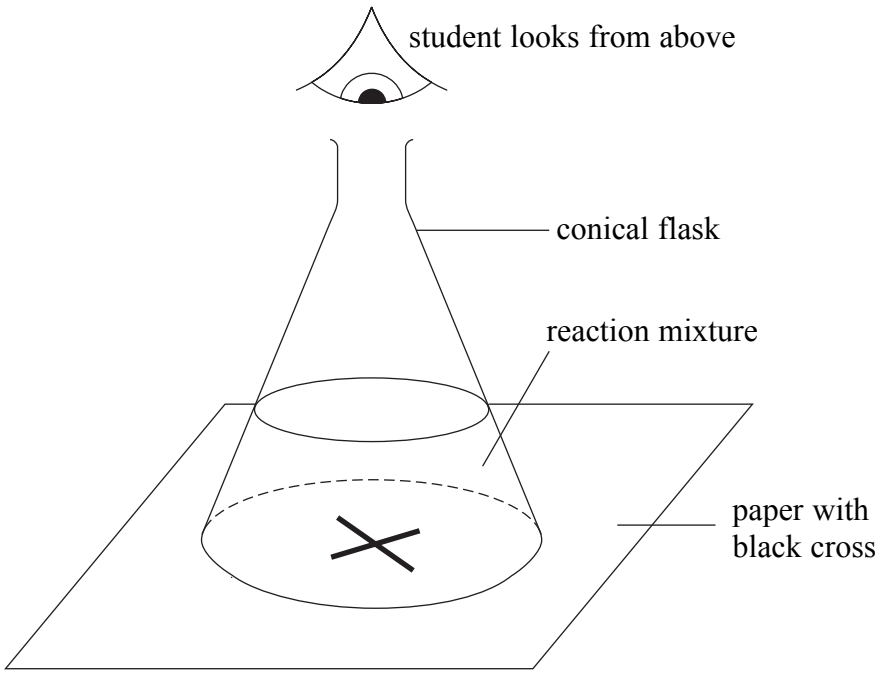
Q2

(Total 14 marks)

Leave blank

3. Sodium thiosulphate solution and hydrochloric acid react to form a precipitate of sulphur. This precipitate makes the mixture go cloudy.

- A student placed 10 cm^3 of sodium thiosulphate solution and 30 cm^3 of water in a conical flask.
- She then added 10 cm^3 of hydrochloric acid.
- She placed the conical flask on a piece of paper with a black cross.
- She timed how long it took until she could not see the cross through the conical flask.



She repeated the experiment using the same volumes of sodium thiosulphate solution, water and hydrochloric acid at different temperatures.

The graph on the next page shows her results.

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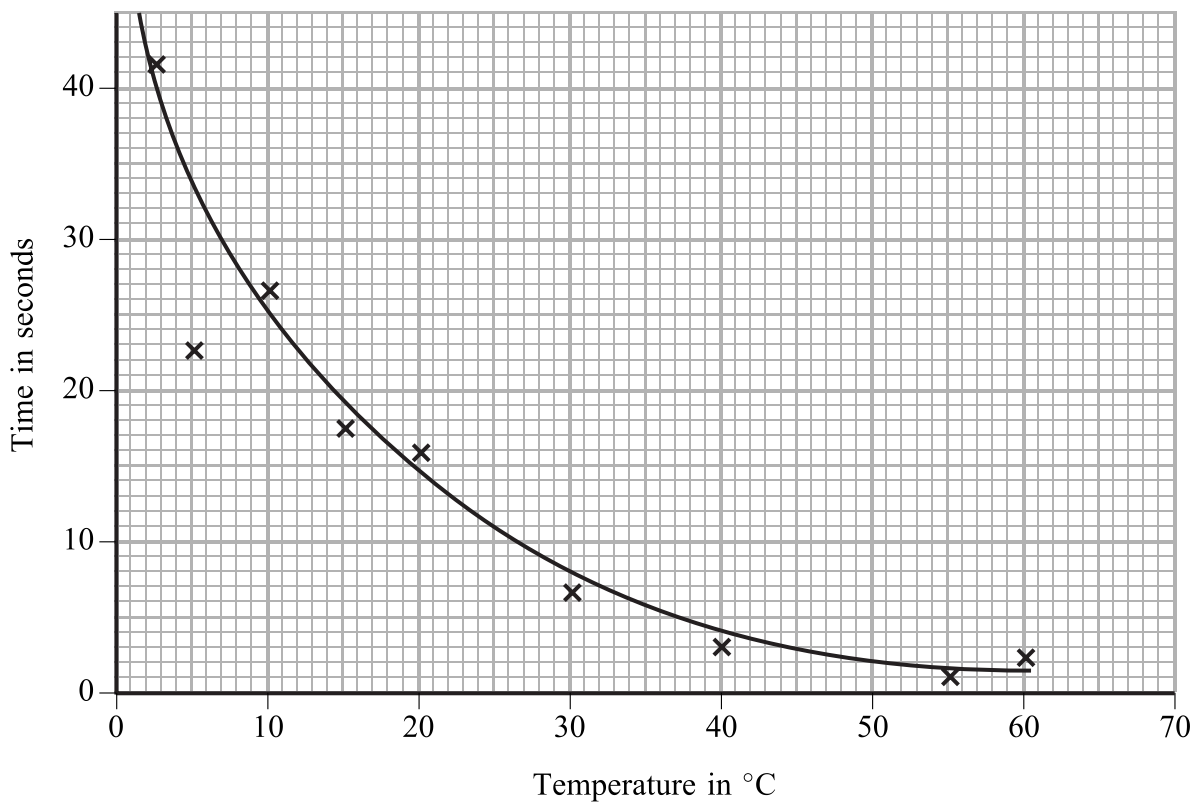

(a) When should the student have started her stopwatch?

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(1)

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

(1)

(ii) Explain what may have happened during the experiment to produce the anomalous result.

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(3)

(iii) Use the graph to find the time taken for the cross to be no longer visible at 32 °C.

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(1)

Question 3 continues on page 10

Leave blank

(c) The student used her results to work out the rate of the reaction at different temperatures.
The equation she used was

rate of reaction = 1 / time taken

Calculate the rate of reaction at 32 °C.

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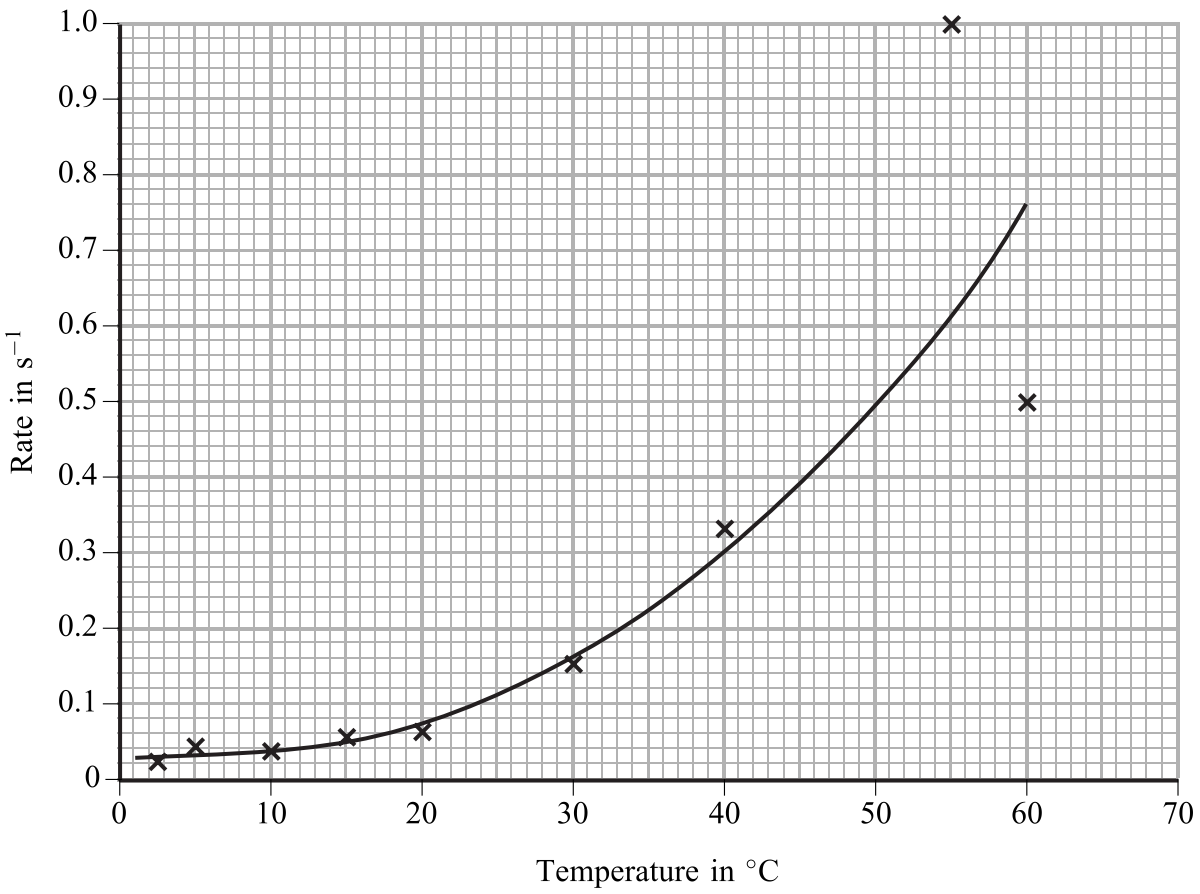
(2)

(d) The second graph shows how the rate of reaction changed as the temperature was increased.



The student looked at her graph and decided the results were least accurate at high temperatures.

Give **two** reasons why the results are least accurate at high temperatures.

1 .....

.....

2 .....

.....

(2)

Leave blank

(e) (i) Describe the relationship between the temperature and the rate of reaction.

.....

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.....

(2)

(ii) Use scientific knowledge to explain why increasing the temperature has this effect on the rate of reaction.

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(3)

(f) The student decided to use the same reaction to investigate how the rate of reaction was affected by changing the volume of hydrochloric acid. Outline the method she should use.

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(4)

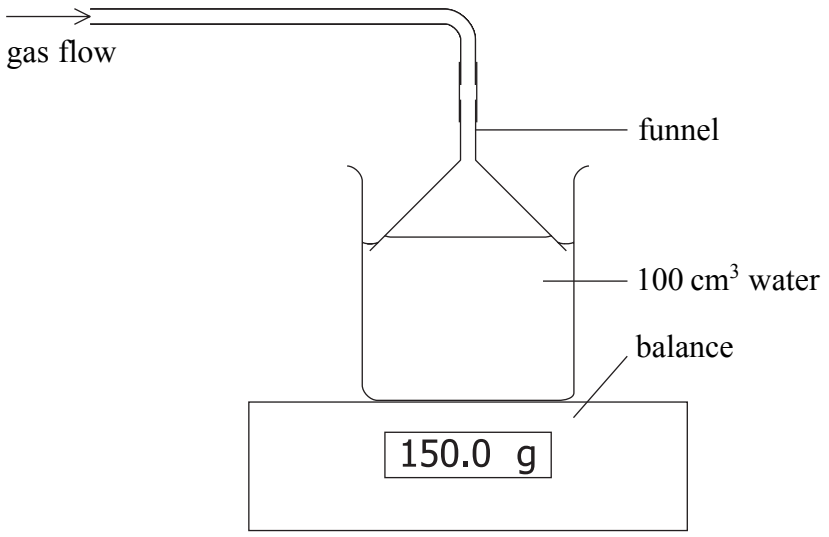
Q3

(Total 19 marks)

Leave blank

4. Sulphur dioxide is a toxic and acidic gas. When it is dissolved in rainwater, acid rain is formed.
A student wanted to investigate how the solubility of sulphur dioxide varied with temperature. He suggested the following plan.

Place 100 cm^3 of water in a beaker.
Place the beaker on a balance.
Bubble gas into the water using the apparatus shown in the diagram.



Continue to pass gas into the water until the mass of the beaker and its contents stops changing.
Repeat the experiment at different temperatures.

The table shows the student's preliminary results.

Mass of beaker and water at start (g)	Temp (°C)	Mass of beaker and solution at end (g)
150.0	15	162.7
150.0	20	160.6
150.0	25	159.0
150.0	30	157.6

(a) What mass of sulphur dioxide dissolved in the water at 20 °C?

.....

(1)

Leave blank

(b) How does the solubility of sulphur dioxide change as the temperature is increased?

.....

(1)

(c) State **one** safety precaution the student should take when doing this experiment. Why is this precaution needed?

Safety precaution .....

Reason .....

(2)

(d) The student did an experiment at a temperature just over 30 °C. He noticed that the balance reading increased at first, but then slowly decreased and did not become constant.

He did an experiment at about 90 ºC. The decrease in the balance reading occurred much more quickly than at 30 ºC.

(i) Suggest why the mass decreased slowly when the temperature was just over 30 ºC.

.....

(1)

(ii) Suggest why the mass decreased more quickly at about 90 °C.

.....

(1)

(e) Sulphur dioxide is an acidic gas. Outline another way the student could compare the amount of sulphur dioxide dissolved in the water at different temperatures.

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.....

.....

(1) **Q4**

(Total 7 marks)

TOTAL FOR PAPER: 50 MARKS

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