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

Paper Reference(s)

4335/03

London Examinations IGCSE

Chemistry

Paper 03

Written alternative to coursework

Tuesday 10 May 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 and 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 book.
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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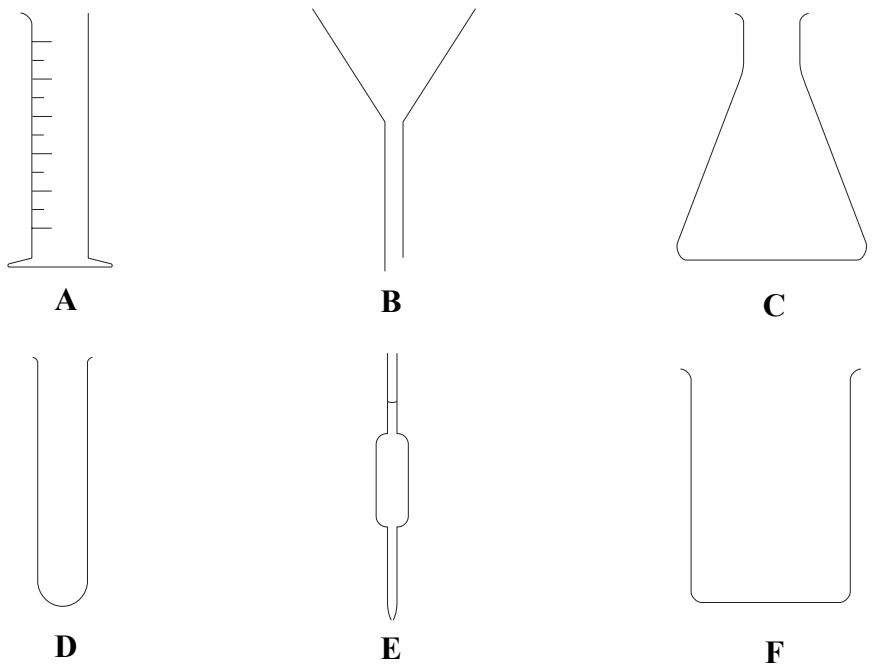
1. The diagrams show a selection of apparatus you can find in a chemistry laboratory.



(a) Complete the table by adding the name of each piece of apparatus.

Letter	Name
A	
B	filter funnel
C	
D	test tube
E	pipette
F	

(3)

(b) Select the **letters** of two pieces of apparatus that you would normally use to measure accurately the volume of a liquid.

1 .....

2 .....

(2)

(c) Which piece of apparatus is needed to separate particles of a solid from a liquid?

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(1)

Q1

(Total 6 marks)

Leave blank

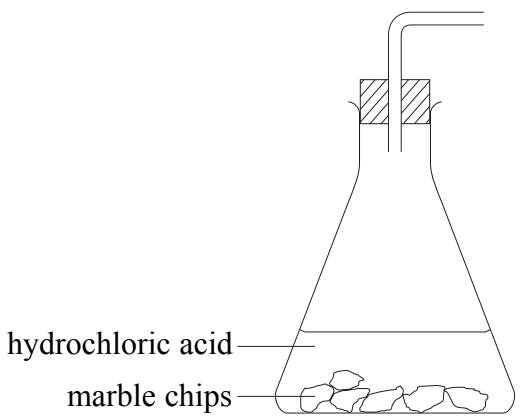
2. Marble chips (calcium carbonate) react with hydrochloric acid.

The equation for the reaction is

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

Some students investigated the rate at which carbon dioxide gas is given off at 25 °C. In separate experiments they used different masses of the same sized marble chips with the same volume of hydrochloric acid (an excess).

(a) The diagram shows the apparatus used. Complete the diagram to show how the carbon dioxide could be collected and its volume measured.



(2)

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(b) The students recorded these results.

Using 2.34 g of marble chips, 83cm^3 of carbon dioxide gas were collected in 60 seconds.

We got 45 cm^3 of gas in 1 minute when we used 1.05 g of marble chips.

With 1.47 g of solid we made 98 cm^3 of gas in 120 seconds.

In 60 seconds 0.59 g of solid gave 29 cm^3 of carbon dioxide.

After 90 seconds, 1.21 g of calcium carbonate had made 54 cm^3 of carbon dioxide.

Draw a suitable table and enter all of the results given and the units.

(3)

QUESTION 2 CONTINUES ON PAGE 6

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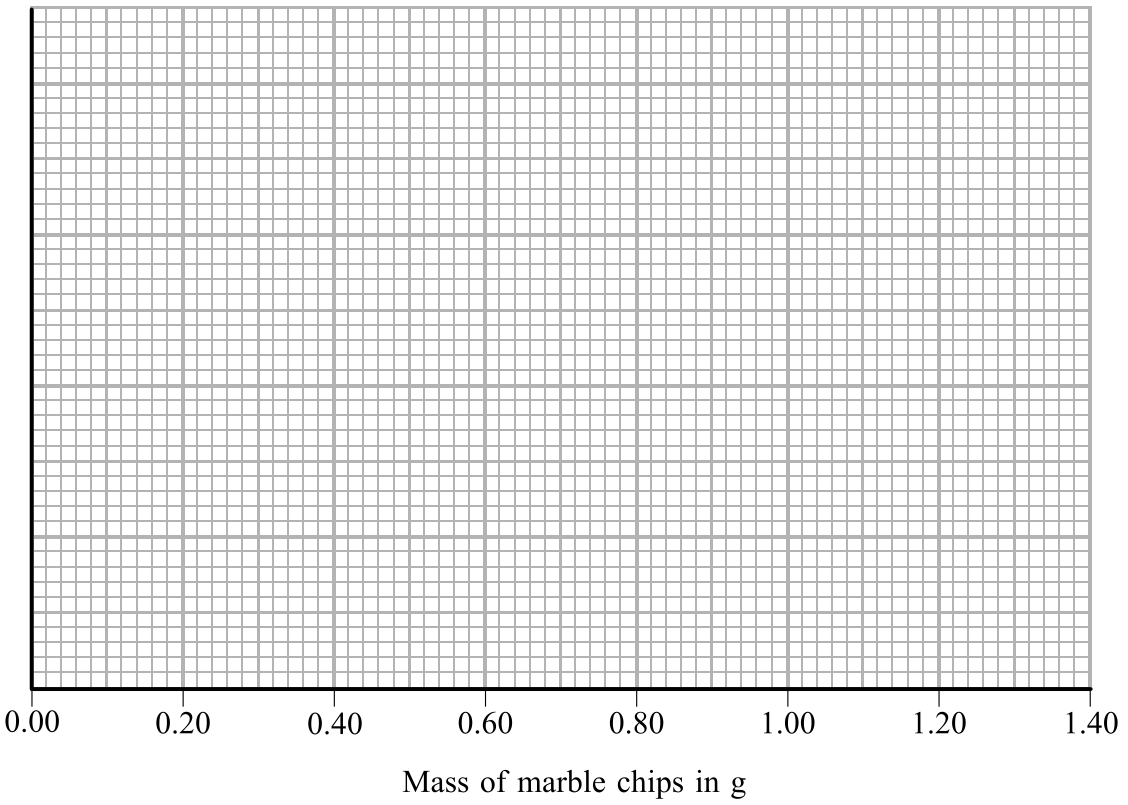
(c) The students' experiment was criticised for not being a **fair test**.
Some students repeated the experiment, making sure it was a fair test.
To do this they measured the volume of gas collected in the first 60 seconds of the reaction.

One student's results are shown in the table.

Mass of marble chips used (g)	**Volume of gas collected in 60 seconds (cm^3)**
0.15	7.5
0.30	17.5
0.60	30.0
0.80	37.5
1.00	50.0
1.25	62.5
1.40	70.0

(i) Draw a graph of these results on the grid. The scale for the *x*-axis has been done for you.



(4)

Leave blank

(ii) Describe how the **rate** of the reaction increases as the mass of marble chips changes.

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(2)

(iii) Give an explanation for this change in rate as the mass of marble chips increases.

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(2)

(d) Suggest a different way in which the original experiment could be improved to make it a fair test.

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(1)

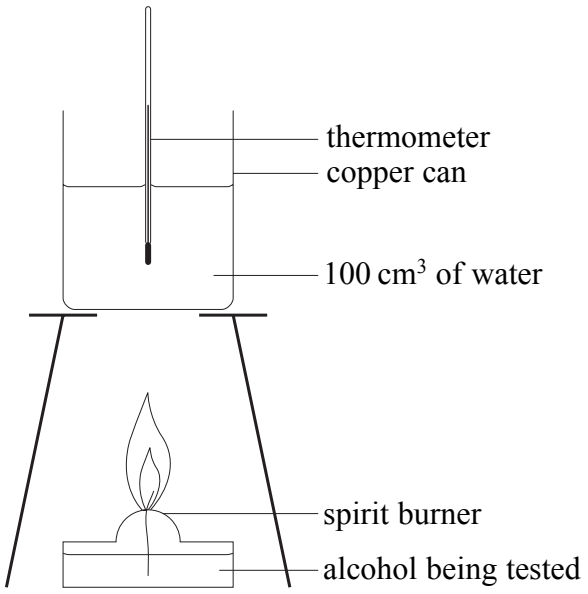
Q2

(Total 14 marks)

Leave blank

3. Alcohols are flammable and can be used as fuels.
A student carried out an investigation to see if there was a relationship between the number of carbon atoms in an alcohol and how much energy it gave out when burned.

The diagram shows the apparatus used.



The student placed a spirit burner containing methanol under the can of water. She lit the spirit burner, heated the water for two minutes and put the spirit burner out. She repeated the experiment two more times. As the fuel was burned, the mass of the spirit burner became less. She repeated the experiment with three other alcohols.

(a) The table shows the results obtained.

Name of alcohol	**Formula of alcohol**	**Mass of fuel used (g)**	**Temperature change of water (°C)**	**Temperature change per gram of fuel (°C g^{-1})**	**Mean temperature change per gram of fuel (°C g^{-1})**
methanol	CH_3OH	0.84		48.2	
		0.79	38.5	48.7	
		0.76	37.0	48.7	
ethanol	C_2H_5OH	0.78	52.5		
		0.64	43.0		
		0.68	45.5		
propanol	C_3H_7OH	0.54	37.0	68.5	
		0.49	30.0	61.2	
		0.57	46.5	81.6	
butanol	C_4H_9OH	0.43	35.5	82.6	
		0.47	38.5	81.9	
		0.51	42.0	82.4	

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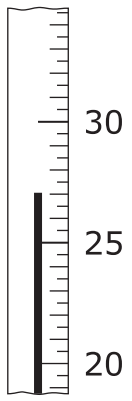
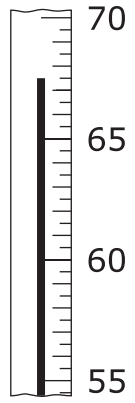
(i) The diagrams show the thermometer readings before and after heating the water in the first experiment for methanol.

Record the temperature shown on each thermometer.

Before



After



Temperature before ..... °C

Temperature after ..... °C

Calculate the **temperature change** for this experiment.

Temperature change .....

(3)

(ii) Other than measuring the temperature of the water before **and** after heating, what measurements must have been taken to get the results shown in the table on page 8?

.....

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(1)

(iii) The temperature change per gram of fuel used is calculated using the equation

$$\textbf{temperature change per gram of fuel} = \frac{\textbf{temperature change}}{\textbf{mass of fuel used}}$$

Complete the table on page 8 to show the temperature change per gram of fuel for each experiment using ethanol.

(3)

(iv) For each fuel, calculate the mean temperature change per gram of fuel. Record your answers in the table on page 8.

(2)

QUESTION 3 CONTINUES ON PAGE 11

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(b) Use the information in the table on page 8 to help you answer this question.

(i) Are the results obtained for **methanol** reliable? Explain your answer.

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(1)

(ii) The results for **propanol** are not reliable. Explain why not.

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(1)

(iii) What should the student have done about the results for **propanol**?

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(2)

(c) The student made the following conclusion.

As the number of carbon atoms in any fuel increases, the energy given out when one gram of the fuel is burned also increases.

Are the results obtained sufficient to support this conclusion? Explain your answer.

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(2)

Q3

(Total 15 marks)

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4. Solutions of lead(II) nitrate and potassium iodide react together to make the insoluble substance lead(II) iodide.

The equation for the reaction is

$$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow 2KNO_3(aq) + PbI_2(s)$$

An investigation was carried out to find how much precipitate formed with different volumes of lead(II) nitrate solution.

- A student measured out 15 cm^3 of potassium iodide solution using a measuring cylinder.
- He placed this solution in a clean boiling tube.
- Using a clean measuring cylinder, he measured out 2 cm^3 of lead(II) nitrate solution (of the same concentration, in mol dm^{-3}, as the potassium iodide solution). He added this to the potassium iodide solution.
- A cloudy yellow mixture formed and this was left to settle.
- The student then measured the height (in cm) of the precipitate using a ruler.

The student repeated the experiment using different volumes of lead(II) nitrate solution. The graph shows the results obtained.

(a) (i) On the graph, circle the point which seems to be anomalous.

(1)

Leave blank

(ii) Explain two things that the student may have done in the experiment to give this anomalous result.

1 .....

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2 .....

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(4)

(iii) Why must the graph line go through (0,0)?

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(1)

(b) Suggest a reason why the height of the precipitate stops increasing.

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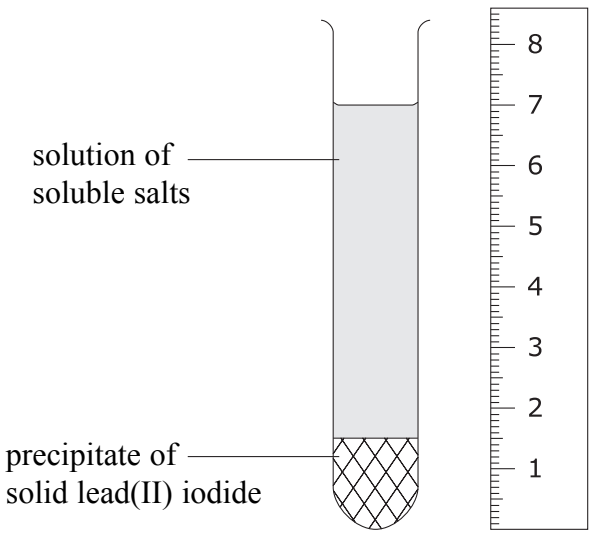
(1)

(c) (i) How much precipitate has been made in the tube?



..... cm

(1)

(ii) Use the graph to find the volume of lead(II) nitrate solution needed to make this amount of precipitate.

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(1)

QUESTION 4 CONTINUES ON PAGE 15

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(d) After he had plotted the graph, the student decided he should obtain some more results.

(i) Suggest what volumes of lead(II) nitrate solution he should use.

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(1)

(ii) Explain why he should use these volumes.

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(1)

(e) Suggest a different method for measuring the amount of precipitate formed. This method **must not** be based on the height of the precipitate.

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(4)

Q4

(Total 15 marks)

TOTAL FOR PAPER: 50 MARKS

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