Surname		Other Names	
Centre Number			Candidate Number	
Candidate Signature			

Leave blank

General Certificate of Secondary Education
June 2005

SCIENCE: SINGLE AWARD (CO-ORDINATED) 3463/2F
FOUNDATION TIER
PAPER 2

Thursday 16 June 2005 9.00 am to 9.45 am

F

In addition to this paper you will require:
- a ruler;
- the Data Sheet (enclosed).

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 45.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

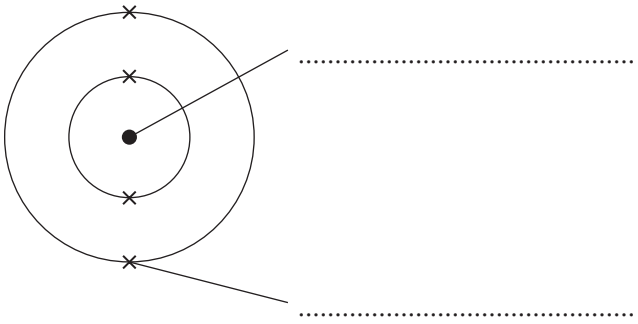
For Examiner's Use			
Number	Mark	Number	Mark
1		6	
2		7	
3		8	
4		9	
5			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

1 (a) The diagram represents an atom of beryllium.

Use words from the box to label the diagram.

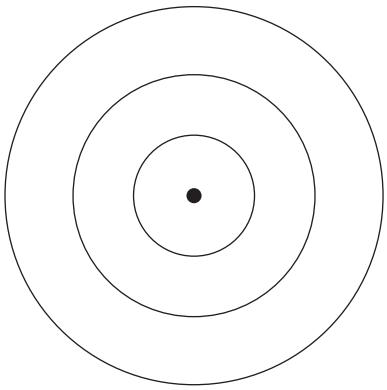
electron	**ion**	**isotope**	**molecule**	**nucleus**



(2 marks)

(b) Use crosses (**×**) to complete the diagram to show the electronic structure of a magnesium atom.

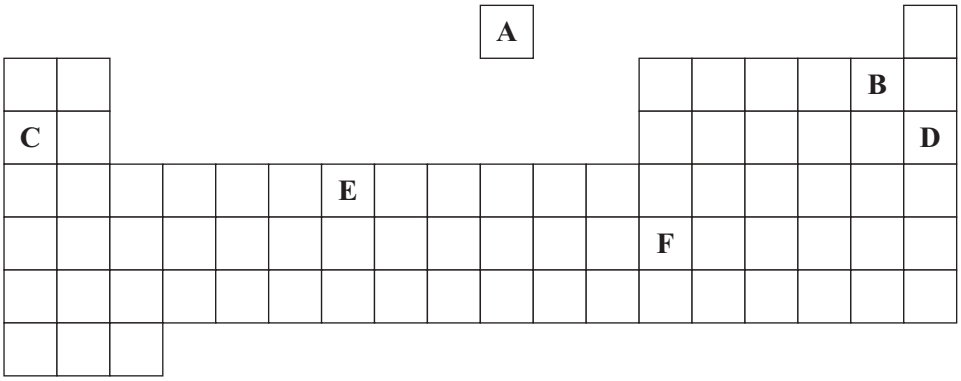
The atomic (proton) number of magnesium is 12.



(2 marks)

4

2 The diagram shows an outline of the periodic table.



Choose your answers **only** from the letters shown on the table above.

The periodic table on the Data Sheet may help you to answer this question.

Which element, **A** to **F**:

(a) is in Group 3; .....
(1 mark)

(b) is a metal which floats on water and reacts violently to make an alkaline solution and hydrogen gas;

.....
(1 mark)

(c) is a gas which burns with a squeaky pop? .....
(1 mark)

3

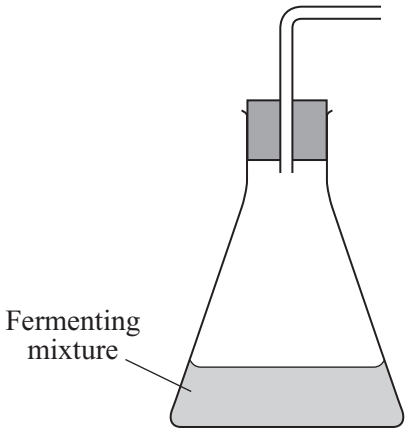
TURN OVER FOR THE NEXT QUESTION

3 Sugar can be fermented. The reaction can be represented by this equation.

sugar → alcohol + carbon dioxide

(a) A student set up this apparatus to show that fermentation produces carbon dioxide. The student wanted to use limewater to test the carbon dioxide.

(i) **Complete** the diagram to show how the carbon dioxide can be bubbled through limewater.



(2 marks)

(ii) What change would you see in the limewater when carbon dioxide is bubbled through it?

.....

(1 mark)

(b) This label was on a loaf of bread.

Farmhouse Bread

Ingredients
Flour
Water
Yeast
Salt
Sugar
Preservative
Ascorbic acid

The fermentation reaction is used when bread is made.

(i) State **two** ingredients in the bread which are essential for the fermentation reaction to occur.

..... and .....

(2 marks)

(ii) Explain why fermentation is used when bread is made.

.....

.....

.....

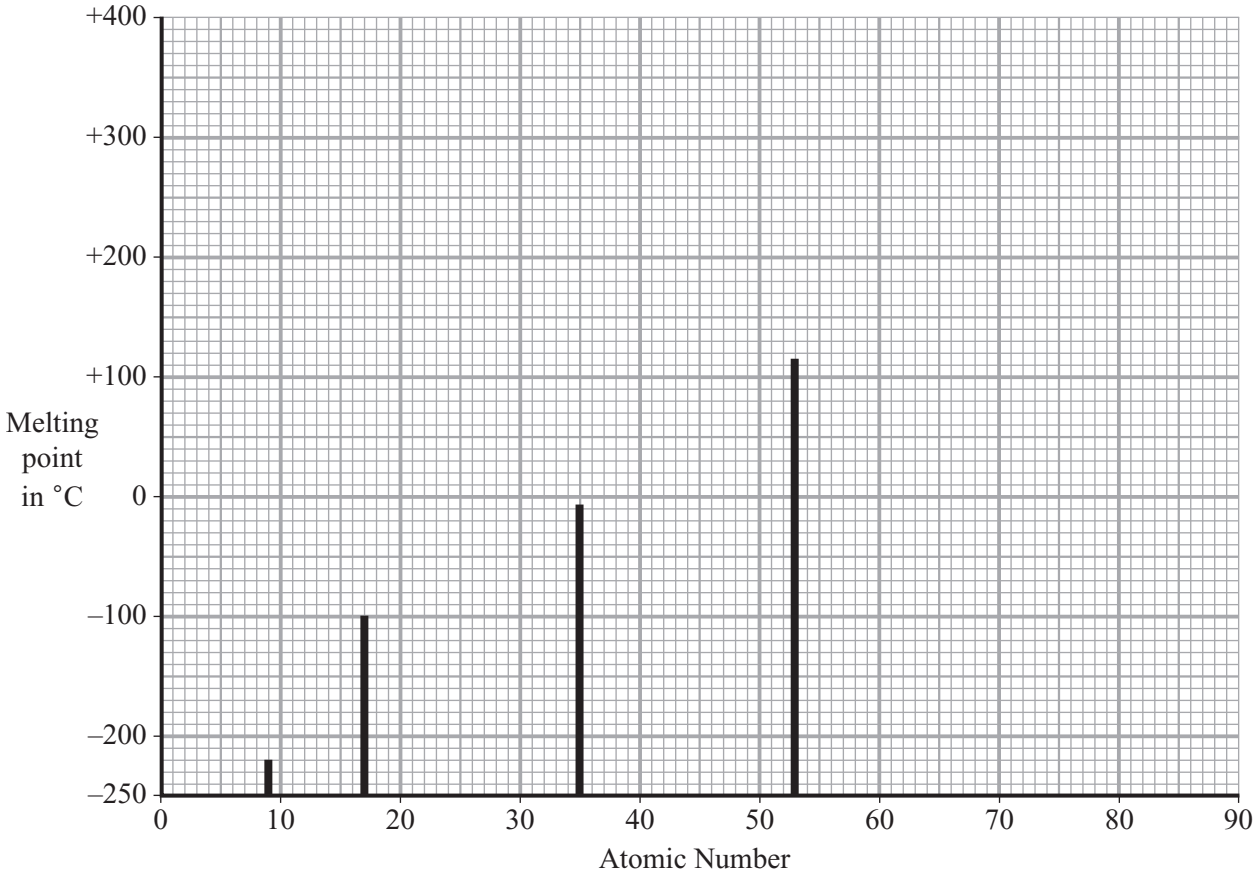
.....

(2 marks)

7

TURN OVER FOR THE NEXT QUESTION

4 (a) The bar graph shows the melting points of the elements in Group 7 plotted against their atomic numbers.



(i) How do the melting points of the Group 7 elements change as the atomic number increases?

.....

.....

(1 mark)

(ii) The melting point of astatine (atomic number = 85) is not shown on the bar graph.

Estimate the melting point of astatine. ..... ºC

(1 mark)

Draw a bar for this value on the bar graph. *(1 mark)*

(b) The water from wells in Japan contains bromide ions.

Bromine is extracted from this water. The bromine is displaced by adding another Group 7 element.

(i) Place a tick (✓) next to the name of **one** Group 7 element that could be used to displace bromine from this water.

Most reactive

Least reactive

Group 7	(✓)
Fluorine	
Chlorine	
Bromine	
Iodine	
Astatine	

(1 mark)

(ii) State why you have chosen this element.

.....

.....

(1 mark)

(iii) One sample of this water contained 2 g of bromine per litre of water.

How many litres of this water would be needed to make 1 kg of bromine?
(1 kg = 1000 g)

.....

..... litres

(1 mark)

6

5 Salts can be prepared by the reaction of acids with alkalis.

(a) (i) The reactions of acids with alkalis can be represented by the equation below.

Choose a substance from the box to complete the equation.

carbon dioxide	**hydrogen**	**oxygen**	**water**

acid + alkali → salt + ...

(1 mark)

(ii) Draw a ring around the word which best describes the reaction.

displacement **neutralisation** **oxidation** **reduction**

(1 mark)

(b) Sodium sulphate is an important salt.

The table gives a list of some substances.

Put a tick (✓) next to the names of the acid **and** the alkali that would react to make sodium sulphate.

Substances	**(✓)**
Hydrochloric acid	
Nitric acid	
Potassium sulphate	
Sodium hydroxide	
Sodium nitrate	
Sulphuric acid	

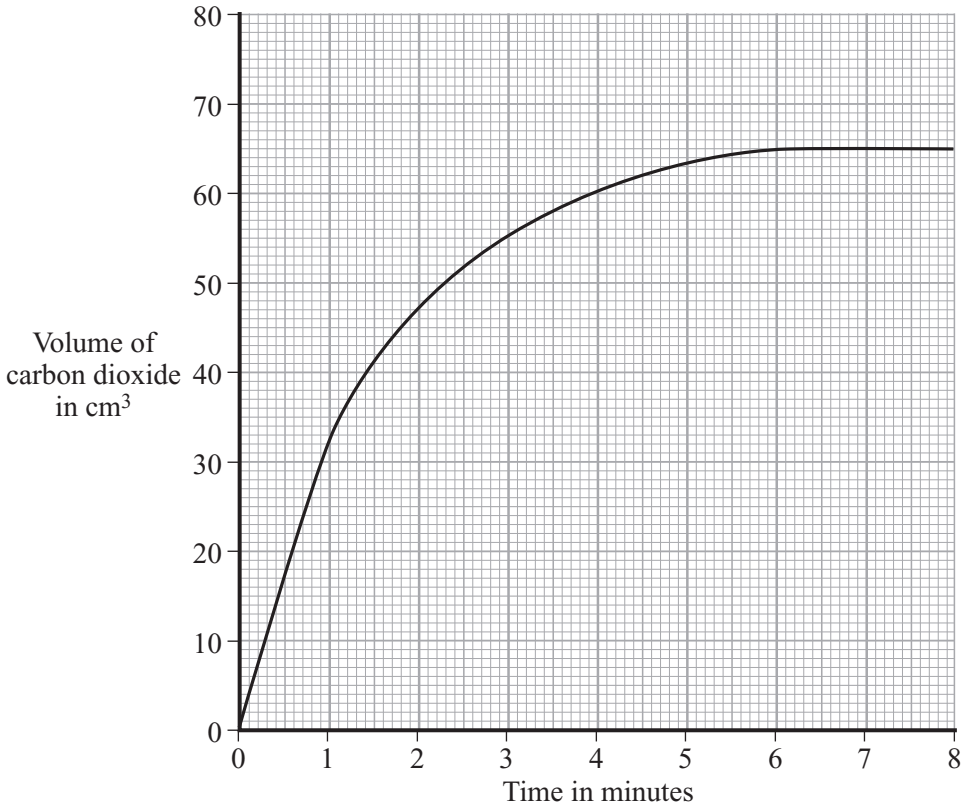
(2 marks)

4

6 A student studied the reaction between dilute hydrochloric acid and an **excess** of calcium carbonate.

calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide

The student measured the volume of carbon dioxide produced in the experiment. The results are shown on the graph.



(a) After how many minutes had all the acid been used up? ..... minutes
(1 mark)

(b) The student wrote this conclusion for the experiment:

'The reaction gets slower and slower as the time increases.'

Explain why the reaction gets slower. Your answer should be in terms of particles.

.....

.....

.....

.....
(2 marks)

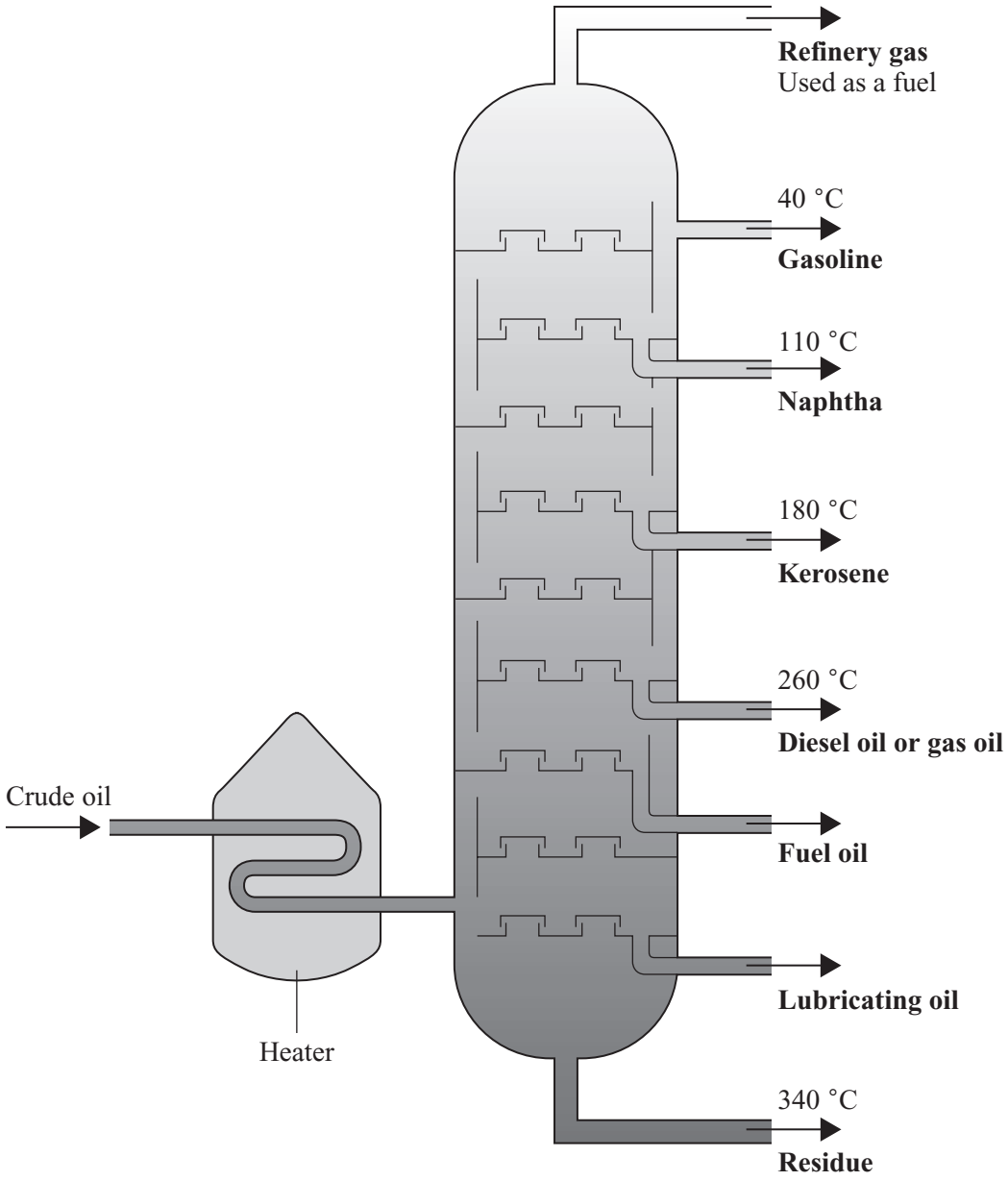
(c) A second experiment was carried out at a higher temperature. All other factors were the same.

Draw a line on the graph above to show the results that you would expect. *(2 marks)*

Turn over ▶

5

7 Crude oil is a mixture of many hydrocarbons. The diagram shows the method used to separate crude oil.



(a) Name this method of separating crude oil.

.....

(1 mark)

(b) Explain, as fully as you can, the way in which this method of separation works.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

5

TURN OVER FOR THE NEXT QUESTION

8 Mendeleev constructed a periodic table in 1869.

In his periodic table:

- most of the elements were put in order of increasing relative atomic mass;
- elements with similar properties were put into groups;
- Mendeleev changed the order of some elements to put them with similar elements;
- spaces were left for elements that Mendeleev thought would be discovered in the future.

One space was in Group 3 between the elements aluminium and indium.

Group 3
Boron
Aluminium
?
Indium
Thallium

Mendeleev called this undiscovered element 'eka-aluminium'. This element is now known as gallium.

In 1871, he also predicted some of the properties of gallium.

The table shows the properties of aluminium and indium, along with some of the predictions made by Mendeleev for gallium.

	Appearance	Metal or non-metal	Boiling point in ^{o}C	Density in g per cm^3	Relative atomic mass
Aluminium	silvery white	metal	2467	2.7	27
Predicted properties of gallium	silvery white	metal	?	?	68
Indium	silvery white	metal	2080	7.31	115

(a) Suggest values for:

(i) the boiling point of gallium;

..... ºC
(1 mark)

(ii) the density of gallium.

..... g per cm^3
(1 mark)

(b) (i) Suggest **two** reasons why other scientists in 1871 did not accept Mendeleev's periodic table.

Reason 1 .....

.....

Reason 2 .....

.....
(2 marks)

(ii) Suggest why the discovery of gallium in 1875 convinced other scientists that Mendeleev's table was correct.

.....

.....

.....
(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

9 The table gives information about some metals.

Name of the metal	Cost of one tonne of the metal in December 2003 (£)	Percentage of the metal in the crust of the earth (%)
Aluminium	883	8.2
Platinum	16720000	0.0000001
Iron	216	4.1
Gold	8236800	0.0000001

(a) Use information in the table to suggest why gold and platinum are very expensive metals.

.....

.....

(1 mark)

(b) Aluminium and iron are made by *reduction* of their ores.

(i) Name the element that is removed from the ores when they are *reduced*.

.....

(1 mark)

(ii) Use the reactivity series on the Data Sheet to suggest a metal that would reduce aluminium ore.

.....

(1 mark)

(c) Aluminium is made by the reduction of molten aluminium ore, using a very large amount of electricity.

(i) How is iron ore reduced in a blast furnace to make iron?

.....

.....

.....

.....

(2 marks)

(ii) Suggest why aluminium is more expensive than iron.

.....

.....

(1 mark)

6

END OF QUESTIONS

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE