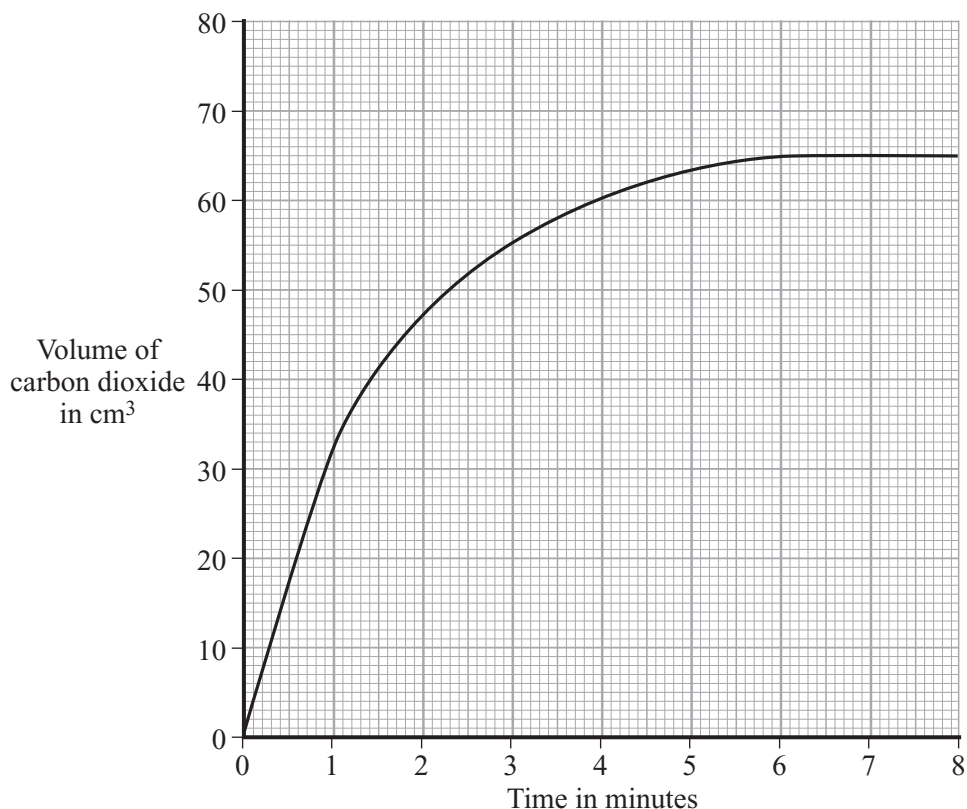


- 1 A student studied the reaction between dilute hydrochloric acid and an **excess** of calcium carbonate.



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)

2 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.

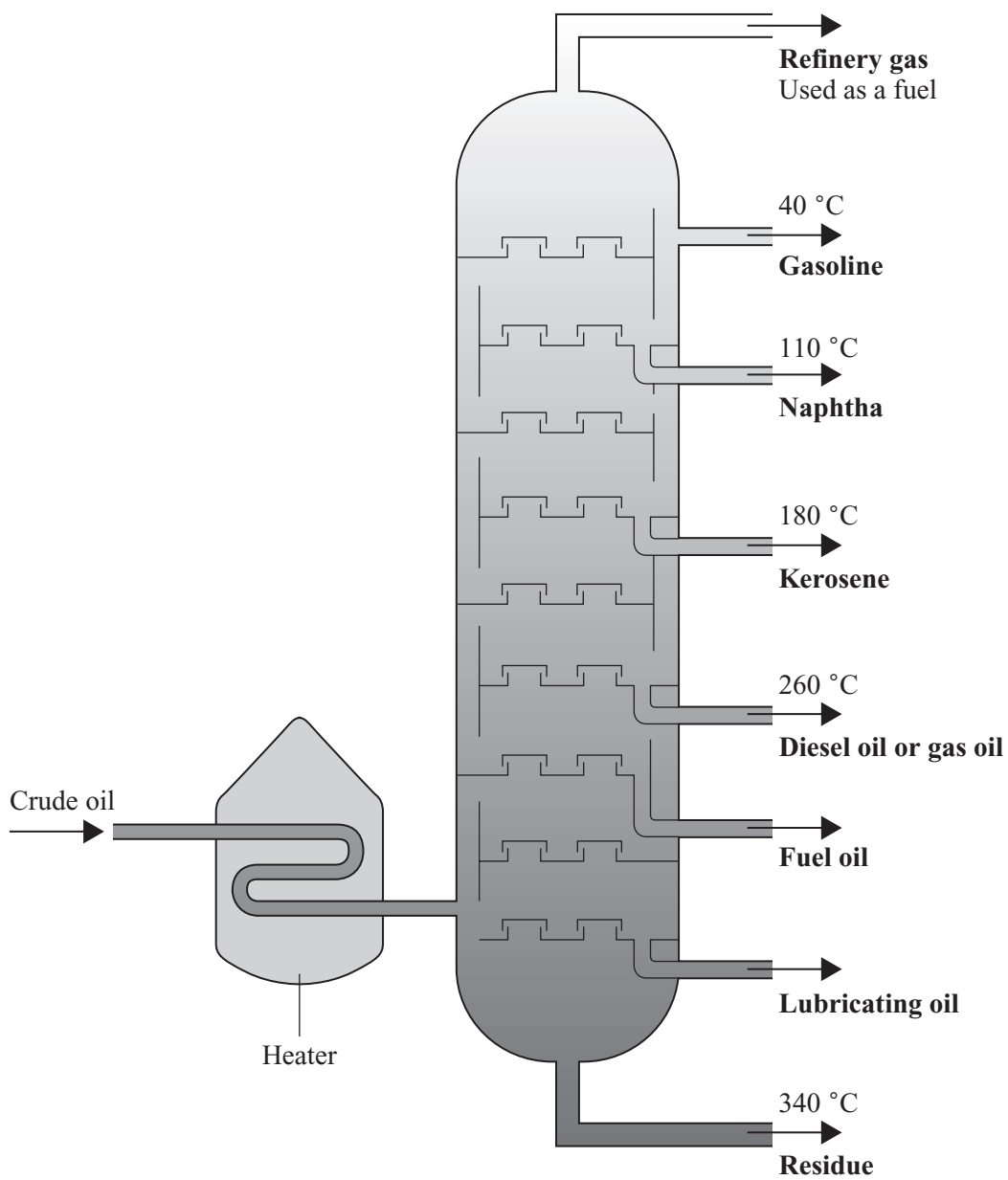
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 (1 mark)

Turn over ►

6

3 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.

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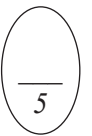
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(4 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

4 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 °C	Density in g per cm³	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;

..... °C
(1 mark)

(ii) the density of gallium.

..... g per cm³
(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.

.....

.....

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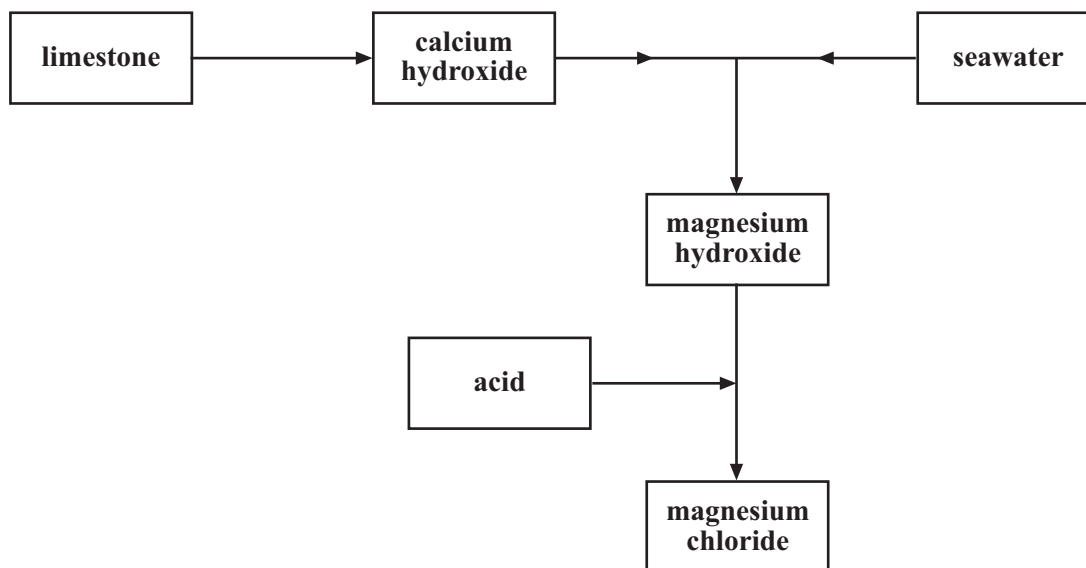
(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 5 Magnesium chloride is a useful salt.
The flow diagram shows how it can be made.



- (a) (i) Describe how calcium hydroxide can be made from limestone.

.....

.....

.....

.....

(2 marks)

- (ii) Write a word equation for the neutralisation of magnesium hydroxide with a suitable acid to form magnesium chloride.

.....

(2 marks)

- (b) Explain, in terms of ions and molecules, what happens when any acid reacts with any alkali.

.....

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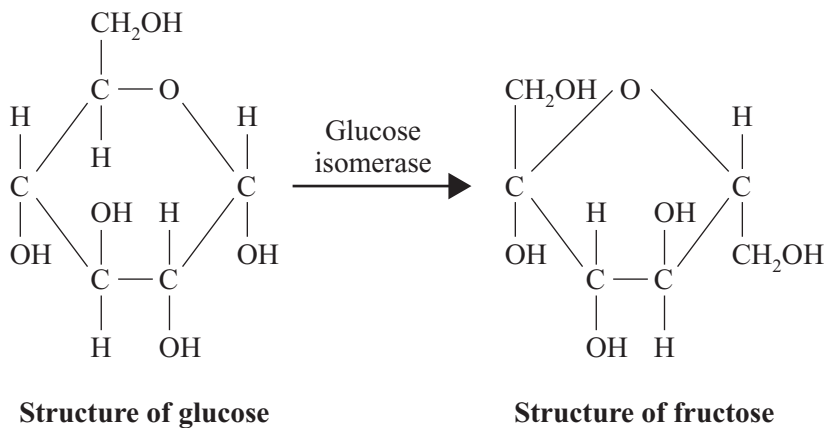
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(3 marks)

6 Glucose can be converted by glucose isomerase into fructose.

Fructose is used as a sweetener in slimming foods and soft drinks.



(a) The formula of glucose is $C_6H_{12}O_6$.

What is the formula of fructose? (1 mark)

(b) What is the advantage of using fructose, instead of glucose, in slimming foods and soft drinks?

.....
..... (1 mark)

(c) What type of substance is glucose isomerase?

..... (1 mark)

(d) The glucose isomerase is immobilised for use in this process.

State how it can be immobilised.

.....
.....
..... (2 marks)

(e) Suggest why glucose isomerase must be immobilised to allow a continuous process.

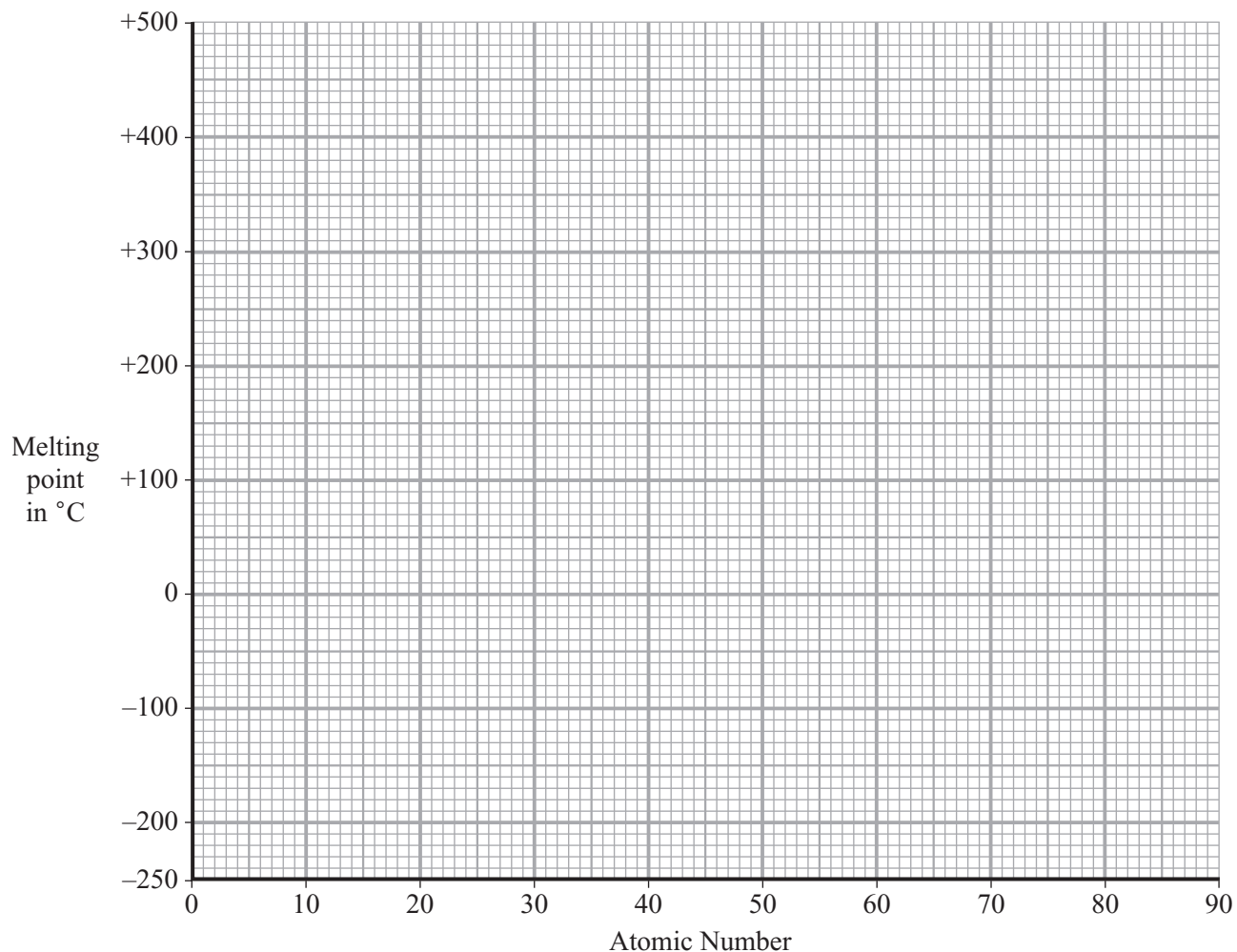
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..... (1 mark)

Turn over ▶

- 7 (a) The table gives the melting points of some of the elements of Group 7.

Element	Atomic number	Melting point in °C
Fluorine	9	- 220
Chlorine	17	- 101
Bromine	35	- 7
Iodine	53	114
Astatine	85	?

- (i) Plot a graph of the melting point against atomic number.



Draw a line of best fit.

Extend your line to estimate a value for the melting point of astatine.

(2 marks)

- (ii) Estimate the melting point of astatine. °C
(1 mark)

(iii) Which of the Group 7 elements are solids at 20°C?

.....
(1 mark)

(b) (i) Draw a diagram to show the arrangement of electrons in an atom of fluorine.

(1 mark)

(ii) The elements of Group 7 have similar chemical properties.

Explain, in terms of electrons, why they have similar chemical properties.

.....
.....
(1 mark)

(c) Xenon is a very unreactive element.

(i) Explain, in terms of electrons, why xenon is so unreactive.

.....
.....
.....
.....
(2 marks)

(ii) Fluorine reacts with xenon but iodine does not.

Explain, in terms of atomic structure, why fluorine is more reactive than iodine.

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.....
.....
.....
.....
(3 marks)

END OF QUESTIONS

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE