

Candidate Name	Centre Number	Candidate Number
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GCSE

236/02

**SCIENCE
HIGHER TIER
CHEMISTRY 1**

P.M. THURSDAY, 15 January 2009

45 minutes

For Examiner's use only	
Total Mark	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

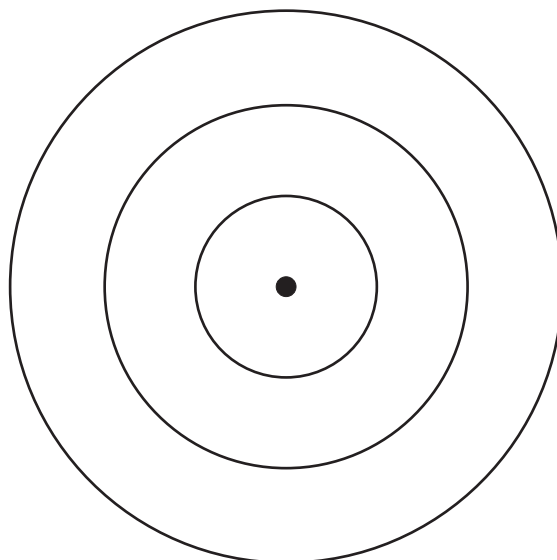
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer all questions.

1. (a) Use the **data** and **key** on the Periodic Table of Elements shown on the **back page of this examination paper** to complete the following sentences.
- (i) The chemical symbol for phosphorus is [1]
- (ii) The element with the atomic number 10 is [1]
- (iii) The element which has the electronic structure 2, 8, 6 is [1]
- (iv) The element which is in Group 3 and Period 2 is [1]
- (b) Using **X** to represent an electron, complete the following diagram to show the electronic structure for an atom of magnesium. [1]



- (c) The diagram below shows part of the periodic table as constructed by Mendeleev in 1869. Elements which had not been discovered in 1869 are shown by an asterisk, *.

<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>	<i>Group 4</i>	<i>Group 5</i>	<i>Group 6</i>	<i>Group 7</i>
H						
Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl
K	Ca	*	Ti	V	Cr	Mn
Cu	Zn	*	*	As	Se	Br
Rb	Sr	Y	Zr	Nb	Mo	*
Ag	Cd	In	Sn	Sb	Te	I

Use the Periodic Table of Elements, shown on the **back page of this examination paper** to help you answer parts (i) and (ii).

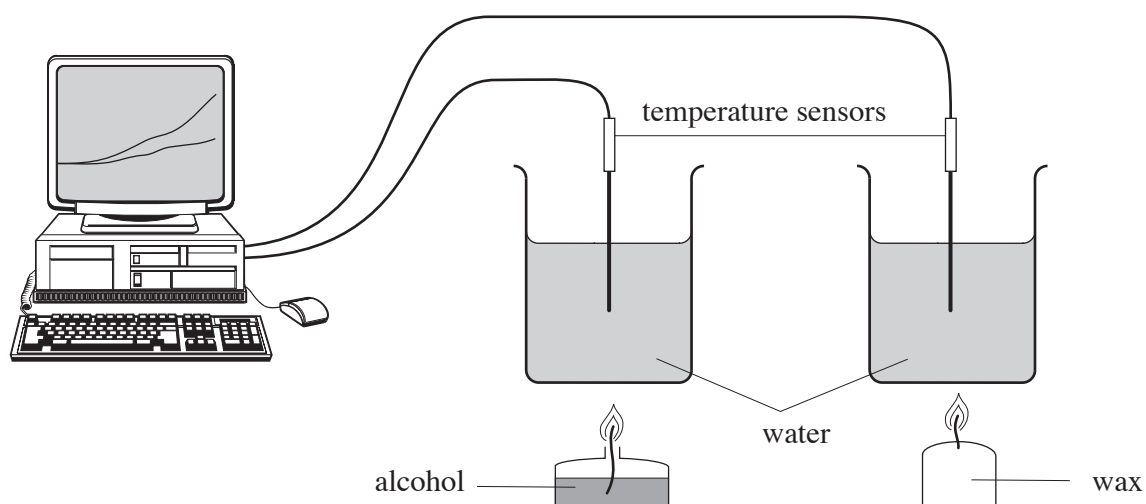
- (i) Name **two** elements found in Group 2 of Mendeleev's periodic table which are **not** found in Group 2 in the present day Periodic Table.

..... and [1]

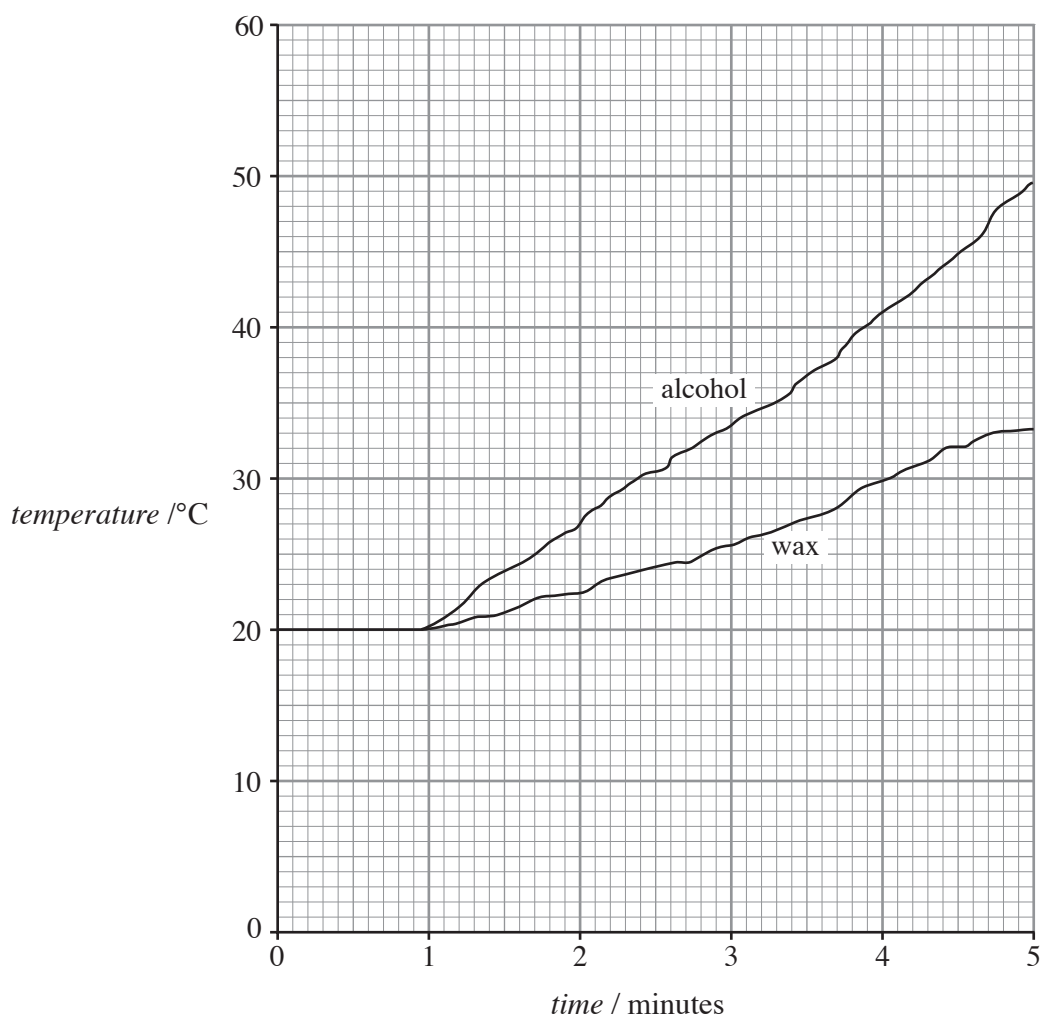
- (ii) Lead is found in Group 4 of the present day Periodic Table but was unknown in 1869. Give the **symbol** of the other element found in Group 4 of the present day Periodic Table which was unknown in 1869.

..... [1]

2. The apparatus below was used to find out which fuel, alcohol or wax, is able to heat up water faster. Temperature sensors were placed in equal volumes of water. After 1 minute, each fuel was set alight.



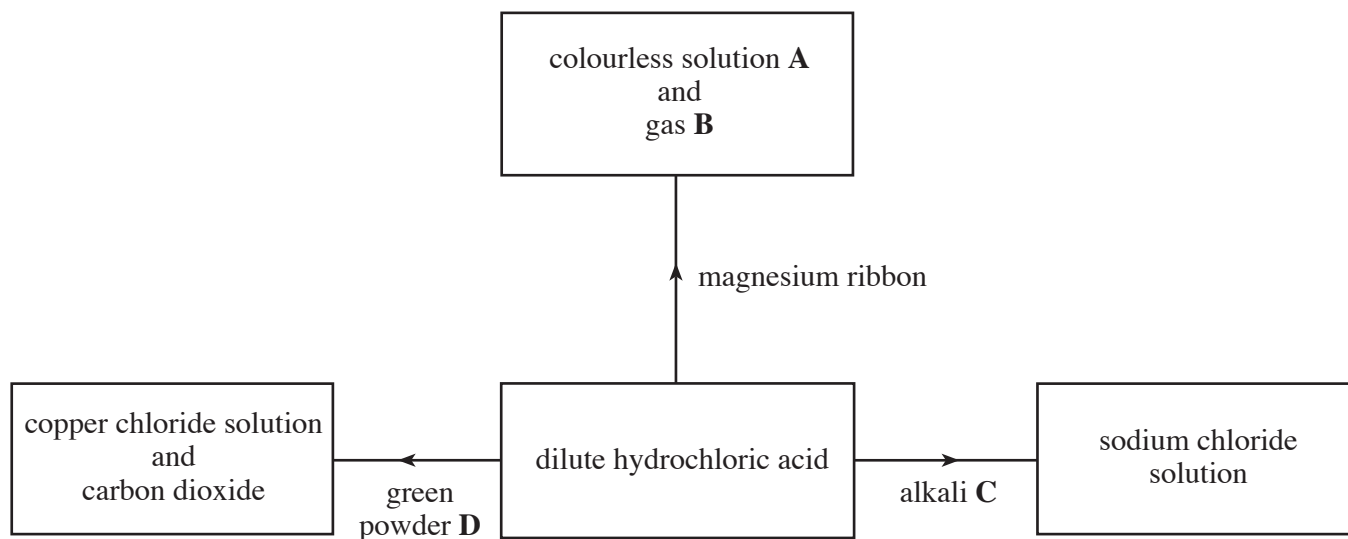
The graph produced by the computer is shown below.



- (i) Use the graph to give the temperature **rise** of the water between 0 and 4 minutes for
- I. alcohol, [1]
..... °C
- II. wax. [1]
..... °C
- (ii) If the heating was continued, state the **maximum** water temperature reached in both beakers.
- Give a reason for your value.
- Maximum temperature* °C [1]
- Reason* [1]

4

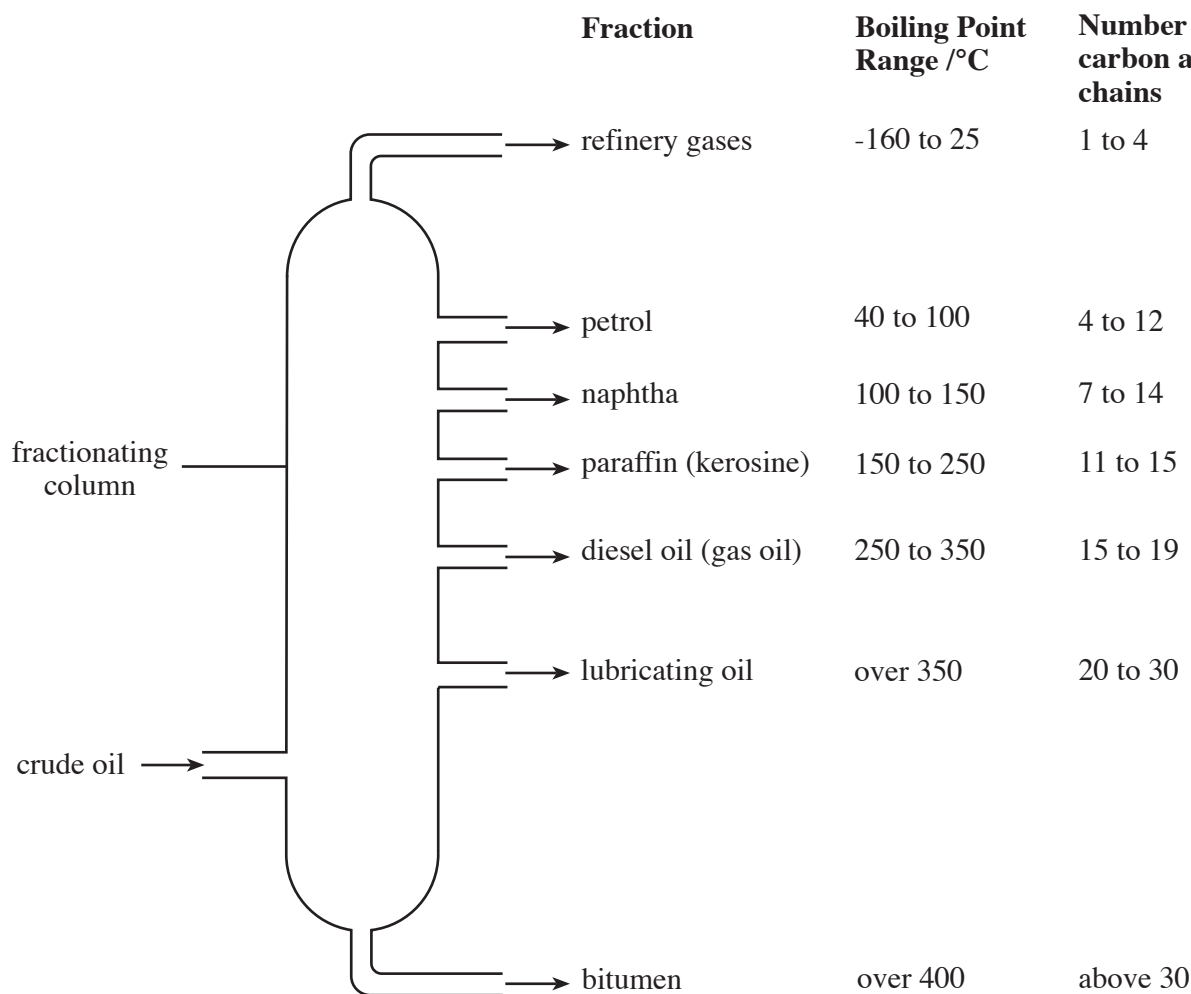
3. The diagram below shows some reactions of dilute hydrochloric acid.



Give the name for

- (i) colourless solution **A** [1]
- (ii) gas **B** [1]
- (iii) alkali **C** [1]
- (iv) green powder **D** [1]

4. Crude oil is a mixture of compounds called hydrocarbons which can be separated into fractions in a fractionating column.



Use only the information in the diagram above to answer parts (i) and (ii).

- (i) Name the fraction that contains the compound with the

I. boiling point of -89°C ,

[1]

.....

II. largest number of carbon atoms in its chains.

[1]

.....

- (ii) Name the fraction that contains **liquids** with the lowest boiling points.

[1]

.....

- (iii) Name the physical **process** occurring to the

I. crude oil as it enters the fractionating column,

[1]

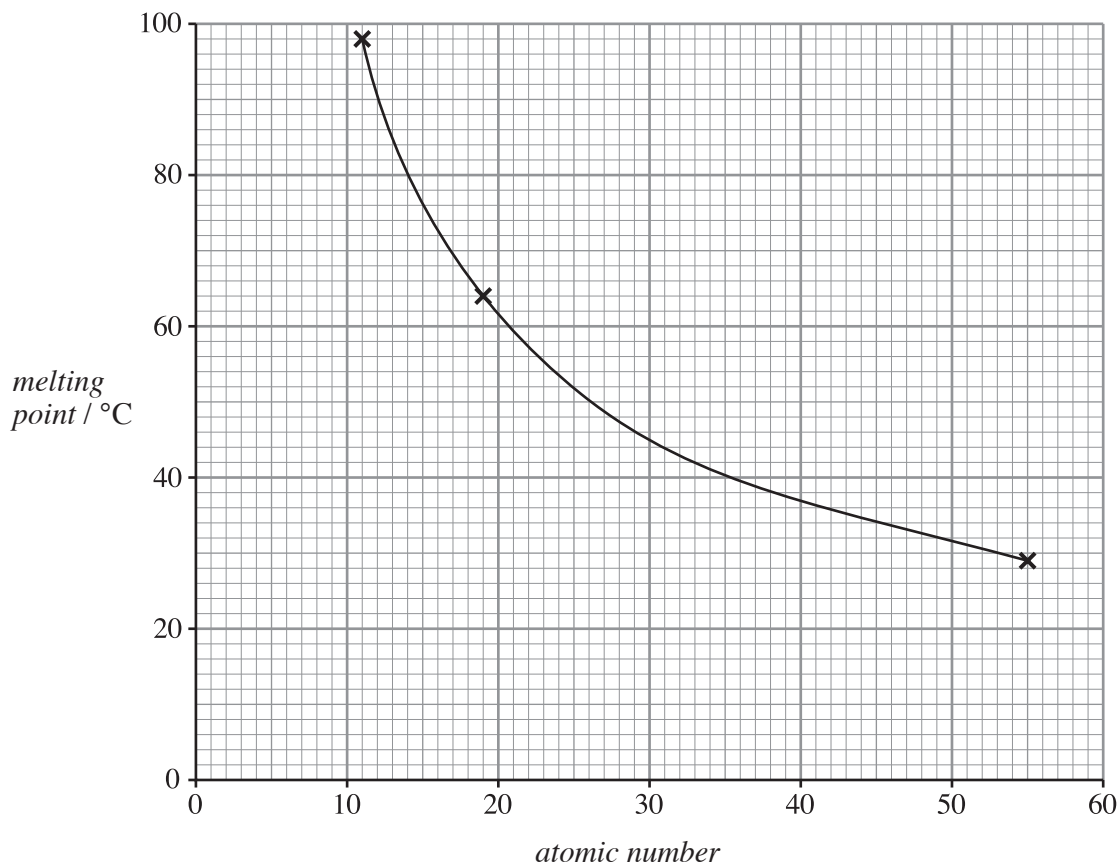
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II. fractions that allows them to be removed at different levels in the fractionating column.

[1]

.....

5. (i) The graph below shows the melting points of three Group 1 elements plotted against atomic number.



Use the Periodic Table of Elements on the **back page of this examination paper** *and* the graph to

- I. find the melting point of rubidium, [1]

.....°C

- II. describe the relationship between the melting points and positions of elements in Group 1. [1]

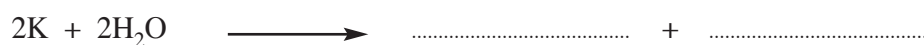
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- (ii) Sodium reacts vigorously with water forming sodium hydroxide solution and hydrogen gas.

- I. Potassium lies below sodium in Group 1.
Describe the **observation** you would expect when potassium reacts with water that would not be seen with sodium. [1]

.....

- II. Complete and balance the following **symbol** equation for the reaction between potassium and water. [2]

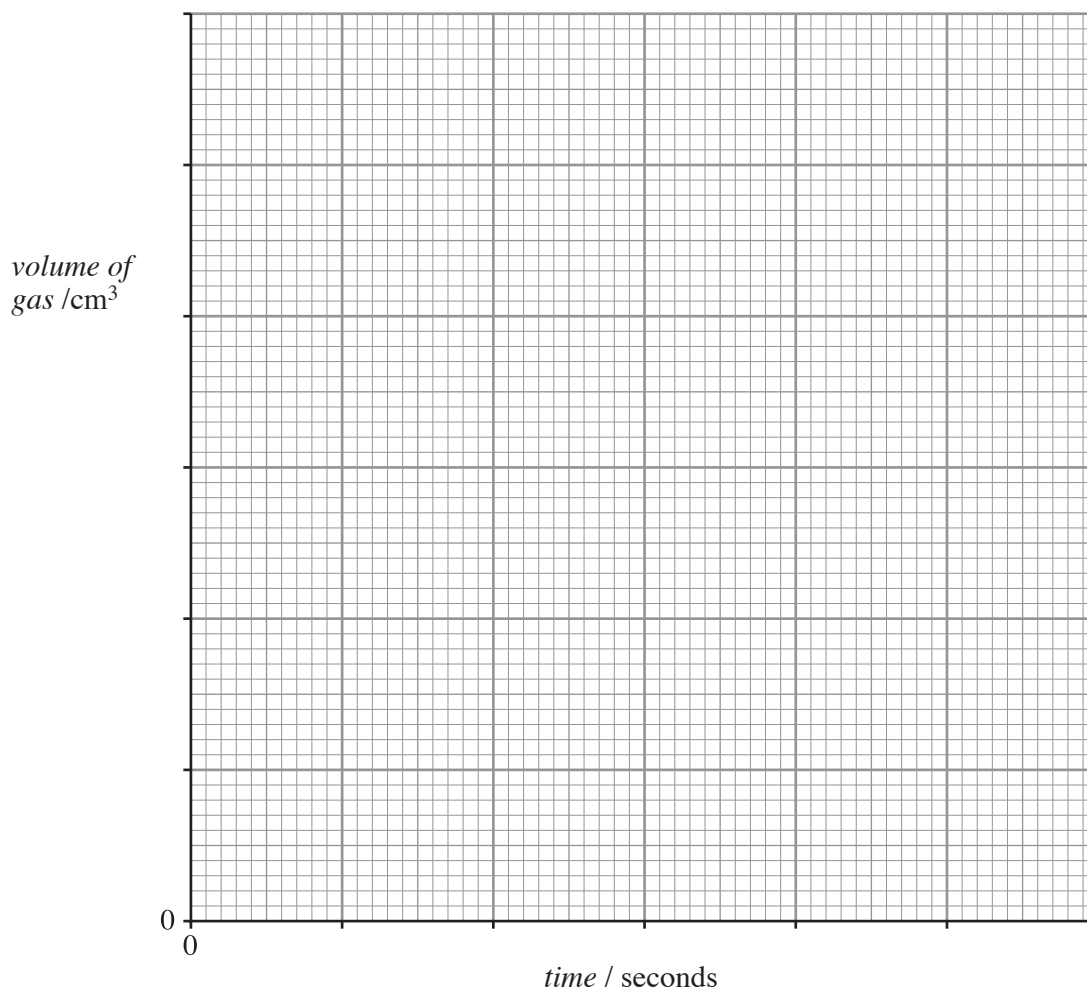


6. The table below shows the volume of carbon dioxide formed during a reaction between marble chips (calcium carbonate) and excess dilute hydrochloric acid.

<i>time / seconds</i>	0	10	20	30	40	50	60
<i>volume of gas / cm³</i>	0	60	92	110	119	120	120

- (i) Draw a graph using the data provided. **Label this graph A.**

[4]



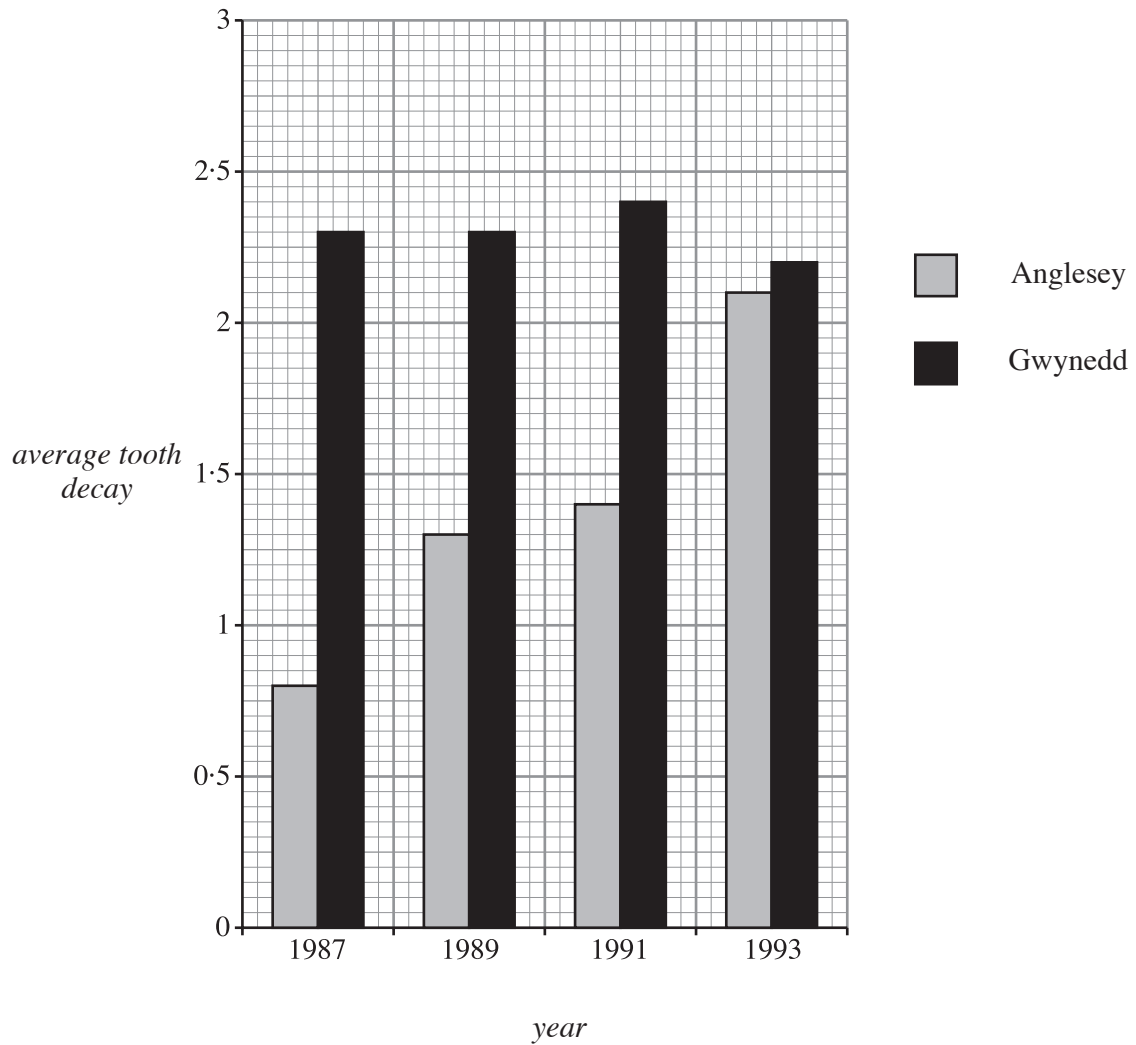
- (ii) Sketch carefully on the grid, the graph that would be obtained if the same mass of marble chips as for graph A had been added to excess dilute hydrochloric acid of the same concentration at a **lower** temperature. **Label the graph B.**

[2]

6

7. (i) In the 1980s, Anglesey, North Wales, took part in a UK fluoridation of drinking water trial. Fluoridation of the drinking water was stopped in Anglesey in 1989.

The bar chart below shows the comparison of tooth decay in 5 year olds in Anglesey with mainland Gwynedd between 1987 and 1993.



Use the bar chart to describe the **general trend** in tooth decay for both Anglesey and Gwynedd between 1987 and 1993. [2]

Anglesey

Gwynedd

- (ii) In 1995, 69% of the general public agreed that the water company should fluoridate the water supply.

How did the water company arrive at the figure of 69%? [1]

.....

- (iii) Give **one** reason for some people opposing the fluoridation of drinking water. [1]

.....

- (iv) Suggest **one** other way, apart from the fluoridation of water, in which people take in small amounts of fluoride ions. [1]

.....

8. (a) (i) A series of experiments was carried out to investigate the displacement reactions of Group 7 elements (halogens). Each halogen was added to a solution containing a different halide ion.

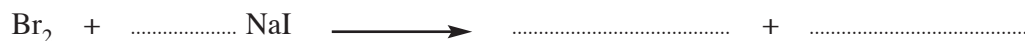
Complete the table below by **either** entering a tick (✓) in a box where you would expect a displacement reaction to occur **or** a cross (×) where you would expect no reaction.

Two entries have been done for you.

[2]

Halogen	Solution of halide ion		
	Sodium chloride	Sodium bromide	Sodium iodide
Bromine, Br ₂	×		✓
Chlorine, Cl ₂			
Iodine, I ₂			

- (ii) Complete and balance the following **symbol** equation for the reaction between bromine and sodium iodide solution. [2]



- (b) Sodium iodide is used in medicine to treat thyroid disorders.

A pupil was asked to identify the presence of sodium ions and iodide ions in a sample of sodium iodide.

State the result the pupil should expect if

- (i) a flame test was carried out on the sample,

.....

[1]

- (ii) silver nitrate solution was added to a solution of the sample.

.....

[1]

9. During the last 150 years, the level of carbon dioxide in the atmosphere has slowly increased. Some scientists believe the increase in the level of carbon dioxide in the atmosphere has resulted in global warming.

(i) The table below shows some data about the atmosphere between 1750 and 2000.

	<i>Year</i>					
	1750	1800	1850	1900	1950	2000
<i>Concentration of carbon dioxide in the atmosphere / % by volume</i>	0.0278	0.0282	0.0288	0.0297	0.0310	0.0368
<i>Average global temperature / °C</i>	13.3	13.4	13.4	13.6	13.8	14.4

- I. Use the data in the table to describe the pattern of change in carbon dioxide levels in the atmosphere between 1750 and 2000. [2]

.....

.....

- II. State **one** reason for the changing amounts of carbon dioxide in the atmosphere. [1]

.....

- (ii) Describe **one** consequence of increases in the temperature of the atmosphere. [1]

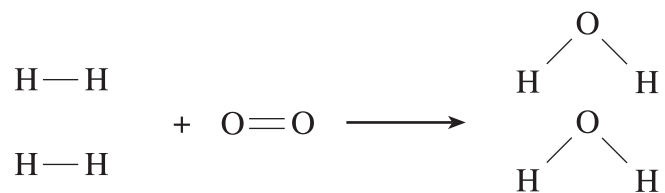
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- (iii) Give **one** way in which you and your family could help to reduce the level of carbon dioxide in the atmosphere. [1]

.....

5

10. When hydrogen, H_2 , burns in air, water is formed.



The **overall** relative energy change during the reaction is **-486 kJ**, showing that the reaction is exothermic.

- (i) The total energy needed to break all the bonds in the reactants is 1370 kJ.

Calculate the total energy **released** when the bonds in the **product** are formed. [1]

.....

- (ii) Calculate the amount of energy released in forming an O-H bond. [2]

.....

.....

3

FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al³⁺	Bromide	Br⁻
Ammonium	NH₄⁺	Carbonate	CO₃²⁻
Barium	Ba²⁺	Chloride	Cl⁻
Calcium	Ca²⁺	Fluoride	F⁻
Copper(II)	Cu²⁺	Hydroxide	OH⁻
Hydrogen	H⁺	Iodide	I⁻
Iron(II)	Fe²⁺	Nitrate	NO₃⁻
Iron(III)	Fe³⁺	Oxide	O²⁻
Lithium	Li⁺	Sulphate	SO₄²⁻
Magnesium	Mg²⁺		
Nickel	Ni²⁺		
Potassium	K⁺		
Silver	Ag⁺		
Sodium	Na⁺		

