

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE  
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU  
Tystysgrif Gyffredinol Addysg Uwchradd

236/01

SCIENCE

FOUNDATION TIER (Grades G-C)

CHEMISTRY 1

P.M. THURSDAY, 21 June 2007

(45 minutes)

<b>For Examiner's use only</b>	
<b>Total Marks</b>	

### ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

### 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.

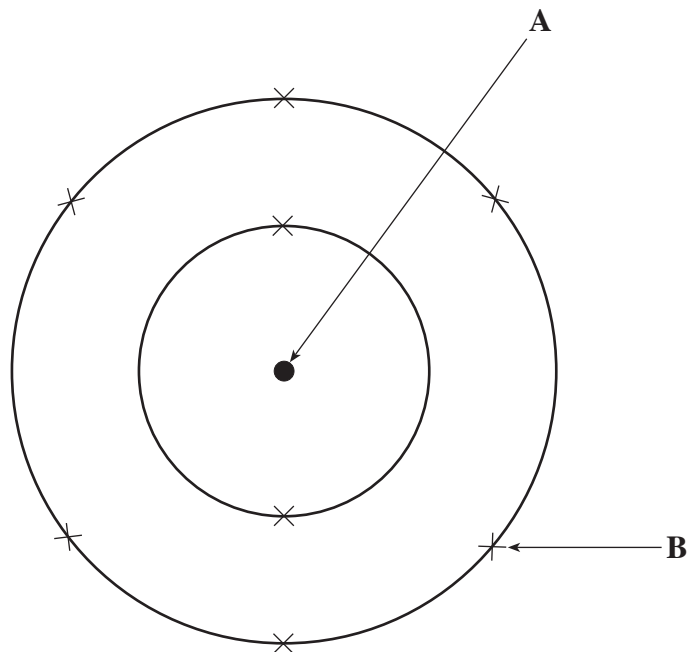
You are reminded of the necessity for good English and orderly presentation in your answers.

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.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer **all** questions.

1. (a) The diagram below shows an atom of oxygen.



Use the words in the box below to complete the following sentences.

electron	neutrons	nucleus	protons
----------	----------	---------	---------

- (i) The centre of the atom, labelled **A**, is called the ..... [1]
- (ii) The centre of the atom contains  
..... and ..... [2]
- (iii) The particle labelled **B** is an ..... [1]
- (b) The chemical formula of sodium sulphate is  $\text{Na}_2\text{SO}_4$ .
- (i) State how many sulphur atoms are present in the formula,  $\text{Na}_2\text{SO}_4$ , ..... [1]
- (ii) Give the **total** number of atoms shown in the formula. .... [1]

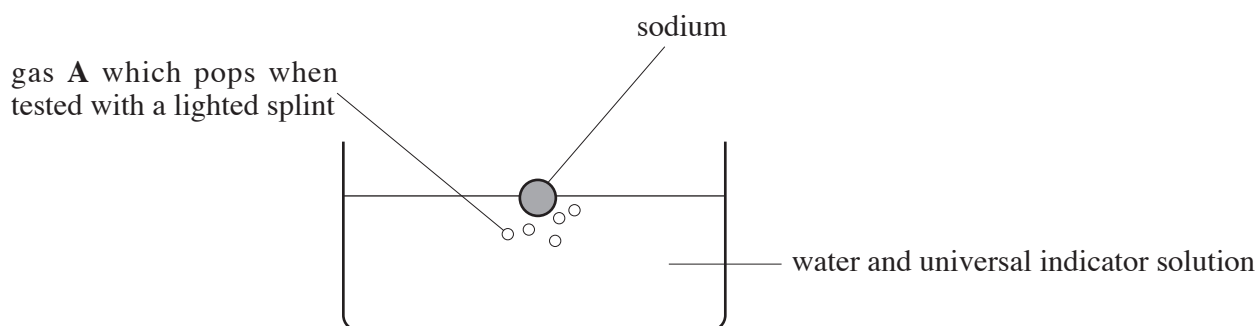
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2. This question is about the reactions of the Group 1 element sodium.

Use only the words in the box below to answer parts (i), (ii) and (iii).

hydrogen	lilac	sodium	sodium chloride
sodium hydroxide		sodium oxide	yellow-orange

(i) The diagram below shows sodium reacting with water.



I. Name gas A. [1]

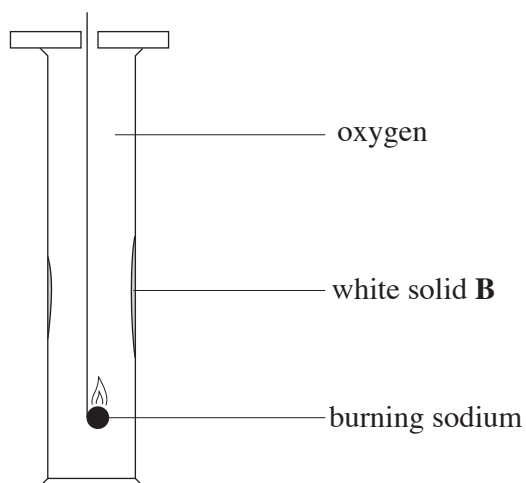
.....

II. The universal indicator solution turns purple showing that a strong alkali is formed during the reaction.

Name the strong alkali formed. [1]

.....

(ii) The diagram below shows sodium reacting with oxygen.



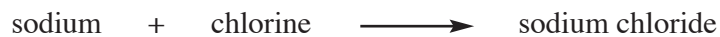
I. Name the white solid **B**. [1]

.....

II. State the **colour** seen when sodium burns in oxygen. [1]

.....

(iii) The **word** equation below represents the reaction between sodium and chlorine.



I. Name the **metal** in the word equation. [1]

.....

II. Name the **product** in the reaction. [1]

.....

## 3. Read the information in the box below.

In 1915, a scientist called Alfred Wegener came up with the idea that the Earth's continents were once joined. He suggested they had moved apart to their present positions. His evidence was the close fit of the coastlines and the similar rocks and fossils found on the separate continents.

His idea was not accepted by other scientists because he could not explain what caused the continents to move.

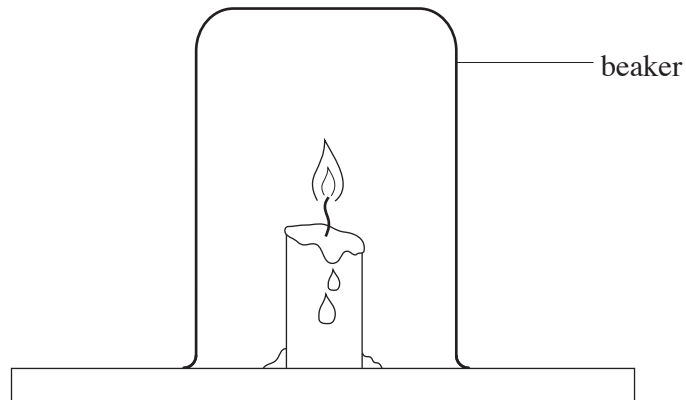
In the 1960s, Wegener's idea was finally accepted when scientists found that convection currents deep inside the Earth were causing the continents to move.

## Use only the information in the box above to answer part (a).

- (a) (i) State the idea that was suggested by Alfred Wegener in 1915. [1]  
.....
- (ii) Give **one** piece of evidence used by Alfred Wegener to support his idea. [1]  
.....
- (iii) State what scientists discovered that resulted in Wegener's idea being accepted. [1]  
.....
- (b) Give **one** way in which people might have learned about Wegener's idea. [1]  
.....

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4. An experiment was carried out to find how long a candle stayed alight under different sized beakers.

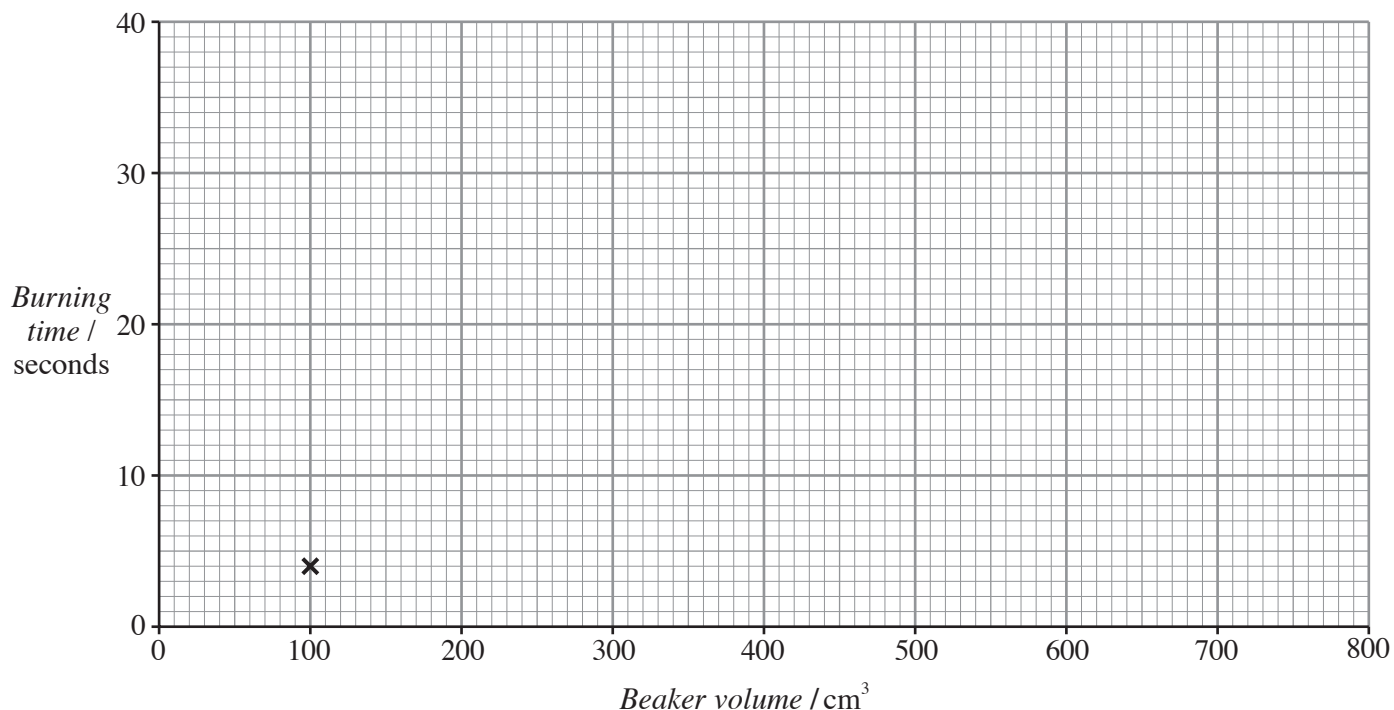


The results are shown in the table below.

<i>Beaker volume/cm<sup>3</sup></i>	<i>Burning time/seconds</i>
100	4
200	11
400	20
600	30
800	38



- (a) (i) Plot the results from the table on the grid below and draw a **line of best fit**. Your line should go through the origin (0, 0).  
The first point in the table has been plotted for you. [3]



- (ii) Use the graph to state how the burning time changes as the volume of the beaker increases. [1]

.....  
 .....

- (iii) State how the results could be made more reliable. [1]

.....

- (b) (i) The beakers become hot during the experiments. State the term used to describe all reactions that produce heat. [1]

.....

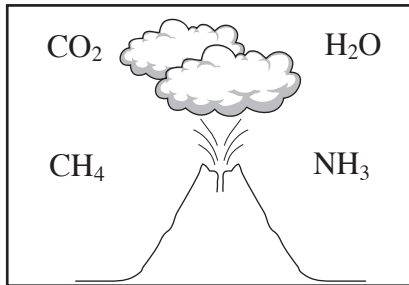
- (ii) The two gases formed when a candle burns in air are carbon dioxide and water vapour.

Use this information to give the **two elements** which must be present in candle wax.

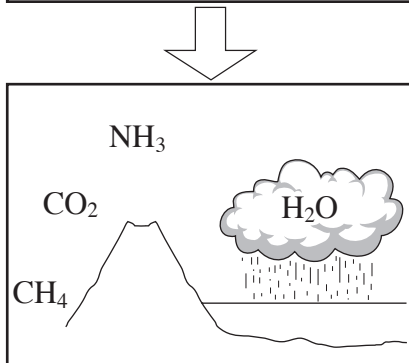
[2]

..... and .....

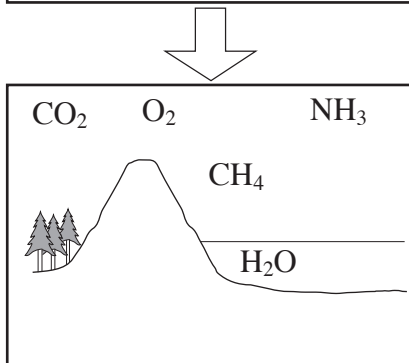
5. The diagrams below show a model of some of the major changes in the Earth's atmosphere since its formation 4500 million years ago.



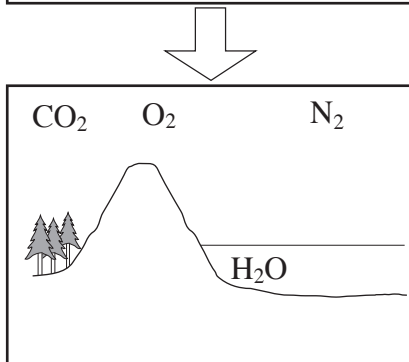
**Stage 1**  
Atmosphere formed from volcanic gases



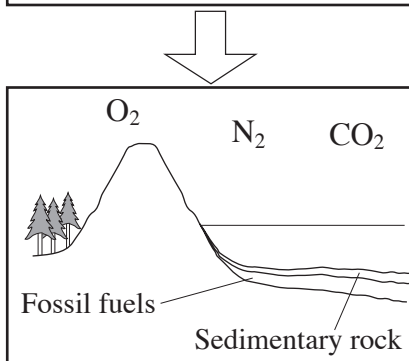
**Stage 2**  
Oceans formed



**Stage 3**  
Photosynthesis taking place



**Stage 4**  
Methane, CH<sub>4</sub>, and ammonia, NH<sub>3</sub>, change to form water, carbon dioxide and nitrogen

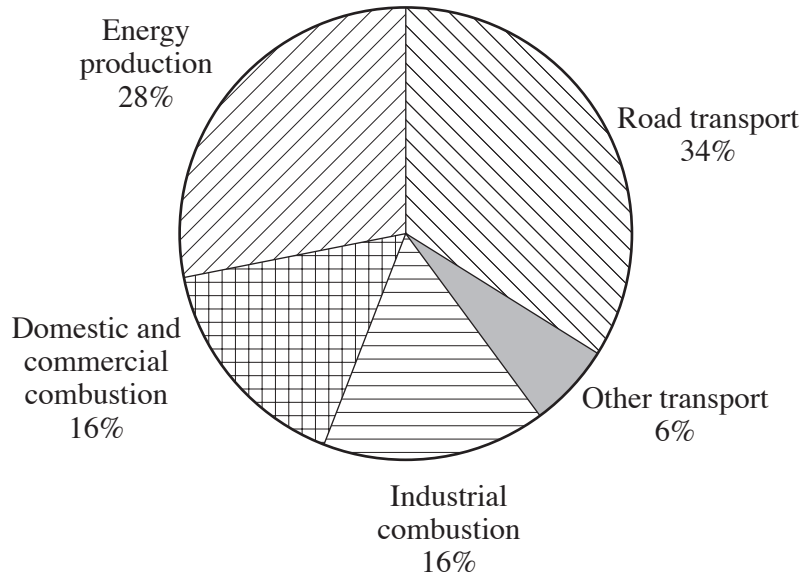


**Stage 5**  
Most of the carbon dioxide becomes locked in fossil fuels and sedimentary rocks.

- (i) Name the gas present in both **Stages 1** and **5**. [1]  
.....
- (ii) I. In **Stage 2**, the oceans were formed from water vapour. Name this process. [1]  
.....
- II. State what must have happened to the temperature of the atmosphere for this process to occur. [1]  
.....
- (iii) I. Name the gas which is formed as a result of photosynthesis in **Stage 3**. [1]  
.....
- II. Name the type of living thing that carries out photosynthesis. [1]  
.....
- (iv) Name **one** example of a fossil fuel formed in **Stage 5**. [1]  
.....

6. Acid rain is an increasing environmental problem. One of the causes is the production of nitrogen oxides.

(i) The pie chart below shows the sources of the nitrogen oxides present in the atmosphere.



**sources of nitrogen oxides in the atmosphere**

Use the chart to give the **main** source of nitrogen oxides present in the atmosphere. [1]

.....

(ii) State **two** ways in which acid rain affects the environment. [2]

1. ....

2. ....

- (iii) The information below was taken from a newspaper article. It shows the number of licensed vehicles in the U.K.

<i>Year</i>	<i>Number of Licenced Vehicles / million</i>
1950	2.4
2000	24.8
2020	100

State the year in which information in the table is **unreliable**.

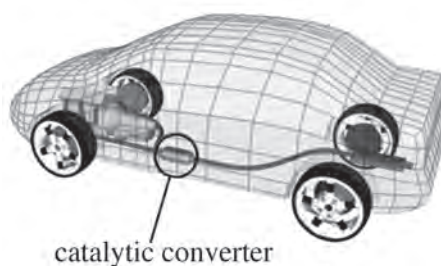
[1]

.....

- (iv) The table below shows the amount of nitrogen oxides released into the atmosphere in the years shown.

<i>Year</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>
thousand tonnes	2501	2581	2759	1737

Since 1993, all new cars have been fitted with a catalytic converter. Catalytic converters remove nitrogen oxides from car exhaust gases by passing them over a platinum catalyst.



Describe how the data in the table above can be used to support the view that catalytic converters are effective. [1]

.....

7. (a) Use the **data** and **key** on the Periodic Table of Elements, shown on the **back page** of the examination paper, to complete the following sentences.

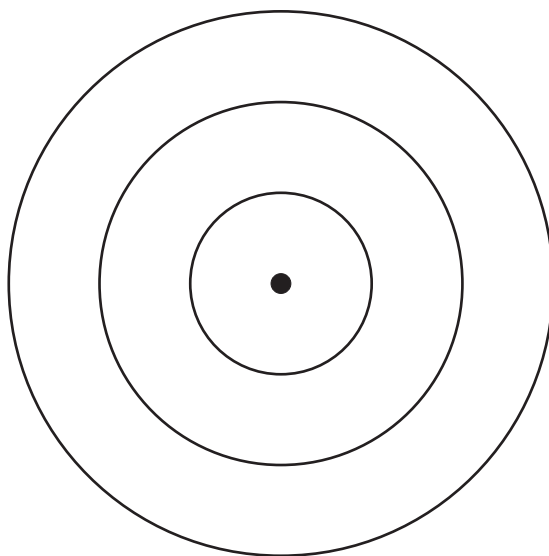
(i) The chemical **symbol** for the smallest atom in Group 1 is ..... [1]

(ii) The element with the atomic number 12 is ..... [1]

(iii) The element which has the electronic structure 2,8,8 is ..... [1]

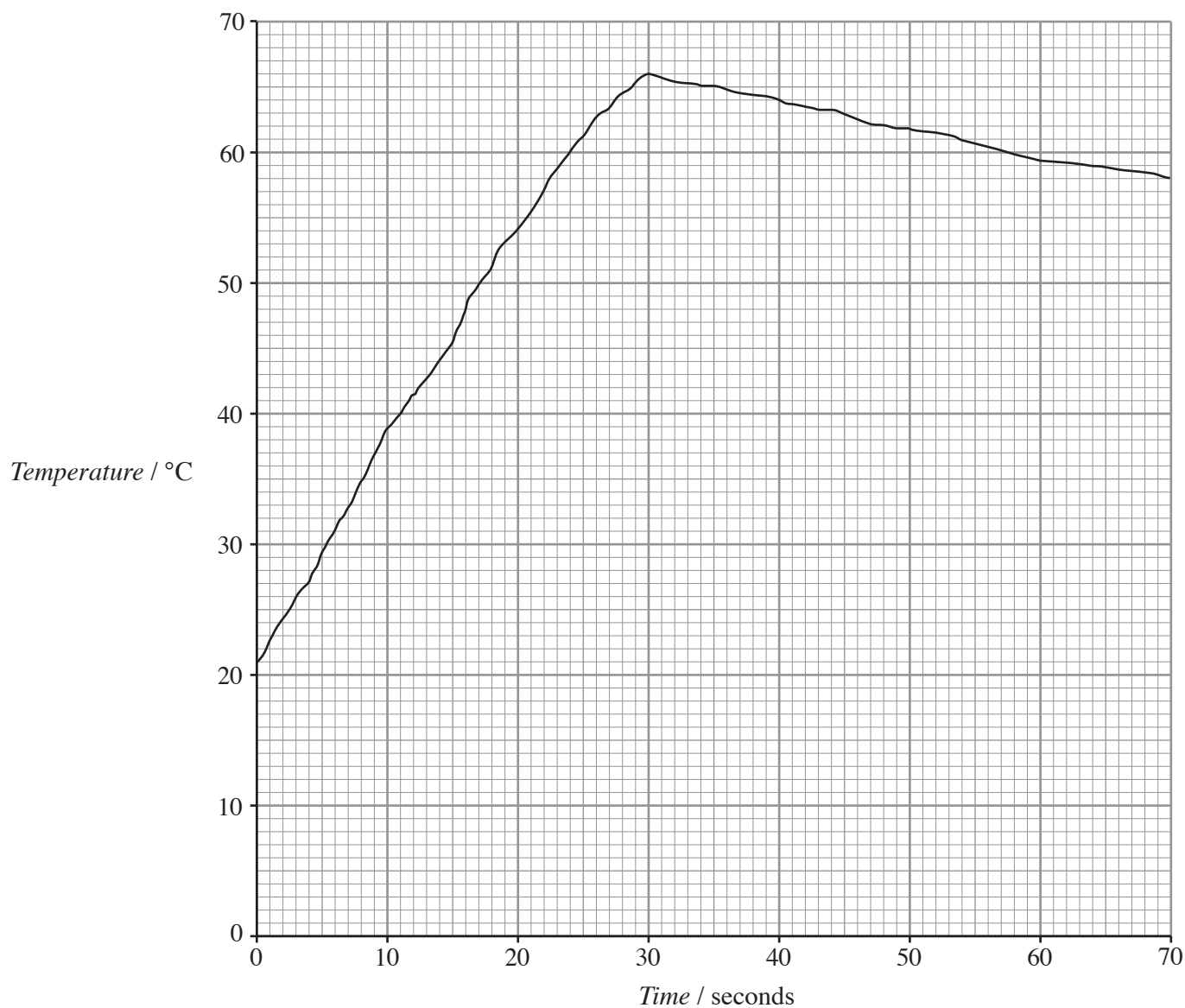
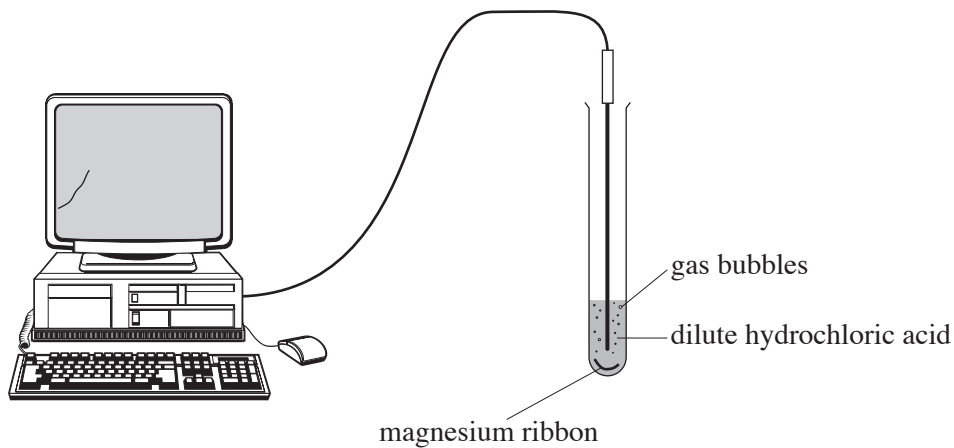
(iv) The element which is in Group 4 and Period 3 is ..... [1]

(b) Using **X** to represent an electron, complete the following diagram to show the electronic structure for an atom of sodium. [1]



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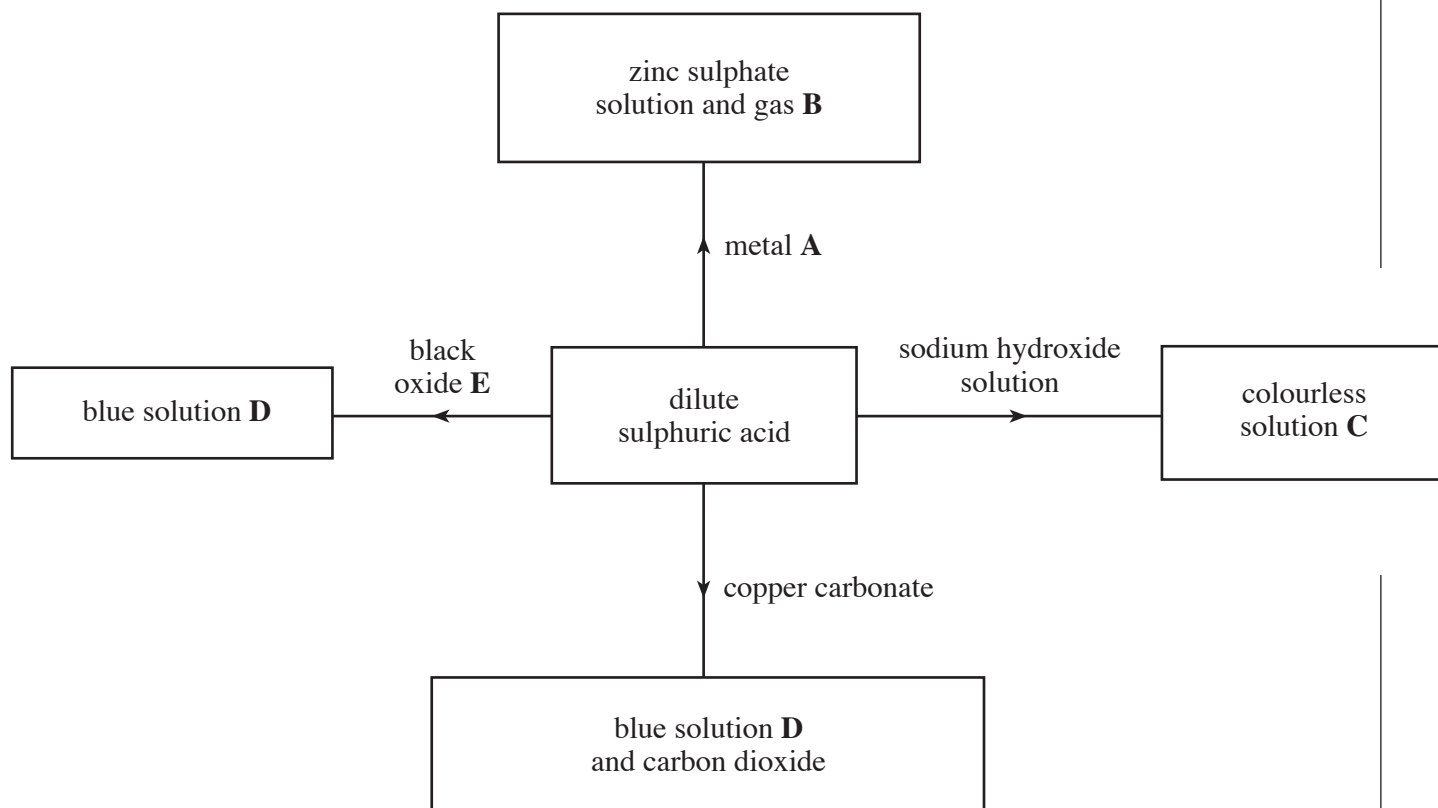
8. A small piece of magnesium ribbon was placed into excess dilute hydrochloric acid in a boiling tube. The temperature of the reaction mixture was recorded using a temperature sensor and displayed on a computer screen.





- (i) Use the graph to give the
- I. temperature of the acid at the start of the experiment, [1]  
..... °C
  - II. maximum temperature reached during the experiment, [1]  
..... °C
  - III. time taken until the reaction stopped. [1]  
..... seconds
- (ii) Give **one** advantage of using a computer to record the temperature. [1]  
.....
- (iii) Describe **one** observation which suggests that a chemical change is occurring when magnesium is added to dilute acid. [1]  
.....

9. The diagram below shows some reactions of dilute sulphuric acid.



Give the name for

- |  |       |     |
|--|-------|-----|
| (i) metal <b>A</b> ,                     | ..... | [1] |
| (ii) gas <b>B</b> ,                      | ..... | [1] |
| (iii) the colourless solution <b>C</b> , | ..... | [1] |
| (iv) the blue solution <b>D</b> ,        | ..... | [1] |
| (v) black oxide <b>E</b> .               | ..... | [1] |

**FORMULAE FOR SOME COMMON IONS**

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	$\text{Al}^{3+}$	Bromide	$\text{Br}^-$
Ammonium	$\text{NH}_4^+$	Carbonate	$\text{CO}_3^{2-}$
Barium	$\text{Ba}^{2+}$	Chloride	$\text{Cl}^-$
Calcium	$\text{Ca}^{2+}$	Fluoride	$\text{F}^-$
Copper(II)	$\text{Cu}^{2+}$	Hydroxide	$\text{OH}^-$
Hydrogen	$\text{H}^+$	Iodide	$\text{I}^-$
Iron(II)	$\text{Fe}^{2+}$	Nitrate	$\text{NO}_3^-$
Iron(III)	$\text{Fe}^{3+}$	Oxide	$\text{O}^{2-}$
Lithium	$\text{Li}^+$	Sulphate	$\text{SO}_4^{2-}$
Magnesium	$\text{Mg}^{2+}$		
Nickel	$\text{Ni}^{2+}$		
Potassium	$\text{K}^+$		
Silver	$\text{Ag}^+$		
Sodium	$\text{Na}^+$		

# PERIODIC TABLE OF ELEMENTS

**1 2****Group****3****4****5****6****7****0**

$\begin{matrix} 7 & \text{Li} \\ 3 & \end{matrix}$ Lithium	$\begin{matrix} 9 & \text{Be} \\ 4 & \end{matrix}$ Beryllium	$\begin{matrix} 11 & \text{Na} \\ 11 & \end{matrix}$ Sodium	$\begin{matrix} 12 & \text{Mg} \\ 12 & \end{matrix}$ Magnesium	$\begin{matrix} 13 & \text{Al} \\ 13 & \end{matrix}$ Aluminium	$\begin{matrix} 14 & \text{Si} \\ 14 & \end{matrix}$ Silicon	$\begin{matrix} 15 & \text{P} \\ 15 & \end{matrix}$ Phosphorus	$\begin{matrix} 16 & \text{S} \\ 16 & \end{matrix}$ Sulphur	$\begin{matrix} 17 & \text{Cl} \\ 17 & \end{matrix}$ Chlorine	$\begin{matrix} 18 & \text{Ar} \\ 18 & \end{matrix}$ Argon	$\begin{matrix} 19 & \text{K} \\ 19 & \end{matrix}$ Potassium	$\begin{matrix} 20 & \text{Ca} \\ 20 & \end{matrix}$ Calcium	$\begin{matrix} 21 & \text{Sc} \\ 21 & \end{matrix}$ Scandium	$\begin{matrix} 22 & \text{Ti} \\ 22 & \end{matrix}$ Titanium	$\begin{matrix} 23 & \text{V} \\ 23 & \end{matrix}$ Vanadium	$\begin{matrix} 24 & \text{Cr} \\ 24 & \end{matrix}$ Chromium	$\begin{matrix} 25 & \text{Mn} \\ 25 & \end{matrix}$ Manganese	$\begin{matrix} 26 & \text{Fe} \\ 26 & \end{matrix}$ Iron	$\begin{matrix} 27 & \text{Co} \\ 27 & \end{matrix}$ Cobalt	$\begin{matrix} 28 & \text{Ni} \\ 28 & \end{matrix}$ Nickel	$\begin{matrix} 29 & \text{Cu} \\ 29 & \end{matrix}$ Copper	$\begin{matrix} 30 & \text{Zn} \\ 30 & \end{matrix}$ Zinc	$\begin{matrix} 31 & \text{Ga} \\ 31 & \end{matrix}$ Gallium	$\begin{matrix} 32 & \text{Ge} \\ 32 & \end{matrix}$ Germanium	$\begin{matrix} 33 & \text{As} \\ 33 & \end{matrix}$ Arsenic	$\begin{matrix} 34 & \text{Se} \\ 34 & \end{matrix}$ Selenium	$\begin{matrix} 35 & \text{Br} \\ 35 & \end{matrix}$ Bromine	$\begin{matrix} 36 & \text{Kr} \\ 36 & \end{matrix}$ Krypton	$\begin{matrix} 37 & \text{Rb} \\ 37 & \end{matrix}$ Rubidium	$\begin{matrix} 38 & \text{Sr} \\ 38 & \end{matrix}$ Strontium	$\begin{matrix} 39 & \text{Y} \\ 39 & \end{matrix}$ Yttrium	$\begin{matrix} 40 & \text{Zr} \\ 40 & \end{matrix}$ Zirconium	$\begin{matrix} 41 & \text{Nb} \\ 41 & \end{matrix}$ Niobium	$\begin{matrix} 42 & \text{Mo} \\ 42 & \end{matrix}$ Molybdenum	$\begin{matrix} 43 & \text{Tc} \\ 43 & \end{matrix}$ Technetium	$\begin{matrix} 44 & \text{Ru} \\ 44 & \end{matrix}$ Ruthenium	$\begin{matrix} 45 & \text{Rh} \\ 45 & \end{matrix}$ Rhodium	$\begin{matrix} 46 & \text{Pd} \\ 46 & \end{matrix}$ Palladium	$\begin{matrix} 47 & \text{Ag} \\ 47 & \end{matrix}$ Silver	$\begin{matrix} 48 & \text{Cd} \\ 48 & \end{matrix}$ Cadmium	$\begin{matrix} 49 & \text{In} \\ 49 & \end{matrix}$ Indium	$\begin{matrix} 50 & \text{Sn} \\ 50 & \end{matrix}$ Tin	$\begin{matrix} 51 & \text{Sb} \\ 51 & \end{matrix}$ Antimony	$\begin{matrix} 52 & \text{Te} \\ 52 & \end{matrix}$ Tellurium	$\begin{matrix} 53 & \text{I} \\ 53 & \end{matrix}$ Iodine	$\begin{matrix} 54 & \text{Xe} \\ 54 & \end{matrix}$ Xenon	$\begin{matrix} 55 & \text{Cs} \\ 55 & \end{matrix}$ Caesium	$\begin{matrix} 56 & \text{Ba} \\ 56 & \end{matrix}$ Barium	$\begin{matrix} 57 & \text{La} \\ 57 & \end{matrix}$ Lanthanum	$\begin{matrix} 58 & \text{Ce} \\ 58 & \end{matrix}$ Cerium	$\begin{matrix} 59 & \text{Pr} \\ 59 & \end{matrix}$ Praseodymium	$\begin{matrix} 60 & \text{Nd} \\ 60 & \end{matrix}$ Neodymium	$\begin{matrix} 61 & \text{Pm} \\ 61 & \end{matrix}$ Promethium	$\begin{matrix} 62 & \text{Sm} \\ 62 & \end{matrix}$ Samarium	$\begin{matrix} 63 & \text{Eu} \\ 63 & \end{matrix}$ Europium	$\begin{matrix} 64 & \text{Gd} \\ 64 & \end{matrix}$ Gadolinium	$\begin{matrix} 65 & \text{Tb} \\ 65 & \end{matrix}$ Terbium	$\begin{matrix} 66 & \text{Dy} \\ 66 & \end{matrix}$ Dysprosium	$\begin{matrix} 67 & \text{Ho} \\ 67 & \end{matrix}$ Holmium	$\begin{matrix} 68 & \text{Er} \\ 68 & \end{matrix}$ Erbium	$\begin{matrix} 69 & \text{Tm} \\ 69 & \end{matrix}$ Thulium	$\begin{matrix} 70 & \text{Yb} \\ 70 & \end{matrix}$ Ytterbium	$\begin{matrix} 71 & \text{Lu} \\ 71 & \end{matrix}$ Lutetium	$\begin{matrix} 72 & \text{Hf} \\ 72 & \end{matrix}$ Hafnium	$\begin{matrix} 73 & \text{Ta} \\ 73 & \end{matrix}$ Tantalum	$\begin{matrix} 74 & \text{W} \\ 74 & \end{matrix}$ Tungsten	$\begin{matrix} 75 & \text{Re} \\ 75 & \end{matrix}$ Rhenium	$\begin{matrix} 76 & \text{Os} \\ 76 & \end{matrix}$ Osmium	$\begin{matrix} 77 & \text{Ir} \\ 77 & \end{matrix}$ Iridium	$\begin{matrix} 78 & \text{Pt} \\ 78 & \end{matrix}$ Platinum	$\begin{matrix} 79 & \text{Au} \\ 79 & \end{matrix}$ Gold	$\begin{matrix} 80 & \text{Hg} \\ 80 & \end{matrix}$ Mercury	$\begin{matrix} 81 & \text{Tl} \\ 81 & \end{matrix}$ Thallium	$\begin{matrix} 82 & \text{Pb} \\ 82 & \end{matrix}$ Lead	$\begin{matrix} 83 & \text{Bi} \\ 83 & \end{matrix}$ Bismuth	$\begin{matrix} 84 & \text{Po} \\ 84 & \end{matrix}$ Polonium	$\begin{matrix} 85 & \text{At} \\ 85 & \end{matrix}$ Astatine	$\begin{matrix} 86 & \text{Rn} \\ 86 & \end{matrix}$ Radon	$\begin{matrix} 87 & \text{Fr} \\ 87 & \end{matrix}$ Francium	$\begin{matrix} 88 & \text{Ra} \\ 88 & \end{matrix}$ Radium	$\begin{matrix} 89 & \text{Ac} \\ 89 & \end{matrix}$ Actinium
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Key:

