



Rewarding Learning

General Certificate of Secondary Education

Centre Number

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Candidate Number

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Single Award Science: Chemistry

Unit 2

Higher Tier



[GSA22]

GSA22

Assessment

TIME

1 hour.

Assessment Level of Control:

Tick the relevant box (✓)

Controlled Conditions	
Other	

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **3(e)**.

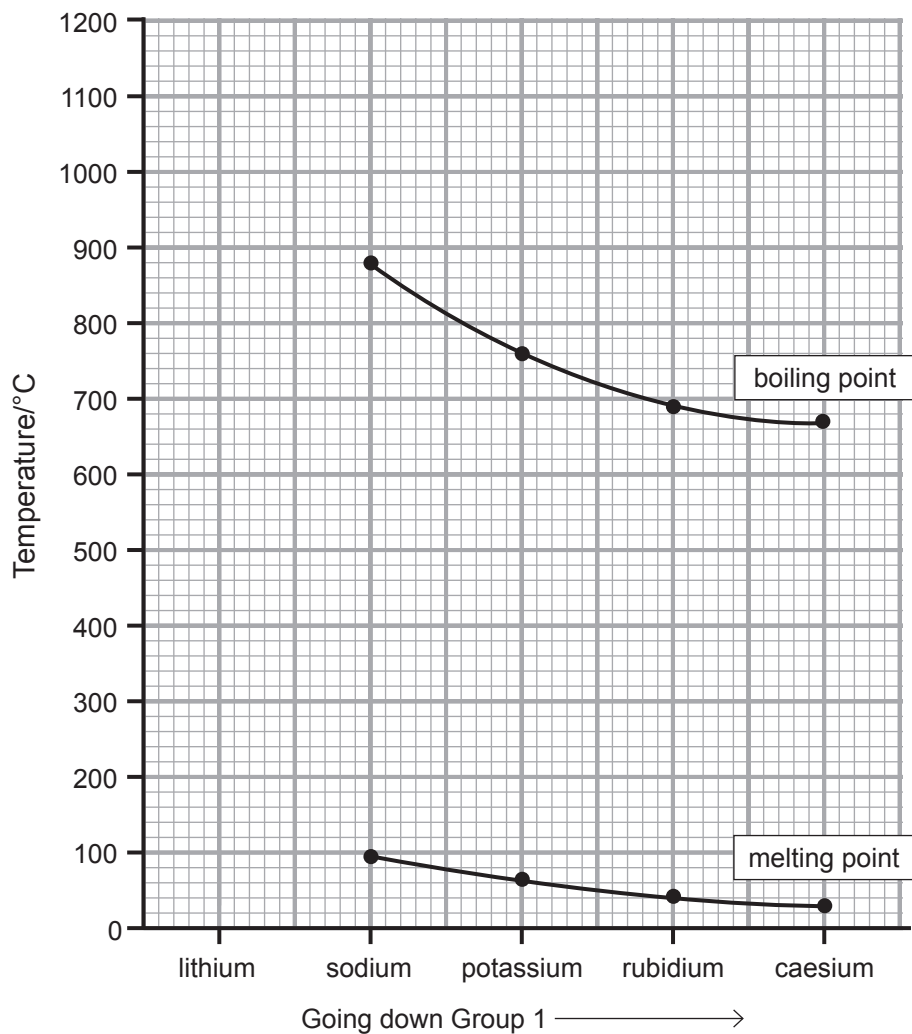
A Data Leaflet, which includes a Periodic Table of the Elements, is included for your use.

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24GSA2201

- 1 The graph below shows the melting points and boiling points of some Group 1 metals.



Source: ©CCEA

- (a) State the trend shown by the **melting points**.

[1]



- (b) Give **one** difference in the trend of the boiling points compared to the trend of the melting points.

_____ [1]

- (c) Predict the **melting point** of lithium.

_____ °C [1]

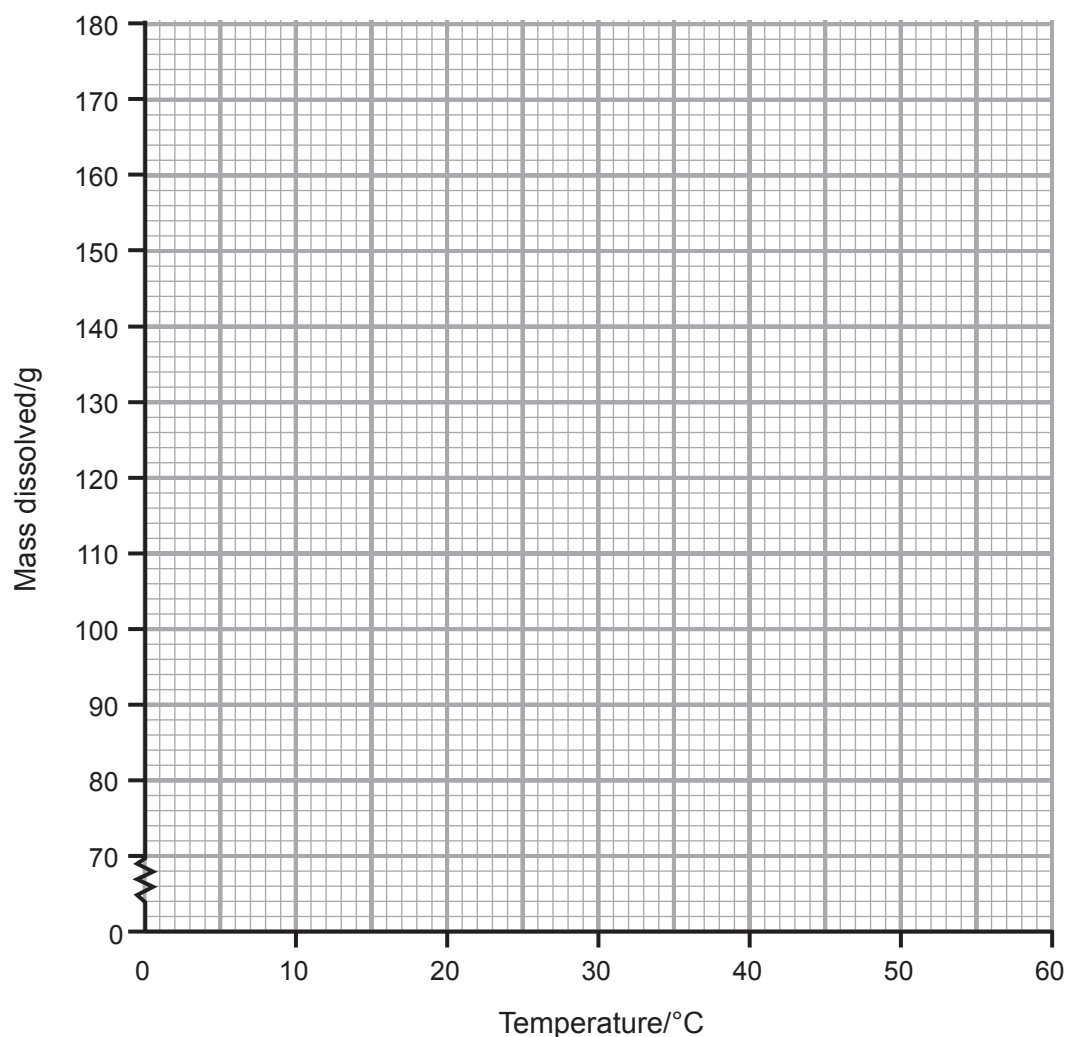
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- 2 A student investigated the maximum mass of a solid that could be dissolved in 100 g of water at different temperatures. The results are shown below.

Temperature/°C	10	20	30	40	50	60
Mass dissolved/g	76.0	123.0	159.0	180.0	180.0	180.0

- (a) On the grid below, plot and draw a line graph of these results.



[3]

- (b) State fully the trend shown by these results.

[2]



- (c) Suggest **one** reason why results could not be obtained for water at temperatures of 0 °C and below.

[1]

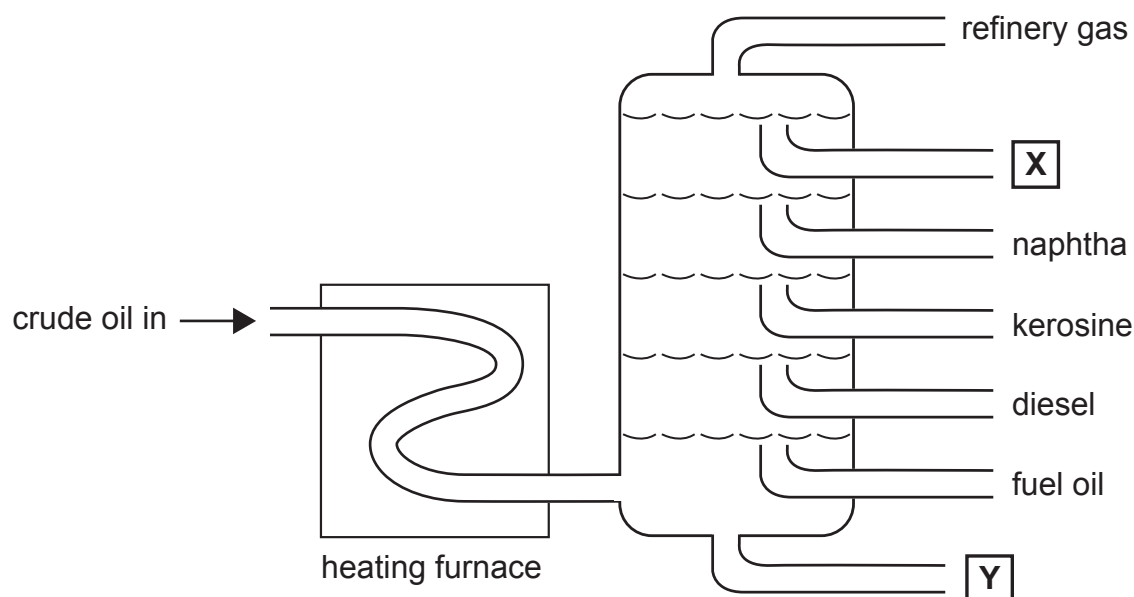
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24GSA2205

- 3 The diagram below shows how hydrocarbons are extracted from crude oil.



Source: ©CCEA

- (a) Name the process, shown above, that is used to separate hydrocarbons.

_____ [1]

- (b) Complete the following sentence.

Hydrocarbons can be separated using this process because they have

different _____. [1]

- (c) Name the fractions labelled **X** and **Y** on the diagram.

X _____

Y _____ [2]



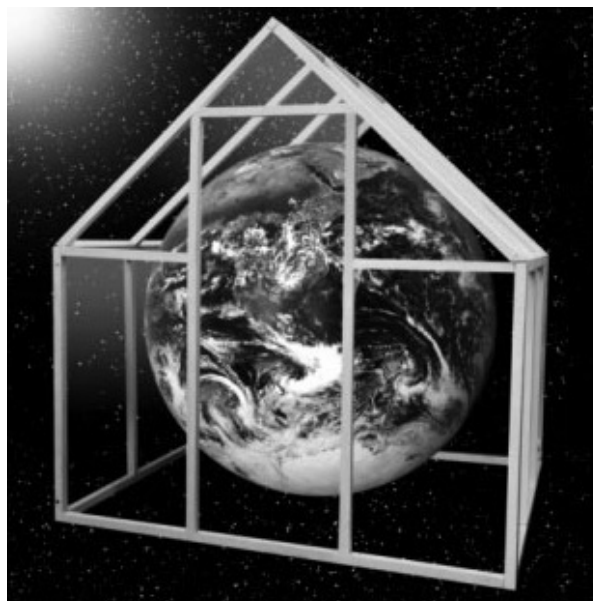
- (d) Refinery gas is mostly made of methane (CH_4). In the box below draw the structure of methane.



[1]



The burning of hydrocarbons is a major source of air pollution and scientists think this is causing an increase in the greenhouse effect.



Source: ©Gettyimages

- (e) Describe how burning hydrocarbons can cause an increase in the greenhouse effect.

Your answer should include:

- the names of the **two** products formed when hydrocarbons burn; and
- **two** consequences of the greenhouse effect.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.





[6]

[Turn over



- 4 The table below shows the approximate melting and boiling points of four metals.

Metal	Melting point/°C	Boiling point/°C
silver	960	2160
iron	1540	2760
magnesium	650	1100
mercury	−40	355

Use information from the table to answer the questions below.

- (a) Name the metal that is a liquid at 0 °C.

_____ [1]

- (b) Name the metal that is a solid at 1000 °C.

_____ [1]

- (c) Name the metal that is a liquid over the largest range of temperatures.

_____ [1]





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(Questions continue overleaf)

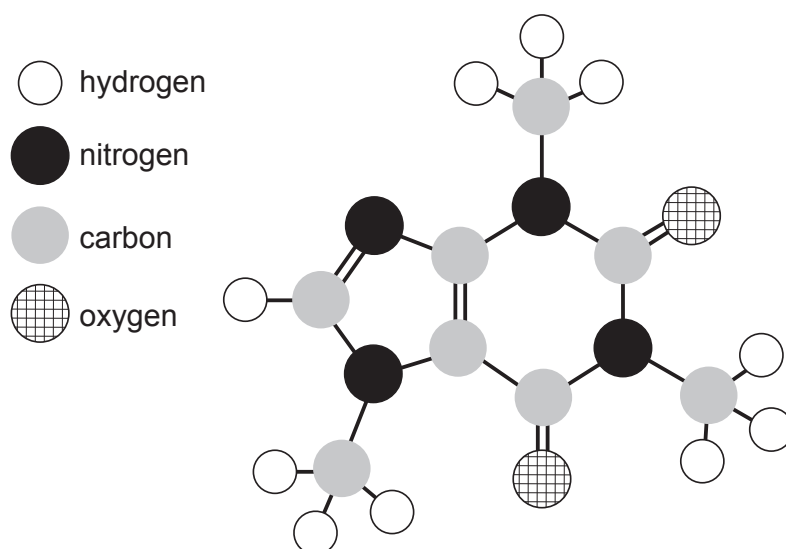
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24GSA2211

- 5 Caffeine is a compound that can be found in tea, coffee and energy drinks. Its structure is shown below.



Source: ©CCEA

- (a) How does the diagram show that caffeine is a compound?

[2]

- (b) The table below shows the mass of caffeine in different drinks.

Drink	Volume in one serving/cm ³	Mass of caffeine in one serving/mg
black tea	240	60.0
green tea	120	12.5
coffee	240	150.0
energy drink	480	80.0
decaffeinated coffee	240	20.0

- (i) Name the drink that has the **most** caffeine in one serving.

[1]



(ii) Name the drink that has the **least** caffeine in 480 cm³.

_____ [1]

The recommended maximum intake of caffeine for a pregnant woman is 200 mg per day.

(iii) Calculate the number of full servings of **black tea** that a pregnant woman can drink per day, without going over the recommended caffeine limit.

_____ [1]

[Turn over]

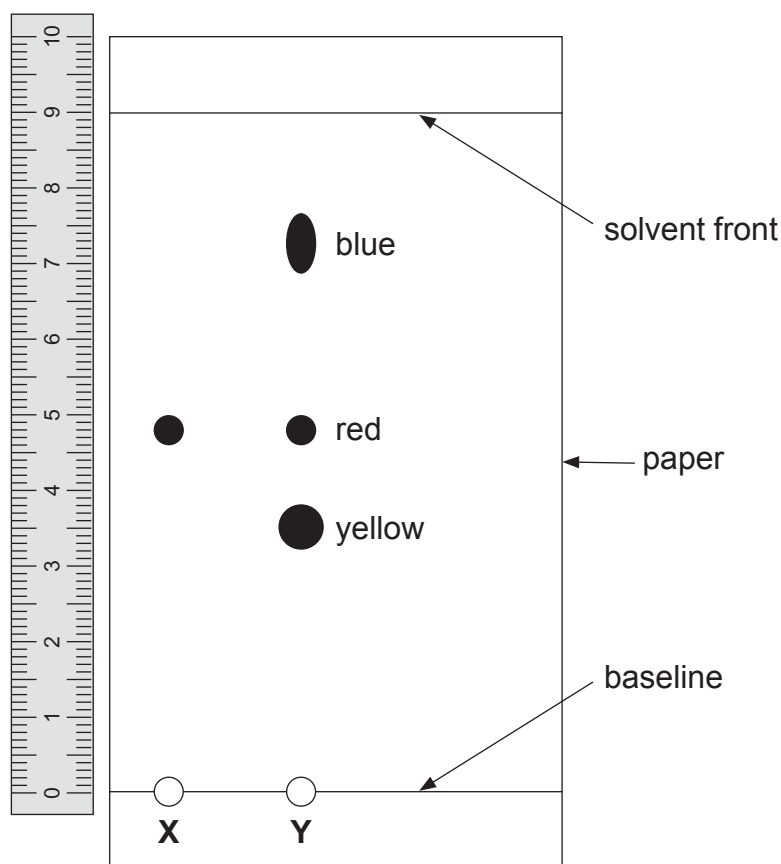
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24GSA2213

- 6 Paper chromatography can be used to separate the different solutes from a mixture. The different solutes are carried by the solvent at different rates, so they separate.

The diagram below shows the results of a chromatography experiment.



Source: ©CCEA

- (a) In this chromatography experiment, the paper is the stationary phase. What name is given to the solvent in this process?

_____ [1]

- (b) Explain why the baseline is drawn in pencil.

_____ [1]



(c) Which substance (**X** or **Y**) is a pure substance? Explain your choice.

[1]

Each solute has a different R_f value.

(d) Calculate the R_f value for the red dye. Give your answer to **one** decimal place.

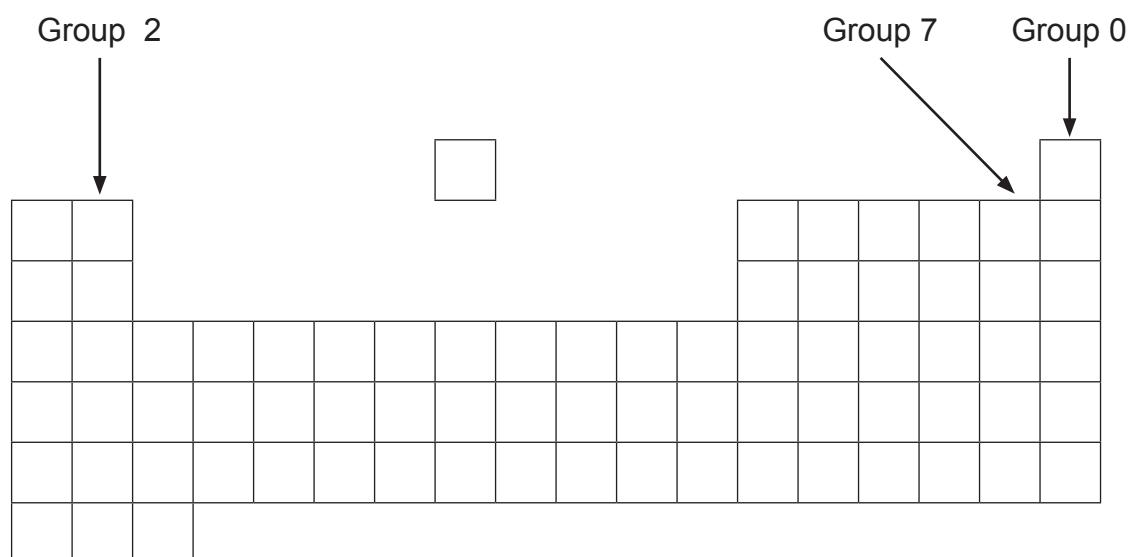
(Show your working out.)

[3]

[Turn over



7 The diagram below represents the Periodic Table.



Source: ©CCEA

(a) What name is given to the elements in:

Group 2? _____

Group 7? _____ [2]

(b) The table below shows information about the elements in Group 0.

Element	Atomic number	Density/ mg/cm ³
helium	2	0.1786
neon	10	0.9002
argon	18	1.7818
krypton	36	3.7080
xenon	54	5.8510



(i) What is meant by the term **atomic number**?

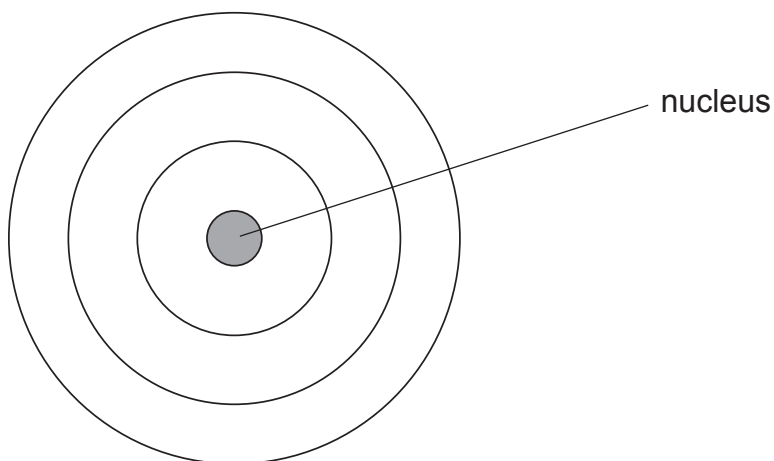
[1]

(ii) Complete the following sentence to give the trend shown by the information in the table.

As the atomic number _____

[1]

(iii) Complete the diagram below to show the electron arrangement of an argon atom.



[1]

(iv) Explain, in terms of electrons, why Group 0 elements are unreactive.

[1]

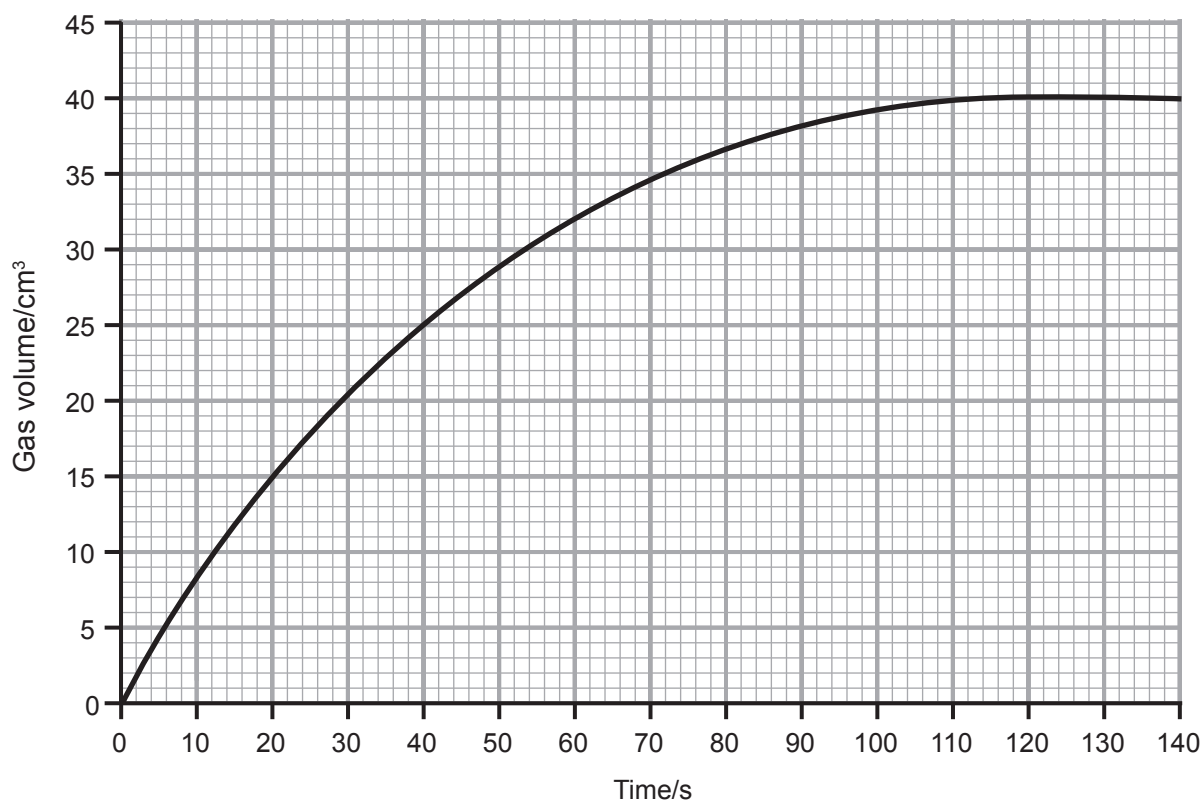
(v) What is the relative mass of an electron?

[1]

[Turn over



- 8 (a) Elaine investigated the reaction between magnesium ribbon and dilute hydrochloric acid. She recorded the volume of gas produced every 10 seconds. Her results are shown in the graph below.



Source: ©CCEA

- (i) What was the total volume of gas produced by this reaction?

_____ cm³ [1]

- (ii) At what time did the reaction finish?

_____ s [1]



(iii) Using your answers from (i) and (ii) and the equation:

$$\text{rate} = \frac{\text{total volume of gas}}{\text{time taken for reaction to finish}}$$

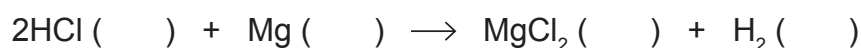
calculate the rate of this reaction.

_____ cm³/s [1]

- (b) State and explain, in terms of particles, the effect of increasing the **concentration** of hydrochloric acid on the rate of reaction with magnesium ribbon.

_____ [3]

- (c) Add state symbols to the balanced symbol equation below for this reaction.



[2]

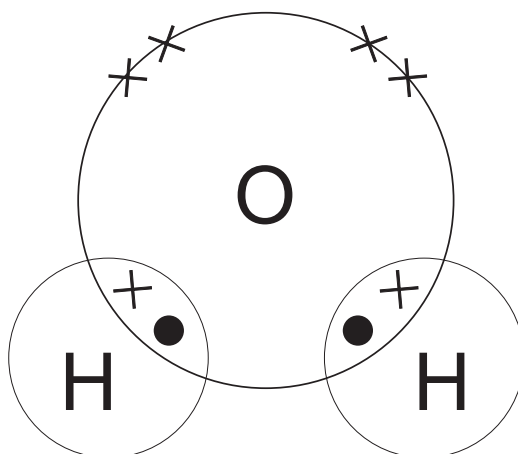
- (d) Elaine's teacher suggested that she could add a catalyst to the reaction. What is meant by the term **catalyst**?

_____ [2]

[Turn over



- 9 The diagram below shows the bonding in a molecule of water.



- (a) How many lone pairs of electrons are present in a molecule of water?

_____ [1]

- (b) Name the type of bonding in a water molecule and describe the bonding in terms of electrons and atoms present.

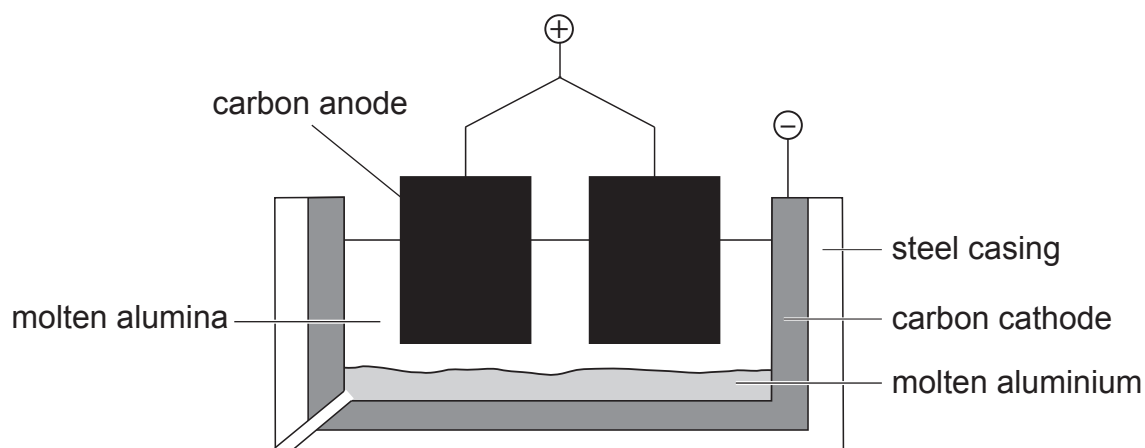
_____ [3]

- (c) Name an **element** that has the same type of bonding as water.

_____ [1]



10 Aluminium can be extracted from its purified ore (alumina) as shown below.



Source: Principal Examiner

(a) Molten alumina is the electrolyte.

(i) What is meant by the term **electrolyte**?

_____ [1]

(ii) Name the ore from which the alumina is purified.

_____ [1]

(b) Explain fully why the carbon anode must be replaced periodically.

_____ [2]

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For Examiner's
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Examiner Number

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