

Paper Reference(s) 1SC0/1CF

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Combined Science
Paper 2: Chemistry 1
Foundation Tier

Thursday 16 May 2019 – Morning

**Time: 1 hour 10 minutes plus your additional
time allowance**

INSTRUCTIONS TO CANDIDATES
**Write your centre number, candidate number,
surname, other names and your signature in
the boxes below. Check that you have the
correct question paper.**

Centre No.					
Candidate No.					
Surname					
Other names					
Signature					
Paper Reference	1	S	C	0	/ 1 C F

- **Use BLACK ink or ball-point pen.**
- **Answer ALL questions.**
- **Answer the questions in the spaces provided – there may be more space than you need.**
- **Calculators may be used.**
- **Any diagrams may NOT be accurately drawn, unless otherwise indicated.**
- **You must show all your working out with your answer clearly identified at the end of your solution.**

MATERIALS REQUIRED FOR EXAMINATION

Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS

Periodic Table

INFORMATION FOR CANDIDATES

- **The total mark for this paper is 60.**
- **The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**

(Instructions continue on next page)

(Turn over)

- In questions marked with an **ASTERISK (*)**, marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- A Periodic Table is provided.

ADVICE TO CANDIDATES

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

(Turn over)

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

1 The three states of matter are solid, liquid and gas.

(a) What is the name of the change of state when a liquid changes into a solid? (1 mark)

☐ **A condensation**

☐ **B evaporation**

☐ **C freezing**

☐ **D melting**

(Question continues on next page)

(Turn over)

(b) A gas was left to cool to form a liquid.

Figure 1 shows how the temperature of the substance changed with time.

temperature
in $^{\circ}\text{C}$

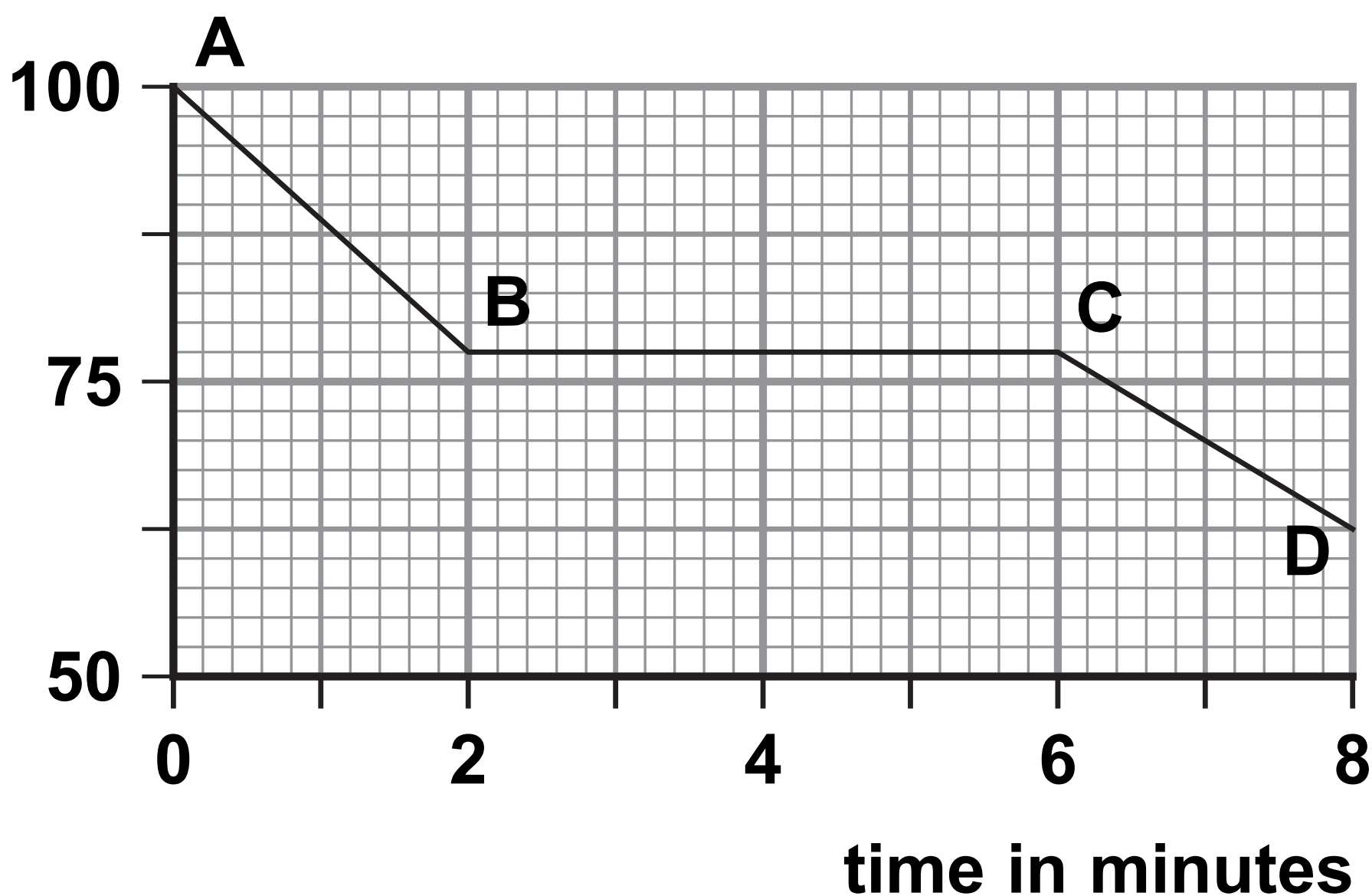


Figure 1

From A to B the substance is a gas.

From C to D the substance is a liquid.

(Question continues on next page)

(Turn over)

- (i) State the time when the gas first started to form a liquid. (1 mark)**

_____ minutes

- (ii) Calculate the number of minutes it took from the gas first starting to form a liquid until the substance was completely liquid. (1 mark)**

_____ minutes

(Question continues on next page)

(Turn over)

(c) Figure 2 shows the melting points and boiling points of four substances, W, X, Y and Z.

substance	melting point in °C	boiling point in °C
W	−220	−188
X	−101	−34
Y	−7	59
Z	114	184

Figure 2

Using the information in Figure 2

- (i) give the letter of the substance that is a solid at 20 °C (1 mark)**

(Question continues on next page)

(Turn over)

(ii) give the letter of a substance that is a liquid at 50 °C (1 mark)

(d) The diagrams on page 9 show particles in five different structures. The different circles show different particles.

Draw one straight line from each substance to its structure. (2 marks)

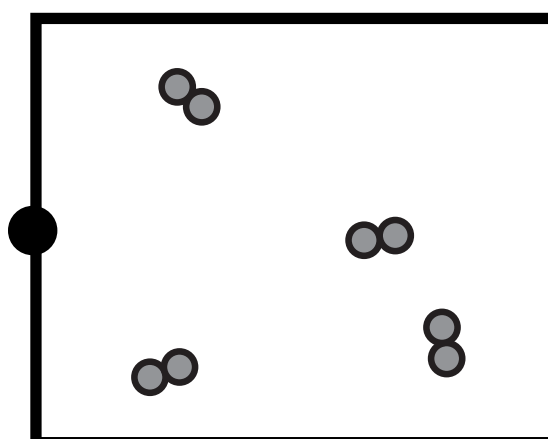
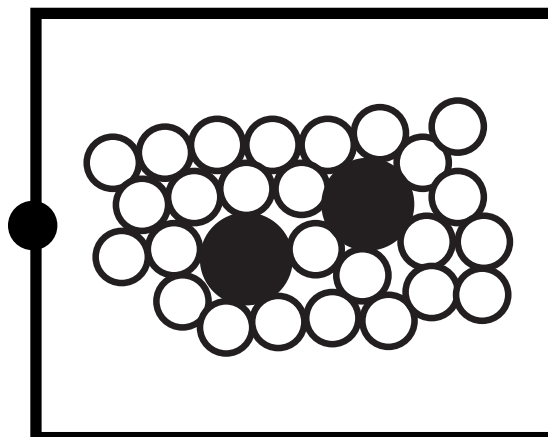
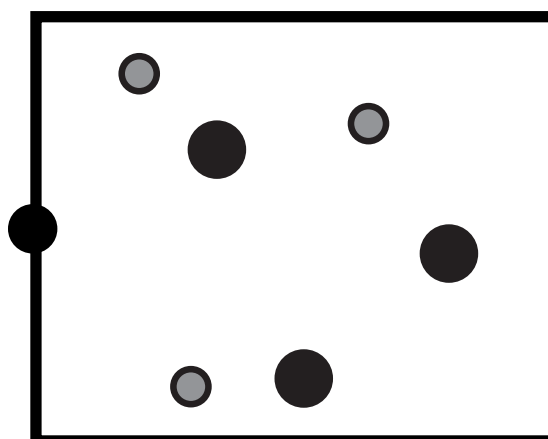
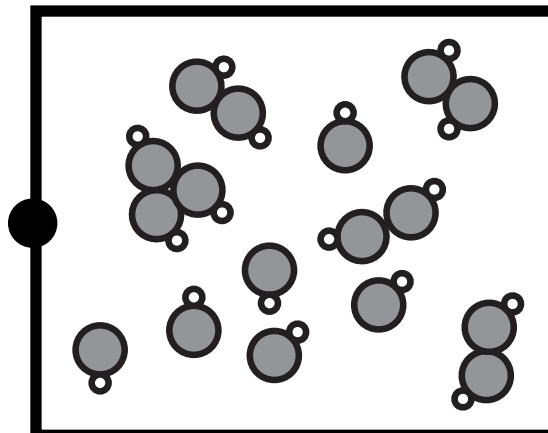
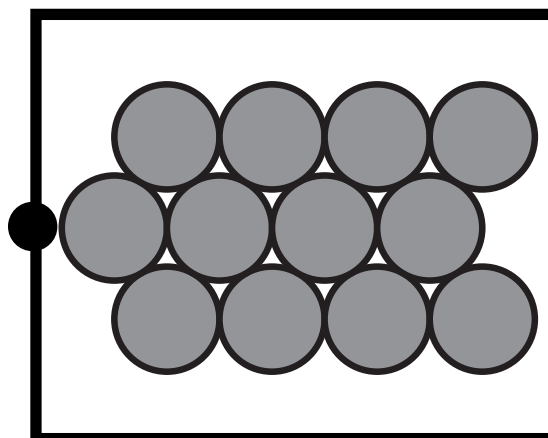
(Question continues on next page)

(Turn over)

substance**particles in structures**

**solid zinc
metal, Zn(s)**

**hydrogen gas,
H₂(g)**



(TOTAL FOR QUESTION 1 = 7 MARKS)

(Questions continue on next page)

(Turn over)

2 Mixtures of substances can be separated using different techniques.

(a) Which of the following is a mixture of substances? (1 mark)

☐ **A air**

☐ **B carbon dioxide**

☐ **C gold**

☐ **D titanium**

(b) Figure 3 on page 11 shows the apparatus that a student set up to obtain pure water from ink.

There are three mistakes in the way the apparatus has been set up.

(Question continues on next page)

(Turn over)

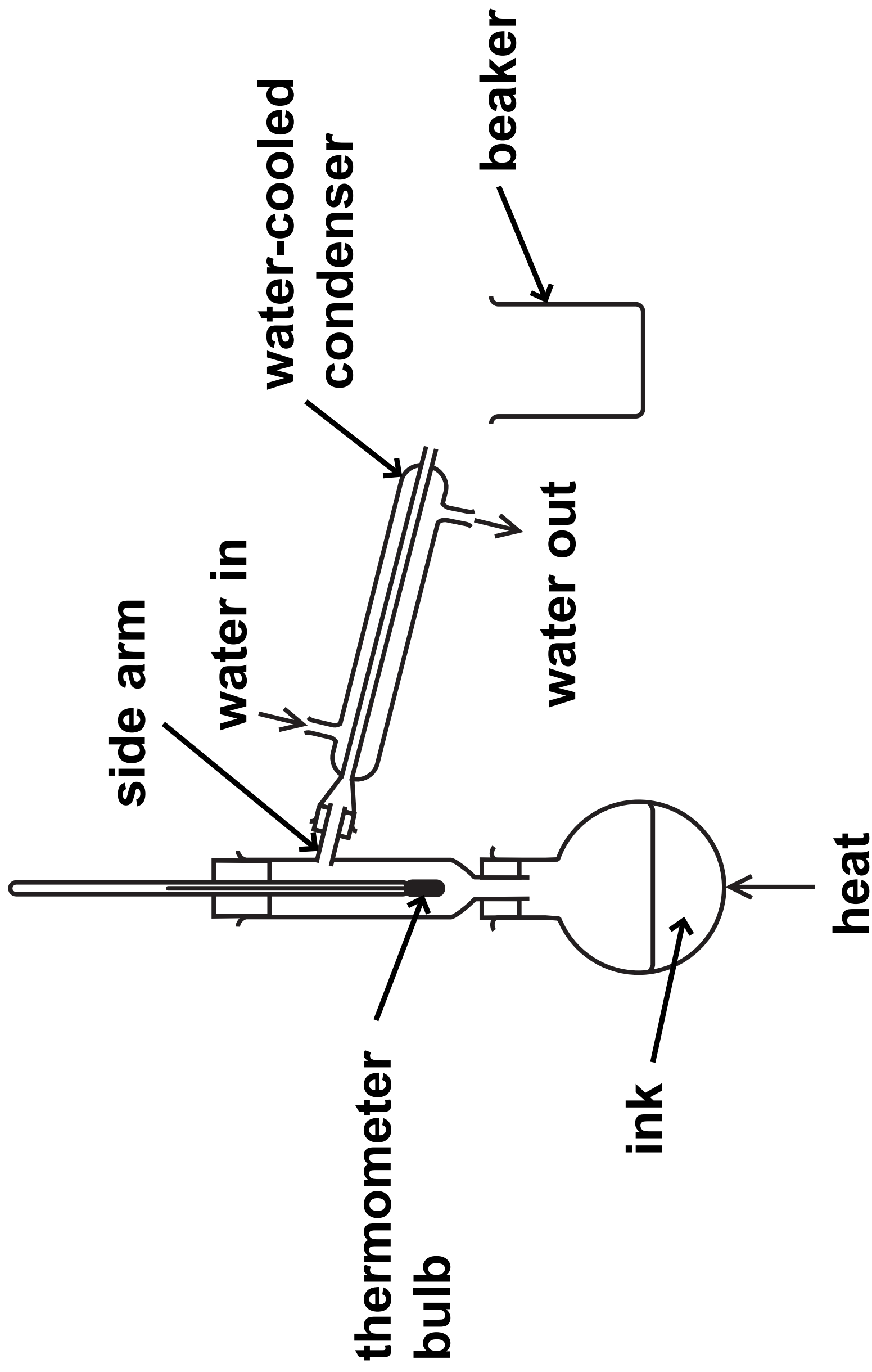


Figure 3

(Question continues on next page)

(Turn over)

- (i) One mistake is that the bulb of the thermometer is too low.

The bulb of the thermometer should be level with the side arm.

Give a reason why the bulb of the thermometer should be level with the side arm. (1 mark)

(Question continues on next page)

(Turn over)

(ii) State ONE other mistake in Figure 3. (1 mark)

(Question continues on next page)

(c) Paper chromatography is used to separate the substances in five different food colourings, P, Q, R, S and T.

Figure 4 shows the chromatogram at the end of the experiment.

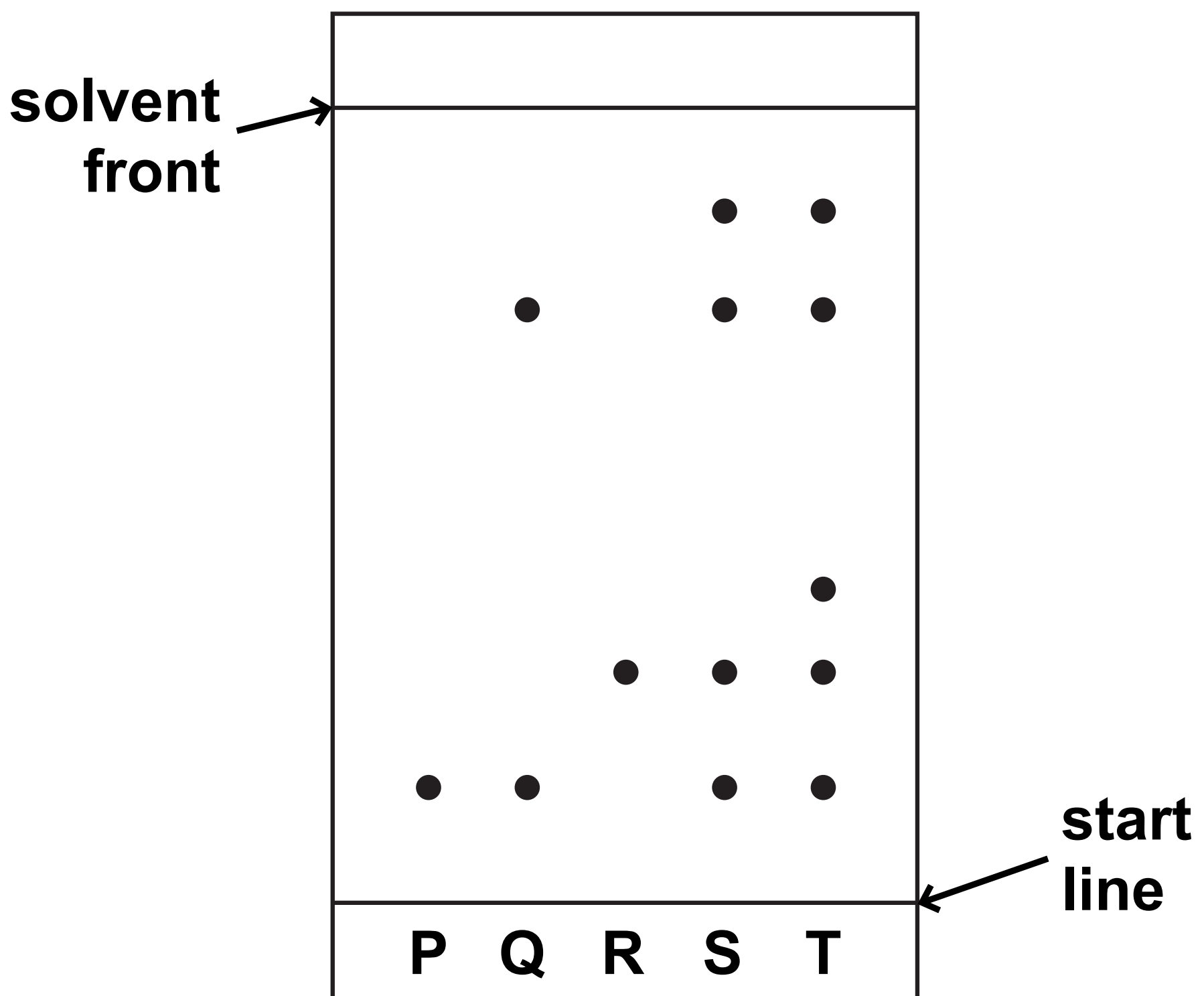


Figure 4

(Question continues on next page)

(Turn over)

(i) The steps needed to carry out the chromatography experiment are listed below.

They are not in the correct order.

- 1 leave the solvent to rise up the paper**
- 2 put solvent in the beaker**
- 3 draw a start line on the piece of paper**
- 4 place the paper in the beaker**
- 5 remove the paper when the solvent is near the top**
- 6 put small spots of the food colourings on the start line**

List the steps in the correct order.

The first two steps have been done for you. (2 marks)

2	3				
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(Question continues on next page)

(Turn over)

- (ii) Explain, using Figure 4, which food colouring contains the greatest number of coloured substances. (2 marks)**

(Question continues on next page)

(Turn over)

- (iii) During chromatography of the food colourings, the solvent front moved 8.00 cm and the food colouring R moved 2.30 cm.

Calculate the R_f value for food colouring R.

Give your answer to two significant figures. (2 marks)

R_f value = _____

(TOTAL FOR QUESTION 2 = 9 MARKS)

(Questions continue on next page)

(Turn over)

- 3 (a) The reactivity of copper, magnesium and zinc was investigated. Each metal was placed separately in dilute hydrochloric acid. The amount of effervescence was observed.**

(i) The same mass of metal was used in each experiment. Which piece of apparatus should be used to find the mass of metal used? (1 mark)

- ☐ **A a balance**
- ☐ **B a pipette**
- ☐ **C a stopwatch**
- ☐ **D a thermometer**

(Question continues on next page)

(Turn over)

- (ii) State TWO variables, apart from the mass of the metals, that should be controlled in this investigation. (2 marks)**

1 _____

2 _____

(Question continues on next page)

(Turn over)

- (iii) Magnesium produces the most vigorous effervescence.
Copper does not produce any effervescence.**

**Give the reason why copper does not produce any effervescence.
(1 mark)**

(Question continues on next page)

(iv) The magnesium reacts with dilute hydrochloric acid to form magnesium chloride solution and hydrogen gas.

The equation for the reaction is



Fill in the missing state symbols in the spaces provided. (2 marks)

21

(Question continues on next page)

(Turn over)

(b) Potassium carbonate reacts with dilute sulfuric acid to form potassium sulfate.

(i) Potassium sulfate contains potassium ions, K^+ , and sulfate ions, SO_4^{2-} .

Write the formula of potassium sulfate. (1 mark)

(Question continues on next page)

(Turn over)

- (ii) Equal volumes of a solution of potassium carbonate were reacted separately with an excess of dilute sulfuric acid solution. Pure dry samples of potassium sulfate were obtained from the resulting solutions.**

The experiment was repeated three times using the same conditions.

The masses of potassium sulfate obtained were

experiment 1 = 5.22 g

experiment 2 = 5.24 g

experiment 3 = 5.21 g

(Question continues on next page)

(Turn over)

24

Calculate the mean mass of potassium sulfate obtained, giving your answer to two decimal places. (2 marks)

**mean mass of
potassium sulfate = _____ g**

(TOTAL FOR QUESTION 3 = 9 MARKS)

(Questions continue on next page)

(Turn over)

4 Metals are extracted from substances naturally occurring in the Earth's crust.

(a) Which of these metals is usually found uncombined in the Earth's crust? (1 mark)

☐ **A calcium**

☐ **B gold**

☐ **C iron**

☐ **D magnesium**

(Question continues on next page)

(Turn over)

(b) Zinc can be extracted by heating zinc oxide with carbon.

The products are zinc and carbon dioxide.

(i) Write the word equation for this reaction. (2 marks)

(ii) In this reaction zinc oxide loses oxygen.

**State the type of reaction taking place when an oxide loses oxygen.
(1 mark)**

(Question continues on next page)

(Turn over)

(c) Aluminium is extracted from aluminium oxide by electrolysis. Aluminium oxide is made up of ions.

(i) The formula of aluminium oxide is Al_2O_3 .

Give the number of ions in the formula Al_2O_3 . (1 mark)

(ii) Complete the balanced equation for the overall reaction by putting numbers in the spaces. (2 marks)



(Question continues on next page)

(Turn over)

- (d) (i) The environmental impact of a product is assessed in a life-cycle assessment.**

The stages in this assessment are given below.

They are not in the correct order.

- A disposal of the product**
- B manufacturing the product**
- C obtaining and processing the raw materials**
- D using the product**

List the stages of the life-cycle assessment, using letters A, B, C, D, in the correct order from start to finish. (2 marks)

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(Question continues on next page)

(Turn over)

- (ii) Aluminium can be obtained by recycling aluminium waste.

Give TWO advantages of obtaining aluminium by recycling aluminium waste rather than mining the raw material and extracting aluminium from that raw material. (2 marks)

1 _____

2 _____

(TOTAL FOR QUESTION 4 = 11 MARKS)

(Questions continue on next page)

(Turn over)

5 In Figure 5, the letters A, E, G, J, X and Z show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

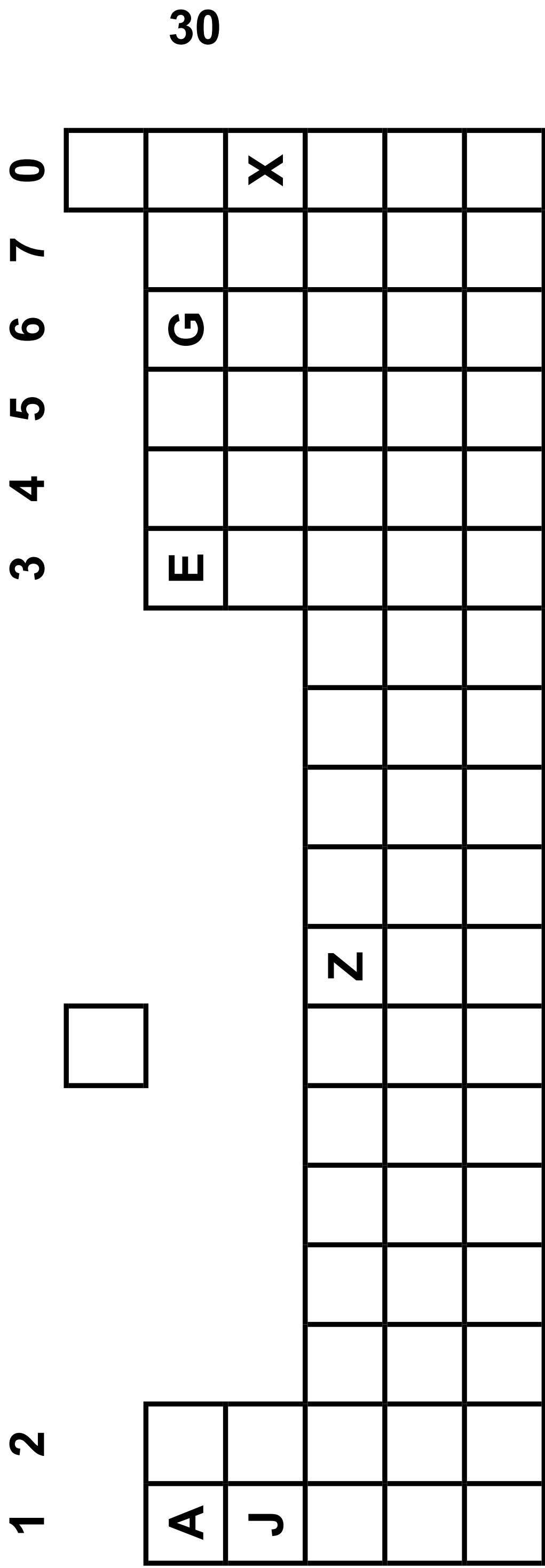


Figure 5

(Question continues on next page)

(Turn over)

(a) Using the letters A, E, G, J, X and Z

(i) give the letters of the TWO elements that are non-metals (1 mark)

(ii) give the letters of TWO elements in period 2 (1 mark)

(iii) give the letter of an element that normally forms an ion with a charge of +1. (1 mark)

(Question continues on next page)

(Turn over)

(b) Element E has an atomic number of 5. In a sample of E there are two isotopes. One isotope has a mass number of 10 and the other isotope has a mass number of 11.

(i) Explain, in terms of subatomic particles, what is meant by the term ISOTOPES. (2 marks)

(Question continues on next page)

(Turn over)

(ii) All atoms of element E in this sample contain (1 mark)

☐ **A 5 protons**

☐ **B 5 neutrons**

☐ **C 6 protons**

☐ **D 6 neutrons**

(c) Element X has an atomic number of 18.

State the electronic configuration of an atom of element X. (1 mark)

(Question continues on next page)

(Turn over)

(d) In an experiment, 3.5 g of element A reacted with 4.0 g of element G to form a compound.

Calculate the empirical formula of this compound.

(relative atomic masses: $A = 7$, $G = 16$)

**You must show your working.
(3 marks)**

(Continue your answer on next page)

(Turn over)

**empirical formula
of this compound = _____**

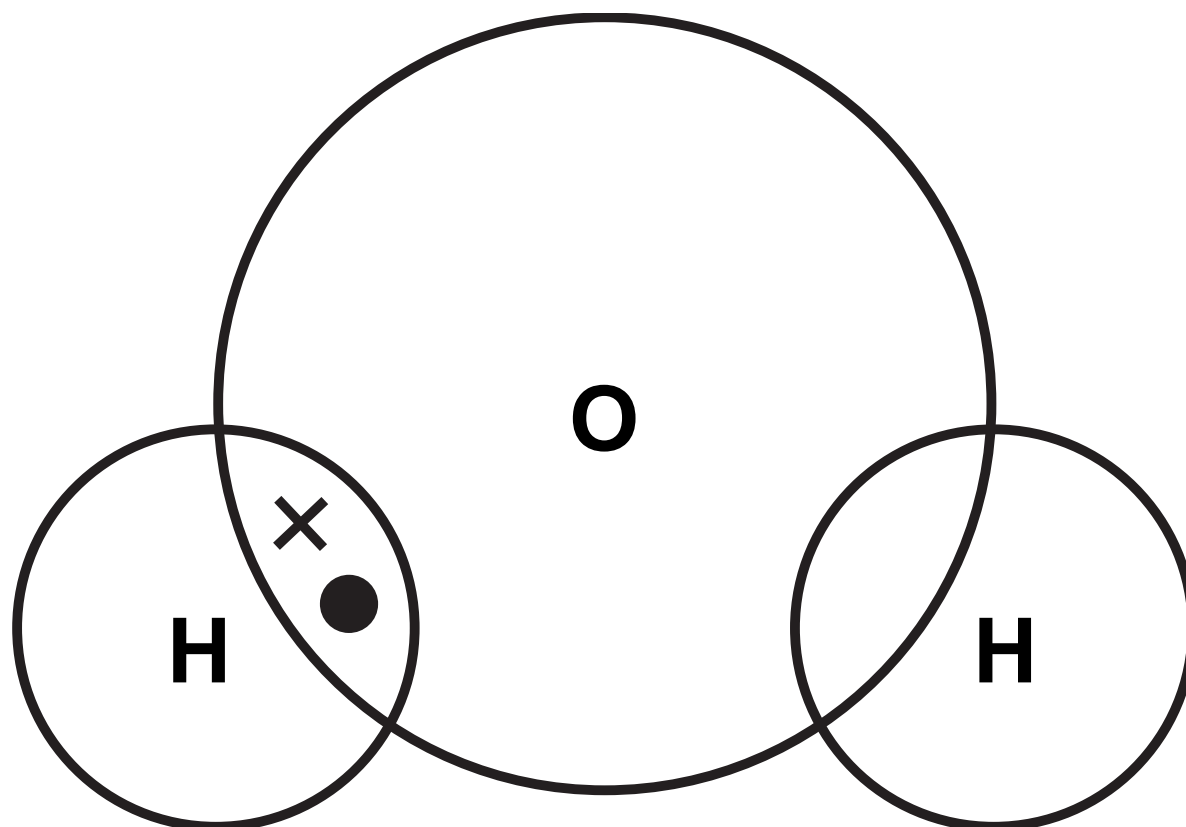
(Question continues on next page)

(e) An oxygen atom has six electrons in its outer shell.

A hydrogen atom has one electron in its outer shell.

Complete the dot and cross diagram of a molecule of water, H_2O .

**Show outer shell electrons only.
(2 marks)**



(TOTAL FOR QUESTION 5 = 12 MARKS)

(Questions continue on next page)

(Turn over)

**6 (a) Water, acidified with sulfuric acid, is decomposed by electrolysis.
The water is decomposed to produce hydrogen and oxygen.**

(i) A sample of hydrogen is mixed with air and ignited.

**State what would happen.
(1 mark)**

(Question continues on next page)

(Turn over)

- (ii) Throughout the experiment the volume of hydrogen and the volume of oxygen are measured at two-minute intervals.

The results are shown in Figure 6.

time in minutes	volume of hydrogen in cm ³	volume of oxygen in cm ³
0	0	0
2	4	2
4	8	4
6	12	6
8	16	8

Figure 6

(Question continues on next page)

(Turn over)

Describe, using the data in Figure 6, what the results show about the volumes of hydrogen and of oxygen produced in this experiment. (2 marks)

(Question continues on next page)

(b) Molten lead bromide is electrolysed.

**The products of this electrolysis are
(1 mark)**

- ☐ **A hydrogen and bromine**
- ☐ **B hydrogen and oxygen**
- ☐ **C lead and bromine**
- ☐ **D lead and oxygen**

(Question continues on next page)

(Turn over)

(c) Calcium nitrate and calcium carbonate are both ionic compounds.

Calcium nitrate mixed with water behaves as an electrolyte.

Calcium carbonate mixed with water does not behave as an electrolyte.

Explain, in terms of solubility and movement of ions, this difference in behaviour. (2 marks)

(Question continues on next page)

(Turn over)

***(d) Impure copper can be purified using electrolysis.**

In this electrolysis

- **the anode is made of impure copper**
- **the cathode is made from pure copper**
- **the electrolyte is copper sulfate solution.**

The apparatus at the start of the experiment is shown in Figure 7.

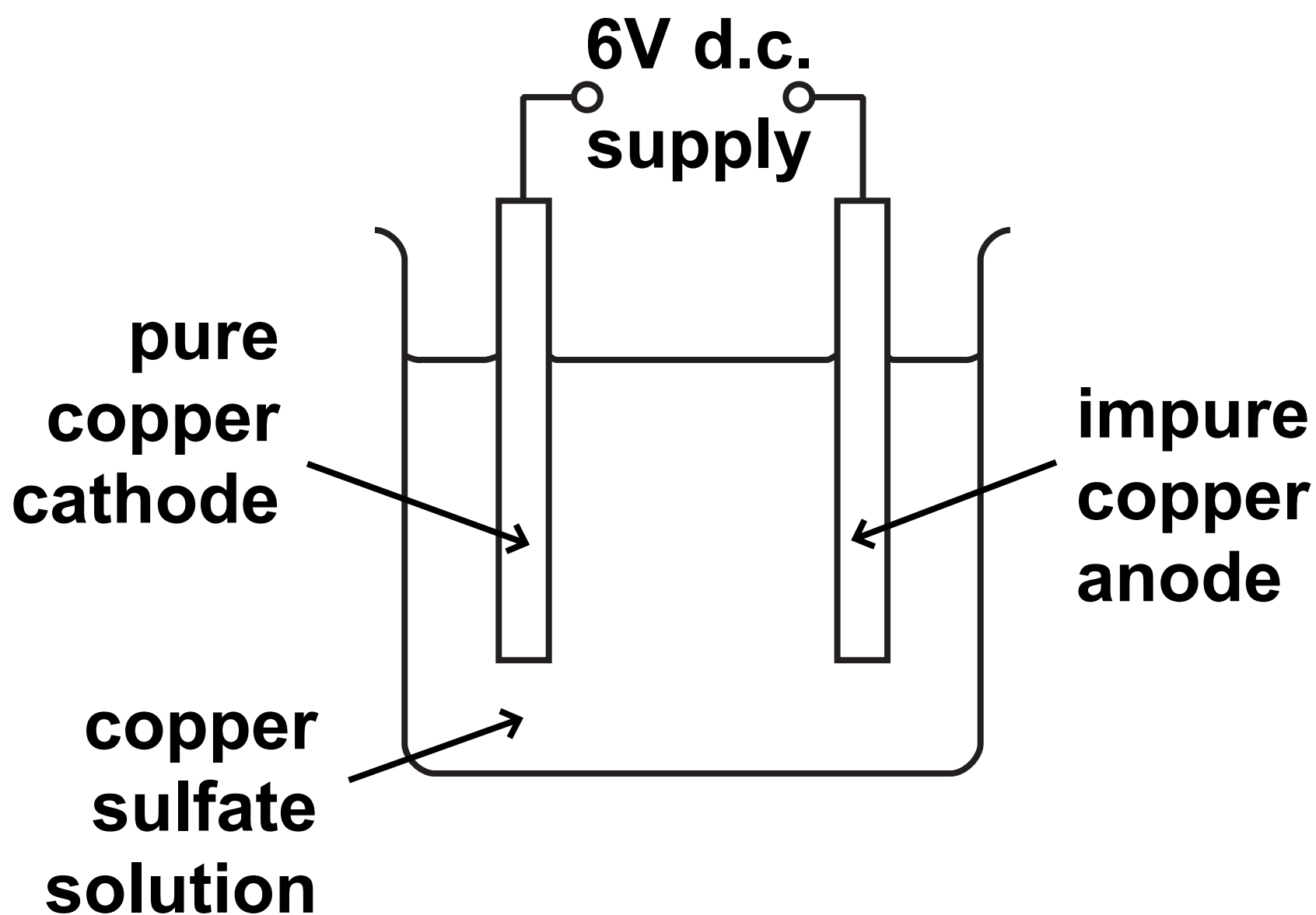


Figure 7

(Question continues on next page)

(Turn over)

During the electrolysis three observations are made

- **the sizes of both the anode and the cathode change**
- **a solid appears directly beneath the anode**
- **the colour of the copper sulfate solution does not change.**

**Explain all three observations.
(6 marks)**

(Continue your answer on next page)

(Turn over)

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(TOTAL FOR QUESTION 6 = 12 MARKS)

TOTAL FOR PAPER = 60 MARKS
END