

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International GCSE (9–1)

Monday 19 May 2025

Morning (Time: 1 hour 10 minutes) **Paper reference 4WSD3/1C**

Science (Double Award) (Modular)  

Chemistry
UNIT 3: 4WSD3
PAPER: 1C

You must have: Calculator, ruler	Total Marks
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Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in the calculations and state the units where required.

Information

- 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.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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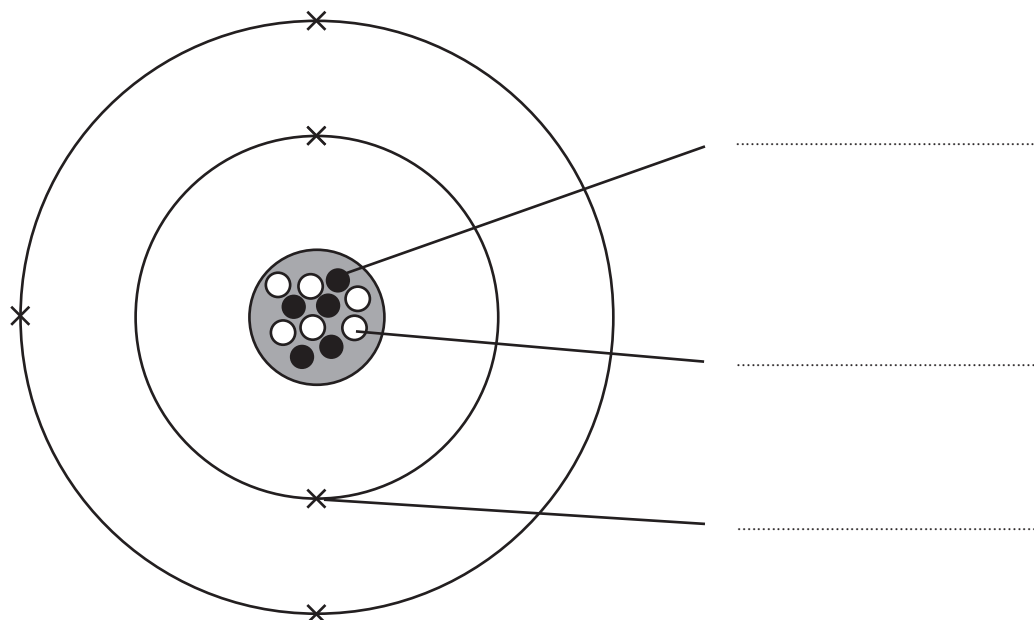
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Answer ALL questions.

Some questions must be answered with a cross ☒. 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 diagram represents an atom of an element.



- (a) Label the three sub-atomic particles on the diagram.

(3)

- (b) Use information from the diagram to complete the table for this element.

(4)

mass number	
group number	
period number	
electronic configuration	

- (c) Give the name of this element.

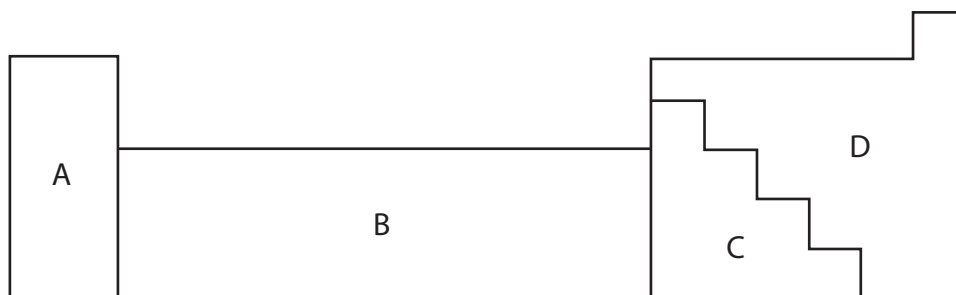
(1)

(Total for Question 1 = 8 marks)



2 This question is about metals and non-metals.

(a) The diagram shows four sections, A, B, C and D of the Periodic Table.



Use the diagram to answer these questions.

(i) Element X has a melting point of -220°C and does not conduct electricity.

Which section of this Periodic Table contains element X?

(1)

- ☐ A
- ☐ B
- ☐ C
- ☐ D

(ii) Element Y has three electron shells and the outer shell contains one electron.

Which section of this Periodic Table contains element Y?

(1)

- ☐ A
- ☐ B
- ☐ C
- ☐ D

(iii) Element Z conducts electricity and reacts violently with water.

Which section of this Periodic Table contains element Z?

(1)

- ☐ A
- ☐ B
- ☐ C
- ☐ D

(b) Neon is a noble gas.

State why neon does not readily react.

(1)

(c) Lithium and potassium have similar chemical properties.

(i) Give another element that will have similar chemical properties to these elements.

(1)

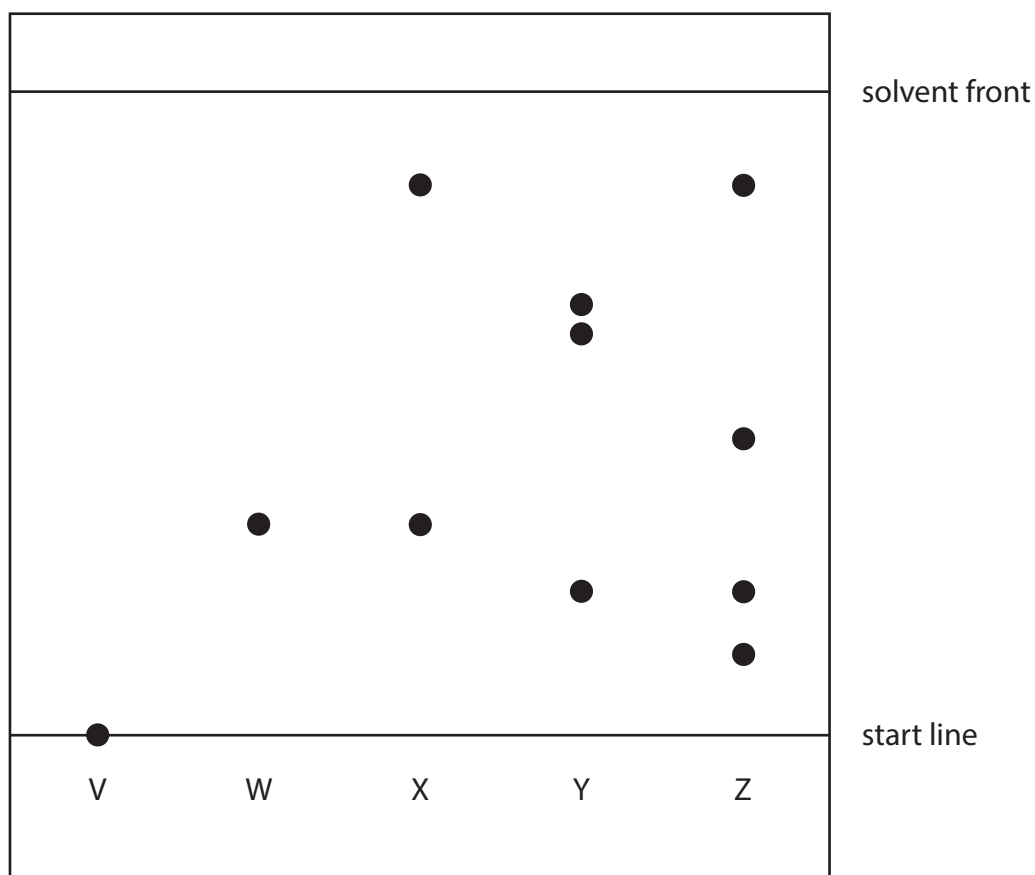
(ii) Explain why these elements have similar chemical properties.

(3)

(Total for Question 2 = 8 marks)

- 3 A student uses paper chromatography to investigate the dyes in five different inks, V, W, X, Y and Z.

The chromatogram shows the results of the investigation.



- (a) Explain why the start line on the paper is drawn in pencil rather than in ink.

(2)

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.....

.....

.....

- (b) Explain which two inks contain the dye that is most soluble in the solvent.

(2)

.....

.....

.....

.....

(c) Explain how the chromatogram shows that

- W contains only one dye
- V may contain more than one dye

(3)

(d) Calculate the R_f value for the dye in W.

Give your answer to two significant figures.

(4)

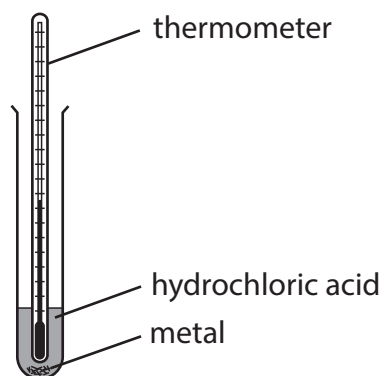
R_f value =

(Total for Question 3 = 11 marks)



- 4 (a) A student does an experiment to identify three metals, iron, magnesium and zinc.

The diagram shows some of the equipment provided.



Describe an experiment that the student could do to identify the three metals, by comparing their reactions with hydrochloric acid.

(6)



(b) Give the chemical equation for the reaction between magnesium and hydrochloric acid.

(2)

(c) Which of these metals is in Group 2?

(1)

- ☐ **A** copper
- ☐ **B** iron
- ☐ **C** magnesium
- ☐ **D** zinc

(Total for Question 4 = 9 marks)

5 (a) Butane (C_4H_{10}) is an alkane.

Explain why butane is a saturated hydrocarbon.

(3)

(b) (i) When butane burns completely in oxygen, carbon dioxide and water are produced.

Give a chemical equation for this combustion reaction.

(2)

(ii) Incomplete combustion can occur when the oxygen supply is limited.

One product of the incomplete combustion of butane is carbon monoxide.

Give the name of another product of this incomplete combustion.

(1)

(iii) State why carbon monoxide is poisonous to humans.

(1)



(c) C_4H_{10} exists as two isomers.

(i) State what is meant by the term **isomers**.

(2)

(ii) Draw the displayed formula of each isomer.

(2)

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(Total for Question 5 = 11 marks)

6 (a) Calculate the amount, in mol, of N_2 in 70 g of nitrogen gas.

(3)

amount of N_2 = mol

(b) Ammonia is a compound containing nitrogen and hydrogen.

Calculate the relative molecular mass of ammonia, NH_3

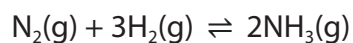
(2)

relative molecular mass =



- (c) Nitrogen reacts with hydrogen to form ammonia, NH_3

This is the equation for the reaction.



- (i) Calculate the mass, in kg, of hydrogen needed to produce 5.10 tonnes of ammonia.

Give your answer in standard form.

[1 tonne = 1000 kg]

(5)

mass of hydrogen = kg



(ii) The reaction produces 3.65 tonnes of ammonia instead of 5.10 tonnes.

Calculate the percentage yield of ammonia.

Give your answer to one decimal place.

(3)

percentage yield = %

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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