

- 11 11.0 g of aluminium reacts with 43.4 g of chlorine to make 54.4 g of aluminium chloride. $2Al + 3Cl_2 \rightarrow 2AlCl_3$

How much **aluminium** is required to make 217.6 g of aluminium chloride? **A** 22.0 g

B 44.0 g **C**

86.8 g **D**

173.6 g

Your answer

[1]

- 12 The table shows the start and end temperatures of four reactions.

Which reaction is endothermic?

	Temperature at start (°C)	Temperature at end (°C)
A	19.0	19.0
B	19.0	15.2
C	20.0	23.2
D	20.0	21.0

Your answer

[1]

- (c) The table shows the volume of alkali the student adds in each experiment.

Experiment	Volume of alkali added (cm ³)
1	24.2
2	24.4
3	23.9
4	24.0

Calculate the mean volume of alkali added.

Give your answer to **3** significant figures.

Mean volume of alkali added = cm³ [3]

- (d) Complete the **word** equation for a neutralisation reaction.

acid + alkali → [2]

- (e) Which **two** ions react together in neutralisation reactions to form H₂O?

Put a ring around **two** ions.

Cl⁺ Cl⁻ H⁺ H⁻ OH⁺ OH⁻ [1]

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21 A carbon atom is 1.7×10^{-10} m wide.

A diamond is 4.0×10^{-3} m wide.

(a) How many **orders of magnitude** larger is the diamond than the carbon atom?

Tick (3) **one** box.

Two ☐

Four ☐

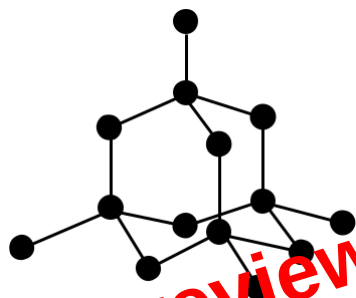
Seven ☐

[1]

(b) Calculate the number of carbon atoms that fit in the width of the diamond. Give your answer in **standard form** to **1** decimal place.

Number of carbon atoms = [3]

(c) The diagram shows the structure of diamond.



Explain why diamond **cannot** conduct electricity.

.....

 [2]

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	A ✓	1	1.1	
2	D ✓	1	2.1	
3	A ✓	1	1.1	
4	C ✓	1	1.1	
5	B ✓	1	1.2	
6	A ✓	1	1.1	
7	B ✓	1	1.1	
8	B ✓	1	2.1	
9	B ✓	1	2.2	
10	D ✓	1	2.2	
11	B ✓	1	2.1	
12	B ✓	1	2.2	
13	C ✓	1	1.2	
14	D ✓	1	1.2	
15	B ✓	1	2.2	

Question	Answer	Marks	AO element	Guidance
20 (a)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) Detailed description of physical properties of metals and non-metals, correctly attributing metal properties to section A and non-metal properties to section B. Correctly identifies X as a metal from section A. Contains properties shiny and conducts electricity. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Clear description of physical properties of metals and non-metals, correctly attributing metal properties to section A and non-metal properties to section B. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Basic description of physical properties of metals/section A OR non-metals/section B. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>	6	2 x 1.1 4 x 2.1	AO1.1 – Demonstrates knowledge and understanding of structures and bonding. • Section A contains metals. • Section B contains non-metals. • Element X is from section A, as section A contains metals and metals are shiny and conduct electricity. AO2.1 – Applies knowledge and understanding of physical properties of metals and non-metals. <u>Examples of physical properties of elements:</u> • Metals (or section A elements) are shiny, malleable, ductile, sonorous. • Non-metals (or section B elements) are dull, brittle. • Metals are good conductors of electricity and heat. • Non-metals are poor conductors of electricity and heat. • Metals have high melting and boiling points • Non-metals have low melting and boiling points

Question	Answer	Marks	AO element	Guidance
(c)	The empirical formula is CH₂. ☐ The melting point is lower than 35 °C. ☒ The pure liquid contains two compounds. ☐ The pure liquid is an element. ☐ The pure liquid will be a gas at above 35 °C. ☒	2	2 x 2.1	
(d)	First check the answer on the answer line If answer = 74.0 / 74 award 3 marks 4 x 12.0 = 48.0 OR 2 x 12.0 = 24.0 ✓ 10 x 1.0 = 10.0 OR 5 x 1.0 = 5.0 ✓ (48.0 + 10.0 + 16.0) = 74.0 ✓	3	3 x 2.2	IGNORE any units given ALLOW ECF for addition of incorrect numbers of C, H and O if no other mark awarded