Year 10 | Chemistry

IGCSE-pathway diagnostic assessment • Atomic structure, bonding and reactions

Student name: _____ Date: _____

Suggested time: 55 minutes. Show working and explain your reasoning. This is an independent diagnostic, not an official examination paper.

1. An atom has 17 protons and 18 neutrons. State its atomic number, mass number and electron arrangement. [5 marks]

2. Explain the difference between ionic and covalent bonding, using sodium chloride and water as examples. [7 marks]

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3. Balance: $Al + O_2 \rightarrow Al_2O_3$. Explain why equations must be balanced. [5 marks]

4. Calculate the relative formula mass of $CaCO_3$ using Ca = 40, C = 12 and O = 16. [4 marks]

5. A 2.4 g sample of magnesium reacts with excess hydrochloric acid. Calculate the amount of magnesium in moles (Ar Mg = 24) and the moles of hydrogen gas produced. [7 marks]

6. Plan an investigation to compare the rate of reaction of marble chips with dilute hydrochloric acid at two temperatures. State what you would measure and control. [9 marks]

7. Explain why graphite conducts electricity but diamond does not, referring to structure and bonding. [7 marks]

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Parent / Tutor Guide | Chemistry

Keep this section separate from the student during the assessment. The marks are diagnostic prompts, not an official IGCSE mark scheme.

Suggested responses and assessment notes

1. (5 marks) 17; 35; 2,8,7.

2. (7 marks) Ionic: electron transfer and attraction of oppositely charged ions; covalent: shared electron pairs.

3. (5 marks) $4Al + 3O_2 \rightarrow 2Al_2O_3$; atoms conserved.

4. (4 marks) 100.

5. (7 marks) 0.10 mol Mg; 0.10 mol H_2 ($Mg + 2HCl \rightarrow MgCl_2 + H_2$).

6. (9 marks) Measure gas volume against time; control acid concentration/volume, chip mass and surface area; repeat.

7. (7 marks) Graphite has delocalised electrons between layers; diamond has all four outer electrons in covalent bonds.

What to observe

Look for subject knowledge, accuracy, use of appropriate terminology, clarity of reasoning, interpretation of command words, and ability to justify or evaluate when asked.

Suggested diagnostic approach

Record which questions were attempted independently, which required prompts, and whether difficulties arose from concepts, literacy, calculations or time management. Plan follow-up teaching around recurring misconceptions.

Curriculum note

This is a general Year 10 IGCSE-oriented diagnostic. It is not endorsed by Cambridge, Pearson Edexcel or the IB. Topic order and examination demands differ by board and school; adjust to the student's actual specification.

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