

Balancing equations and conserving atoms

Grade 8 science (Year 9 · Class 8) · Test answers (mark scheme)

The model answers show where each mark is earned. Check the working as well as the final result, because balancing and calculation methods are marked separately from the answer.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS1-2, MS-PS1-5

Question 1 Reactants and products (2 marks)

Reactants: hydrogen and chlorine. Product: hydrogen chloride. Left: 2 H atoms and 2 Cl atoms.

Marking: 1 mark for reactants and product, 1 mark for the atom count.

Question 2 Balance three equations (3 marks)

(a) $4 \text{ K} + \text{O}_2 \rightarrow 2 \text{ K}_2\text{O}$. (b) $3 \text{ Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2$. (c) $\text{H}_2 + \text{Br}_2 \rightarrow 2 \text{ HBr}$.

Marking: 1 mark each; no mark if a subscript was changed.

Question 3 Ozone (3 marks)

(a) Left 3 atoms, right 2 atoms. (b) The numbers of atoms are not equal, but atoms cannot be created or destroyed. (c) Use 6 atoms on each side: $2 \text{ O}_3 \rightarrow 3 \text{ O}_2$.

Marking: 1 mark for each part.

Question 4 Zinc sulfide (3 marks)

(a) $13.0 + 6.4 = 19.4 \text{ g}$. (b) Conservation of mass: total mass of products equals total mass of reactants. (c) 26.0 g is twice 13.0 g, so $2 \times 19.4 = 38.8 \text{ g}$.

Marking: 1 mark for each part.

Question 5 Conservation of atoms (3 marks)

The bonds in H_2 and Cl_2 break and the atoms rejoin as two HCl molecules. No atom is created or destroyed: 2 H and 2 Cl atoms exist before and after. Only the way they are connected changes.

Marking: 1 mark for rearrangement, 1 mark for atom count, 1 mark for no creation or destruction.

Question 6 Spot the error (2 marks)

She changed a subscript, which gives a different substance. Only coefficients can change: **2 Mg + O₂ → 2 MgO.**

Marking: 1 mark for the mistake, 1 mark for the equation.

Question 7 State symbols (2 marks)

(s) means solid, (aq) means dissolved in water and (g) means gas. The gas is hydrogen, H₂.

Marking: 1 mark for three meanings, 1 mark for the gas.

Question 8 Evidence of a reaction (2 marks)

Examples: a gas is formed (bubbles), a colour change, a temperature change, a solid forms in a liquid, or light is given out.

Marking: 1 mark for any two correct observations, 2 marks for four.