Year 11 Science: Chemical equations, ion formulae and conservation of mass

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Write the formulae of potassium carbonate, iron(III) hydroxide and zinc nitrate.

2. Count the atoms of each element in $3Ca(NO_3)_2$.

3. Balance $Fe + O_2 \rightarrow Fe_2O_3$, the equation for iron rusting.

4. Hydrogen peroxide breaks down into water and oxygen. Balance $H_2O_2 \rightarrow H_2O + O_2$.

5. 5.0 g of baking soda is added to 50.0 g of vinegar in an open cup. When the fizzing stops the cup's contents weigh 52.4 g. What mass of carbon dioxide escaped?

6. Steel wool is heated in air and its mass goes up. Explain why, using conservation of mass.

Fix the mistake

7. Correct this statement: "To balance $H_2 + O_2 \rightarrow H_2O$, change the water to H_2O_2."

8. Correct this statement: "Magnesium hydroxide is $MgOH_2$."

9. Correct this statement: "The mass went down in the open flask, so mass was not conserved."

10. Correct this statement: "Aluminium oxide is AlO because aluminium and oxygen combine."

Answer key (for parents and tutors)

1. Write the formulae of potassium carbonate, iron(III) hydroxide and zinc nitrate.
   K^+ and CO_3^{2-} give K_2CO_3; Fe^{3+} and OH^- give $Fe(OH)_3$; Zn^{2+} and NO_3^- give $Zn(NO_3)_2$.

2. Count the atoms of each element in $3Ca(NO_3)_2$.
   Ca 3, N 6, O 18 (3 × 2 × 3 = 18).

3. Balance $Fe + O_2 \rightarrow Fe_2O_3$, the equation for iron rusting.
   $4Fe + 3O_2 \rightarrow 2Fe_2O_3$ (Fe 4 and O 6 on each side).

4. Hydrogen peroxide breaks down into water and oxygen. Balance $H_2O_2 \rightarrow H_2O + O_2$.
   $2H_2O_2 \rightarrow 2H_2O + O_2$ (H 4 and O 4 on each side).

5. 5.0 g of baking soda is added to 50.0 g of vinegar in an open cup. When the fizzing stops the cup's contents weigh 52.4 g. What mass of carbon dioxide escaped?
   5.0 + 50.0 = 55.0 g at the start, so 55.0 − 52.4 = 2.6 g of CO_2 escaped.

6. Steel wool is heated in air and its mass goes up. Explain why, using conservation of mass.
   Iron atoms combine with oxygen atoms from the air to make iron oxide; no atoms are created, but the oxygen atoms were not weighed at the start, so the solid gains their mass.

7. Correct this statement: "To balance $H_2 + O_2 \rightarrow H_2O$, change the water to H_2O_2."
   H_2O_2 is hydrogen peroxide, a different substance; change coefficients only: $2H_2 + O_2 \rightarrow 2H_2O$.

8. Correct this statement: "Magnesium hydroxide is $MgOH_2$."
   Two hydroxide ions need brackets, $Mg(OH)_2$, because the 2 applies to both the O and the H.

9. Correct this statement: "The mass went down in the open flask, so mass was not conserved."
   Mass was conserved, but a gas product escaped into the air, so the balance no longer weighed all the products.

10. Correct this statement: "Aluminium oxide is AlO because aluminium and oxygen combine."
    Al^{3+} and O^{2-} only cancel as Al_2O_3: 2 × (+3) = +6 and 3 × (−2) = −6.