FORMULAE & EQUATIONS

- Meaning of an equation, if we consider the following equation:

$Zn_{(s)}$ + $H_2SO_{4(aq)}$ → $Zn\ SO_{4(aq)}$ + $H_{2(g)}$
65 (2 + 32 + 64) (65 + 32 + 64)

65 98 → 161g + 2

It expresses the following information:

- That 1 molecule of H_2SO_4 contains: 2 atoms of H, 1 atom of S and 4 atoms of oxygen.
- Molecule of $ZnSO_4$ contains: 1 atom of Zn, 1 atom of sulphur and 4 atoms of oxygen.

CHEMICAL EQUATIONS

A chemical equation:
Is the symbols and formulae which represent a chemical reaction
e.g. $C(s) + O_2(g) \rightarrow CO_2(g)$

$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$

Laws governing writing chemical equation.

1. The reactants are written on the left-hand side and the products on the right-hand side.

2. The atoms of the products must balance with those of the reactants.

3. Each element or compound must have a state symbol.

Balancing the equation

$Zn(s) + \mathbf{2}HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

Zn	=	1	Zn	=	1
H	=	2	H	=	2
Cl	=	2	Cl	=	2

EXERCISE
Balance the following equations.

1. $C_4H_8 + O_2 \rightarrow H_2O + CO_2$

2. $P + O_2 \rightarrow PO_5$

3. $Cu(NO_3)_2 + NaCl \rightarrow NaNO_3 + CuCl_2$

4. $NO + O_2 \rightarrow NO_2$

5. $KCl \rightarrow K + Cl_2$

6. $Cu + H_2SO_4 \rightarrow CuSO_4 + H_2O + SO_2$

7. $CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$

8. $Cu + HNO_3 \rightarrow Cu(NO_3)_2 + NO_2 + H_2O$

9. $NH_3 + O_2 \rightarrow NO + H_2O$

10. $P_4O_{10} + CaO \rightarrow Ca_3(PO_4)_2$

11. $FeSO_4 + O_2 + H_2O \rightarrow Fe(OH)\,SO_4$

12. $P + Fe_2O_3 \rightarrow P_4O_{10} + Fe$

13. $Zn(OH)_2 + HNO_3 \rightarrow Zn(NO_3)_2 + H_2O$

14. $NH_4OH + H_3PO_4 \rightarrow (NH_4)_3PO_4 + H_2O$

15. *Indicate whether the equations are balanced as written:*

    (a) $2Sn + 2H_2SO_4 \rightarrow 2SnSO_4 + SO_2 + 2H_2O$
    (b) $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$

Answers

1. $C_4H_8 + 6O_2 \rightarrow 4H_2O + 4CO_2$

2. $2P + 5O_2 \rightarrow 2PO_5$

3. $Cu(NO_3)_2 + 2NaCl \rightarrow 2NaNO_3 + CuCl_2$

4. $2NO + O_2 \rightarrow 2NO_2$

5. $2KCl \rightarrow 2K + Cl_2$

6. $Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O + SO_2$

7. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

8. $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 4NO_2 + 2H_2O$

9. $4NH_3 + 3O_2 \rightarrow 4NO + 2H_2O$

10. $P_4O_{10} + 6CaO \rightarrow 2Ca_3(PO_4)_2$

11. $4FeSO_4 + 2O_2 + 2H_2O \rightarrow 4Fe(OH)SO_4$

12. $4P + 10Fe_2O_3 \rightarrow P_4O_{10} + 20Fe$

13. $Zn(OH)_2 + 2HNO_3 \rightarrow Zn(NO_3)_2 + 2H_2O$

14. $3NH_4OH + H_3PO_4 \rightarrow (NH_4)_3PO_4 + 3H_2O$

15. *Indicate whether the equations are balanced as written:*

    (c) $2Sn + 2H_2SO_4 \rightarrow 2SnSO_4 + SO_2 + 2H_2O$ *(not balanced)*
    (d) $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$ *(balanced)*

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