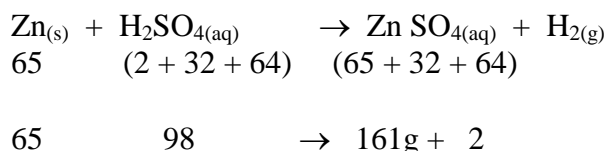


O-level

## FORMULAE & EQUATIONS

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



It expresses the following information:

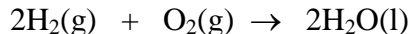
- That 1 molecule of  $\text{H}_2\text{SO}_4$  contains: 2 atoms of H, 1 atom of S and 4 atoms of oxygen.
- Molecule of  $\text{ZnSO}_4$  contains: 1 atom of Zn, 1 atom of sulphur and 4 atoms of oxygen.

## CHEMICAL EQUATIONS

### A chemical equation:

Is the symbols and formulae which represent a chemical reaction

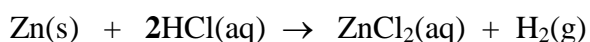
e.g.  $\text{C}(s) + \text{O}_2(g) \rightarrow \text{CO}_2(g)$



### Laws governing writing chemical equation.

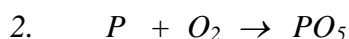
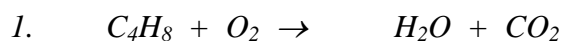
- The reactants are written on the left-hand side and the products on the right-hand side.
- The atoms of the products must balance with those of the reactants.
- Each element or compound must have a state symbol.

### Balancing the equation



### EXERCISE

Balance the following equations.



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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