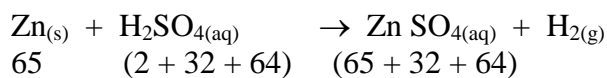


## O-level

### FORMULAE & EQUATIONS

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



It expresses the following information:

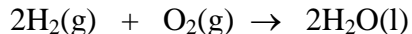
- That 1 molecule of  $\text{H}_2\text{SO}_4$  contains: 2 atoms of H, 1 atom of S and 4 atoms of oxygen.
- Molecule of  $\text{ZnSO}_4$  contains: 1 atom of Zn, 1 atom of sulphur and 4 atoms of oxygen.

### CHEMICAL EQUATIONS

#### A chemical equation:

Is the symbols and formulae which represent a chemical reaction

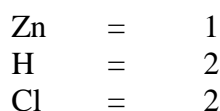
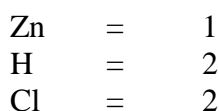
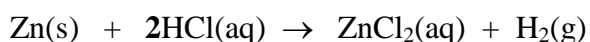
e.g.  $\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$



#### Laws governing writing chemical equation.

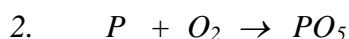
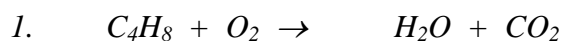
- The reactants are written on the left-hand side and the products on the right-hand side.
- The atoms of the products must balance with those of the reactants.
- Each element or compound must have a state symbol.

#### Balancing the equation



### EXERCISE

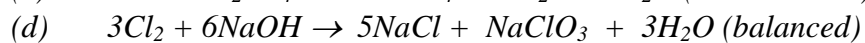
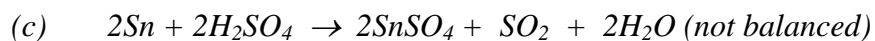
Balance the following equations.



3.  $\text{Cu}(\text{NO}_3)_2 + \text{NaCl} \rightarrow \text{NaNO}_3 + \text{CuCl}_2$
4.  $\text{NO} + \text{O}_2 \rightarrow \text{NO}_2$
5.  $\text{KCl} \rightarrow \text{K} + \text{Cl}_2$
6.  $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O} + \text{SO}_2$
7.  $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$
8.  $\text{Cu} + \text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{NO}_2 + \text{H}_2\text{O}$
9.  $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$
10.  $\text{P}_4\text{O}_{10} + \text{CaO} \rightarrow \text{Ca}_3(\text{PO}_4)_2$
11.  $\text{FeSO}_4 + \text{O}_2 + \text{H}_2\text{O} \rightarrow \text{Fe}(\text{OH})\text{SO}_4$
12.  $\text{P} + \text{Fe}_2\text{O}_3 \rightarrow \text{P}_4\text{O}_{10} + \text{Fe}$
13.  $\text{Zn}(\text{OH})_2 + \text{HNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + \text{H}_2\text{O}$
14.  $\text{NH}_4\text{OH} + \text{H}_3\text{PO}_4 \rightarrow (\text{NH}_4)_3\text{PO}_4 + \text{H}_2\text{O}$
15. *Indicate whether the equations are balanced as written:*
  - (a)  $2\text{Sn} + 2\text{H}_2\text{SO}_4 \rightarrow 2\text{SnSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
  - (b)  $3\text{Cl}_2 + 6\text{NaOH} \rightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$

## 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:*



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