

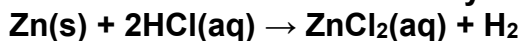
## Exercise 1B

**What is a chemical equation? Why it is necessary to balance it. Solution:**

A chemical equation is a symbolic representation of a chemical reaction. Here we use symbols and formulas of the substance involved in the reaction.

According to law of conservation of mass, "matter can neither be created nor be destroyed in a chemical reaction. This is possible only, if total number of atoms on the reactants side is equals to total number of atoms on products side. Thus, a chemical reaction should be always balanced.

**1. State the information conveyed by the following equation.**



**Solution:**

This chemical equation shows 'single displacement reaction', in which a non-metal is displaced by a metal. Here, non-metal is hydrogen which is evolved as gas. It is displaced by the metal zinc. In the given equation -  $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ , Zinc (Zn) is a reductant metal that displaces hydrogen ( $\text{H}_2$ ) from aqueous solution of Hydrochloric acid (HCl).

**2. Write the limitation of reaction given in question 2.**

**Solution:**

HCl will be the limiting reagent in the reaction and Zn will be excess reagent.

**3. Write chemical equations for the following equations and balance them.**

a) Carbon + Oxygen  $\rightarrow$  Carbon-di-oxide

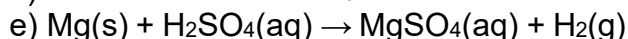
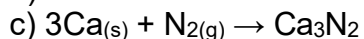
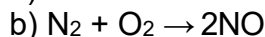
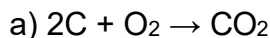
b) Nitrogen + Oxygen  $\rightarrow$  Nitrogen monoxide

c) Calcium + Nitrogen  $\rightarrow$  Calcium nitride

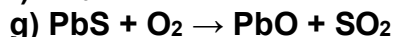
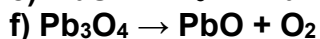
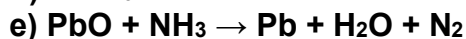
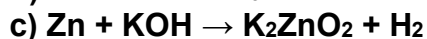
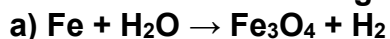
d) Calcium oxide + carbon dioxide  $\rightarrow$  Calcium carbonate

e) Magnesium + Sulphuric acid  $\rightarrow$  Magnesium sulphate + Hydrogen

**Solution:**



**4. Balance the following equations**



- h)  $S + H_2SO_4 \rightarrow SO_2 + H_2O$   
 i)  $S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$   
 j)  $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$   
 k)  $C + H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$   
 l)  $KOH + Cl_2 \rightarrow KCl + KClO + H_2O$   
 m)  $NO_2 + H_2O \rightarrow HNO_2 + HNO_3$   
 n)  $Pb_3O_4 + HCl \rightarrow PbCl_2 + H_2O + Cl_2$   
 o)  $H_2O + Cl_2 \rightarrow HCl + O_2$   
 p)  $NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$   
 q)  $HNO_3 + H_2S \rightarrow NO_2 + H_2O + S$   
 r)  $P + HNO_3 \rightarrow NO_2 + H_2O + H_3PO_4$   
 s)  $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + H_2O + NO_2$

**Solution:**

- a)  $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$   
 b)  $3Ca + N_2 \rightarrow Ca_3N_2$   
 c)  $Zn + 2KOH \rightarrow K_2ZnO_2 + H_2$   
 d)  $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$   
 e)  $3PbO + 2NH_3 \rightarrow 3Pb + 3H_2O + N_2$   
 f)  $2Pb_3O_4 \rightarrow 6PbO + O_2$   
 g)  $2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$   
 h)  $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$   
 i)  $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$   
 j)  $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$   
 k)  $C + 2H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$   
 l)  $2KOH + Cl_2 \rightarrow KCl + KClO + H_2O$   
 m)  $2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$   
 n)  $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + 4H_2O + Cl_2$   
 o)  $2H_2O + 2Cl_2 \rightarrow 4HCl + O_2$   
 p)  $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$   
 q)  $2HNO_3 + H_2S \rightarrow 2NO_2 + 2H_2O + S$   
 r)  $P + 5HNO_3 \rightarrow 5NO_2 + H_2O + H_3PO_4$   
 s)  $Zn + 4HNO_3 \rightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$