Chemical equations: A Chemical Equations is the shorthand form of representing a chemical reaction using symbols and formula. The element/compounds involved in the reaction are called reactants and the new elements/compounds formed are called the products. Steps to write the chemical equation:

1) Indentify the reactants and the products of the chemical reaction.
2) Write the names of the reactants on the left hand side & products on the right hand side with a '+' sign between them. Place arrow (--→) between the two sides. This equation is called word equation.
3) Replace the names of the products and reactants with symbols & formulae. This gives chemical equation.
4) The number of atoms of each element should be equal on both sides & This is called balancing the equation.

Crystallization: Crystals are the purest solid form of a substance having a definite geometrical shape. The process by which an impure compound is converted into its crystals is known as crystallization. This process is used in obtaining common salt from seawater.

Balancing an Equation

1) Count the number of atoms of each element on the both sides of equations for example. Magnesium burns in oxygen to give magnesium oxide.

$Mg + O_2 \longrightarrow MgO$

Element	No. of atoms in LHS	No. of atoms in RHS
Mg	1	1
O	2	1

2. To balance oxygen on both sides, multiply RHS by 2 i.e.

$Mg + O_2 \longrightarrow 2MgO$

3. Now oxygen atom is balanced but number of magnesium atom is not therefore multiply on the LHS by 2.

$2Mg + O_2 \longrightarrow 2MgO$

This a balanced chemical equation.

A chemical equation should be balanced. A balanced chemical equation is that in which number of atoms of each element are same on both sides of the equation. In order to balance the number of atoms of various elements on either side of the equation, the chemical formula of a substance is not changed. For example:

$H_2(g)$ + $O_2(g)$ ⟶ H_2O (g)

Hydrogen Oxygen Water

Here, the number of oxygen atoms is not same on both sides of the equation. So, coefficient '2' is written with the formula of water on the right hand side of the equation.

$H_2(g) + O_2(g) \longrightarrow 2H_2O(g)$

Now, to balance the number of hydrogen atoms, coefficient '2' is written with the formula of hydrogen on the left hand side of the equation.

$2H_2(g) + O_2(g) \longrightarrow 2H_2O(g)$

This is a balanced chemical equation.

Types of Chemical Reactions: Chemical reactions can be classified into different types depending upon the type of chemical change occurring during the reaction. Let us study different type of reactions one - by -one.

1. **Combination Reactions**: A chemical reaction in which two or more substances (reactants) combine to form a new substance (product) is called combination

ABHYAS Academy, Behind Pragat Shiv Mandir, Near Govt. College, Nishat Cinema Road, Ambala Cantt.
Ph No. +91-171-2631595, 9416541198, e-Mail: anusethi1968@yahoo.com Website: www. abhyasonline.in

reaction. For example:

$2H_2(g) + O_2(g) \longrightarrow 2H_2O(g)$

Combination of nitrogen and hydrogen gas yields ammonia gas.

$N_2(g)$ (Nitrogen) + $3H_2(g)$ (Hydrogen) $\longrightarrow$ $2NH_3(g)$ (Ammonia)

2. Decomposition Reaction: A chemical reaction in which more than one product are obtained from a single reactant is called decomposition reaction. Breaking up of water into hydrogen and oxygen gas on passing the electric current is an example of a decomposition reaction.

$2H2O(/) \xrightarrow{\text{electrolysis}} 2H_2(g) + O_2(g)$

On strong heating, limestone (calcium carbonate) decomposes into quick lime (calcium oxide) and carbon dioxide gas.

$CaCO_3(s) \xrightarrow{\text{heat}} CaO(s) + CO_2(g)$

Quick lime; Carbon dioxide

3. **Displacement Reaction**: A chemical reaction in which one element displaces another in a compound is called displacement reaction.

The chemical equation or this reaction is given below:

$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

iron; Copper sulphate (blue); Iron sulphate (green); Copper

4. Neutralization Reaction: A chemical reaction between an acid and a base is called neutralization reaction, A neutralization reaction always leads to the formation of salt and water.

Acid + Base $\longrightarrow$ Salt + Water

For example, reaction between hydrochloric acid and sodium hydroxide (a base) yields sodium chloride (a salt) and water.

$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H2O(l)$

Sodium hydroxide; Hydrochloric acid; Sodium chloride; water

Similarly, reaction between magnesium hydroxide and sulphuric acid yields magnesium sulphate and water.

$Mg(OH)_2(aq) + H_2SO_4(aq) \longrightarrow MgSO_4(aq) + 2H_2O(/)$

Magnesium hydroxide; Sulphuric acid; Magesium sulphate; Water

Rusting of Iron: Iron is one of the strongest metals which possess a high tensile strength with one disadvantage that the metal undergoes corrosion very easily. Corrosion of iron is known as rusting. It is the process which affects iron articles and slowly eats it away. Word equation for rusting of iron:

$Fe + O_2 + H_2O \longrightarrow Fe_2O_3$

iron; oxygen from air; hydrated iron oxide

For rusting the presence of both oxygen and water (or water vapors is essential). If the moisture content is more it will lead to more rusting. Methods to prevent rusting

1. **Paints and grease**: the simplest way to prevent rusting is to apply a coat of paint or grease. These coats should be applied regularly to prevent rusting. Paints and grease prevent the articles from coming in contact with oxygen or water or both.
2. **Galvanization**: this method is practiced world wide. It is the process in which a layer of zinc or chromium is deposited over the iron sheets. These metals do not allow iron to react with oxygen or moisture and hence prevent rusting.
3. **By alloying**: another way to prevent rusting is by alloying. Iron is mixed with some other elements like chromium, nickel, manganese and carbon which enhance the properties of iron.

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