Chap 1. Chemical Reactions and Equations

1. What is a chemical change?

A chemical change is a process in which new substances (products) are formed with different properties from the original substances (reactants). It involves breaking of old bonds in reactants and formation of new bonds in products.

2. How a chemical change differ from a physical change?

Chemical change	Physical change
New substance formed.	No new substance formed.
Usually irreversible change.	Usually reversible change.
eg: Burning of wood	eg: Melting of ice

3. What is a chemical equation?

A chemical equation is a symbolic representation of a chemical reaction using chemical formulae of reactants and products.

Reactants are substances that take part in the reaction and they are written on the left hand side (LHS).

Products are the new substances formed after the reaction and they are written on the right hand side (RHS).

A single arrow points from reactants to products.

eg: $2MgO \dashrightarrow 2Mg + O_2$

4. What is the significance of Law of Conservation of Mass in a chemical reaction?

Law of Conservation of Mass states that matter can neither be created nor be destroyed in a chemical reaction. The total mass of reactants must equal the total mass of products. It means, the number of atoms of each element must be equal on both sides of the equation.

5. What is an aqueous solution? give examples.

Any solution that has water as solvent is called aqueous solution.

eg: vinegar - acetic acid dissolved in water.

salt water - NaCl dissolved in water

sugar water - Sucrose ($C_{12}H_{22}O_{11}$) dissolved in water

6. What is a combination reaction?

Two or more substances combine to form a single new substance (product) is called a combination reaction. It is usually represented in the format:

A + B ---> AB

eg: Calcium oxide reacts vigorously with water to produce slaked lime
(calcium hydroxide) releasing a large amount of heat.

$CaO + H_2O$ ---> $Ca(OH)_2$ + Heat

7. What is a decomposition reaction?

A single reactant breaks down into two or more products is called a decomposition reaction. It is usually represented in the format:

AB ---> A + B

eg: Thermal decomposition of calcium carbonate (limestone) to calcium oxide (quick lime)

$CaCO_3$ ---> $CaO + CO_2$

8. What is electrolysis?

A decomposition reaction triggered by electrical energy is called electrolysis.

eg: Electrolysis of water. Here water is decomposed into hydrogen gas (at cathode) and oxygen gas (at anode).

$2H_2O$ ---> $2H_2 + O_2$

9. What is a displacement reaction?

A displacement reaction is one in which a more reactive element displaces (pushes out) a less reactive element from its salt solution. It is usually represented in the format:

A + BC ---> AC + B

eg: Iron nails placed in copper sulphate (blue) solution.

Fe + $CuSO_4$(aq) ---> $FeSO_4$(aq) + Cu

Iron is more reactive than copper, so it displaces copper. The solution changes from blue to green ($CuSO_4$ → $FeSO_4$). Reddish copper metal deposits on the iron nail.

10. What is a double displacement reaction?

A reaction in which two ionic compounds exchange their ions to form two new compounds is called double displacement reaction.

eg: Neutralization reaction between acid and base

HCl + NaHO ---> NaCl + H_2O

11. What is a precipitation reaction?

It is a type of double displacement reaction, in which one of the products formed is an insoluble solid (precipitate), that separates from the solution. Eg:

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

Here, Barium sulphate ($BaSO_4$) is the white precipitate.

12. Define oxidation reaction.

In a reaction, if the reactant gains oxygen or loses hydrogen is called an oxidation reaction. eg:

$2Cu + O_2 \rightarrow 2CuO$

$CH_3CH_2OH \rightarrow CH_3CHO + H_2$

13. Define reduction reaction.

In a reaction, if the reactant gains hydrogen or loses oxygen is called a reduction reaction. eg:

$CuO + H_2 \rightarrow Cu + H_2O$

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ (smelting iron ore)

14. What is a redox reaction?

A redox reaction is one in which oxidation and reduction occur simultaneously — one substance is oxidised while another is reduced. eg:

$Zn + CuSO4 \rightarrow ZnSO4 + Cu$

Here Zn is oxidised prodect and Copper is reduced product.