CHEMICAL REACTIONS AND EQUATIONS

Chemical reaction:

Most of the substance around us undergoes various changes. Some of these changes are temporary with no new substances being formed. They are called physical changes.

In certain other changes change the new substance formed in which the reactant or the parent loses its identity to form new substance called product. These changes are permanent as we won't get the reactant back

Chemical Change:

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Ν

Atoms in the reactants are rearranged to form one or more different substances.

Old bonds are broken: new bonds are formed.

Reactants lose their properties to form product of different properties.

4 Fe(s) + 3O2 →2Fe2O3 (rust). Iron Oxygen Ferric oxide

Chemical equation:

A chemical equation is the symbolic representation of a chemical reaction in the form of symbols and formula, wherein the reactant entities are given on the left- hand side and the product on the right-hand side.

Magnesium + oxygen (reactants) → magnesium oxide (product)

Balanced Chemical Equation:

A balanced chemical equation has the number of atoms of each element equal on both sides.

Example: Zn + H2SO4 → ZnSO4 + H2

Law of Conservation of Mass:

In a chemical reaction matter is conserved. Total no. of atoms = Total no. of atoms Total mass = Total mass. [While Balancing a Chemical Equation Formula of reactants and products should not be changed].

Example: $Fe_3O_4 + 4H_2 \rightarrow 3Fe + 4H_2O$

Unbalanced Chemical Equation:

If the number of atoms of each element in reactants is not equal to the number of atoms of each element present in the product, then the chemical equation is called Unbalanced Chemical Equation.

Example: Fe + $H_2O \rightarrow Fe_3O_4 + H_2$

TYPES OF REACTIONS

1. Combination Reaction: Two or more reactant combine to form a single product.

2Mg (s) + O₂ (g) → 2MgO Magnesium Oxygen Magnesium oxide (White ash) (basic) turns Red litmus blue

2. Decomposition Reaction: A single compound decomposes or break down to give two or more simpler substances.

 $2FeSO_4(s) \rightarrow Fe_2O_3(s) + SO_2(g) + SO_3(g)$

3. Displacement Reaction: A more reactive element [metal] displaces less reactive element [metal] from its aqueous salt

soln Fe (s) + ZnSO4 (aq) → FeSO4 (aq) + Zn (s) (Colorless) (green)

4. Double Displacement Reaction: Aqueous soln of two ionic compounds react by exchange of their ions is called double displacement Reaction

 $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq) Pb(NO_3)2 + 2$ $KI (aq) \rightarrow PbI_2 (\downarrow) + 2 KNO_3 (aq)$

5. Oxidation Reaction: In oxidation reaction, addition of oxygen or removal of hydrogen or loss of electron takes place.

 $2 \text{ Mg(s)} + O_2(g) \rightarrow 2 \text{MgO (s)} 2 \text{ Cu} + O \rightarrow 2 \text{ CuO (Black)}$ (Copper II Oxide)

6. Reduction Reaction: In reduction Reaction addition of hydrogen or removal of oxygen or gain of electron takes place.

 $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(I)$

7. Redox Reaction: Reaction involving both oxidation and reduction simultaneously

Α

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Α

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С

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U

N

В

Α

L

Α

N

С

Ε

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 $CuO(s)+ H_2 \rightarrow Cu(s) + H_2O(l)$

8. Exothermic Reaction: Reaction in which heat is evolved.

 $C(s) + O₂(g) \rightarrow CO(g) + Heat$

9. Neutralization Reaction: When an acid and a base react together to form salt and

HCl (aq) + NaOH (aq) → H O2(I) + NaCl

Rusting and Corrosion

Rusting: Iron when reacts with oxygen and moisture forms red substance which is called Rust.

$$4Fe(s) + 3O_2(g) + H_2O(l) \longrightarrow 2Fe_2O_3$$
, $xH_2O(s)$
Rust
(Hydrated ferric oxide)

Corrosion of Copper: Copper objects lose their lustre and shine after some time because the surface of these objects acquires a green coating of basic copper carbonate, CuCO3.Cu(OH)2 when exposed to air.

2Cu(s) + CO₂(g) + O₂(g) + H₂O(l)
$$\longrightarrow$$
 CuCO₃-Cu(OH)₂
Copper Motat Air Basic Copper
Carbonate (Oreen)

Corrosion of Silver Metal: The surface of silver metal gets tarnished (becomes dull) on exposure to air, due to the formation of a coating of black silver sulphide(Ag₂S) on its surface by the action of H2S gas present in the air.

Exothermic Reaction & Endothermic Reaction



Exothermic Reaction: Reaction which produces energy is called Exothermic Reaction. Most of the decomposition reactions are exothermic.

 $C_6H_{12}O_6(aq) + 6O_2(q) \longrightarrow 6CO_2(q) + 6H_2O(l) + Energy$

Respiration is a decomposition reaction in which energy is

(Calcium oxide)

 $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + Energy$ hydroxide (Slaked lime)

When guick lime (CaO) is added to water, it releases energy.

Endothermic Reaction: A chemical reaction in which heat energy is absorbed is called Endothermic Reaction. Example: Decomposition of calcium carbonate.

 $CaCO_3(s) \xrightarrow{heat} CaO(s) + CO_2(g)$ dioxide carbonate oxide

Precipitation Reaction & Neutralization

Precipitation Reaction: The reaction in which

aqueous solution of two salts is called Precipitation Reaction.

precipitate is formed by the mixing of the

Example:

 $AgNO_3(aq) + NaCl(aq) -$

→ AgCl(s) + NaNO₃(aq) Chloride

Neutralization Reaction: The reaction in which an acid reacts with a base to form salt and water by an exchange of ions is called Neutralization Reaction.

Example:

NaOH(aq) + HCl(aq) -Hydrochloric hydroxide Acid

→ NaCl(aq) + H₂O(4) Chloride

Corrosion: It is an undesirable change that occurs in metals when they are attacked by moisture, air, acids and bases. Example, Corrosion (rusting) of Iron: Fe2O3. nH2O (Hydrated iron

Rancidity: Undesirable change that takes place in oil containing food items due to the oxidation of fatty acids. Preventive methods of rancidity: Adding antioxidants to the food materials, storing food in the airtight container, flushing out air with nitrogen gas and refrigeration.