CHEMISTRY

1. CHEMICAL REACTIONS AND EQUATIONS

1. **CHEMICAL REACTION:** It is a chemical process in which new substances with new properties are formed due to rearrangement of atoms.
2. **CHEMICAL EQUATION:** It is a short hand representation of a chemical reaction with the help of symbols and formulae of the substanc es involved in it.
3. **LAW OF CONSERVATION OF MASS:** In a chemical reaction, the total mass of reactants is always equal to the total mass of products. (or) Mass (matter) can neither be created nor destroyed in a chemical reaction.
4. **PRECIPITATION REACTION:** A chemical reaction in which one of the products formed is a precipitate.
5. **CHEMICAL COMBINATION:** A chemical reaction in which two or more substances combine together to form a single new substance.

➢ Examples for combination reactions

$$\underset{(quick\ lime)}{CaO_{(s)}} + H_2O_{(l)} \rightarrow \underset{(Slaked\ lime)}{Ca(OH)_{2\ (aq)}} + Heat$$

$$\underset{Ammonia}{NH_{3(g)}} + \underset{Hydrogen\ chloride}{HCl_{(g)}} \rightarrow \underset{Ammonia\ chloride}{NH_4Cl_{(s)}}$$

6. **CHEMICAL DECOMPOSITION:** A Chemical reaction in which a compound split into two or more simpler substances by the Supply of heat/ light/ electricity.
7. **THERMAL DECOMPOSITION: -** A Chemical reaction in which a compound split into two or more simpler substances by the supply of heat .
8. **Examples for thermal decomposition reactions**

i) $2FeSO_{4(s)} \xrightarrow{\Delta} Fe_2O_{3(s)} + SO_{2(g)} + SO_{3(g)}$

Ferroussulphate — Ferricoxide — Sulphar dioxide — Sulphar Trioxide

ii) $2Pb(NO_3)_{2(s)} \xrightarrow{\Delta} 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$

Lead nitrate (Colouless) — Leadmonoxide (Yellow) — Nitrogenoxide — Oxygen

iii) The digestion of food in the body

9. **CHEMICAL DISPLACEMENT:** - A chemical reaction in which a highly reactive element displaces/replaces a low reactive element from its solution.

Examples for displacement reactions

$$\underset{\text{Copper sulphate (Blue)}}{CuSO_{4\ (aq)}} + \underset{\text{Zinc (Silver white)}}{Zn(s)} \rightarrow \underset{\text{Zinc sulphate (Clour less)}}{ZnSO_{4\ (aq)}} + \underset{\text{Copper (Red-Brown)}}{Cu_{(s)}}$$

$$\underset{(Blue)}{CuSO_{4(aq)}} + \underset{(Silver\ white)}{Fe} \longrightarrow \underset{(Green)}{FeSO_4} + \underset{(\mathrm{Re}d\text{-}Brown)}{Cu}$$

10. **CHEMICAL DOUBLE DISPLACEMENT:** - A chemical reaction in which there will be mutual exchange of ions/radicals between two compounds to form two new compounds.

11. Example for double displacement reaction

i) $$\underset{(Silver\ nitrate)}{AgNO_{3(aq)}} + \underset{(Sodium\ chloride)}{NaCl_{(aq)}} \longrightarrow \underset{(Silver\ chloride)\ (White\ ppt)}{AgCl_{(s)}} + \underset{Sodium\ chloride}{NaNO_{3(aq)}}$$

ii) $$\underset{Sodium\ sulphate}{Na_2SO_{4(aq)}} + \underset{Barium\ chloride}{BaCl_{2(aq)}} \longrightarrow \underset{Barium\ sulphate}{BaSO_{4(s)}} + \underset{Sodium\ chloride}{2NaCl_{(aq)}}$$

12. When the metal surface is exposed to atmospheric oxygen, moisture, chemicals such as acids etc; they get deteriorated or corroded.

13. **RANCIDITY: -** The condition produced by aerial oxidation of oils and fats present in the food materials marked by unpleasant smell and taste..

14. When an iron object is left in damp air for a considerable time, it gets covered with a reddish brown flaky substance called rust. This process is called as Rusting of Iron. Chemical formula of rust is $Fe_2O_3.\times H_2O$.

15. **GALVANISATION:** - Applying a thin coating of zinc or chromium on the surface of the metals to prevent them from corrosion.

16. **Oxidation:** The addition of oxygen to a substance or the removal of hydrogen from a substance (or) loss of electrons (or) increase in the oxidation state.

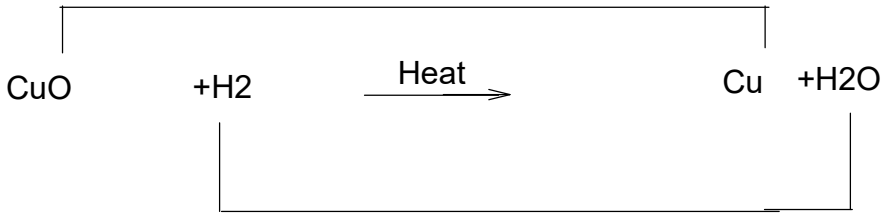
17. **Reduction:** The addition of hydrogen to a substance or the removal of oxygen from a substance (or) gain of electrons (or) decrease im the oxidation state.

18. **Oxidizing agent:** The substance which gives oxygen for oxidization or the substance which removes hydrogen

19. **Reducing agent:** The substance which gives hydrogen for reduction or the substance which removes oxygen

20. Example for Redox reaction :-

    Removal of oxygen: Reduction



Addition of oxygen : oxidation

Oxidising agent : CuO and Oxydised substance: H_2

Reducing agent : H_2 and Reduced substance: CuO

21. Examples of Electrolytic precipitation reactions :-

i) $\underset{\text{Sulphuric acid}}{H_2SO_4} + \underset{\text{Barium chloride}}{BaCl_2} \longrightarrow \underset{\text{Barium sulphate}}{BaSO_4} + \underset{\text{Hydrochoric Acid}}{2HCl}$

ii) $\underset{\text{Lead nitrate}}{Pb(NO_3)_2} + \underset{\text{Potassium Iodine}}{2KI} \longrightarrow \underset{\text{Yellow ppt}}{PbI_2} + \underset{\text{Pottasium Nitrate}}{2KNO_3}$

22. Example of electrolytic decomposition reactions :-

i) $2H_2O_{(l)} \xrightarrow[\text{Decomposition}]{\text{Electricity}} 2H_{2\,(g)} + O_{2\,(g)}$

ii) $\underset{\text{Aluminium oxide (Mortar)}}{2Al_2O_{3(l)}} \xrightarrow{\text{Electricity}} \underset{\text{Aluminium (metal)}}{4Al_{(l)}} + \underset{\text{oxygen}}{3O_{2(g)}}$

23. An unbalanced chemical equation is called a skeletal equation.

24. Reactions in which heat is given out along with the products are called Exo-thermic reactions.

25. Reactions in which energy is absorbed are known as Endo-thermic reactions.

2. ACIDS, BASES AND SALTS

1. **Acids:** Acids are sour to taste, turn blue litmus to red, and dissolve in water to release H^+ ions.

Eg:- Vinegar, Hydrochloric acid and Sulphuric acid.

2. **BASES:** These are the substances which are bitter to taste and soapy to touch. They turn red litmus solution blue. They give "OH^-" ions in aqueous solution.

3. Indicators are the substances which change their colour/smell in different types of substances.

4. TYPES OF INDICATORS

Natural indicators	Synthetic indicators	Olfactory indicators
Found in nature in plants Litmus, red cabbage leaves extract, flowers of hydrangea plant, turmeric.	These are chemical substances. Methyl orange, phenolphthalein	These substances have different odour in acid and bases.

5. **Pop test:** When a burning candle is brought near a test tube containing hydrogen gas ,it put off with a 'Pop' sound. This test is conducted for examining the presence of hydrogen gas.

6. **Neutralization Reaction:** Reaction of acid with base is called as neutralization reaction.

   Eg:-HCl + NaOH ----> NaCl + H_2O

7. While diluting acids, it is recommended that the acid should be added to water and not water to acid because the process of dissolving an acid or a base in water is highly exothermic.

8. Mixing an acid or a base with H_2O results in decrease of concentration of ions (H_3O^+/OH^-) per unit volume. Such a process is called as dilution.

9. Strength of acid or base can be estimated by using universal indicator.

10. **pH Scale:** A scale for measuring H^+ ion concentration in a solution.

    P in pH stands for 'potenz' a German word which means power.

    pH = 7 $\rightarrow$ neutral solution

    pH lessthan 7 $\rightarrow$ acidic solution

    pH morethan 7 $\rightarrow$ basic solution

11. When pH of rain water is less than 5.6, it is called acid rain.

12. Acids react with metals& gives salt and hydrogen

$$Zn(s) + H_2SO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)}$$

Zinc (Metal) — Sulphuric acid (dilute) — Zinc sulphate (salt) — Hydrogen

13. Acids react with carbonates [CO_3^{2-}] or Hydrogen carbonates [HCO_3^-] and Gives salt, carbon dioxide, and water

$$2Na_2CO_{3(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$$

Sodium carbonate — *Sodium chloride* — *Carbon dioxide*

$$NaHCO_{3(s)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + CO_{2(q)} + H_2O_{(l)}$$

Sodium hydrogen Carbonate

14. Antacids:- Cure indigestion and get rid of pain

    Examples : $Mg(OH)_2$ (Milk of magnesia)

    $NaHCO_3$ (Baking soda)

15. An ants sting injects : Methanoic acid, it can be neutralized by rubbing the affected part with baking soda.

16. Equation for Chlor-alkali process

$$2NaCl_{(aq)} + 2H_2O_{(l)} \longrightarrow 2NaOH_{(aq)} + \underset{At\ anode}{Cl_{2(g)}} + \underset{At\ Cathode}{H_{2(g)}}$$

17. Formula for Bleaching powder : $CaOCl_2$

    Calcium oxychloride (or) Bleaching powder

18. Plaster of Paris (POP):

$$\underset{Gypsum}{CaSO_4.2H_2O} \xrightarrow[100^0C]{Heat} \underset{Plaster\ of\ paris}{CaSO_4.\frac{1}{2}H_2O} + 1\frac{1}{2}H_2O$$

19. Baking powder is a mixture of baking soda (sodiumm hydrogen carbonate) and a mild edible acid such as tartaric acid.

20. Sodium hydrogen carbonate $NaHCO_3$: is used in soda - acid fire extinguishers.

21. Washing soda:- $Na_2CO_3.10H_2O$

    can be obtained by recrystallization of sodium carbonate.

    Equation:

$$\underset{sodium\,carbonate}{Na_2CO_3} + 10H_2O \longrightarrow \underset{Washing\ soda}{Na_2CO_3.10H_2O}$$

22. Water of crystallization:- is the fixed number of water molecules present in one formula unit of a salt.

    Eg:

    i) washing soda : $Na_2CO_3.10H_2O$

    ii) Plaster of paris : $CaSO_4.\frac{1}{2}H_2O$

    iii) Gypsum : $CaSO_4.2H_2O$

    iv) Hydrated copper sulphate : $CuSO_4.5H_2O$

23. Colour changes in Hydrated copper sulphate ($CuSO_4.5H_2O$):-

$$CuSO_4.5H_2O \underset{cool}{\overset{heat}{\rightleftharpoons}} CuSO_4 + 5H_2O$$

Blue *White*

Hydrated copper sulphate $CuSO_4.5H_2O$ is Blue in colour.

Anhydrous copper sulphate $CuSO_4$ is white in colour.

24. Plaster of Paris (POP):- $CuSO_4.\frac{1}{2}H_2O$

Uses:

i) For making toys

ii) Decoration materials

iii) Making surfaces smooth.

3. METALS AND NON-METALS

1. Metals are known as electro positive elements because they can form positive ions by losing electrons
2. Nonmetals are known as electronegative elements because they can form negative ions by gaining electrons
3. The property of metals to exhibit a shining surface on rubbing their surface with sand paper is known as Metalic lustre.
4. The property of metals to be beaten or hammered into thin sheets is known as malleability.
5. Ductility is the property of metals to be drawn into thin wires.
6. Sonarity is The property of metals to produce a ringing sound on striking them with a hard surface.
7. Anodising is the process of forming a thick layer of aluminium oxide (corrosion resistant) by aluminium metal when exposed to air or by electrolysis.
8. **REACTIVITY SERIES or ACTIVITY SERIES:** - Arrangement of different metals in the decreasing order of their reactivity.
9. When metals react with acids, liberates the hydrogen gas.

   Ex:- $Zn(s) + H_2SO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)}$

10. **IONIC COMPOUNDS:** - Compounds formed by transfer of electrons from metal to non-metal and form ionic bond
11. Covalent compounds formed by sharing of one or more electrons between two or more atoms and form covalent bond
12. **MINERAL:** - Naturally occurring state of metals in the form of elements and compounds in the earth's crust.

13. **ORE:** - A mineral which contains highest percentage of metal from which a metal can be extracted easily, profitably without economic losses.

14. **GANGUE or MATRIX:** - Unwanted or undesired impurities such as soil, sand, silica, stones, clay etc .which are present along with ores and minerals.

15. **CALCINATION:** -The process of strong heating of a concentrated ore to form a metal oxide in the limited supply of air or oxygen.

    Ex:-$ZnCO_3 \xrightarrow{\Delta} ZnO+CO_2$

16. **ROASTING:** - The process of strong heating of a concentrated ore to form a metal oxide in the excess amount of air or oxygen.

    Ex:-$2ZnS+3O_2 \xrightarrow{\Delta} 2ZnO+CO_2$

17. **ALUMINO-THERMITE PROCESS:-** The process of strongly heating an oxide of moderate reactive metals like MnO_2 or Fe_2O_3 etc by using Aluminium as a reducing agent.

18. **REFINING or PURIFICATION OF METALS:** - The process of removing the impurities which are still left in the ores to obtain pure metals.

19. **Alloys:-** The mixture of two or more metals is called an Alloy. Examples:- Brass, Bronze and Amalgam

20. **Aqua regia:-** Aqua-regia is a freshly prepared mixture of 1 part of concentrated nitric acid and 3 parts of concentrated hydro chloric acid

21. **Amalgam:-** If one of the metals in an alloy is Mercury.

22. **Brass:-** An alloy of copper and Zinc(Cu+Zn)

23. **Bronze:-** An alloy of copper and Tin (Cu+Sn)

24. Solder:- An alloy of lead and Tin (Pb+Sn)

25. 22 Carat gold:- 22 parts of gold is alloyed with 2 parts of either coppper (or) silver.