

Chemistry short note for grade 10

UNIT THREE

IMPORTANT INORGANIC COMPOUNDS

Inorganic compounds:-

- Are consisting mineral constituent of the earth.
- Are found in nonliving things.
- Are Mostly found in nature as silicates, oxides, carbonates, nitrate, sulphates, etc.

Organic compounds- are generally found in living things(plants & animals).

Inorganic compounds are generally classified into four groups. These are:-

1. Oxides
2. Acids
3. Bases
4. Salts

1. OXIDES

Oxides-are binary compounds consist of oxygen and any other elements except noble gas and inactive metals (gold, platinum and palladium).

Binary compounds- are compounds consisting of only two elements. eg H_2O , NaCl , CO_2 etc.

Oxygen + Element(metal, nonmetal, or metalloid) $\rightarrow$ Oxides

Eg. $\text{Na} + \text{O}_2 \rightarrow \text{Na}_2\text{O}$, $\text{S} + \text{O}_2 \rightarrow \text{SO}_2$

Oxides based on their chemical properties are classified as:-

A. Acidic oxides B. Basic oxides C. Neutral oxide D. Amphoteric oxide E. Peroxide

A. Acidic oxides

- Are formed by the chemical combination of oxygen with nonmetal
- Are also called acid anhydride.eg. CO_2 , NO_2 , SO_3 , P_4O_{10} , etc

Note - all nonmetallic oxides are not necessarily acidic oxide. eg. CO , N_2O , NO are neutral oxide

- Few metallic oxides are acidic oxide. eg. CrO_3 , Mn_2O_7 , WO_3 are acidic oxide

- some metalloid oxides are acidic oxide. eg. B_2O_3 , SiO_2 , GeO_2 are acidic oxide

Chemical properties of acidic oxide

1. Acidic oxide + water $\rightarrow$ acid. Eg. $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$ (sulphurous acid)

$\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$ (sulphuric acid)

2. Acidic oxide + basic oxide → salt. eg. $\text{CO}_2 + \text{Na}_2\text{O} \rightarrow \text{Na}_2\text{CO}_3$

$\text{SO}_2 + \text{K}_2\text{O} \rightarrow \text{K}_2\text{SO}_3$ (Potassium sulphite)

3. Acidic oxide + bases → salt + water. Eg. $\text{P}_4\text{O}_{10} + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{O}$. This reaction also called neutralization reaction

B. Basic oxide

- Are composed of metal and oxygen.
- It is also called basic anhydride.
- When dissolved in water to give alkaline solution (base).

Note - all basic oxides are metallic oxide but all metallic oxides are not necessarily basic oxides

Eg. Al_2O_3 and ZnO are amphoteric oxide .

- Oxides of active metals, group IA and heavier members of group IIA metals dissolved in water to form base,
Examples of insoluble basic oxides are: FeO , Fe_2O_3 , CuO , MnO_2 , MgO etc

Examples of soluble basic oxides are: Li_2O , Na_2O , CaO , BaO , etc.

Chemical properties of basic oxides

1. Basic oxides + water → alkaline solution (base). eg. $\text{Li}_2\text{O} + \text{H}_2\text{O} \rightarrow 2\text{LiOH}$

$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$

2. Basic oxides + acidic oxide → salt. Eg. $\text{BaO} + \text{SO}_3 \rightarrow \text{BaSO}_4$

3. Basic oxides + acid → salt + water. eg. $\text{CaO} + 2\text{HCl} \rightarrow \text{CaCl}_2$

* **Indicators** - are substances used to identify acidity or basicity in a given solution.

READ TEXT BOOK ON PAGE 115 table 3.1

C. Amphoteric oxides

- show both acidic and basic behavior. eg. ZnO , Al_2O_3 , BeO , PbO , PbO_2 , SnO , SnO_2

- Amphoteric oxides + acid → salt + water. eg. $\text{Al}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O}$

- Amphoteric oxide + base → salt + water. eg. $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}$

- **$\text{Al}(\text{OH})_3$** also amphoteric in nature.

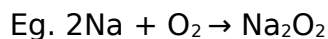
* The common characteristics of acidic, basic and amphoteric oxides are **salt forming oxides**.

D. Neutral oxides

- are neither react with acids nor bases to form salt and water.
- do not show basic and acidic property. eg. H_2O , CO , N_2O
- are not salt forming oxide

E. Peroxides

- have more oxygen atom than the normal oxide.
- the oxidation number of oxygen in peroxide is -1.
- contain “- O- O -”link. eg. H_2O_2 , Na_2O_2 , CaO_2 , etc.
- formed by burning the metal with sufficient amount of oxygen.



Chemical properties of peroxides

- are powerful oxidizing agent (by losing oxygen)
eg. $\text{PbS(s)} + 4\text{H}_2\text{O(aq)} \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$
- peroxides react with aqueous acid to form hydrogen peroxide.
eg. $\text{Na}_2\text{O}_2(\text{s}) + 2\text{HCl(aq)} \rightarrow 2\text{NaCl(aq)} + \text{H}_2\text{O(aq)}$

Hydrogen peroxides

- is colorless liquid
- used t as an antiseptics for mouth wash , bleaching agent and cleansing wounds
- disappear colour. eg . $\text{PbS (black)} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4(\text{white}) + \text{H}_2\text{O}$

2. ACIDES

There are many acids in our daily life

Examples: - Lemmon and orange contain citric acid

- Vinegar – dilute acetic acid
- Sour milk – lactic acid
- Our stomach produce – hydrochloric acid
- Pepsi, Ambo water –carbonic acid

Arrhenius definition of Acids

Arrhenius - defined as an acid is a substance that release hydrogen ion or proton, H^+ or hydron-

ium ion, $H_2O_3^+$ in aqueous solution.

eg. $HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$

- Arrhenius acid, should contain ionizable hydrogen

Examples: HNO_3 , H_2SO_4 , HI , H_3PO_4 , etc.

Classification of Acids

A. Based on the number of ionizable hydrogen acids classified in to:

1. monoprotic acid - contain only one H-atom per molecule.

eg. HNO_3 , HCl , etc

2. polyprotic acid - contain more than one H-atom per molecule.

Eg H_2SO_4 (diprotic acid), H_3PO_4 (triprotic acid) etc.

B. Based on the number of constituents of elements, acids classified:

1. Binary acids - composed of two different elements. eg. HCl , H_2S , HBr , etc

2. Ternary acids - contain three different elements. eg. H_3PO_4 , HNO_3 , $HClO_4$, etc.

*Ternary acids are also called oxy acids.

General properties of acids

1. Acids have a sour taste.

2. Acids change the color of acid certain acid-base indicators.

3. Acids react with active metals to yield hydrogen gas.

4. Concentrated acid react with sulphite to form salts with the liberation of SO_2

5. Acids react with bases (oxides and hydroxides of metals and ammonium hydroxide) to form salts

and water.

6. Aqueous solution of acids are electrolytes(conductor).

Strength of acids (strong and weak acids)

Acids classified into two based on their degree of dissociation. These are:

i) Strong acid - completely dissociates in aqueous solution. eg. HCl , H_2SO_4 , HNO_3 , HBr , etc.

ii) Weak acid – dissociates only partially in aqueous solution. eg.
 CH_3COOH (acetic acid), $\text{H}_2\text{C}_2\text{O}_4$

(oxalic acid), H_2CO_3 , HF, etc.

- Organic acids are generally weak acid.

Concentrated and dilute acid

i) Concentrated acid – has relatively large amount of solute dissolved in the solvent.

ii) Dilute acid – has relatively smaller amount of solute dissolved in the solvent.

Read Precaution in handling acid from text book on page 133