

Acids, Bases and Salts

Class 10th Chemistry

Chemfinity @ Infinity and Beyond



Glossary

- Acids and Bases
- Olfactory indicators
- Characteristics
- Reactions
- Vs
- pH
- Ionisation
- Hydronium ion
- Acid rain
- Common Salt
- Antacids
- Dilution
- Washing Soda
- Baking soda
- Baking powder
- POP
- Gypsum
- Bleaching Powder.



Some common (characteristics and acid-base indicators)

- Acids are sour in taste, turn blue litmus red, hydrogen gas on reaction with metals *
- Bases are bitter in taste, turn red litmus blue, hydrogen gas on reaction with metals *
- Litmus is a common natural indicator extracted from lichens.
- Commonly used indicators: Litmus, Phenolphthalein, Methyl Orange, Turmeric powder.
- Olfactory indicators: Clove oil, Vanilla essence



A/B vs “the metals”

- Acid + Metal \rightarrow Salt + H_2
- $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$
- $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$
- The above reaction is not possible with all the metals.
- Metal (Hydrogen)Carbonates + Acid \rightarrow Metal salt + Water + Carbon Dioxide

- On passing CO_2 through slaked lime :
- Slaked lime + $CO_2 \rightarrow$ Calcium Carbonate + Water
- On passing excess of CO_2 : $Ca(HCO_3)_2$



The Acids vs the Bases

- Acid + Base \rightarrow Salt + H₂O
- The reaction of an acid with a base is called a neutralisation reaction.
- Acidic salts, Basic salts and Neutral salts.



Metal oxides vs the acids

- Metal oxide + Acid \rightarrow Metal Salt + Water
- $\text{Cu}_2\text{O} + \text{HCl} \rightarrow \text{CuCl} + \text{H}_2\text{O}$
- Why should curd and sour substances not be kept in brass and copper vessels?



Ionisation of acids in water: Protonation

- The process of dissolution of an acid or a base in water is exothermic. Therefore...
- Hydronium ion (H_3O^+)
- Splitting of salts
- Dilution



pH: The power of a(n) acid/base

- 0 to 14 → scale
- Potenz == p
- H == hydrogen
- 7 to 14 == Basic
- 0 to 7 == Acidic

Importance of pH

Our bodies work in pH range of about 7 to 7.8

When the pH of rain water is less than 5.6, an acid rain is said to have occurred.

Consequences of acid rain.

Acidity and Antacids.

Soil and acid rain.

Our body and the pH.

pH less than 5.5 causes tooth decay.



Some Common Salts

Rock Salt is the ore

- Chlorides
 - Sulphates
 - Nitrates
 - Carbonates
 - Acetates
- NaCl ←
 - CaCl_2
 - MgCl_2
 - ZnCl_2
 - Na_2SO_4
 - Na_2CO_3
 - NaHCO_3
 - CaSO_4
 - MgSO_4
- CH_3COONa
 - NaNO_3
 - $\text{Al}_2(\text{SO}_4)_3$
 - ZnSO_4
 - $(\text{NH}_4)_2\text{SO}_4$

- A salt is an ionic compound formed on reaction of
- an acid and a base.



Sodium Chloride

- NaCl or table salt or common salt or rock salt.
- Obtained from the ore or sea-water.
- Evaporation of sea water.
- Of great importance to industry, majorly used to manufacture other sodium compounds.
- Caustic Soda, Washing Soda, Baking Soda, Hydrochloric Acid, Hydrogen, Chlorine, Sodium metal.
- Improves food taste. Preservative.
- Manufacturing of soap.
- In European countries, it is used to depress the freezing point of ice.



Caustic Soda

- NaOH
- Most common alkali.
- Industrial use.
- Electrolysis of brine water aka the “chlor-alkali process”.
- $2\text{NaCl} + 2\text{H}_2\text{O} \xrightarrow{\text{electrolysis}} 2\text{NaOH} + \text{Cl}_2 + \text{H}_2$
- Chlorine at anode, Hydrogen at cathode, Alkali near the cathode.
- Used in making soaps and detergents.
- Manufacturing of paper.
- Other sodium compounds.
- Dyes and Bleaches.
- Purification of Bauxite.



Hydrochloric acid

- Formed when chlorine and hydrogen combine in 1:1.
- Used as an electrolyte.
- Preparation of chlorides.
- PVC.
- Textiles.
- Households.
- Our body.
- Chlorine is used :
- Bleaching action.
- Sterilisation.
- Organic compounds like tetrachloromethane.
- Paints and dyes.
- Chloroform.



Bleaching Powder

- A substance that removes colors from colored substances and renders them colorless is called a bleaching agent.
- Chloride of lime or Calcium oxychloride.
- CaOCl_2
- By passing Cl_2 over Ca(OH)_2 , BP is obtained:
- $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$
- White powder.
- Strong smell of chlorine.
- Soluble in water.
- Reacts with dil. Acids to liberate chlorine.
- Used in bleaching of wood pulp in paper industry.
- Bleaching washed clothes in laundry.
- Disinfecting water.
- Making of Chloroform.
- Powerful oxidising agent.



Baking Soda

- Sodium bicarbonate or Sodium Hydrogen carbonate
- $\text{NaCl} + \text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{NaHCO}_3 + \text{NH}_4\text{Cl}$
- White Crystals
- Sparingly soluble in water.
- Mildly alkaline.
- Used for faster cooking.
- Used in making of baking powder (BS + Tartaric/citric acid)
- An antacid.
- In Fire extinguishers
- Baking cakes and breads.



Washing Soda

- Sodium carbonate decahydrate.
- $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
- Transparent crystalline solid.
- Soluble in water.
- Alkaline.
- Cleansing nature.
- Permanent hardness removal.
- Manufacturing of glass and borax.

Slightly Soluble

- $\text{NaCl} + \text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{NaHCO}_3 + \text{NH}_4\text{Cl}$
- $2\text{NaHCO}_3 \xrightarrow{h} \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$
- $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O} \rightarrow \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

Soda Ash



Plaster of Paris

- Calcium sulphate hemihydrate.
- $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ or $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$
- Prepared by heating gypsum in a controlled environment:
- $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} \xrightarrow{100^\circ\text{C}} \text{CaSO}_4 \cdot 1/2\text{H}_2\text{O} + 3/2\text{H}_2\text{O}$
- If Gypsum is heated at a temperature more than 100°C , dead burnt plaster(CaSO_4) is formed, which is of no use.
- White powder.
- Sets into hard mass on mixing with water, in about half an hour. This is because of formation of crystals of gypsum.
- Hospitals
- Toy industry. Laboratories
- Fire proofing.



Water of crystallisation

- The water molecules which form part of the structure of a crystal of a compound are called WOC.
- Salts containing WOC are called hydrated salts.
- $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
- $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
- $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- On intensive heating, these turn anhydrous.

