

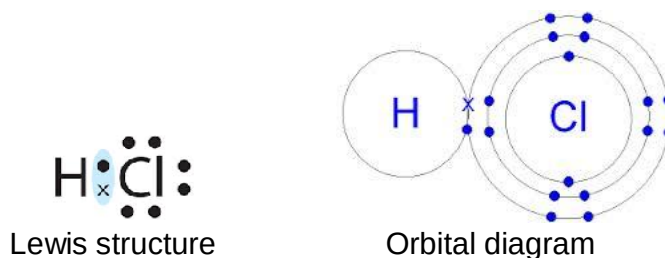
Study of Compounds – Hydrogen Chloride

Hydrogen Chloride

Molecular formula: HCl

Molecular mass: 36.5 amu

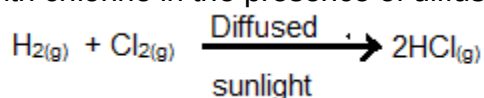
Bond: Covalent



General Preparation of HCl gas

i. By synthesis

Moist hydrogen gas combines with chlorine in the presence of diffused sunlight.



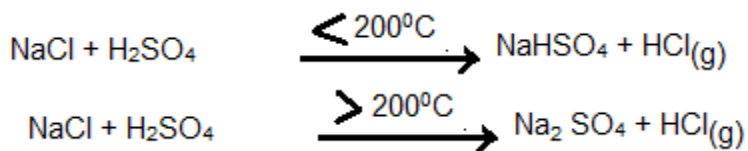
ii. By heating metallic chloride with conc. sulphuric acid



Laboratory Preparation of Hydrogen Chloride

Hydrogen chloride gas is prepared by heating a metallic chloride (NaCl) with conc. sulphuric acid (H_2SO_4).

Reactions:



Collection

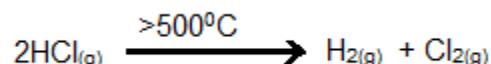
- Hydrogen chloride gas is collected by the upward displacement of air as it is 1.28 times heavier than air.
- It is not collected over water because it is highly soluble in water.

Physical Properties

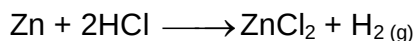
- Colourless, pungent, choking odour, slight sour taste.
- It is 1.28 times heavier than water and highly soluble in water.
- Liquefies at temperature of about 10°C at 40 atmospheric pressure.
- Boiling point is -83°C , and freezing point is -113°C .

Chemical Properties of HCl

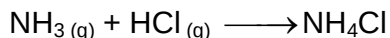
1. **Combustibility:** The gas is neither combustible nor a supporter of combustion.
2. **Thermal dissociation:** On heating above 500°C, it dissociates into hydrogen and chlorine.



3. **With metals:** Metals which come before hydrogen in the electrochemical series form chlorides with the liberation of hydrogen.



4. **Reaction with ammonia:** It combines with ammonia to form dense white fumes of ammonium chloride.



Hydrochloric Acid

Hydrochloric acid is prepared by dissolving hydrogen chloride gas in water using a special funnel arrangement because direct absorption of HCl gas in water using a delivery tube causes back suction.

Properties of Hydrochloric Acid

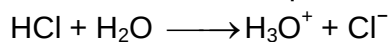
Physical Properties

- Colourless, slightly pungent with sharp sour taste.
- Corrosive in nature and causes blisters on the skin.
- Density is 1.2 gm/cc with boiling point of 110°C.

Chemical Properties

- **Monobasic in nature**

HCl dissociates in aqueous solution to produce one hydrogen ion [H⁺] per molecule of the acid.



- **Acidic nature**

The presence of hydrogen ion [H⁺] in HCl imparts acidic properties to an aqueous solution of hydrochloric acid.

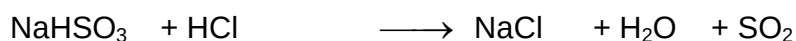
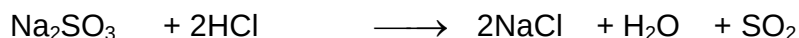
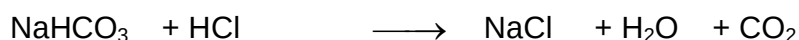
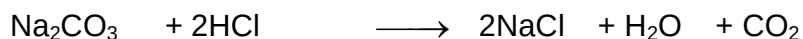
- **Action on metals**



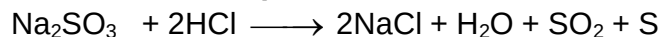
- **Action on oxides and hydroxides**



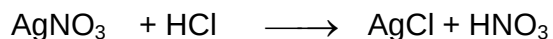
- **With salts of weaker acids**



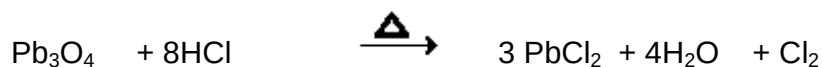
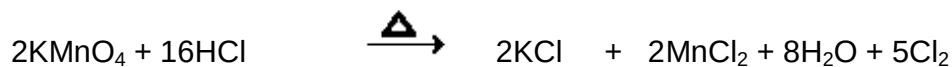
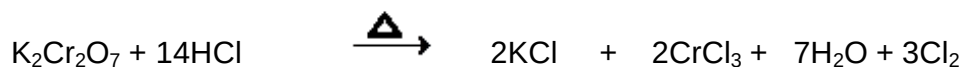
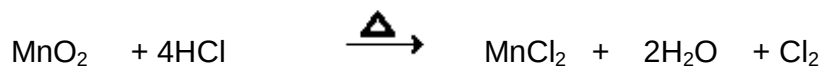
- **Action on thiosulphates**



- **Reaction with nitrates**

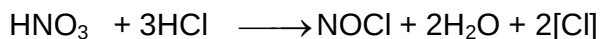


Oxidation of Hydrochloric Acid

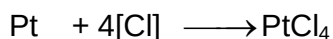
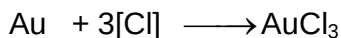


Formation of Aqua Regia

Aqua regia is a mixture of one part of conc. nitric acid and three parts of conc. hydrochloric acid.



The nascent chlorine released reacts with noble metals such as gold and platinum to give their soluble chlorides.



Uses of Hydrochloric Acid

- a. In the manufacture of dyes, drugs, paints and silver chloride.
- b. For purifying bone black, because HCl dissolves the calcium phosphate present in bones.
- c. To remove rust from iron sheets.