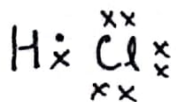


Hydrogen Chloride (HCl)

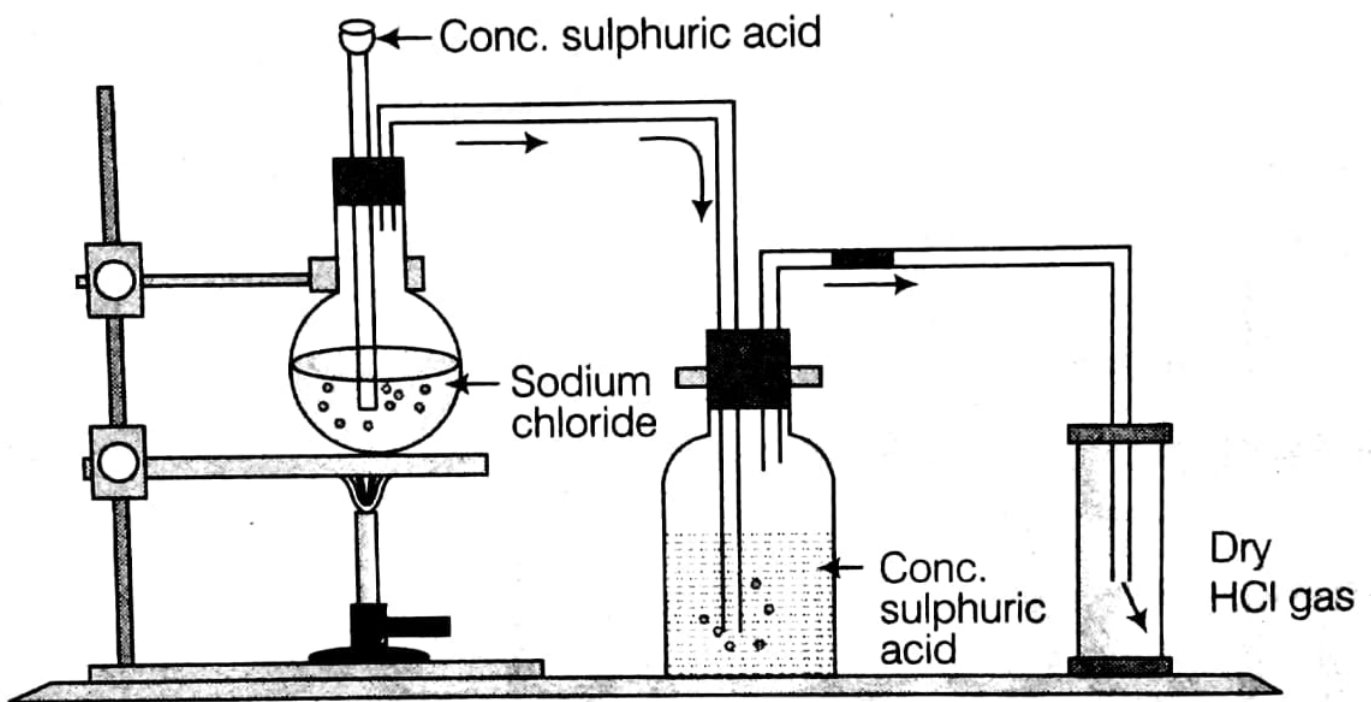


Laboratory Preparation :- From metallic chloride of HCl gas.

Reactants: NaCl and conc. H_2SO_4 .

Reactions:- Below 200°C :- $\text{NaCl} + \text{H}_2\text{SO}_4 \xrightarrow[200^\circ\text{C}]{\text{Below}}$ $\text{NaHSO}_4 + \text{HCl}$
sodium bisulphate

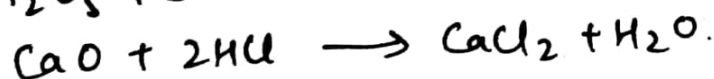
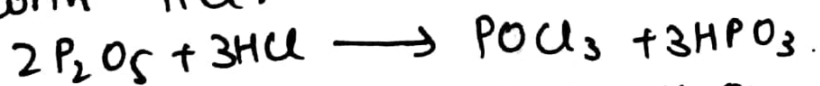
Above 200°C : $2\text{NaCl} + \text{H}_2\text{SO}_4 \xrightarrow[200^\circ\text{C}]{\text{Above}}$ $\text{Na}_2\text{SO}_4 + 2\text{HCl}$
(conc)



Laboratory preparation of dry hydrogen chloride gas

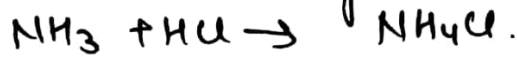
- The HCl gas is collected by upward displacement of air in a gas jar.
- ★ It is not collected over water, since it is highly soluble in water.
- The HCl gas formed in the flask passes through conc. H_2SO_4 and is collected in the jar as dry HCl.

Note:- Drying agents like phosphorous pentoxide (P_2O_5) and quick lime (CaO) cannot be used, since they react with HCl.



Note:- Concentrated Nitric acid is not used during the preparation of HCl because it is volatile and may volatilise along with HCl gas.

Observation:- A glass rod dipped in NH_3 (ammonia) solution is brought near the mouth of glass jar containing HCl gas, white dense fumes of ammonium chloride are formed.



Precaution: Temp. is maintained at 200°C otherwise sodium sulphate forms a hard crust which sticks to the glass and is difficult to remove.

Physical Properties :- (a) colourless, pungent choking smell, Sour taste
(b) Corrosive in nature
(c) Highly soluble in water.
(d) 1.28 times heavier than air.

Experiment to Demonstrate Solubility (Fountain Experiment)

To show that HCl gas is highly soluble.

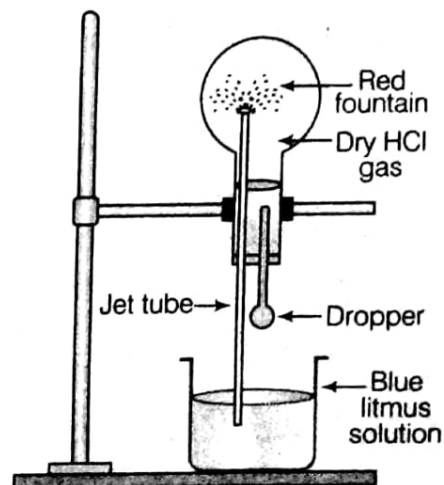
Apparatus Dry round bottom flask with dry HCl gas, a rubber stopper with two holes, blue litmus solution.

Procedure Set the apparatus as shown in the figure. The dropper containing water is squeezed and the water enters the flask.

Observation As HCl gas present in the flask dissolves in water due to its high solubility, thereby lowering the pressure inside.

The outside pressure being higher pushes the blue litmus solution up the jet tube which emerges out at the end of the tube as a red fountain.

Inference HCl gas is highly soluble in water and acidic in nature.

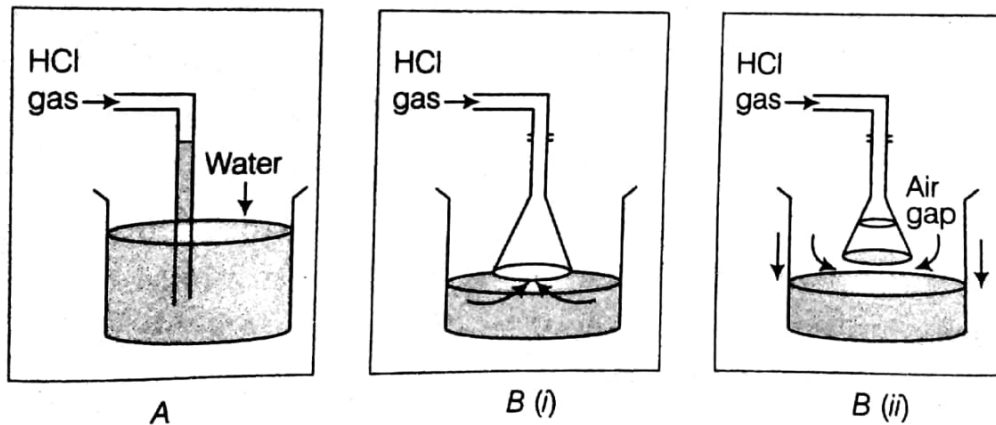


Fountain experiment

Laboratory Method of Preparation of Hydrochloric Acid

Hydrochloric acid is prepared by dissolving hydrogen chloride gas in water using a special funnel arrangement.

Procedure Hydrochloric acid is prepared by dissolving hydrogen chloride gas in water using a special funnel arrangement as shown in figure B.



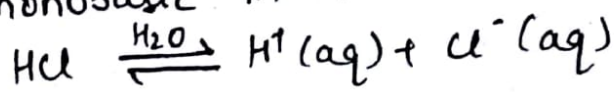
To show funnel arrangement

Note:

- The funnel arrangement is necessary because
- (i) It prevents or minimises back-suction of water.
 - (ii) And it also provides a large surface area for the absorption of HCl gas.

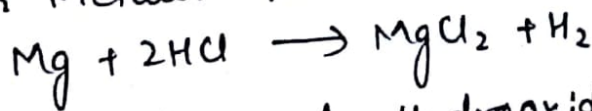
Properties of HCl Acid :-

- (i) Colourless, pungent choking smell, acidic.
- (ii) Conc. acid is corrosive.
- (iii) Readily soluble in water.
- (iv) The presence of H^+ in HCl imparts acidic properties. It is monobasic in nature.

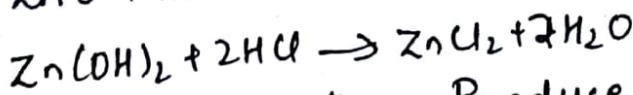


Chemical Properties.

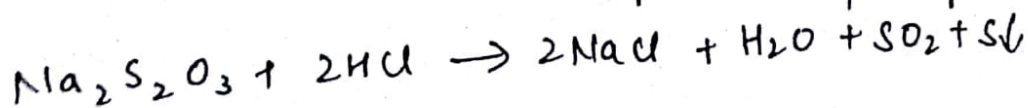
(i) Action on Metals: Form metal chlorides and Hydrogen.



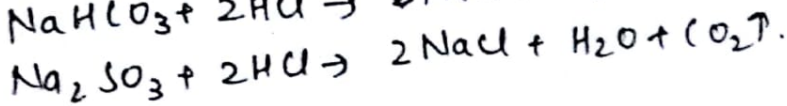
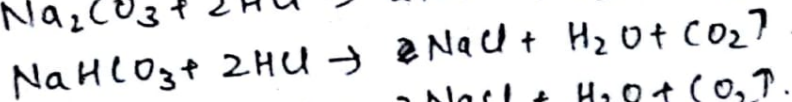
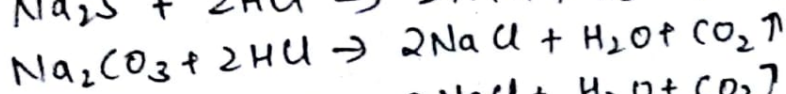
(ii) Action on Oxides and Hydroxides:- Form salt and water only.



(iii) Action on Thiosulphates: Produce SO_2 gas and yellow sulphur is precipitated.

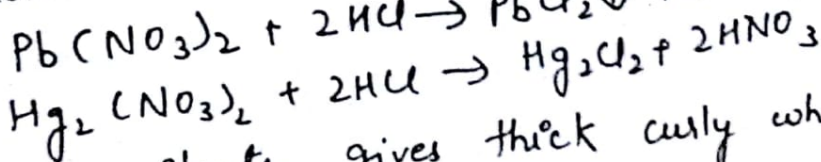
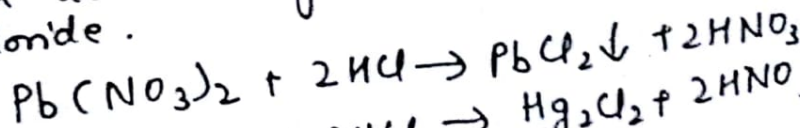


(iv) With Salts of weaker Acids: HCl decomposes salts of weaker acids (carbonates, sulphates, sulphides)

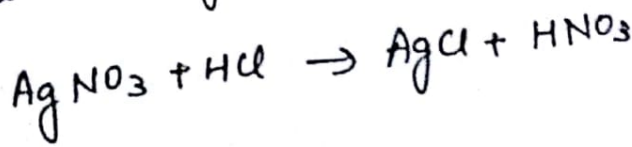


(v) Reaction with nitrates:

(i) Lead nitrate and mercury(I) nitrate react with HCl acid to give white ppt of lead and mercury(I) chloride.

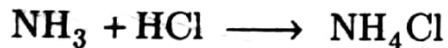


(ii) Silver nitrate gives thick curly white ppt of silver chloride.

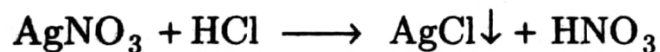


Test for Hydrogen Chloride and Hydrochloric Acid ✓

HCl gas gives thick white fumes of ammonium chloride (NH_4Cl), when a glass rod dipped in NH_3 is held near the mouth of the tube.



With silver nitrate solution both gives white precipitate of silver chloride.

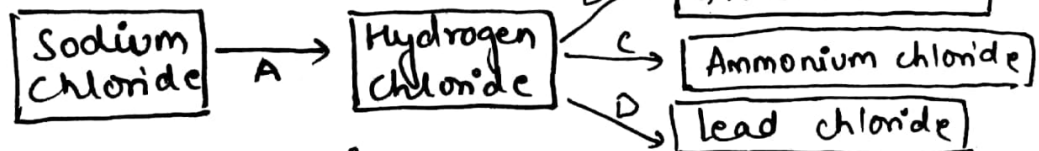


Q1. What is the difference between the chemical nature of an aqueous solution of hydrogen chloride and an aqueous solution of ammonia?

Ans: Aq. solution of HCl
 → Acidic and neutralises bases or alkalis.
 → Turns blue litmus red

Aq. solution of ammonia
 → is alkaline.
 → Turns red litmus blue.

Q2. Give balanced equation with condition for.



- Ans:
- (A) $\text{NaCl} + \text{H}_2\text{SO}_4 \xrightarrow{>200^\circ\text{C}} \text{NaHSO}_4 + \text{HCl}$
 - (B) $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$
 - (C) $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightarrow \text{NH}_4\text{Cl}(\text{s})$
 - (D) $\text{PbO}_2 + 4\text{HCl} \rightarrow \text{PbCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$