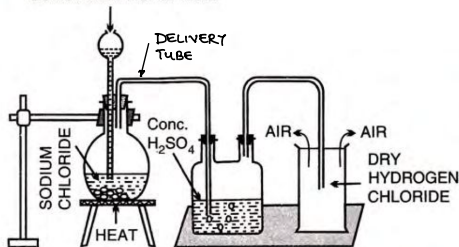


Laboratory Method to prepare HCl gas

CONC. SULPHURIC ACID



Precautions:

- Lower end of thistle funnel must be dipped in Conc. H_2SO_4 - else HCl gas will enter it.
- Delivery tube should be dipped in drying agent i.e. Conc. H_2SO_4 - else HCl gas may escape before drying.

Purification:

- Moisture is removed (drying) by passing through Conc. H_2SO_4 .
- Other drying agents like CaO, P_2O_5 react with HCl and so are not used.

Reactants: NaCl, Conc. H_2SO_4

Products: $NaHSO_4 + HCl$.

Reaction: $NaCl + H_2SO_4 \xrightarrow[\text{(conc.)}]{\leq 200^\circ C} NaHSO_4 + HCl$

Temp: $\leq 200^\circ C$

NOTE: In case temp. $> 200^\circ C$,

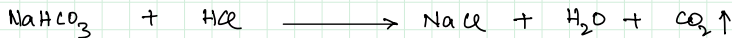
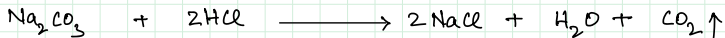
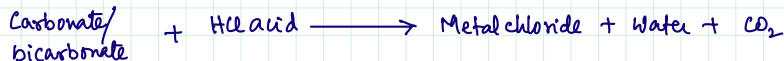
- Glass apparatus may crack
- fuel is wasted
- Na_2SO_4 forms a hard crust which is difficult to remove from the flask.

Collection:

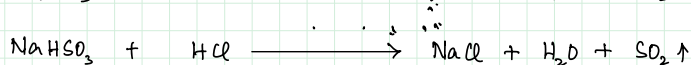
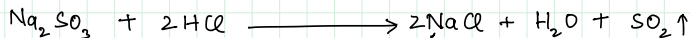
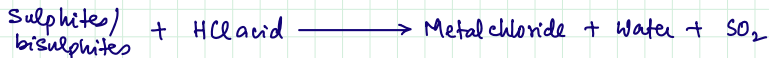
- HCl being heavier than air (≈ 1.28 times) is collected by ~~downward~~ upward displacement of air.
- HCl being highly soluble is not collected by downward displacement of water.

Identification: A glass rod dipped in ammonia sol^y placed over the gas jar produces white fumes of NH_4Cl .

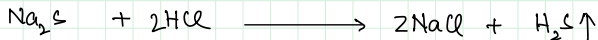
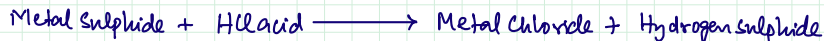
5. Reaction with Carbonates/bicarbonates



6. Reaction with metal sulphites

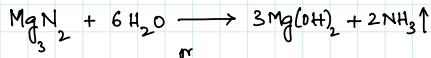


7. Reaction with metal sulphide

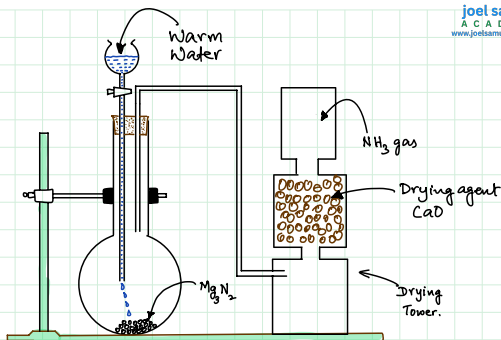
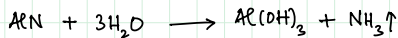


1. From Metal Nitrides (Costly Process)

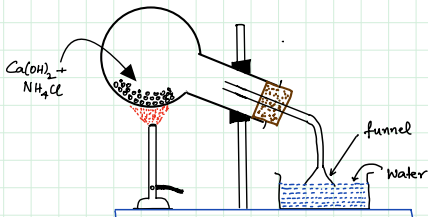
Metal Nitride + Hot Water → Metal hydroxide + Ammonia gas



or



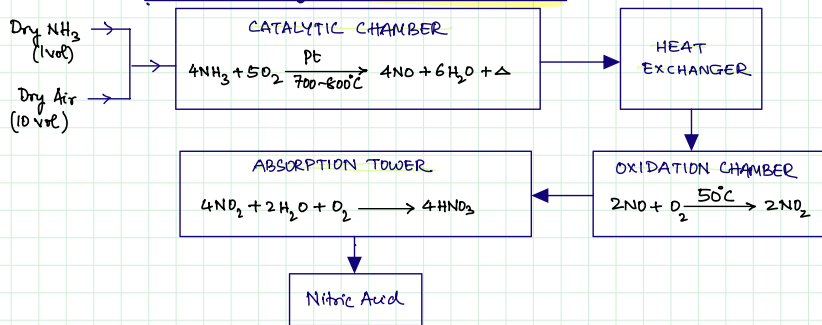
Preparation of Aqueous ammonia



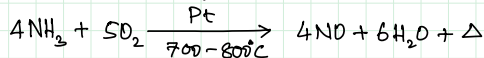
- Rate of dissolution of NH_3 in water is very high (1 vol. of water dissolves 702 vols of NH_3)
- This causes **back suction** of water.
- To prevent this, a funnel is attached to the end of the delivery tube.
- Due to larger cross sectional area of the funnel, the suction pressure reduces & **back suction** of water is prevented.

Industrial Method of Preparing Nitric acid – Ostwald's process.

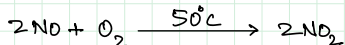
Flow chart for Ostwald's process



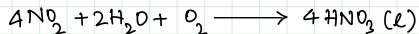
Step I : Catalytic oxidation of NH₃ gas.



Step II : Oxidation of NO to NO₂ in the oxidation chamber.

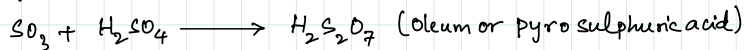


Step III : Absorption of NO₂ in water in the absorption chamber.

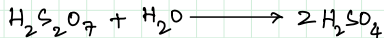


Step IIIAbsorption of SO_2 in Conc. H_2SO_4

In the absorption tower :

**Step IV**Dilution of oleum to obtain Sulphuric acid

In the dilution tank :



Note: SO_3 is not dissolved in water to obtain H_2SO_4 since it does not dissolve satisfactorily and gives a lot of heat & forms misty droplets of H_2SO_4 .

Physical properties of Sulphuric acid

- Colourless, odourless
- Dense oily, hygroscopic liquid (absorbs moisture hence should always be kept stoppered)
- Highly corrosive in nature and chars the skin black.

Chemical properties of Sulphuric acid

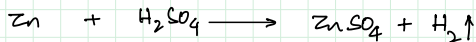
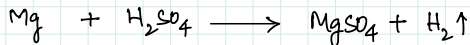
Pure 100% H_2SO_4 is not an acid since it does not ionize.

Dilution of H_2SO_4 :

- Water should never be added to acid in order to dilute it, since a large amount of heat is evolved which vaporizes water to steam which causes spurting of acid.
- Acid is poured onto a given volume of water by continuous stirring, the heat evolved is dissipated in water itself.

a) Properties of dilute H_2SO_4

(i) With metals



(ii) With metal oxide / hydroxide



- Its behaviour as an acid when dilute - reaction with metal, metal oxide, metal hydroxide, metal carbonate, metal bicarbonate, metal sulphite, metal sulphide.