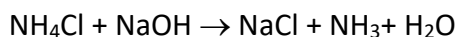
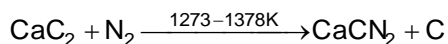


**Ammonia :** Distillation of  $\text{NH}_4^+$  salt with a base gives ammonia.



#### Cyanamide process :

- Calcium carbide on reaction with nitrogen gas at 1273K in the presence of  $\text{CaCl}_2$  or  $\text{CaF}_2$  as catalyst gives calcium cyanamide and graphite mixture. This is called as nitrolim.

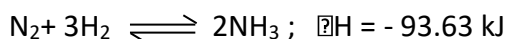


- Hydrolysis of cyanamide with steam gives  $\text{NH}_3$ .



#### Haber – Bosch process :

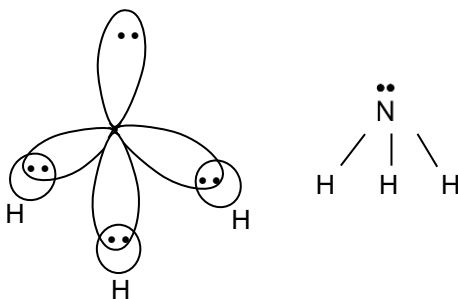
- $\text{H}_2$  and  $\text{N}_2$  gives in 3 : 1 ratio with iron as catalyst and Mo or small amounts of mixture of potassium and aluminium oxides ( $\text{K}_2\text{O}$  and  $\text{Al}_2\text{O}_3$ ) as promoter and at a pressure of 200 atm, 725 – 775 K. gives ammonia.



- In serpeck's process by product is  $\text{NH}_3$ .
- Quick lime is used to dry  $\text{NH}_3$ .
- $\text{CaCl}_2$ ,  $\text{P}_2\text{O}_5$  and  $\text{H}_2\text{SO}_4$  are acidic hence they can't be used as drying agents for  $\text{NH}_3$ .
- At  $20^\circ\text{C}$  1 litre  $\text{H}_2\text{O}$  dissolves 700 litres of  $\text{NH}_3$ .
- Saturated sol of  $\text{NH}_3$  at room temperature contains 35% (w/w)  $\text{NH}_3$ .
- $\text{NH}_3$  in the presence of catalyst gives  $\text{NO}$ .
- $\text{NH}_3$  with hot  $\text{CuO}$  gives  $\text{N}_2$  gas.
- With lesser  $\text{Cl}_2$  on oxidation  $\text{NH}_3$  gives  $\text{N}_2$  and with excess  $\text{Cl}_2$  gives  $\text{NCl}_3$ .
- $\text{NH}_3$  is Lewis base.
- $\text{NH}_3$  acts as ligand and forms complexes like  $[\text{Ag}(\text{NH}_3)_2]^+$ ,  $[\text{Cu}(\text{NH}_3)_4]^{2+}$  etc.

#### Uses of Ammonia :

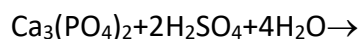
- $\text{NH}_3$  is used in refrigeration due to high latent heat of evaporation.
- For nitrogenous fertilizers like ammonium sulphate, urea, calcium ammonium nitrate etc. Preparation, ammonia is the starting material.
- In the manufacture of sodium carbonate by Solvay process ammonia is used.
- In the preparation of rayon and artificial silks, explosive like ammonium nitrate, ammonia is required.
- Nitric acid manufacture (by Ostwald's process), explosive like ammonium nitrate, ammonia is required.
- Liquor ammonia is useful as a good solvent for both ionic as well as covalent compounds.
- Structure : Pyramidal in shape, Hybridisation  $\text{sp}^3$ .



- A mixture of  $\text{CaC}_2 + \text{Ca}_3\text{P}_2$  is used as Holmes signals.

**Superphosphate of lime (calcium superphosphate)  $\text{Ca}(\text{H}_2\text{PO}_4)_2 + 2(\text{CaSO}_4 \cdot 2\text{H}_2\text{O})$**

- Mixture of calcium dihydrogen phosphoate  $[\text{Ca}(\text{H}_2\text{PO}_4)_2]$  and gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) is known as super phosphate of lime.
- Powdered phosphate rock (calcium phosphate) on treating with concentrated sulphuric acid (chamber acid)



- The reaction between phosphate rock and conc.  $\text{H}_2\text{SO}_4$  is allowed to take place for 24 – 36 hours.
- In the above reaction the temperature rises to about 373 – 383 K.
- The carbonate and the fluoride impurities in the phosphate rock react with  $\text{H}_2\text{SO}_4$  and liberate  $\text{CO}_2$  and HF gases.
- **Uses:** Superphosphate of lime is a good phosphate fertilizer.
- $\text{CaSO}_4$  present in superphosphate of lime is insoluble waste product. To avoid it superphosphate is changed into triple phosphate which is completely dissolves in water.