

**Name of the Teacher- Sutapa Chakrabarty**

**Subject: Chemistry**

**Class: Semester-6**

**Paper: DSE3T: Industrial Chemistry**

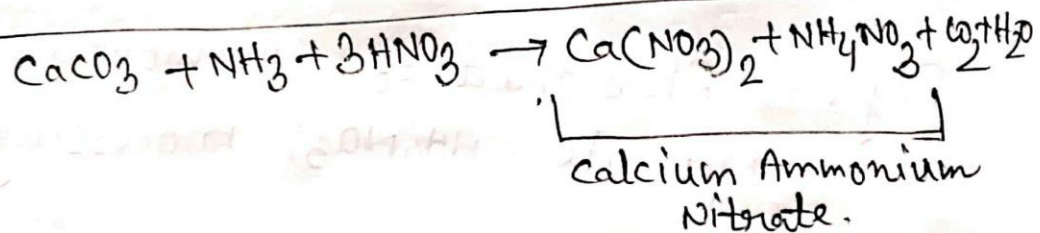
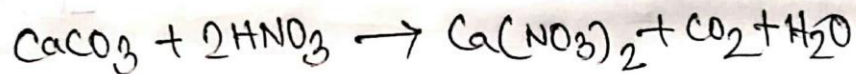
**Topic: Fertilizers**

**PART 2(last part)**

**Comments -** Read the lesson in details and practice the flow chart.

## Calcium Ammonium Nitrate :-

Calcium Ammonium Nitrate contains nitrate and its manufacturing process involves reaction of lump limestone with concentrated nitric acid, addition of ammonia to neutralise excess of acid, evaporation of resulting solution and prilling or flaking the melt. The resulting product is a double salt,  $5\text{Ca}(\text{NO}_3)_2 \cdot \text{NH}_4\text{NO}_3$  called calcium ammonium nitrate and is more useful than the single salt calcium nitrate.



The granules of calcium ammonium nitrate are binally coated with thin layer of soap stone powder which acts as protective coating and prevents absorption of moisture during storage.

## Ammonium Phosphate

### 1. Mono Ammonium phosphate

mono ammonium phosphate is prepared today by the action of  $H_2SO_4$  on mixture of calcium phosphate and ammonium sulphate. As a result mono ammonium phosphate is formed along with slurry of  $CaSO_4$ . The phosphate is separated from the slurry and crystallised to get fine crystals of mono ammonium phosphate containing about 12% Nitrogen and 50%  $P_2O_5$ .

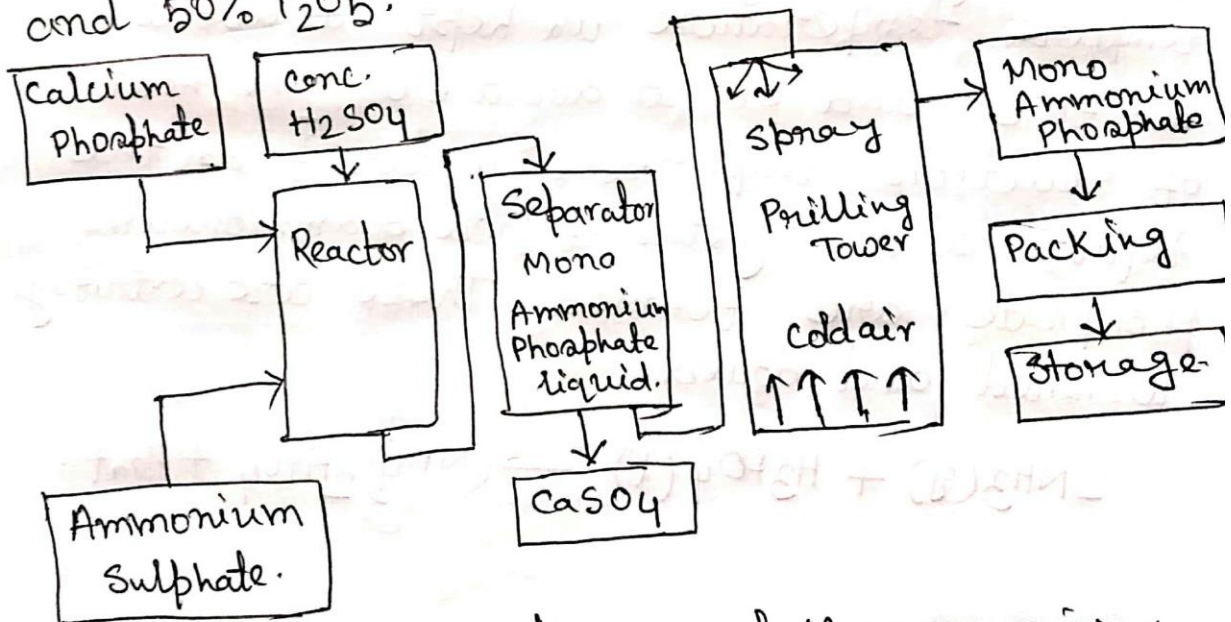
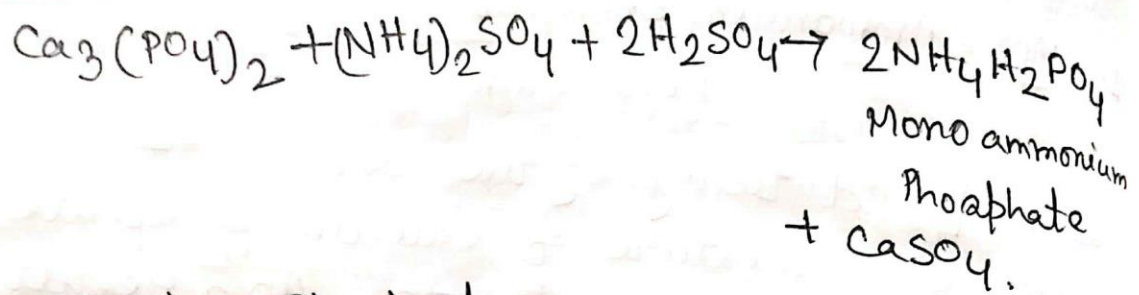


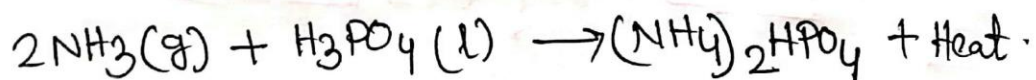
Fig:- Flow diagram of Mono ammonium phosphate.

## Reaction



## Diammonium Phosphate :-

It is prepared by a continuous process in which anhydrous ammonium gas and almost pure phosphoric acid are passed into saturated mother liquor containing mono ammonium phosphate. The ~~temperature~~ temperature is kept at about 60-70°C and pH at about 6.0. The heat of reaction vaporises water from the liquor and crystal of pure diammonium phosphate are formed. These are centrifuge washed and dried.

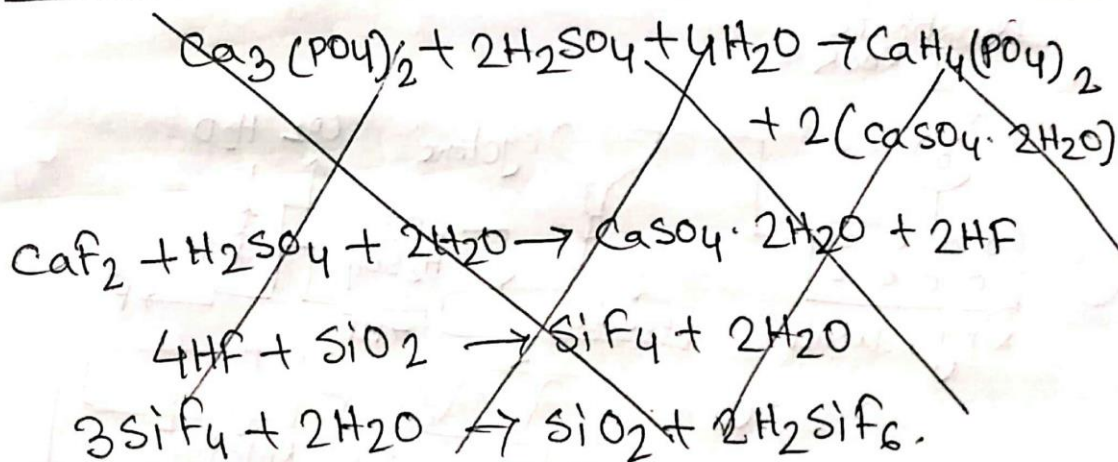


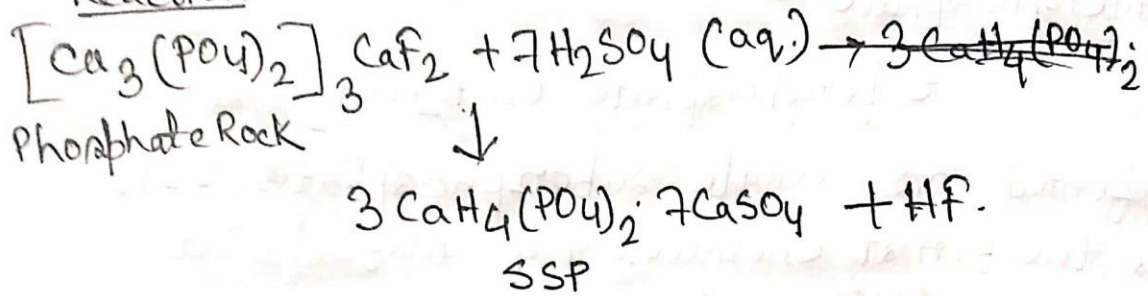
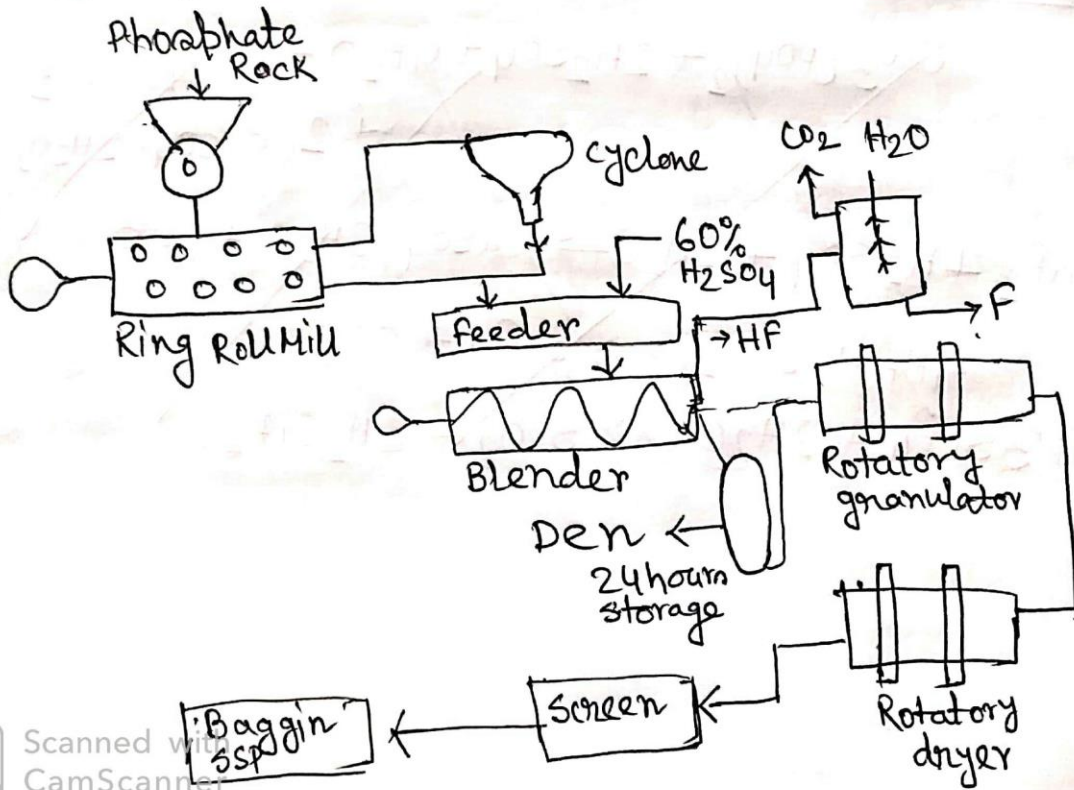
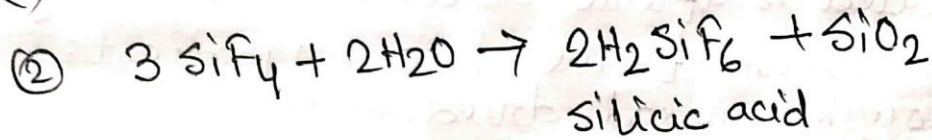
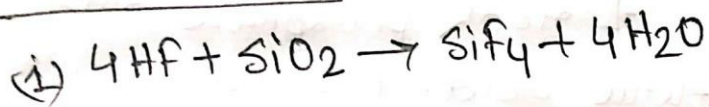
## Superphosphate :-

Superphosphate,  $\text{Ca}(\text{H}_2\text{PO}_4)_2$  also referred as single superphosphate (SSP) is the first chemically manufactured commercial fertilizer.

Single Superphosphate is produced as a combination of rock phosphate and concentrated sulfuric acid. Approximately equal amounts of the two ingredients are thoroughly mixed, dried.

### Reaction



ReactionSide reaction

## Potassium Sulphate :-

Potassium sulphate is an important potash fertilizers. It is also used for certain crops that do not tolerate the chloride ion well. e.g - tobacco and some fruits and vegetable. Potassium sulphate may be preferred because of its sulfur content where soils are deficient in both potassium and sulfur.

## Potassium Sulphate Production :-

Potassium sulphate has been ~~made~~ produced from  $KCl$  and  $H_2SO_4$  with the by product  $HCl$ . The reaction is two stage:

(a) Exothermic reaction



(b) Endothermic reaction



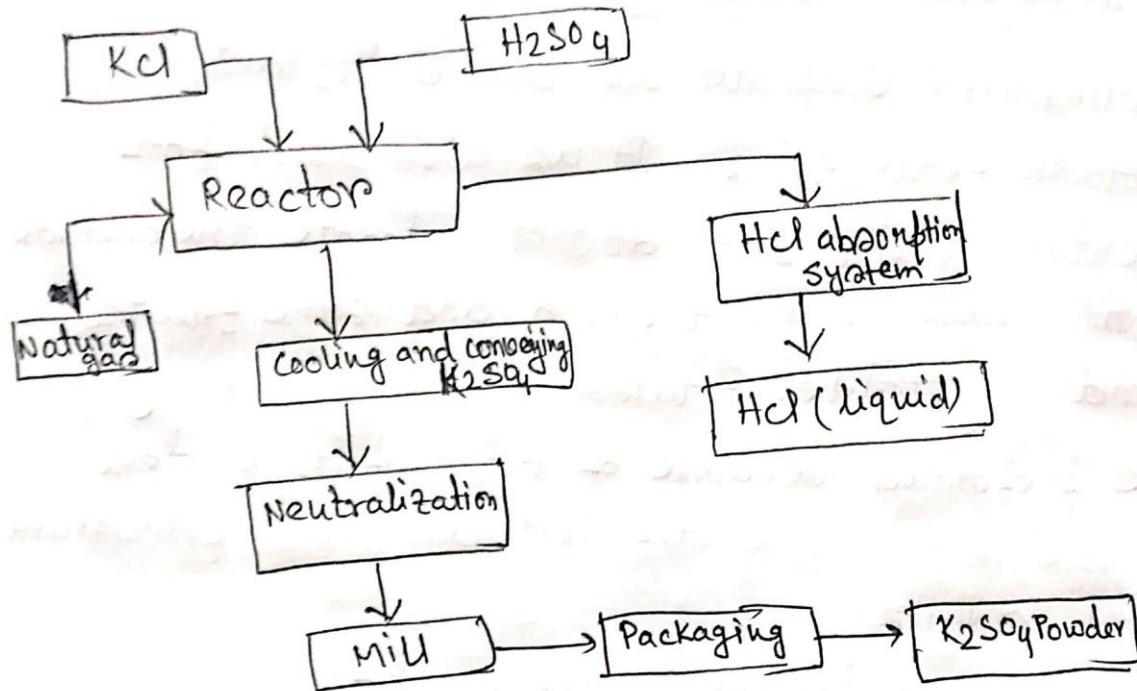


Fig - flow diagram of  $K_2SO_4$  production.

The Potassium chloride reacts during slow mixing in the heated furnace with  $H_2SO_4$  producing gaseous HCl and  $K_2SO_4$ . The furnace is heated by natural gas or fuel oil. The product  $K_2SO_4$  is cooled in a cooling drum. Lump material from the cooler is crushed and finished or can be compacted and granulate as KCl.



Compound Fertilizer :- Compound fertilizer is the fertilizer which contains two or three nutrients of N, P, K. NPK fertilizers are three-component fertilizers providing nitrogen, phosphorus and potassium. It is available in powder or granular form. Nitrogen helps plant to grow strong. Phosphorus helps root development and promote flowering. Potassium is important for overall plant health and helps in fruiting.

Q:-

- ① State the manufacturing process of urea.
- ② What is mono ammonium and diammonium phosphate?
- ③ What are the functions of nitrogen fertilizers?
- ④ What is compound or mixed fertilizer?

