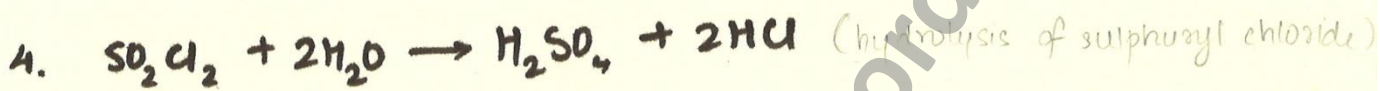
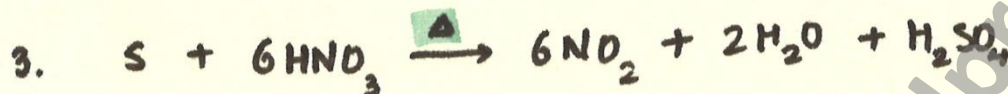
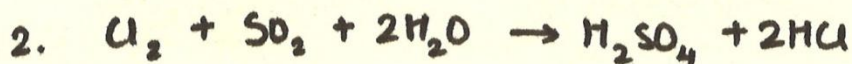
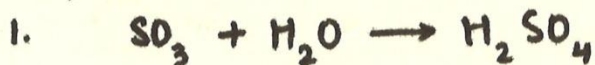


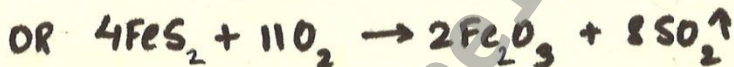
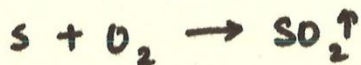
# Sulphuric Acid

Preparation:



5. Contact Process / Catalytic Oxidation of Sulphur Dioxide

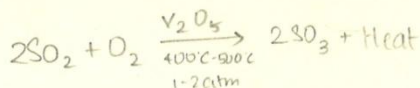
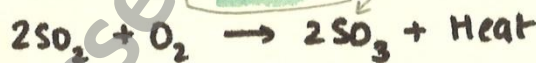
(a) Production of  $\text{SO}_2$



(b) Purification of gaseous mixture

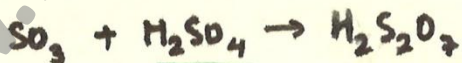
Passed through  $\text{H}_2\text{O}$  and  $\text{Fe}(\text{OH})_3$  absorbs impurities of  $\text{As}_2\text{O}_3$  (arsenic trioxide)

(c) catalytic Oxidation

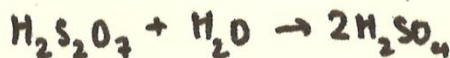


\*  $\text{K}_2\text{O}$  as promoter.

(d) Absorption of  $\text{SO}_3$



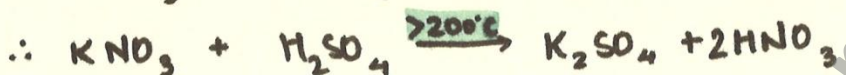
conc. oleum or pyrosulphuric acid



# Nitric Acid

Preparation:

## 1. Laboratory Preparation



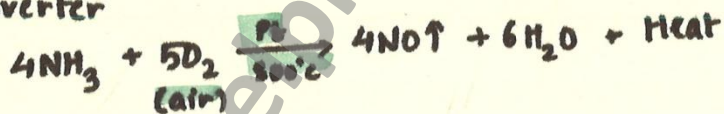
\* Higher temperature above  $200^\circ\text{C}$  is avoided, since this forms  $\text{K}_2\text{SO}_4 / \text{Na}_2\text{SO}_4$  which sticks to the glass apparatus and is difficult to remove. +  $\text{HNO}_3$  vapors rapidly decompose to form  $\text{NO}_2$  gas.

\*  $\text{HNO}_3$  prepared is yellow in color due to dissolved  $\text{NO}_2$  formed during decomposition of  $\text{HNO}_3$  by heat. However, pure conc.  $\text{HNO}_3$  is a colorless liquid.

\* In this preparation of  $\text{HNO}_3$ , the apparatus is made of glass, since  $\text{HNO}_3$ , being highly corrosive, attacks rubber, cork, etc.

## 2. Ostwald's Process / Industrial Method

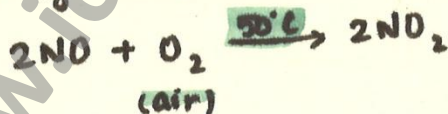
(a) Converter



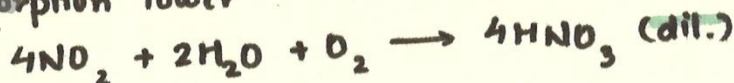
1:10 ratio

(b) Cooling Pipes (cooled to  $50^\circ\text{C}$ )

(c) Oxidizing Chamber

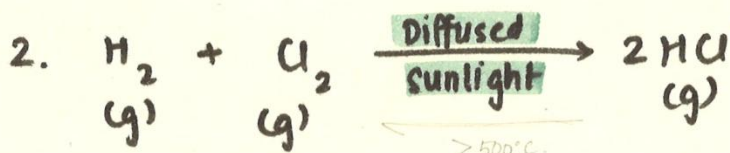
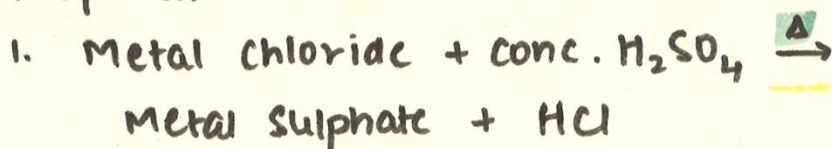


(d) Absorption Tower

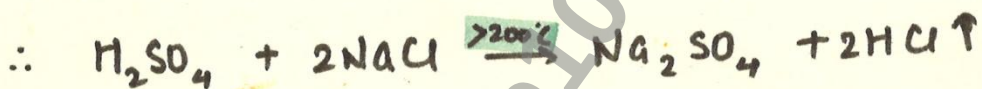
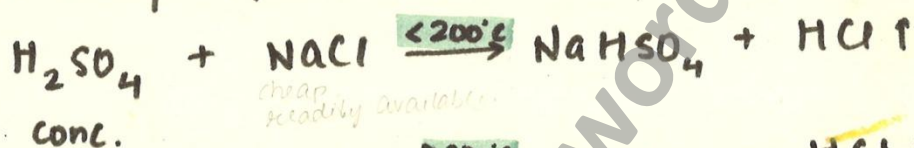


# Hydrogen Chloride

Preparation:



3. Laboratory Preparation



\* Higher temperature above  $200^\circ C$  is avoided, since this forms  $Na_2SO_4$ , which sticks to the glass apparatus and is difficult to remove, and the glass apparatus may break.  
fuel is wasted

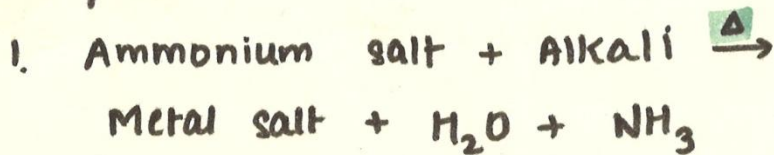
The moistened gas is passed through a washer bottle containing conc.  $H_2SO_4$ , which absorbs moisture and a dry gas is obtained.

HCl, being heavier than air and highly soluble in water, is collected by upward displacement of air.

HCl, being corrosive, can pollute the atmosphere in the laboratory, which is why the preparation should be carried out in a fume chamber.

# Ammonia

## Preparation:



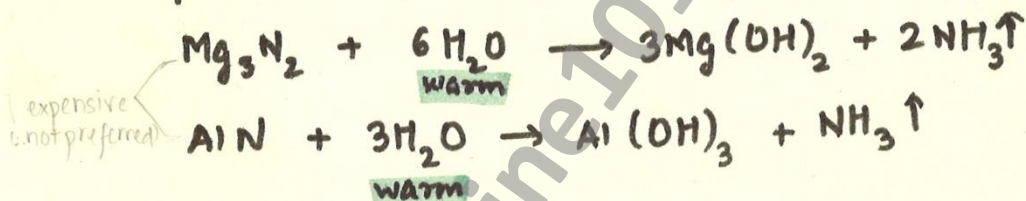
## 2. Laboratory Preparation 1



2:3 by weight

\* NH<sub>4</sub>NO<sub>3</sub> is not used since it is explosive and hence, may decompose

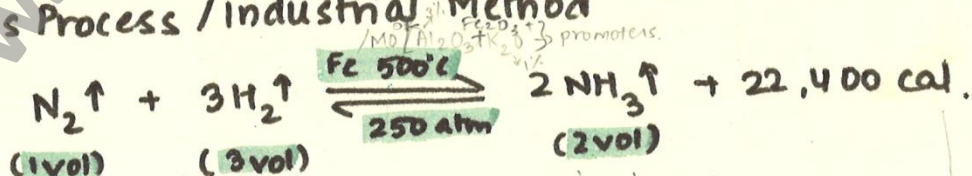
## 3. Laboratory Preparation 2 (Hydrolysis of Metal Nitride)



**Quicklime (CaO)** is used as a drying agent, since it is basic in nature and does not react with ammonia gas. (NH<sub>3</sub> reacts w/ conc H<sub>2</sub>SO<sub>4</sub>, CaCl<sub>2</sub>, P<sub>2</sub>O<sub>5</sub> etc)

Ca(OH)<sub>2</sub> slaked lime → not deliquescent + cheap  
Ammonia gas is collected by downward displacement of air, in an inverted gas jar, since it is lighter than air and is highly soluble in water.

## 4. Haber's Process / Industrial Method



\* exothermic + reversible reaction

↳ loss of volume in the form of heat energy

\* Ammonia formed can be obtained by liquefaction or by dissolving in water.

\* Apparatus should be dry = NH<sub>3</sub> is highly soluble in water