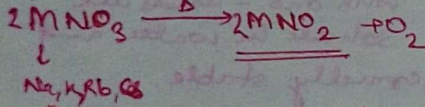
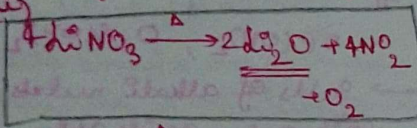


⑤ Diff. b/w Li and Alkali metals

- (i) Li is harder; MP, BP are high.
- (ii) Li is least reactive. Highest reducing power. On combustion, forms nitride.
 
$$Li_2 + O_2 \xrightarrow{-N_2} Li_2O + Li_3N$$
- (iii) LiCl is deliquescent, forms  $LiCl \cdot 2H_2O$  crystals (other alkali metal don't form hydrates).
- (iv) Lithium hydrogen carbonate does not exist in solid form but other alkali metals form solid hydrogen carbonates.
- (v) Lithium forms no ethynide with ethyne.



(vi) LiF and Li<sub>2</sub>O are less soluble in water.

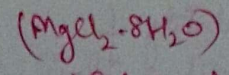
⑥ Diagonal Relationship  
(Li - Mg) ⇒ similar size.

- (i) Li and Mg are harder and lighter than other elements of their group.
- (ii) Li and Mg react slowly with water.

- oxides and hydroxides less soluble in water.
- hydroxides decompose on heating.
- form Li<sub>2</sub>N, Mg<sub>3</sub>N<sub>2</sub> with N<sub>2</sub>.
- (iii) Li<sub>2</sub>O<sub>2</sub> and MgO don't combine with excess oxygen to give superoxides.

(iv) → solid ~~and~~ hydrogen carbonates are not formed.  
→ carbonates decompose to give oxide and CO<sub>2</sub>.

(v) LiCl and MgH<sub>2</sub> are deliquescent (LiCl · 2H<sub>2</sub>O)

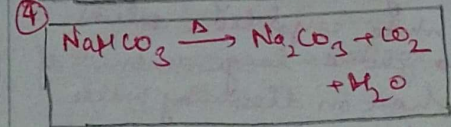
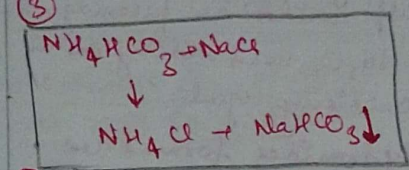
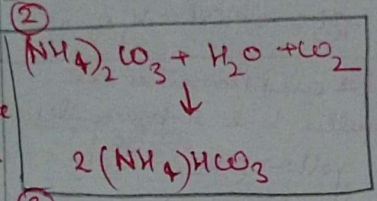
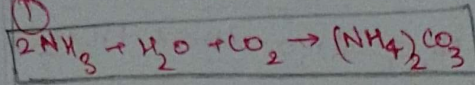


(vi) NaCl and MgH<sub>2</sub> are soluble in ethanol.

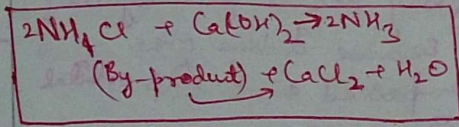
⑦ Compounds of Sodium

(i) Sodium Carbonate  
(Na<sub>2</sub>CO<sub>3</sub> · 10H<sub>2</sub>O)

Prepared by "Solvay Process"



→ NH<sub>3</sub> can be recovered as :-

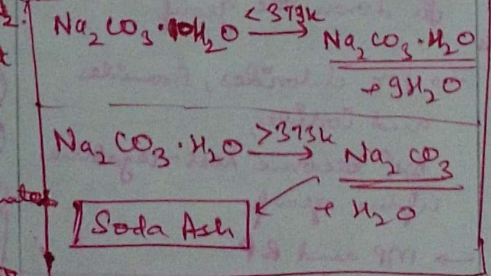


\* K<sub>2</sub>CO<sub>3</sub> cannot be formed by Solvay process.

∵ K<sub>2</sub>HCO<sub>3</sub> is too soluble to be precipitated.

Properties :-

- Crystalline solid.
- exist as decahydrate.
- on heating at 373K or below, forms monohydrate.



→ carbonate part get hydrolysed to form an alkaline solution.

Uses:-

- ① Softening of water, cleaning.
  - ② Manufacture of glass, soap and caustic soda.
  - ③ Paper, textile and paint industries.
  - ④ Laboratory reagent (both qualitative and quantitative analysis).
- called washing soda.  
→ soluble in water.

(ii) Sodium Chloride  
(NaCl)

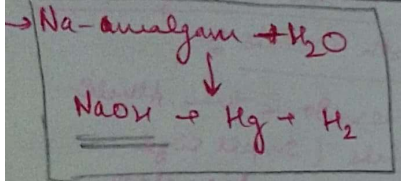
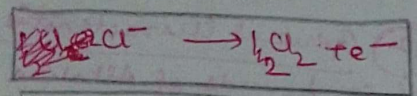
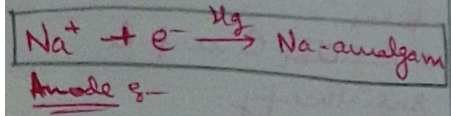
- Sea water 2.7 to 2.9% salt by mass.
- Produced by evaporation of sea water (in tropical countries).
- Crude NaCl is obtained by crystallisation of brine solution.
- Crude NaCl contains impurities MgSO<sub>4</sub>, Na<sub>2</sub>SO<sub>4</sub>, CaSO<sub>4</sub>, MgH<sub>2</sub>, CaH<sub>2</sub>.
- MgH<sub>2</sub> and CaH<sub>2</sub> are ~~deliquescent~~ impurities because they are deliquescent.
- Crude NaCl is dissolved in minimum amount of H<sub>2</sub>O and filtered to remove insoluble impurities.
- Solution is then saturated with HCl gas.
- Crystals of pure NaCl separate out.
- MgH<sub>2</sub>, CaH<sub>2</sub> remains in solution being more soluble than NaCl.
- Melts at 1073K
- solubility 36g in 100g H<sub>2</sub>O (at 29°C).
- Used as table salt.
- Preparation of NaOH, Na<sub>2</sub>CO<sub>3</sub>, Na<sub>2</sub>O<sub>2</sub>

Sodium Hydroxide

(NaOH) "Caustic Soda"  
 prepared by electrolysis  
 of brine solution  
 in Castner-Kellner cell.

→ Mercury Cathode,  
 Carbon Anode.

→ Cathode:-



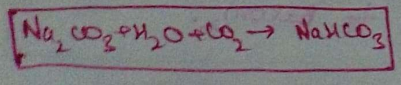
- white, translucent solid, melts at 511k.
- Soluble in water gives alkaline solution.
- Deliquescent
- NaOH at surface reacts with  $\text{CO}_2$  to form  $\text{Na}_2\text{CO}_3$ .
- Uses:-

- 1) In manufacture of soap, paper, artificial silk.
- 2) Laboratory.
- 3) Petroleum refining.
- 4) Purification of bauxite.
- 5) Textile industry (mercerizing cotton fabrics).
- 6) Preparation of fats and oils.

(iv) Sodium Hydrogencarbonate  
 $(\text{NaHCO}_3)$  (Baking Soda)

It decomposes on heating to give bubbles of  $\text{CO}_2$  which makes cakes and pastries fluffy.

Prepared by saturating  $\text{Na}_2\text{CO}_3$  solution with  $\text{CO}_2$ .



White crystalline powder separates out being less soluble.

- Used as an mild antiseptic for skin infections.
- Used in fire extinguishers.

⑧ Biological Importance of Sodium and Potassium

→ Normally a 70kg man contains 90g Na and 170g K.  
 [0.06g Cu, 5g Fe]

→ Sodium ions are found on the outside of cells in blood plasma and interstitial fluid.

→ Participate in transmission of nerve signals, in regulating flow of water across cell membrane, and in transport of amino acids and sugars.

→  $\text{K}^+$  differ quantitatively from  $\text{Na}^+$  in ability to penetrate cell membrane, transport mechanisms and in their efficiency to activate enzymes.

→  $\text{K}^+$  in cell fluids activate enzymes, participate in oxidation of glucose to ATP and transmission of nerve signals.

→ Variation in conc. of  $\text{K}^+$  and  $\text{Na}^+$  on the opposite sides of cell membrane;

$143 \text{ mmol/L Na}^+ - 5 \text{ mmol/L K}^+$   
 in blood plasma.

which changes to  
 $10 \text{ mmol/L Na}^+ - 105 \text{ mmol/L K}^+$

→ These ionic gradient demonstrate sodium-potassium pump (diff. in mechanism). This operates across cell membranes.