



Question 13. Potassium carbonate cannot be prepared by Solvay process. Why?

Answer: Potassium carbonate being more soluble than sodium bicarbonate does not get precipitated when  $\text{CO}_2$  is passed through a concentrated solution of KCl saturated with ammonia.

Question 14. Why is  $\text{Li}_2\text{CO}_3$  decomposed at a lower temperature whereas  $\text{Na}_2\text{CO}_3$  at higher temperature?

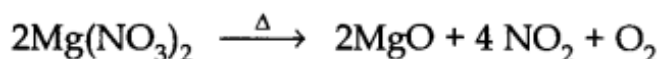
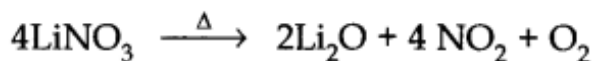
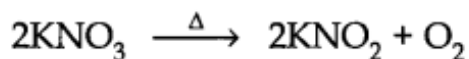
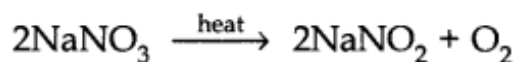
Answer:  $\text{Li}_2\text{CO}_3$  is a covalent compound whereas  $\text{Na}_2\text{CO}_3$  is an ionic compound. Therefore, Lattice energy of  $\text{Na}_2\text{CO}_3$  is higher than that of  $\text{Li}_2\text{CO}_3$ . Thus,  $\text{Li}_2\text{CO}_3$  is decomposed at a lower temperature.

Question 15. Compare the solubility and thermal stability of the following compounds of the alkali metals with those of the alkaline earth metals.

(a) Nitrates (b) Carbonates (c) Sulphates

Answer:

(a) Nitrates of both group 1 and group 2 elements are soluble in water because hydration energy is more than the lattice energy. Nitrates of both group 1 and group 2 elements are thermally unstable but they decompose differently except  $\text{LiCO}_3$  e.g.



(b) Carbonates of group 1 elements are soluble in water except  $\text{Li}_2\text{CO}_3$ . They are also thermally stable except  $\text{Li}_2\text{CO}_3$



Group 2 carbonates are insoluble in water because their Lattice energy are higher than hydration energy.

Thermal stability of carbonates of group 2 increases down the group because Lattice energy goes on increasing due to increase in ionic character.

(c) Sulphates of group 1 are soluble in water except  $\text{Li}_2\text{SO}_4$ . They are thermally stable.

Solubility of sulphates of group 2 decreases down the group because Lattice energy dominates over hydration energy.

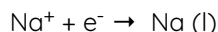
Sulphates of group 2 elements are thermally stable and increasing down the group due to increases in Lattice energy.

Question 16. Starting with sodium chloride how would you proceed to prepare.

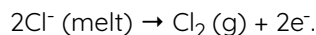
- (i) Sodium metal
- (ii) Sodium hydroxide
- (iii) Sodium peroxide
- (iv) Sodium carbonate?

Answer: (i) Sodium metal is manufactured by electrolysis of a fused mass of NaCl 40% and CaCl<sub>2</sub> 60% in Down's cell at 873 K, using iron as cathode and graphite as anode. Na is liberated at the cathode.

At cathode:

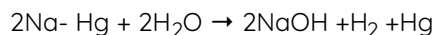
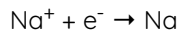


At anode:

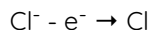


(ii) Sodium hydroxide is manufactured by electrolysis of an aqueous solution of NaCl (brine) in Castner-Kellner cell.

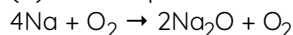
At cathode:



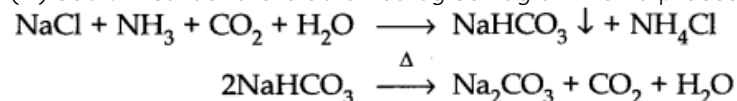
At anode:



(iii) Sodium peroxide:

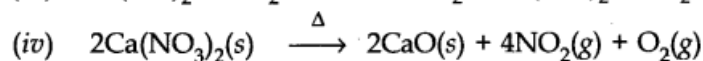
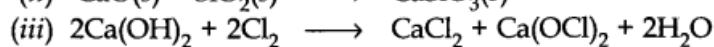
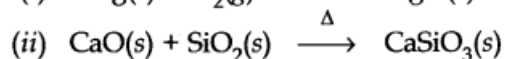
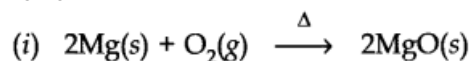


(iv) Sodium carbonate is obtained by Solvay ammonia process.



Question 17. What happens when (i) magnesium is burnt in air, (ii) Quick lime is heated with silica (iii) chlorine reacts with slaked lime (iv) calcium nitrate is heated?

Answer:



Question 18. Describe two important uses of each of the following:

(i) caustic soda

(ii) sodium carbonate

(iii) quick lime

Answer:

(i) Caustic soda

(a) It is used in the manufacturing of soap paper, artificial silk etc.

(b) It is used in textile industries.

(ii) Sodium carbonate

(a) Used in the softening of water, for laundry and cleaning purposes.

(b) It is used in glass manufacturing.

(iii) Quick lime

(a) It is used in the preparation of bleaching powder.

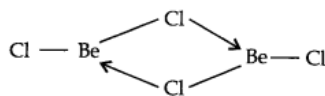
(b) Used in the purification of sugar and in the manufacturing of cement.

Question 19. Draw the structure of (i) BeCl<sub>2</sub> (vapour), (ii)

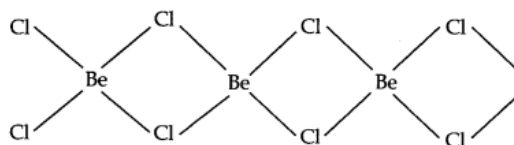
BeCl<sub>2</sub> (solid).

Answer: BeCl<sub>2</sub> (vapour)

In the vapour state, it exists as a chlorobridged dimer.



**BeCl<sub>2</sub> (solid)**



Question 20. The hydroxides and carbonates of sodium and potassium are easily soluble in water while the corresponding salts of magnesium and calcium are sparingly soluble in water. Explain.  
 Answer: Since group 1 hydroxides and carbonates due to large size contain higher hydration energy than the lattice energy so, they are easily soluble in water. Whereas, in magnesium and calcium due to small size their lattice energy dominates over hydration energy they are sparingly soluble in water.

Question 21. Describe the importance of the following:

- (i) Limestone
- (ii) Cement
- (iii) Plaster of Paris.

Answer: Limestone:

- Extensively used in the manufacturing of high quality paper.
- Used as mild abrasive in toothpaste.
- As a filler in cosmetics.
- Used as an antacid.

Cement:

- An important building material.
- Used in concrete and reinforced cement.

Plaster of Paris:

- Used in plasters.
- In dentistry, in ornamental work for making statues.

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