

## Long Answer Type Questions

**Q. 1. (i) A solution of  $\text{Na}_2\text{CO}_3$  is alkaline. Why?**

**(ii) BeO is insoluble but  $\text{BeSO}_4$  is soluble in water? Why?**

**(iii) Lithium salts are commonly hydrated and those of other alkali metal ions are usually anhydrous?**

**(iv) What is the importance of cement?**

**(v) What happens when quick lime is heated with silica? [KVS, 2008; MSE, 2007]**

**Ans. (i)**  $\text{Na}_2\text{CO}_3 + \text{H}_2\text{O} \rightarrow \text{NaHCO}_3 + \text{NaOH}$

When  $\text{Na}_2\text{CO}_3$  dissolves in water it forms, strong base (NaOH) and sodium bicarbonate ( $\text{NaHCO}_3$ ). So, the solution is alkaline.

**(ii)** Since lattice energy of BeO is greater than its hydration energy, so it is insoluble in water whereas in case of  $\text{BeSO}_4$ , hydration energy is greater than lattice energy, so it is readily soluble in water.

**(iii)** As the size decreases, hydration enthalpy increases. Since the size of  $\text{Li}^+$  ion is increases. It easily gets hydrated. The hydration enthalpy decreases with increases in size and in the order  $\text{Li}^+ > \text{Na}^+ > \text{K}^+ > \text{Rb}^+ > \text{Cs}^+$ . Hence, the other alkali metal ions are usually anhydrous.

**(iv) Cement: (a)** Cement is used in concrete and reinforced concrete.

**(b)** Mixed with sand, cement is used for plastering.

**(v)** Quick lime on heating with silica forms calcium silicate (slag).  $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$   
Calcium silicate

**Q. 2. (i) When alkali metals are heated in excess of air. What is the nature of oxides formed?**

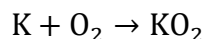
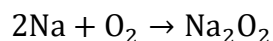
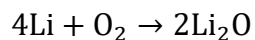
**(ii) How can you prepare baking soda?**

**(iii) Which is more reducing, alkali metals or alkaline earth metals?**

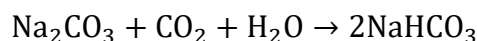
**(iv) Alkaline earth metals impart a characteristic colour to the flame but Be and Mg do not, why?**

**(v) Write general configuration of alkali and alkaline earth metals. [MSE-2007]**

**Ans. (i)** When heated with excess of air, lithium forms normal oxide,  $\text{Li}_2\text{O}$  sodium forms peroxide,  $\text{Na}_2\text{O}_2$ , whereas potassium, rubidium and caesium form superoxide's having general formula  $\text{MO}_2$ .



**(ii) Baking soda:** It is prepared commercially by dissolving soda ash in water and treating with carbon dioxide.



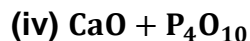
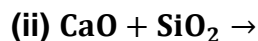
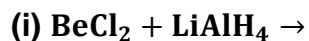
**(iii)** Alkali metals are more reducing than alkaline earth metals because of low ionisation energy.

**(iv)** Alkaline earth metals impart colour to flame but Be and Mg do not, because they do not have unpaired electrons for excitation.

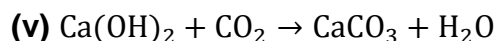
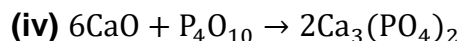
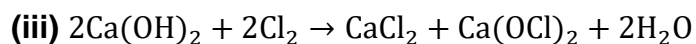
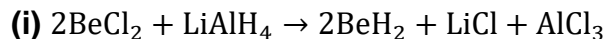
**(v)** Alkali metals  $ns^1$

Alkaline earth metals  $ns^2$

**Q. 3. Complete the following reaction equations:**



**Ans.**



**Q. 4. (i) Arrange the alkaline earth metal ions in decreasing order of hydration enthalpy.**

**(ii) What is milk of magnesia? Give its use.**

**(iii) Explain the significance of magnesium and calcium in significance of magnesium and calcium in biological fluids.**

**Ans. (i)** The decreasing order of hydration enthalpy is  $-\text{Be}^{2+} > \text{Mg}^{2+} > \text{Ca}^{2+} > \text{Sr}^{2+} > \text{Ba}^{2+}$

**(ii)** A suspension of magnesium hydroxide in water is called milk of magnesia. It is used as antacid in medicine.

**(iii) Significance of Mg and Ca in biological fluids**

**(a)** All enzymes that utilize ATP in phosphate transfer require magnesium as the cofactor.

**(b)** The main pigment is chlorophyll which contains magnesium.

**(c)** About 99% of body calcium is present in bones and teeth which is essential for them.

**(d)** Ca plays an important role in neuromuscular function, interneuron transmission, cell membrane integrity and blood coagulation.