

## S-Block Elements

### (IA & IIA Groups)

#### Very Short Answer Questions:

1. Why are alkali metals not found in the free state in nature? (Mar-2013)

**Ans.** Alkali metals are highly reactive because of their high electropositivity and lower ionisation enthalpies. Hence they occur in combined state but not in elementary i.e. free state in nature.

2. Write completely the electronic configurations of K and Rb?

**Ans.** Potassium (Z = 19) -  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

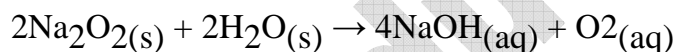
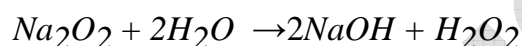
Rubidium (Z = 37) -  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 5s^1$

3. Write balanced equations for the reactions between

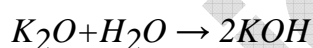
i)  $Na_2O_2$  and water

ii)  $K_2O$  and water

**Ans.** (i) The balanced chemical equation for the reaction between  $Na_2O_2$  and water is:



(ii) The balanced chemical equation for the reaction between  $K_2O$  and water is:



4. Which of the alkali metals shows abnormal density? What is the order of the variation of density among the IA group elements?

**Ans.** Potassium (K) shows abnormal density due to abnormal increase in atomic size and the presence of vacant 3d orbitals. The order of density  $Li < K < Na < Rb < Cs$

5. Lithium reacts with water less vigorously than sodium. Give your reasons?

**Ans.** In lithium salts, due to very small size of lithium ion ( $Li^+$ ) it gets readily hydrated but the other alkali metal ions are comparatively big in size. Therefore, lesser tendency to get hydrated.

6. Write the complete electronic configurations of any two alkaline earth metals?

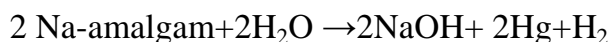
**Ans.** Magnesium (Z = 12) -  $1s^2 2s^2 2p^6 3s^2$ ; Calcium (Z = 20) -  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

**7. Write the reactions that take place at anode and cathode in the manufacture of NaOH by**

**Castner - Kellner process**

**Ans.** In Castner - Kellner process NaOH is manufactured by the electrolysis of brine using a mercury cathode and carbon anode. The reactions at electrodes are

**At cathode:**  $\text{Na}^+ + \text{e}^- + \text{Hg} \rightarrow \text{Na-amalgam}$



**At anode:**  $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

**8. What is the role of alkali metal ions in biology?**

**Ans.** i. Sodium ions participate in the transmission of nerve signals, in regulating the flow of water across cell membranes and in transport of sugar and amino acids into the cell.

ii. Potassium ions are the most abundant cations with in cell fluids, where they activate many enzymes and participate in the oxidation of glucose to produce ATP. Potassium ions also participate in the synthesis of proteins.

**9. What is the importance of  $\text{Mg}^{+2}$  and  $\text{Ca}^{+2}$  in biology?**

**Ans.** Role of  $\text{Mg}^{+2}$  in biology

1.  $\text{Mg}^{+2}$  ions are concentrated in animal cells.

2. Enzymes like 'phosphohydrolases' and 'phosphotransferases' contain  $\text{Mg}^{+2}$  ions. These enzymes participate in ATP reactions and release energy in the process.  $\text{Mg}^{+2}$  forms a complex with ATP.

3.  $\text{Mg}^{+2}$  is a constituent of chlorophyll, the green component of plants

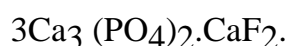
Role of  $\text{Ca}^{2+}$  in biology

1.  $\text{Ca}^{+2}$  ions are necessary for blood clotting.

2.  $\text{Ca}^{+2}$  ions are necessary to maintain regular heart beating

3.  $\text{Ca}^{2+}$  ions are necessary for muscle contraction

4.  $\text{Ca}^{2+}$  present in bones and teeth as apatite  $\text{Ca}_3(\text{PO}_4)_2$ . Enamel on teeth is fluorapatite



**10. What are the characteristic colours imparted by the IIA elements?**

**Ans.** In flame test Calcium gives brick red, Strontium gives crimson and barium imparts apple green colours. Beryllium and magnesium do not impart any colour to the flame due to their very high excitation energy.

**11. What happens when magnesium metal is burnt in air?**

**Ans.** Magnesium burns with dazzling brilliant white light in air to give MgO and  $Mg_3N_2$ .



**12. Write a balanced equation for the formation of ammoniated IIA metal ions from the metals in liquid ammonia?**

**Ans.** Alkaline earth metals [M] dissolve in liquid ammonia to give deep blue black solutions due to formation of ammoniated electrons.



**13. Write the average composition of portland cement?**

**Ans.** The average composition of portland cement is CaO 50-60%; SiO<sub>2</sub>, 20 - 25%; Al<sub>2</sub>O<sub>3</sub>, 5-10%; MgO, 2-3%; Fe<sub>2</sub>O<sub>3</sub>, 1-2% and SO<sub>2</sub> 1-2%

**14. Why is gypsum added to cement?**

**Ans.** The purpose of adding gypsum is it decreases the rate of setting of cement. It increases the time required for setting of cement.

**15. Describe the important uses of caustic soda?**

**Ans.** It is used in

- i) The manufacture of soaps, paper, artificial silk and a number of chemicals
- ii) In petroleum refining
- iii) In the Purification of bauxite
- iv) In the textile industries for mercirising cotton fabrics

**16. Describe the important uses of sodium carbonate?**

**Ans.** i) In water softening, cleaning and laundries.

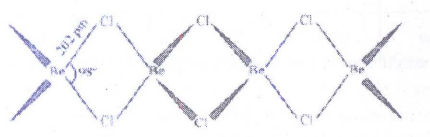
- ii) In the manufacture of glass, soap, borax, NaOH, paper, paints and textile industry.
- iii) It is an important laboratory reagent both in qualitative and quantitative analysis.

**17. Describe the important Uses of quick lime?**

- Ans.** i) It is an important primary material for manufacturing cement  
ii) It is used in the manufacture of sodium carbonate from caustic soda.  
iii) It is used in the purification of sugar and dye stuffs

**18. Draw the structures of i)  $BeCl_2$  (vapour) and ii)  $BeCl_2$  (solid)**

**Ans.** (a) Structure of  $BeCl_2$ , (solid)



$BeCl_2$  exists as a polymer in condensed (solid) phase.

In the vapour state,  $BeCl_2$  exists as a monomer with a linear structure.  $Cl - Be - Cl$

**19. Describe the importance of plaster of paris?**

- Ans.** 1) The largest use of plaster of paris is in the building industry as well as plasters.  
2) It is used for immobilising the affected part of organ where there is a bone fracture or sprain  
3) It is also employed in dentistry, in ornamental work and for making casts of statues and busts.

**20. Lithium salts are mostly hydrated. Why?**

**Ans.** Lithium salts are mostly hydrated because  $Li^+$  ion has high polarizing power due to its smaller size. As the size of the ions increases, their polarizing power decreases. Hence, other alkali metal ions usually form anhydrous salts.

**E.g.**  $LiCl \cdot 2H_2O$