s -Block Elements (Alkali & Alkaline Earth Metals)

Short Answer Type Questions

1. How do you account for the strong reducing power of lithium in aqueous solution?
2. When heated in air, the alkali metals form various oxides. Mention the oxides formed by Li, Na and K.
3. Complete the following reactions

   (i) $O_2^{2-} + H_2O \longrightarrow$ (ii) $O_2^- + H_2O \longrightarrow$

4. Lithium resembles magnesium in some of its properties. Mention two such properties and give reasons for this resemblance.
5. Name an element from Group 2 which forms an amphoteric oxide and a water soluble sulphate.
6. Discuss the trend of the following:
   - (i) Thermal stability of carbonates of Group 2 elements.
   - (ii) The solubility and the nature of oxides of Group 2 elements.

7. Why are $BeSO_4$ and $MgSO_4$ readily soluble in water while $CaSO_4$, $SrSO_4$ and $BaSO_4$ are insoluble?
8. All compounds of alkali metals are easily soluble in water but lithium compounds are more soluble in organic solvents. Explain.
9. In the Solvay process, can we obtain sodium carbonate directly by treating the solution containing $(NH_4)_2CO_3$ with sodium chloride? Explain.
10. Write Lewis strucure of O_2^- ion and find out oxidation state of each oxygen atom? What is the average oxidation state of oxygen in this ion?
11. Why do beryllium and magnesium not impart colour to the flame in the flame test?
12. What is the structure of $BeCl_2$ molecule in gaseous and solid state?

Long Answer Type Questions

1. The s-block elements are characterised by their larger atomic sizes, lower ionisation enthalpies, invariable +1 oxidation state and solubilities of their oxosalts.In the light of these features describe the nature of their oxides, halides and oxosalts.
2. Present a comparative account of the alkali and alkaline earth metals with respect to the following characteristics:
    - (i) Tendency to form ionic / covalent compounds
    - (ii) Nature of oxides and their solubility in water
    - (iii) Formation of oxosalts
    - (iv) Solubility of oxosalts
    - (v) Thermal stability of oxosalts

3. When a metal of group 1 was dissolved in liquid ammonia, the following observations were obtained:
    - (i) Blue solution was obtained initially.
    - (ii) On concentrating the solution, blue colour changed to bronze colour.

4. How do you account for the blue colour of the solution? Give the name of the product formed on keeping the solution for some time.
5. The stability of peroxide and superoxide of alkali metals increase as we go down the group. Explain giving reason.
6. When water is added to compound (A) of calcium, solution of compound (B) is formed. When carbon dioxide is passed into the solution, it turns milky due to the formation of compound (C). If excess of carbon dioxide is passed into the solution milkiness disappears due to the formation of compound (D). Identify the compounds A, B, C and D. Explain why the milkiness disappears in the last step.
7. Lithium hydride can be used to prepare other useful hydrides. Beryllium hydride is one of them. Suggest a route for the preparation of beryllium hydride starting from lithium hydride. Write chemical equations involved in the process.

8. An element of group 2 forms covalent oxide which is amphoteric in nature and dissolves in water to give an amphoteric hydroxide. Identify the element and write chemical reactions of the hydroxide of the element with an alkali and an acid.
9. Ions of an element of group 1 participate in the transmission of nerve signals and transport of sugars and aminoacids into cells. This element imparts yellow colour to the flame in flame test and forms an oxide and a peroxide with oxygen. Identify the element and write chemical reaction to show the formation of its peroxide. Why does the element impart colour to the flame?