Topic : s-block

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.10	(3 marks 3 min.)	[30, 30]

1. Sodium and potassium react with water much more vigorously than lithium because :
   (A) sodium and potassium have high values of hydration energy as compared to that of lithium.
   (B) sodium and potassium have higher melting point than that of lithium.
   (C) sodium and potassium have lower melting point than that of lithium.
   (D) sodium and potassium have lower hydration energy than that of lithium.

2. The following compounds have been arranged in order of their increasing thermal stabilities. Identify the correct order. K_2CO_3 (I), $MgCO_3$ (II), $CaCO_3$ (III), $BeCO_3$(IV)

   (A) I < II < III < IV   (B) IV < II < III < I   (C) IV < II < I < III   (D) II < IV < III < I.

3. Identify the correct statement :
   (A) Sodium metal can be prepared by the electrolysis of an aqueous solution of NaCl.
   (B) Sodium metal can be kept under ethyl alcohol.
   (C) Sodium metal is insoluble in liquid NH_3 at low temperature.
   (D) Elemental sodium is easily oxidised.

4. Which of the following statements are true about the alkali metals ?
   (1) All alkali-metal salts impart a characteristic colour to the Bunsen flame.
   (2) The correct order of increasing thermal stability of the carbonates of alkali metals is Li_2CO_3 < Na_2CO_3 < K_2CO_3 < Rb_2CO_3 < Cs_2CO_3 .
   (3) Among the alkali metals, cesium is the most reactive.
   (4) The reducing character of the alkali metal hydrides follow the order : LiH > NaH > KH > RbH > CsH.
   (A) (1), (2) and (3)   (B) (1), (3) and (4)   (C) (2), (3) and (4)   (D) (1), (2), (3) and (4)

5. **Statement-1 :** Solubilities of alkali metal fluorides and carbonates increase down the group.
   Statement-2 : Hydration energies of alkali metal halides decrease down the group with increase in size of cations.
   (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
   (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
   (C) Statement-1 is True, Statement-2 is False
   (D) Statement-1 is False, Statement-2 is True

6. The melting point of lithium (180°C) is almost double the melting point of sodium (97°C) because :
   (A) down the group, the hydration energy decreases
   (B) down the group, the ionization energy decreases
   (C) down the group, the cohesive energy decreases
   (D) none of these

7. Which of the following statement (s) is/are true for the solutions of alkali metals and alkaline earth metals in ammonia (ℓ) ?
   (A) Concentrated solutions of alkali metals in ammonia are copper - bronzed coloured and have a metallic lusture.
   (B) Dilute solutions of alkaline earth metals are deep bule-black in colour due to the spectrum from the solvated electron.
   (C) Concentrated solutions of the alkaline earth metals in ammonia are bronze coloured.
   (D) Evaporation of the ammonia from solutions of alkali metals yields the metal, but with alkaline earth metals evaporation of ammonia gives hexammoniates of the metals.

8.   **Statement-1 :** Lithium is the most powerful reducing agent and sodium is the least powerful reducing agent amongst the alkali metals in aqueous solutions.
Statement-2 : Lithium has the highest hydration enthalpy and the sodium the least value.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

9.   Which of the following statements is incorrrect ?
(A) The superoxide ion (i.e. O_2^-) is stable only in presence of larger cations such as K^+, Rb^+, Cs^+.
(B) Alkali metals are normally kept in kerosene oil.
(C) All the alkali metal hydrides are ionic solids with high melting points.
(D) The concentrated solution of alkali metals in liquid ammonia is paramagnetic in nature.

10.   Property of the alkaline earth metals that increases with their atomic number is :
(A) Ionisation energy   (B) solubility of their hydroxides
(C) solubility of their sulphates   (D) Electronegativity

Answer Key

DPP No. # 63

1. When sodium and potassium react with water, the heat evolved causes them to melt, giving a larger area of contact with water, lithium on the other hand, does not melt under these condition and thus reacts more slowly.

	Li	Na	K
Melting point (ºC)	180	98	64.

2. As the size of cation decreases, the extent of polarisation increases so covalent character $\uparrow$ and stability $\downarrow$

4. (4) Reducing nature increases down the group as their stability decreases down the group
CsH > RbH > KH > NaH > LiH
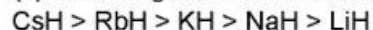
5. Both statements are correct but S_2 is not correct explanation of S_1.
Statement -1 : The reason for this is that their lattice energies change is more than the hydration energies on descending the group.

Statement -2 : Hydration energy $\propto \dfrac{1}{\text{size of cation}}$.

6. The atom becomes larger on descending the group, so the bonds are weaker (metallic bond), the cohesive force/energy decreases and accordingly melting point also decreases.

7. (A) Due to the formation of metal ion clusters   (B) $M + (x + y) NH_3 \longrightarrow M^+(NH_3)_x + e^-(NH_3)_y$
(C) due to the formation of metal clusters.   (D) $M(NH_3)_6 \longrightarrow$ true statement

8. (i) $E^0\ Li^+/Li = -3.04$; $Na^+/Na = -2.71$ which is least among the alkali metals.
(ii) Hydration enthalpy / KJ mol^{-1}
$Li = -506$; $Na = -406$; Cs has the least $\Delta H_{hyd} = -276$

9. (A) Bigger anion is stabilised by bigger cation through lattice energy effect.
(B) Because of their high reactivity towards air and water.
(C) True Statement
(D) In concentrated solution, unpaired electrons with opposite spins paired up – forming the solution diamagnetic.

10. Solubility of alkaline earth metal hydroxide increases as the solubility product increases.

$Be(OH)_2 < - - - - - - < Ba(OH)_2$

| K_{SP} | 1.6×10^{-26} | 5.4×10^{-3} |