Question 22. Why are lithium salts commonly hydrated and those of the other alkali metal ions usually anhydrous?
Answer: Due to smallest size, Li^+ can polarize water molecules easily than the other alkali metal ions.

Question 23. Why is LiF almost insoluble in water whereas LiCl soluble not only in water but also in acetone?
Answer: It is due to high lattice energy of LiF as compared to LiCl. LiCl is soluble in water because its hydration energy is higher than its lattice energy.

Question 24. Explain the significance of sodium, potassium, magnesium and calcium in biological fluids.
Answer: Sodium ions:

- Na^+ ions participate in the transmission of nerve signals, in regulating the flow of water across cell membranes.
- In the transport of sugars and amino acids into cell.

Potassium ions:

- They activate many enzymes.
- Participate in the oxidation of glucose to produce ATP.

Magnesium ions:

- All enzymes that utilise ATP in phosphate transfer require magnesium as a cofactor.
- Mg is the main pigment for the absorption of light in plants.

Calcium:

- Ca^{2+} ions are present in bones.
- plays important roles in neuromuscular function.

Question 25. What happens when
(i) Sodium metal is dropped in water?
(ii) Sodium metal is heated in free supply of air?
(iii) Sodium peroxide dissolves in water?
Answer: (i) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
(ii) $2Na + O_2 \rightarrow Na_2O_2$
(iii) $Na_2O_2 + 2H_2O \rightarrow 2NaOH + H_2O_2$

Question 26. Comment on each of the following observations:
(a) The mobilities of the alkali metal ions in aqueous solution are
$Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$
(b) Lithium is the only alkali metal to form a nitride directly.
(c) Ee for M^{2+} (aq) + $2e^- \rightarrow$ M(s) (where M = Ca, Sr, or Ba) is nearly constant.
Answer:
(a) Smaller the size of the ion, more highly it is hydrated and hence greater is the mass of the hydrated ion and thus the ionic mobility become lesser. The extent of hydration decreases in the order.
$Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$
Thus the mobility of Cs^+ will be the highest.
(b) Due to its smaller size lithium can form nitride directly.

(c) It is because reduction potential depends upon sublimation energy, ionisation energy and hydration energy. Their resultant is almost constant for these ions.

Question 27. State as to why
(a) a solution of Na_2CO_3 is alkaline?
(b) alkali metals are prepared by electrolysis of their fused chlorides?
(c) Sodium is found to be move useful than potassium?
Answer: (a) Na_2CO_3 is a salt of a weak acid, carbonic acid (H_2CO_3) and a strong base NaOH. Thus it undergoes hydrolysis to produce strong base NaOH and its aqueous solution is alkaline in nature.
$Na_2CO_3(s) + H_2O(l) \rightarrow 2NaOH$
(b) Because the discharge potential of alkali metals is much higher than that of hydrogen, therefore when the aqueous solution of any alkali metal chloride is subjected to electrolysis, H_2, instead of the alkali metal, is produced at the cathode. Therefore alkali metals are prepared by electrolysis of their fused chlorides.
(c) Since potassium is move reactive than sodium and it is found in nature to a less extent than Na, sodium is found to be more useful.

Question 28.Write balanced equations for reactions between.
(a) Na_2O_2 and water
(b) KO_2 and water
(c) Na_2O and CO_2
Answer:
(a) $Na_2O_2 + 2H_2O \rightarrow 2Na0H + H_2O_2$
(b) $2KO_2 + 2H_2O \rightarrow 2KOH + O_2 + H_2O_2$
(c) $Na_2O + CO_2 \rightarrow Na_2CO_3$

Question 29. How would you explain the following observations?
(i) BeO is almost insoluble but $BeSO_4$ is soluble in water.
(ii) BaO is soluble but $BaSO_4$is insoluble in water.
(iii) LiI is more soluble than KI in ethanol.
Answer:
(i) Lattice energy of BeO is compartively higher than the hydration energy. Therefore, it is almost insoluble in water. Whereas $BeSO_4$ is ionic in nature and its hydration energy dominates the lattice energy.
(ii) Both BaO and $BaSO_4$ are ionic compounds but the hydration energy of BaO is higher than the lattice energy therefore it is soluble in water.
(iii) Since the size of Li^+ ion is very small in comparison to K^+ ion, it polarises the electron cloud of I^- ion to a great extent. Thus LiI dissolves in ethanol more easily than the KI.

Question 30. Which of the alkali metal is having least melting point?
(a) Na (b) K (c) Rb (d) Cs
Answer: Size of Cs is the biggest thus, its melting point is the lowest, (d) is correct.

Question 31. Which one of the following alkali metals give hydrated salts?
(a) Li (b) Na (c) K (d) Cs
Answer: Li^+ is the smallest. Thus, it has the highest charge density and hence attracts the water molecules more strongly.

Question 32. Which one of the following alkaline earth metal carbonates is thermally most stable?
(a) $MgCO_3$
(b) $CaCO_3$
(c) $SrCO_3$
(d) $BaCO_3$

Answer: (d) $BaCO_3$

********** END **********