SOLUTIONS

Module - 3 / JEE-2022

IN-CHAPTER EXERCISES	Chemistry	s-block Elements & Compounds

EXERCISE-A

1.(AB) Ammoniated electron imparts blue colour to the solution and makes it conducting as well.

2.(C) Wavelength of bright D-lines correspond to yellow visible colour of spectrum.

3.(AB) Combustion of Na in excess air gives Na_2O_2 and Na_2O.

4.(ACF) (A), (C) and (F) are correct options.

5.(D) Due to absence of d-orbital Be can't have more than four water of crystallisation associated with it.

EXERCISE-B

1. Group 2 atoms are smaller in size and has more polarising power than group 1 atoms. This character help them to have higher hydration enthalpy. Hence group 2 metal compounds have more water of crystallisation.

2.(D) lattice ethalpy decreases down the group due to increase in radius.

3.(B) (B) is correct.

Solubility of most of the group I metal compounds decreases down the group except for fluorides, hydroxides and carbonate. And solubility of most of the group II metal compounds decreases down the group except for fluorides and hydroxides. You will learn more about this concept in p-block module.

4.(B) Stability of carbonates increases down the group, and K_2CO_3 is more stable than $CaCO_3$ due to less polarisation by cation part.

5.(BCD) $LiNO_3 \xrightarrow{\text{Heat}} Li_2O + NO_2 + O_2$

EXERCISE-C

1.(B) Here phosphorus goes from 0 oxidation state to +1 oxidation state in NaH_2PO_2 and – 3 oxidation state in PH_3.

2.(C) $1.79\text{ kg } Mg^{2+} \equiv 74.58\text{ mol } Mg^{2+}$

1 mol. of slacked lime will precipitate 1 mol of Mg^{2+}.

$\Rightarrow \quad 74.58\text{ mol } Ca(OH)_2 \equiv 5.52\text{ kg}$

3.(BD) $Li_3N + H_2O \longrightarrow LiOH + NH_3$

4.(A) KO_2 is paramagnetic in nature.

5.(B) $2KO_2 + CO_2 \longrightarrow K_2CO_3 + \frac{3}{2}O_2$

Here KO_2 absorb CO_2 and produces O_2 giving the life supporting property.

6.(ACD) (A), (C) and (D) are correct options.

7.(C) $Na_2O + H_2O \longrightarrow 2NaOH$

$Na_2O_2 + 2H_2O \longrightarrow 2NaOH + H_2O_2$

$2KO_2 + 2H_2O \longrightarrow 2KOH + H_2O_2 + O_2$

(C) is the only possible option.

EXERCISE-D

1. $NaHCO_3 + NaOH \longrightarrow Na_2CO_3 + H_2O$

2. It is because hydration energy of group 1 hydroxides and carbonates is higher than lattice energy where as in group 2 hydroxides and carbonates lattice energy dominates hydration energy.

3. K_2CO_3 can't be prepared from solvay's process because $KHCO_3$ formed in the reaction is highly soluble and hence can't be separated from $NH_4Cl + KHCO_3$ mixture easily.

4. MgO and BeO are used for lining of steel making furnance because they are less reactive, have high melting point, good conductivity towards heat and bad conductivity towards electricity.

5. (A) is calcium metal which reacts with water and evolves hydrogen (B) and $Ca(OH)_2$ solution (C).

$\underset{(A)}{Ca} + 2H_2O \longrightarrow \underset{(C)}{Ca(OH)_2} + \underset{(B)}{H_2}$ "Colourless and Odourless gas"

$Ca + \underset{(B)}{H_2} \longrightarrow \underset{(D)}{CaH_2}$ Solid product

$CaH_2 + 2H_2O \longrightarrow \underset{(E)}{Ca(OH)_2} + 2H_2$

$Ca(OH)_2 + CO_2 \longrightarrow \underset{(F)}{CaCO_3} \xrightarrow{CO_2} \underset{(G)}{Ca(HCO_3)_2}$

$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$ "Gives deep red colouration to flame"

$\underset{(F)}{CaCO_3} \xrightarrow{\Delta} \underset{(H)}{CaO} \xrightarrow{C} \underset{(I)}{CaC_2}$

6.(A) $Na_2SO_4.10H_2O$

7.(A) Product at cathode $\rightarrow H_2$

Product at anode $\rightarrow O_2$

H^+ and O^{2-} has more potential than Na^+ and SO_4^{2-} to gain and lose electrons.

8.(A) Asbestos diaphragm is used in Nelson cell.

9.(BC) K^+ and NH_4^+.

10.(BCD) Na_2CO_3, $NaHCO_3$, $CaCl_2$

$Ca(OH)_2$ acts as reactant in preparation of Na_2CO_3 and not as some product or side product.

11.(B) Pure form of common salt is colourless.

12.(A) HCl and H_2O.

13.(A) A is correct.