PHYSICAL / INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 62

Total Marks : 41

Max. Time : 41 min.

Topic : Surface Chemistry

Type of Questions		M.M., Min.
Subjective Questions ('–1' negative marking) Q.1,2, 5,6,7	(4 marks 5 min.)	[20, 20]
Single choice Objective ('–1' negative marking) Q.3,4,8,9,11,12	(3 marks 3 min.)	[18, 18]
Assertion and Reason (no negative marking) Q.10	(3 marks 3 min.)	[3, 3]

1. Give reasons for the following in one or two sentences only :
$BeCl_2$ can be easily hydrolysed.

2. A white solid is either Na_2O or Na_2O_2. A piece of red litmus paper turns white when it is dipped into a freshly made aqueous solution of the white solid.
(i) Identify the substance and explain with balanced equation.
(ii) Explain what would happen to the red litmus if the white solid were the other compound.

3. **Statement-1 :** LiCl is predominantly a covalent compound.
Statement-2 : Electronegativity difference between Li and Cl is too small.
(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

4. Highly pure dilute solution of sodium in liquid ammonia :
(A) show blue colour
(B) exhibits electrical conductivity
(C) produces sodium amide
(D) produces hydrogen gas

5. Arrange the following sulphates of alkaline earth metals in order of decreasing thermal stability :
$BeSO_4$, $MgSO_4$, $CaSO_4$ $SrSO_4$

6. The crystalline salts of alkaline earth meals contain more water of crystallisation than the corresponding alkaline metal salts. Why ?

7. Element A burns in nitrogen to give an ionic compound B. Compound B reacts with water to give C and D. A solutions of C becomes 'milky' on bubbling carbon dioxide. Identify A, B, C and D.

8. A dilute aqueous solution of Na_2SO_4 is electrolysed using platinum electrodes. The products at the anode and cathode are
(A) O_2, H_2
(B) $S_2O_8^{2-}$, Na
(C) O_2, Na
(D) $S_2O_8^{2-}$, H_2

9. 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

10. **Statement-1 :** The alkali metals can form ionic hydrides which contain the hydride ion H^-.
Statement-2 : The alkali metals have low electronegativity; their hydrides conduct electricity when fused and liberate hydrogen at the anode.
Evaluate the above statement and the explanation.
(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

11. Which is not correctly matched ?
(1) Basic strength of oxides $Cs_2O < Rb_2O < K_2O < Na_2O < Li_2O$
(2) Stability of peroxides $Na_2O_2 < K_2O_2 < Rb_2O_2 < Cs_2O_2$
(3) Stability of bicarbonates $LiHCO_3 < NaHCO_3 < KHCO_3 < RbHCO_3 < CsHCO_3$
(4) Melting point $NaF < NaCl < NaBr < NaI$
(A) 1 and 4 (B) 1 and 3 (C) 1 and 2 (D) 2 and 3

12. $Li + N_2 \xrightarrow{\Delta} A \xrightarrow{H_2O} B + (C)\ gas$
Then the correctly matched pair for A, B, C are

	A	B	C		A	B	C
(A)	LiN_3	LiOH	NH_3	(B)	LiN_3	LiH	NO_2
(C)	Li_3N	LiOH	NO_2	(D)	Li_3N	LiOH	NH_3

Answer Key

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1. $BeCl_2$ is hydrolysed due to high polarising power and presence of vacant p-orbitals in Be-atom. (Be = $1s^2, 2s^2 2p_x^1\ 2p_y^0 2p_z^0$)

2. (i) Na_2O_2 is powerful oxidant and bleaching agent and bleaches red litmus paper to white in aqueous solution according to the following reaction,

$$Na_2O_2 + 2H_2O \longrightarrow 2NaOH + H_2O + [O]$$
$$[O] + \text{Litmus} \longrightarrow \text{White (bleaching)}$$

(ii) The other compound Na_2O will give NaOH on dissolution in water according to the following reaction.

$$Na_2O + H_2O \longrightarrow 2NaOH\ .$$

The red litmus will turn to blue due to stronger alkaline nature of NaOH

3. (C) **4.*** (AB) **5.** $SrSO_4 > CaSO_4 > MgSO_4 > BeSO_4$

6. Lower the size of cation, higher will be hydration tendency because hydration energy of cation is inversely proportional to size of cation. The size of alkaline earth metal ions are lower than the size of alkali metal ions. So in crystalline form the salts of alkaline earth metals have more water molecules than those of alkali metals.

7. Ba, Ba_3N_2, $Ba(OH)_2$ $BaCO_3$

8. (A) **9.** (B) **10.** (A) **11.** (A) **12.** (D)

Hints & Solutions

PHYSICAL / INORGANIC CHEMISTRY

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1. $BeCl_2$ is hydrolysed due to high polarising power and presence of vacant p-orbitals in Be-atom. (Be = $1s^2, 2s^2 2p_x^1\ 2p_y^0 2p_z^0$)

4. $M + (x + y)\ NH_3 \longrightarrow [M(NH_3)_x]^+ + [e(NH_3)_y]^-$

The electrical conductivity is due to the solvated ions and blue colour is due to solvated electrons.

5. As metallic character i.e. electropositive character of cations increases thermal stability of their sulphates increases and thus the correct order is $SrSO_4 > CaSO_4 > MgSO_4 > BeSO_4$.

7. $\underset{'A'}{3M} + N_2 \rightarrow \underset{'B'}{M_3N_2}$

$\underset{'B'}{M_3N_2} + 6H_2O \rightarrow \underset{'C'}{3M(OH)_2} + \underset{'D'}{2NH_3}$

$\underset{'C'}{M(OH)_2} + CO_2 \rightarrow \underset{'D'}{MCO_3} + H_2O$

M may be either Ca or Ba. It is not magnesium because $Mg(OH)_2$ has very low solubility in water.

9. The increasing thermal stability is

$\underset{(IV)}{BeCO_3} < \underset{(II)}{MgCO_3} < \underset{(III)}{CaCO_3} < \underset{(I)}{K_2CO_3}$

Increasing size of cation decreases its polarization ability towards carbonate, making the compound more stable.

11. Basic strength of the oxides increase in the order $Li_2O < Na_2O < K_2O < Rb_2O < Cs_2O$. The increase in basic strength is due to the decrease in I.E. down the group.

The melting point of the halides decrease in the order NaF < NaCl < NaBr < NaI, because of the decrease in lattice energies, as the size of the halide ion increases.

12. $Li + N_2 \longrightarrow \underset{\text{A = Lithium Nitride}}{Li_3N} \xrightarrow{H_2O} \underset{B}{LiOH} + \underset{C}{NH_3}$