INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 21

Total Marks : 120

Max. Time : 120 min.

Topic : Chemical Bonding

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.4	(3 marks, 3 min.)	[12, 12]
Comprehension ('–1' negative marking) Q.5 to Q.7	(3 marks, 3 min.)	[9, 9]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

1. Choose the compounds of maximum and minimum ionic character from LiCl, RbCl, $BeCl_2$ and $MgCl_2$:
(A) LiCl and RbCl (B) RbCl and $BeCl_2$ (C) RbCl and $MgCl_2$ (D) $MgCl_2$ and $BeCl_2$

2. An ion without pseudo-inert gas configuration is :
(A) Ag^+ (B) Cd^{2+} (C) Zn^{2+} (D) Fe^{3+}

3. Correct order of increasing solubility in water of RbI, CdI_2 and PbO_2 is :
(A) PbO_2, CdI_2, RbI (B) RbI, CdI_2, PbO_2 (C) CdI_2, PbO_2, RbI (D) PbO_2, RbI, CdI_2

4. AgCl is colourless whereas AgI is yellow, because :
(A) Ag^+ possesses 18 electrons in shell to screen the nuclear charge.
(B) Ag^+ shows pseudo inert gas configuration.
(C) Distortion of I^- is more pronounced than Cl^- ion.
(D) Existence of d-d transition.

Comprehension # (Q.5 to Q.7)

Fajan's Rule

When anions and cation approach each other, the valence shell of anions are pulled towards cation nucleus and thus, shape of anion is deformed. The phenomenon of deformation of anion by a cation is known as polarization and the ability of the cation to polarize the anion is called as polarizing power of cation. Due to polarization, sharing of electrons occurs between two ions to some extent and the bond shows some covalent character.

The magnitude of polarization depends upon a number of factors. These factors were suggested by Fajan and are known as Fajan's rules.

(i) Greater is the polarization in a molecule, more is covalent character.
(ii) As the charge on cation increases, its tendency to polarize the anion increases.
(iii) As the size of the cation decreases or size of the anion increases, the polarization increases.
(iv) The cations with 18 electrons in the outermost shell bring greater polarization of the anion than those with inert gas configuration even if both the cation have same size and same charge.

Many important properties of ionic compounds like solubility, melting point, thermal stability, etc. can be explained on the basis of Fajan's rule.

5. Arrange the following in decreasing order of melting point : $BeCl_2$, $MgCl_2$, $CaCl_2$ and $BaCl_2$
(A) $BeCl_2 > MgCl_2 > CaCl_2 > BaCl_2$ (B) $BaCl_2 > MgCl_2 > CaCl_2 > BeCl_2$
(C) $BeCl_2 > CaCl_2 > MgCl_2 > BaCl_2$ (D) $BaCl_2 > CaCl_2 > MgCl_2 > BeCl_2$

6. Which among the following has maximum covalent character :
(A) NaCl (B) $MgCl_2$ (C) $A\ell Cl_3$ (D) $CaCl_2$

7. Which of the following statements is INCORRECT :
(A) AgI is less soluble in water than AgF due to more polarisation of I^- in comparison to F^- ion.
(B) LiI is less soluble in water than LiF due to more polarisation of I^- in comparison to F^- ion.
(C) Colour of some compounds can also be explained on the basis of polarisation of anion.
(D) The greater covalent character of AgCl as compared to NaCl can be explained on the basis of Fajan's rule.

8. Answer the following question :
(a) Among LiF and LiI, which has more covalent character ?
(b) LiI is soluble in water but LiF is not. Why ?

Answer Key

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1. (B) **2.** (D) **3.** (A) **4.** (C) **5.** (D)

6. (C) **7.** (B)

8. (a) Electronegativity difference Li and iodine is less than Li and F. Thus, LiI is more covalent.
(b) Although Li^+ is same in both the compounds yet difference in the size of F^- and I^- is not same. Since F^- is smaller than I^- hence lattice energy of LiF is more than that of LiI. Similarly heat of hydration of F^- is more than that of I^-. But the decrease of L.E. from LiF to LiI is much more than the decrease in heat of hydration from LiF to LiI. Hence solubility increases from LiF to LiI.

Hints & Solutions

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5. $BeCl_2$, $MgCl_2$, $CaCl_2$, $BaCl_2$

$\longrightarrow$ cationic size $\uparrow$ $\therefore$ covalent character $\downarrow$ $\therefore$ mp $\uparrow$

6. Greater the charge on cation and smaller the size of cation, more will be the covalent character in ionic compound.

7. (B) For this comparison, larger the size difference between cation and anion, greater will be the water solubility.

8. (a) Electronegativity difference Li and iodine is less than Li and F. Thus, LiI is more covalent.
(b) Although Li^+ is same in both the compounds yet difference in the size of F^- and I^- is not same. Since F^- is smaller than I^- hence lattice energy of LiF is more than that of LiI. Similarly heat of hydration of F^- is more than that of I^-. But the decrease of L.E. from LiF to LiI is much more than the decrease in heat of hydration from LiF to LiI. Hence solubility increases from LiF to LiI.