CHEMISTRY

TARGET : JEE-2024 **Maximum Time : 50 Min.**

DPP No. : 08

SCQ (Single Correct Type) :

1. Amongest LiCl, RbCl, $BeCl_2$ and $MgCl_2$, the compounds with the greatest and the least ionic charcter, respectively are
(A) LiCl and RbCl (B) RbCl and $BeCl_2$ (C) RbCl and $MgCl_2$ (D) $MgCl_2$ and $BeCl_2$

2. Which of the following is ionic ?
(A) KHF_2 (s) (B) CaC_2 (s) (C) PCl_5 (s) (D) All

3. Which of the following cannot conduct electricity ?
(A) Ionic compounds in aqueous state (B) Metallic crystals in solid state
(C) Polar covalent compounds in molten state (D) None of above

4. $CaCN_2$ has :
(A) 2σ bonds, 2π bonds (B) 3σ bonds, 1π bond
(C) 1σ bond, 2π bonds (D) 3σ bonds, 2π bonds

5. In SO_2 molecule, there are two σ-bonds and two π-bonds. The two π-bonds are formed by :
(A) pπ–pπ overlap between S and O atoms
(B) sp2–p overlap between S and O atoms
(C) one by pπ–pπ overlap and other by pπ–dπ overlap
(D) both by pπ–dπ overlap

6. Which of the following cannot be explained on the basis of Fajan's Rules.
(A) Ag_2S is much less soluble than Ag_2O
(B) $Fe(OH)_3$ is much less soluble than $Fe(OH)_2$
(C) $BaCO_3$ is much less soluble than $MgCO_3$
(D) Melting point of $AlCl_3$ is much less than that of NaCl

7. Orbital angular momentum of an electron in a particular subshell is $\sqrt{5}\frac{h}{}$. The maximum number of electrons having $s = -\frac{}{2}$, present in this subshell is :

8. Match list-I with list-II and choose the correct answer

List-I	List-II
(P) SO_3	(1) Square planar
(Q) ClO_3^-	(2) trigonal bipyramidal
(R) ICl_4^-	(3) pyramidal
(S) PCl_5	(4) trigonal planar

Codes :

	P	Q	R	S		P	Q	R	S
(A)	1	3	4	2	(B)	4	3	1	2
(C)	4	2	1	3	(D)	1	2	4	3

9. Least melting point is shown by the compound :
(A) $PbCl_2$ (B) $SnCl_4$ (C) NaCl (D) $AlCl_3$

10. The average charge on each O atom and average bond order of S–O bond in SO_4^{2-} is :
(A) –1 & 1.67 (B) – 1/2 & 1.5 (C) –1/2 & 1.67 (D) –1/2 & 1.33

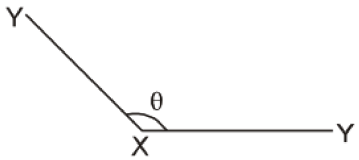
11. The nodal plane in the π-bond of ethene is located in -
(A) the molecular plane
(B) a plane parallel to molecular plane
(C) a plane perpendicular to the molecular plane which bisects the carbon - carbon sigma bond at right angle
(D) a plan perpendicular to the molecular plane which contains the carbon-carbon σ-bonds

12. In which of the following ionization processes the bond order has decreased and the magnetic behaviour has changed?
(A) $O_2 \longrightarrow O_2^+$ (B) $C_2 \longrightarrow C_2^+$ (C) $NO \longrightarrow NO^+$ (D) $B_2 \longrightarrow B_2^+$

13. Which of the following models best describes the bonding within a layer of the graphite structure ?
(A) metallic bonding (B) ionic bonding
(C) non-metallic covalent bonding (D) van der Waals forces

14. Which of the following molecular orbital has nodal planes perpendicular to each other ?
(A) σ2s (B) $\pi 2p_x$ (C) $\pi^* 2p_x$ (D) $\sigma^* 2p_z$

15. Which bond angle θ would result in maximum dipole moment for the triatomic molecule XY_2 shown below:

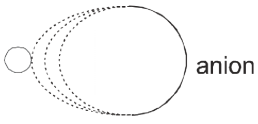


(A) θ = 90° (B) θ = 120° (C) θ = 150° (D) θ = 180°

16. The dipole moments of the given molecules are such that :
(A) $BF_3 > NF_3 > NH_3$ (B) $NF_3 > BF_3 > NH_3$
(C) $NH_3 > NF_3 > BF_3$ (D) $NH_3 > BF_3 > NF_3$

Comprehension # (Que. No. 17 to 20)

When a cation and an anion come near each other, the cation pulls the electronc cloud of the anion towards itself. Such distortion of electronic cloud of anion by a cation is known as polarisation and the ability of cation to polarize an anion is called as polarizing power of the cation.



As polarising power of cation & polarizability of anion in a molecule increases, covalent character in-

creases. According to Fajan's rules, covalent character will be more if

Cation has more polarising power if	**Anion has more polarisability if**
(i) Greater charge on cation	(i) Greater charge on anion
(ii) Smaller size of cation	(ii) Larger size of anion

(iii) Pseudo inert gas configuration of cation e.g [Cu^+, Ag^+, Zn^{+2}]

Note: If charge is same then cation having pseudo inert gas configuration has more polarizing power than a cation having inert gas configuration. Thus, Cu^+ is more polarising than Na^+.

Cu^+ = [Ne] $3s^2$ p^6 d^{10} Na^+ = 1s2 2s2 p6

$18e^-$ $8e^-$

Pseudo inert gas configuration (poor shielding by d-electrons) Inert gas configuration (more shielding by s and p electrons)

Example: $BeCl_2$ $MgCl_2$ $CaCl_2$ $SrCl_2$ $BaCl_2$

Size of cation increases Polarisation decreases Covalent character decreases

LiF LiCl LiBr LiI

– Size of anion increases
– Polarisation increases
– Covalent character increases

NaCl $MgCl_2$ $AlCl_3$

– Charge of cation increases
– Polarisation increases
– Covalent character increases

AlF_3 Al_2O_3 AlN

– Charge on anion increases
– Polarisation increases
– Covalent character increases

Applications :

(i) Ag_2S is less soluble than Ag_2O in H_2O because Ag_2 S is more covalent due to bigger S^{2-} ion.

(ii) $Fe(OH)_3$ is less soluble than $Fe(OH)_2$ in water because Fe^{3+} has higher charge and smaller size than Fe^{2+}. Therefore, $Fe(OH)_3$ is more covalent than $Fe(OH)_2$.

(iii) The colour of some compounds can be explained on the basis of polarisation of their bigger negative ions. The bigger anions are more polarised and hence their electrons get easily excited by partial absorption of visible light.

For example :

AgCl is white AgBr is plae yellow and AgI, Ag_2CO_3 are yellow.

$PbCl_2$ is white but PbI2 is yellow.

(iv) **Variation of Melting Point**

$BeCl_2$, $MgCl_2$, $CaCl_2$, $SrCl_2$, $BaCl_2$

Since size of cation increases, Ionic character increases, melting point increases; ?

CaF_2, $CaCl_2$, $CaBr_2$, CaI_2

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since size of anion increases, Covalent character increase, melting point decreases

17. According to Fajan's rule covalent bond is favoured by –

(A) Large cation and small anion (B) Large cation and large anion

(C) Small cation and large anion (D) Small cation and small anion

18. Among LiCl, $BeCl_2$, BCl_3 and CCl_4, the covalent bond characteristics follow the order -

(A) $LiCl > BeCl_2 > BCl_3 > CCl_4$ (B) $LiCl < BeCl_2 < BCl < CCl_4$

(C) $LiCl > BeCl_2 > BCl_3 > CCl_4$ (D) $LiCl > BeCl_2 < BCl_3 > CCl_4$

19. AgCl is colourless whereas AgI is yellow, because of :

(A) Ag^+ have 18 electron 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.

20. Choose correct option:

(A) More distortion of anion, more will be polarisation then covalent character increases.

(B) No compound is 100% ionic.

(C) Charge on cation $\propto$ polarisation.

(D) Size of anion $\propto$ polarisation

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ANSWER KEY OF DPP NO. : 08

1.	(B)	**2.**	(D)	**3.**	(C)	**4.**	(A)	**5.**	(C)	**6.**	(C)	**8.**	(B)
9.	(B)	**10.**	(B)	**11.**	(A)	**12.**	(B)	**13.**	(C)	**14.**	(C)	**15.**	(A)
16.	(C)	**17.**	(C)	**18.**	(B)	**19.**	(C)	**20.**	(ABCD)				