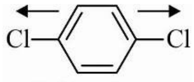
Daily Tutorial Sheet-1	**JEE Main (Archive)**

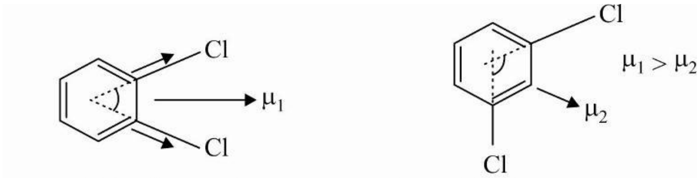
1.(C) N_2 has triple bond and each covalent bond is associated with one pair of electrons, therefore, six electrons are involved in forming bonds in N_2.

2.(B) p-dichlorobenzene is non-polar.



p-dichlorobenzene

The two dipole vectors cancelling each other giving zero resultant dipole moment. *o*-dichlorobenzene has greater dipole moment than meta isomer.



(*o*-dichlorobenzene) dipole vectors are 60° angle

(*m*-dichlorobenzene) dipole vectors are at 120° angle

Ethylbenzene is less polar than both ortho and para dichlorobenzene. Therefore, the increasing order of dipole moment is *p*-dichlorobenzene < Ethylbenzene < *m*-dichlorobenzene < *o*-dichlorobenzene.

3.(A) H-bond is the strongest intermolecular force.
All are different with 1, 0 and 2 lone pairs of electrons at central atom.

4.(A) In NH_3 and BF_4^- the hybridization is sp^3 and the bond angle is almost $109°28'$

5.(B) $O_2^+(15) = KK\sigma 2s^2, \sigma * 2s^2, \sigma 2p_x^2, \{\pi 2p_y^2 = \pi 2p_z^2, \{\pi * 2p_y^1 = \pi 2p_z^0$

Bond order $= \frac{1}{2}(8-3) = \frac{5}{2} = 2.5$

$O_2(16) = KK\sigma 2s^2, \sigma * 2s^2, \sigma 2p_x^2, \{\pi 2p_y^2 = \pi 2p_z^2, \{\pi * 2p_y^1 = \pi * 2p_z^1$

Bond order $= \frac{1}{2}(8-4) = 2$

$O_2^-(17) = KK\sigma 2s^2, \sigma * 2s^2, \sigma 2p_x^2, \{\pi 2p_y^2 = \pi 2p_z^2, \{\pi * 2p_y^2 = \pi * 2p_z^1$

Bond order $= \frac{1}{2}(8-5) = 1.5$

$O_2^{2-}(18) = KK\sigma 2s^2 \sigma * 2s^2 \sigma 2p_x^2, \{\pi 2p_y^2 = \pi 2p_z^2, \{\pi * 2p_y^2 = \pi * 2p_z^2$

Bond order $= \frac{1}{2}(8-6) = 1$

NOTE: As we know that as the bond order decreases, stability also decreases and hence the bond strength also decreases. Hence the correct order of their increasing bond strength is $O_2^{2-} < O_2^- < O_2 < O_2^+$ ll cases.

6.(A) **Tips/Formulae:**

Hybridisation $= \frac{1}{2}\Big[\big(\text{No. of electron in valence shell of atom}\big) +$

$$\left(\begin{matrix}\text{No. of monovalent}\\ \text{atoms around it}\end{matrix}\right) - \left(\text{charge on cation}\right) + \left(\text{charge on anion}\right)\Big]$$

(a) For AlH_3,

hybridization of Al atom $= \frac{1}{2}[3 + 3 - 0 + 0] = 3 = sp^2$

For AlH_4^-,

Hybridisation of Al atom $= \frac{1}{2}[3 + 4 - 0 + 1] = 4 = sp^3$

(b) For H_2O,

Hybridisation of O atom $= \frac{1}{2}\left[6 + 2 - 0 + 0\right] = 4 = sp^3$

For H_3O^+, Hybridisation of O atom $= \frac{1}{2}\left[6 + 3 - 1 + 0\right] = 4 = sp^3$

For NH_3 Hybridisation of N atom $= \frac{1}{2}[5 + 3 - 0 + 0] = 4\,sp^3$

For NH_4^+, Hybridisation of N atom $= \frac{1}{2}\left[5 + 4 - 1 + 0\right] = 4 = sp^3$

Thus hybridization changes only in option (A).

7.(C) In ether, there is no H-bonding while alcohols have intermolecular H-bonding

8.(B) Both NO_2 and O_3 have angular shape and hence will have net dipole moment.

9.(B) In H_2S, due to low electronegativity of Sulphur the L.P. – L.P. repulsion is more than B.P. – B.P. repulsion and hence the bond angle is minimum.

	SO_2	H_2O	H_2S	NH_3
Bond angle	119.5°	104.5°	92.5°	106.5°

10.(A) Both XeF_2 and CO_2 have a linear structure.

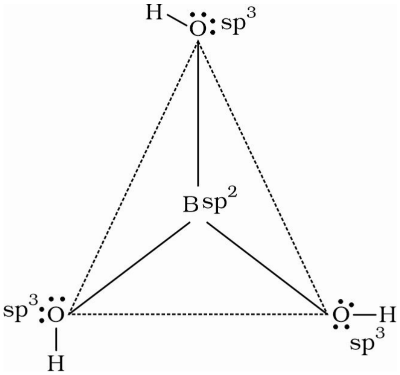
$F - Xe - F$ $\qquad\qquad$ $O = C = O$

11.(A) the order of bond angles

$$\underset{120°}{BF_3} > \underset{109°.28'}{SiH_4} > \underset{107°}{NH_3} > \underset{92.5°}{H_2S}$$

12.(B) Now since bond order of NO^+ given (3) is higher than that of NO (2.5). Thus bond length of NO^+ will be shorter.

13.(B)

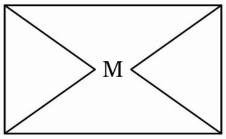


14.(A) XeF_4 (sp^3d^2 square planar),

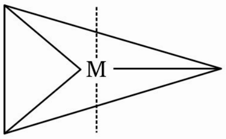
$[Ni(CN)_4]^{2-}$ (dsp^2 square planar),

BF_4^- (sp^3 tetrahedral), SF_4 (sp^3d see saw shaped)

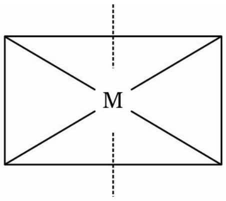
15.(D)



dsp^2 hybridisation
Number of 90° angle between bonds = 4



sp^3d or dsp^3 hybridisation
Number of 90° angle between bonds = 6



sp^3d^2 hybridisation
Number of 90° angle between bonds = 12