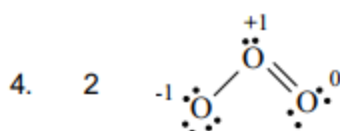


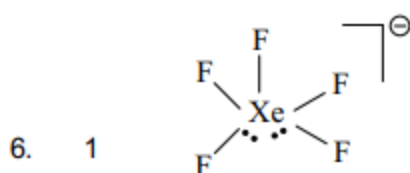
CHAPTER - 04

CHEMICAL BONDING AND MOLECULAR STRUCTURE

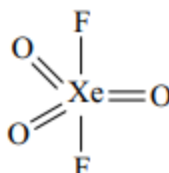
1. 4 SF_4 has an expanded octet around sulphur atom (10 valence electrons)
2. 4 Bond order follows the order : $\text{CO} > \text{CO}_2 > \text{CO}_3^{2-}$
3. 2 Melting point follows the order : $\text{LiF} > \text{LiCl} > \text{LiBr} > \text{LiI}$



5. 1 Chlorine atom is sp^3 hybridised

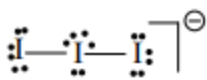


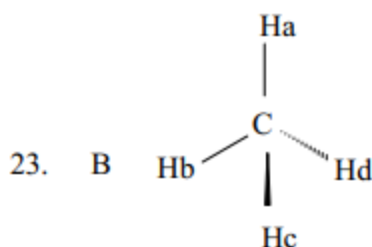
(Pentagonal planar)



(Trigonal bipyramidal)

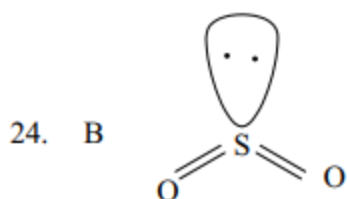
7. 2 $\text{SF}_4 - \text{sp}^3\text{d}$; $\text{XeF}_4 - \text{sp}^3\text{d}^2$; $\text{I}_3^- - \text{sp}^3\text{d}$; $\text{XeF}_2 - \text{sp}^3\text{d}$;
 $\text{ICl}_4^+ - \text{sp}^3\text{d}$; $\text{SiCl}_4 - \text{sp}^3$; $\text{ClO}_3^- - \text{sp}^3$; $\text{ClF}_3 - \text{sp}^3\text{d}$
8. 2 Bond angle of hydrides decreases down the group due to lack of hybridisation
9. 4 XeO_3 contains $\text{d}\pi - \text{p}\pi$ bonds. Bond order of XeO_3 is 2
10. 4 $\text{P}_x - \text{P}_x$, $\text{P}_y - \text{P}_y$ overlaps will lead to π bond when z-axis is the internuclear axis
11. 2 p-dichlorobenzene has zero dipole moment
12. 4 BF_3 has zero dipole moment
13. 1 Both CH_4 and CCl_4 have zero dipole moment
14. 3 B_2 is paramagnetic due to presence of unpaired electrons in π_{2p} orbitals. Highest occupied molecular orbital in B_2 is π_{2p}

15. 1 Bond order of O—O bond follows the sequence : $O_2 > O_3 > H_2O_2$. Thus, O—O bond length is in the order : $O_2 < O_3 < H_2O_2$
16. 9 
Total number of lone pairs = 3 + 3 + 3 = 9
17. 3 PCl_2F_3 , ICl_3 and SF_4 are polar molecules
18. 4 $BeCl_2$, N_3^- , N_2O and NO_2^+ are linear with no contribution from d-orbitals in hybridisation
19. B C—C bond length decreases with increase in the number of electronegative fluorine atoms on the carbon (Bent's rule)
20. D π - electron clouds of $C_1 - C_2$ and $C_2 - C_3$ bonds are mutually perpendicular
As per the given information, Cl and H atoms on C_1 lie in a plane perpendicular to the plane of paper whereas F and H atoms on C_3 lie in the plane of paper itself
21. C Backbonding affects bondlength bond order and Lewis acidity; the doesnot affect bond angle, geometry and planarity of BF_3 molecule
22. A Due to backbonding, O—H bond in $(CH_3)_3SiOH$ is more polarised, resulting in the formation of stronger hydrogen bonds



The required planes are

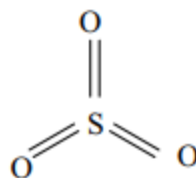
$H_a - C - H_b$, $H_a - C - H_c$, $H_a - C - H_d$, $H_b - C - H_c$, $H_b - C - H_d$ and $H_c - C - H_d$



'S' is sp^2 hybridised

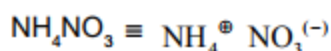
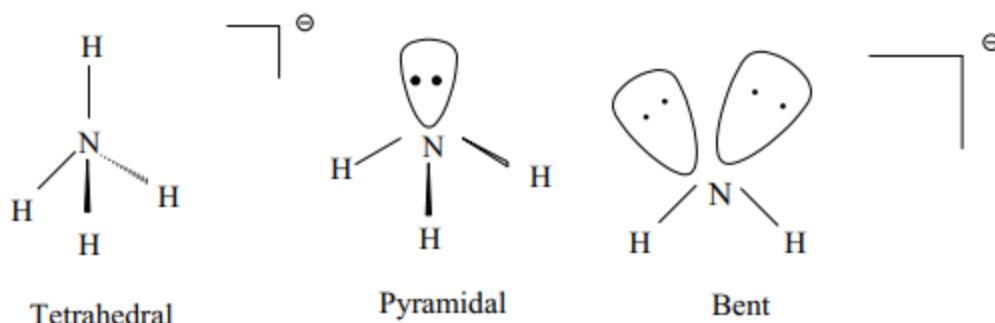
One $p\pi - p\pi$ bond and

one $p\pi - d\pi$ bond



S is sp^2 hybridised

One $p\pi - p\pi$ bond and two $p\pi - d\pi$ bonds



N is sp^3 hybridised in NH_4^+ whereas sp^2 hybridised in $\text{NO}_3^{(-)}$.

Bond energy and bond length of C_2 molecule are greater than that of O_2 molecule

31. C XeO_3F_2 – Trigonal bipyramidal

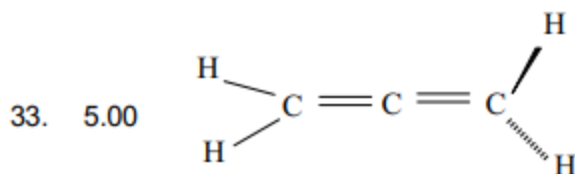
ICl_4^- – square planar

SF_4 – See - saw shaped (distorted TBP electron pair geometry)

PF_2Cl_3 – Trigonal bipyramidal

Thus only SF_4 doesnot contain 90° bond angle (s)

32. 3.00 Bond dipole moment due to the three C-Cl bonds at 120° cancel out each other. Now, only one C-Cl bond dipole moment remains making the net dipole moment 1.5D



Maximum five atoms can be accommodated in the same plane

34. 2.00 $p = 3, q = 5, r = 2, s = 6$ and $t = 2$

35. 5.00 $\text{PCl}_4^+, \text{ICl}_2^+, \text{SF}_2, \text{AsF}_4^+$ and SiF_4 have sp^3 hybridisation, thus no involvement of d - orbitals in hybridisation

36. 6.00 $P = 3, Q = 2, R = 1$ and $S = 0$

37. D $\text{CH}_3^-, \text{NH}_3^-, \text{BF}_4^-, \text{CH}_4$ and NH_4^+ are non planar:

$\text{BF}_3, \text{CH}_3^+, \text{CH}_3^\bullet$ and NH_2^- are planar

$\text{BF}_4^-, \text{CH}_4$ and NH_4^+ have perfect tetrahedral geometry

38. A PBr_3Cl_2 and BF_3 are nonpolar whereas $\text{HO}-\text{C}_6\text{H}_4-\text{OH}$ and PBr_2Cl_3 are polar