

Topic :- Chemical Bonding and Molecular Structure

1 (a) The tendency to show lower ionic state increases down the group due to inert pair effect.

2 (b)
 $\text{CH} \equiv \text{C} - \text{CH}_2 - \text{CH}_3$
 $sp \quad sp \quad sp^3 \quad sp^3$

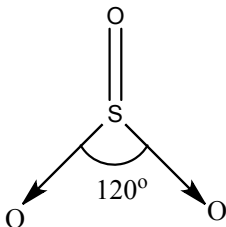
In butyne - 1, there is no carbon with sp^2 hybridisation.

3 (b)
 $\text{NO}^+ : \sigma 1s^2, \sigma^x 1s^2, \sigma 2s^2, \sigma^x 2s^2, \sigma 2p_x^2 \left[\begin{matrix} \pi 2p_y^2 \\ \pi 2p_z^2 \end{matrix} \right] \therefore \text{B.O.} = \frac{10-4}{2} = 3$

$\text{CN}^- : \sigma 1s^2, \sigma^x 1s^2, \sigma 2s^2, \sigma^x 2s^2, \sigma 2p_x^2 \left[\begin{matrix} \pi 2p_y^2 \\ \pi 2p_z^2 \end{matrix} \right] \therefore \text{B.O.} = \frac{10-4}{2} = 3$

4 (c) Electron affinity order for halogens is $\text{Cl} > \text{F} > \text{Br} > \text{I}$.

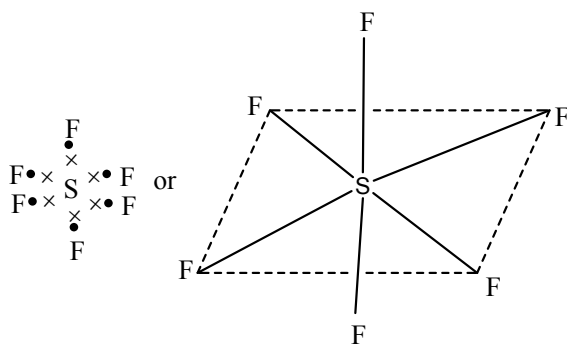
5 (d) Sulphur trioxide has no S - S linkage. It has triangular planar geometry.



7 (d) All molecules or ions *i.e.*, H_2O , NH_4^+ , SO_4^{2-} , ClO_4^- , and NH_3 are involved in sp^3 hybridisation in their formation.

9 (b) p -orbitals always show lateral overlapping.

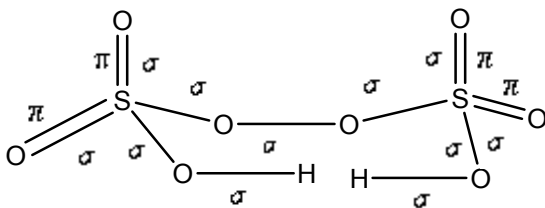
10 (a) SF_6 does not obey octet rule as in it S-atom has 12 electrons in its valence shell.



11

(b)

The structure of peroxodisulphuric acid ($\text{H}_2\text{S}_2\text{O}_8$) is



Hence, it contains 11σ and 4π -bonds.

12

(d)

Paramagnetic species have unpaired electrons

13

(c)

N in it has three σ -bonds and one lone pair of electron.

14

(a)

Electron deficient species can accept lone pair of electron and thus, act as Lewis acid.

15

(a)

NH_3 has pyramidal shape and thus, possesses three folds axis of symmetry.

16

(d)

ICl_2^- has sp^3d -hybridization and has two bond pairs and three lone pairs of electrons.

17

(a)

The dipole moment of a polar molecule depends upon its geometry. A symmetrical molecule is non-polar even though it contain polar bonds. Methane molecule (CH_4) has zero moment value of dipole moment due to its symmetrical structure.

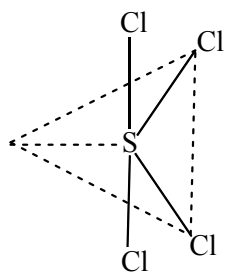
In CHCl_3 , the resultant of C - H and C - Cl dipole oppose the resultant of two C - Cl dipoles while in CH_2Cl_2 , the resultant of C - H dipoles adds to resultant of two C - Cl. In case CH_3Cl , the resultant of two C - H dipole adds to the resultant of two C - Cl. In case CH_3Cl the resultant of two C - H dipoles add to the resultant of C - H and C - Cl dipoles.

Thus dipole moment of CH_3Cl is highest among the given compounds. The molecule (CCl_4) again becomes symmetrical and dipole moment reduces to zero.

18

(c)

S in SCl_4 is sp^3d -hybridized and possesses see-saw structure whereas SiCl_4 is tetrahedral.



19

(c)

Oxygen cannot expand its octet due to absence of *d*-orbitals in its valence shell.

PE

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	B	B	C	D	C	D	B	B	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	D	C	A	A	D	A	C	C	C

PE