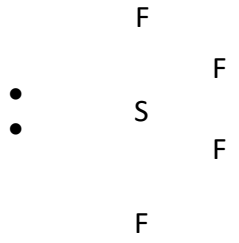
CHEMISTRY

101. (1)

FXF angles of two types are present in sp^3d hybrid orbitals.

Since, SF_4 shows sp^3d hybridization as follows, therefore, it exhibits two different FXF angles.



102. (4)

Species having same hybridization show similar geometry.

SO_4^{2-} : Hybridization of S $\rightarrow sp^3$

ClO_4^- : Hybridization of Cl $\rightarrow sp^3$

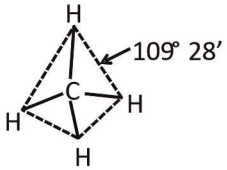
103. (4)

BCl_3 = 3σ bonds + 0*l*p of e^- = 3 $\Rightarrow sp^2$ hybridization

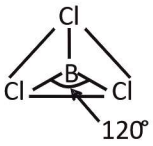
NCl_3 = 3σ bonds + 1*l*p of e^- = 4 $\Rightarrow sp^3$ hybridization

104. (3)

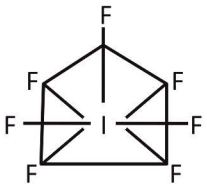
(i) CH_4 $\Rightarrow$



(ii) BCl_3 $\Rightarrow$



(iii) IF_7 $\Rightarrow$

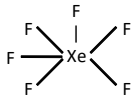


(iv) I^-_3 $\Rightarrow$

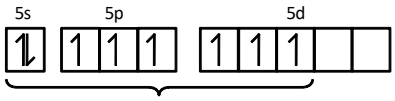
Hence, the increasing order of bond angles is (ii) < (i) < (ii) < (iv)

105. (1)

In XeF_6, the oxidation state of Xe is +6. The shape of XeF6 should be pentagonal bipyramid due to sp^3d^3 hybridization but due to the presence of one lone pair at one *trans* position its shape becomes distorted octahedral.



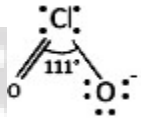
distorted octahedral shape



xenon atom in third excited state

106. (4)

ICl_2^-, I_3^-, N_3^- are linear but ClO_2^- is angular due to sp^3 hybridization of Cl atom.



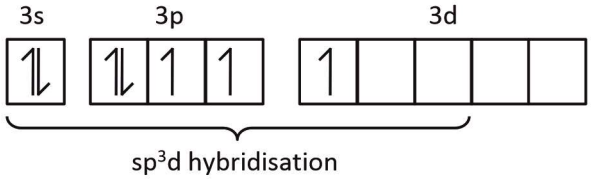
So, ClO_2^- is non-linear.

107. (3)

S in SF_4 possesses trigonal bipyramidal structure with sp^3d hybridization.

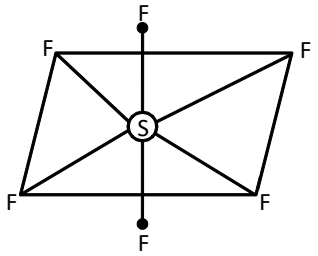
S in ground state

S in excited state



108. (2)

SF_6 has octahedral geometry, sp^3d^2 hybridization and bond angle is 90°.



% of d-character

$$= \frac{2(\text{no. of d-orbital})}{6(\text{total hybridised orbitals})} \times 100$$

= 33%

So, SF_6 are bond angle = 90° and d-character = 33%.

109. (3)

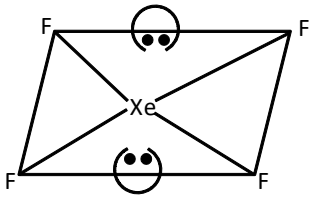
In XeF_4, the central atom Xe, has eight electrons in its outermost shell. Out of these four are used for forming four σ-bonds with F and four remain as lone pairs.

$\therefore$ $XeF_4 \Rightarrow$ 4 σ bonds + 2 lone pairs

$\Rightarrow$ 6 hybridised orbitals,

i.e., sp^3d^2 hybridization

Since, two lone pairs of electrons are present; the geometry of XeF_4 becomes square planar from octahedral.



110. (3)

If there is four σ-bonds, hybridization is sp^3, if three σ-bonds, hybridization is sp^2 and if two σ-bonds, hybridization is sp.

(1) $\underset{sp^2}{CH_2} = \underset{sp}{C} = \underset{sp^2}{CH_2}$

(2) $\underset{sp^3}{CH_3} - \underset{sp^2}{CH} = \underset{sp^2}{CH} - \underset{sp^2}{CH_2^+}$

(3) $\underset{sp^3}{CH_3} - \underset{sp}{C} \equiv \underset{sp}{C} - \underset{sp^2}{CH_2^+}$

(4) $\underset{sp^3}{CH_3} - \underset{sp^2}{CH} - \underset{sp^2}{CH} - \underset{sp^3}{CH_2^-}$

Hence, in $CH_3-C \equiv C-CH_2^+$, all the three types of hybrid carbons are present.