
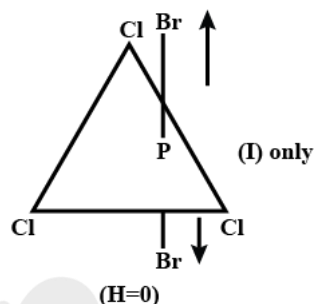
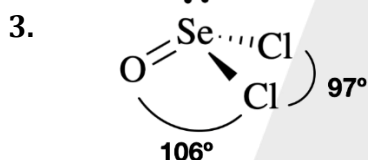
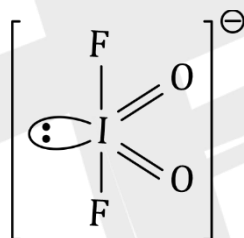


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1. Dipole moment:- The bond dipole moment uses the idea of electric dipole moment to measure the polarity of a chemical bond within a molecule.



2. Statement D is true for  $\text{IO}_2\text{F}_2$ . The electrons are located at the corners of a trigonal bipyramidal, but one of the equatorial pairs is unshared. Its structure is analogous to  $\text{SF}_4$ . Both  $\text{SF}_4$  and  $\text{IO}_2\text{F}_2$  has See-saw shape.



4. Bond angle  $\propto$  size of side atom  $\propto \frac{1}{\text{size of central atom}}$

(A)  $\text{O}_5\text{F}_2$ ,  $\text{O}_5\text{Cl}_2$ ,  $\text{OS}_5\text{Br}_2$  central atom = O S

Order of size of side atom:  $\text{Br} > \text{Cl} > \text{F}$  -

$\therefore$  Order of Bond angle:

$\text{OSBr}_2 > \text{OSCl}_2 > \text{OSF}_2$


(B)  $\text{SbCl}_3$ ,  $\text{SbBr}_3$ ,  $\text{SbI}_3$

order of size of side atom:  $\text{I} > \text{Br} > \text{Cl}$

$\therefore$  Order of Bond angle:  $\text{SbI}_3 > \text{SbBr}_3 > \text{SbCl}_3$

(c)  $\text{PI}_3$ ,  $\text{AsI}_3$ ,  $\text{SbI}_3$

Order of size of central atom:  $\text{Sb} > \text{As} > \text{P}$

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∴ Order of Bond angle:  $PI_3 > AsI_3 > SbI_3$

Hence, the smallest bond angle from all the options are  $OSF_2$ ,  $SbCl_3$  and  $SbI_3$ . Thus correct option is (D)

5.

Name of Molecule	Phosphorous trichloride
Chemical formula	$PCl_3$
Molecular geometry of $PCl_3$	Trigonal pyramid
Electron geometry of $PCl_3$	Tetrahedral
Hybridization	$sp^3$
Bond angle	Less than $109^\circ$
Nature	Polar molecule
Total Valence electron in $PCl_3$	26
Overall Formal charge in $PCl_3$	Zero

All the hybrid orbitals of P-atom having bond pairs are identical to each other

6. The link between the electronegative nature of substituents and the orbital hybridisations of the key atoms in molecules is described and explained by Bent's Rule.


Bent's rule states that the main atom attached to several groups in a molecule will hybridise such that the atomic s character concentrates in orbitals oriented toward electropositive groups, while the atomic p character concentrates in orbitals oriented toward electronegative groups.

An example of Bent's rule is given below.

By altering the substituent groups, molecule geometry can be anticipated and described. The bond angle of  $Cl-X-Cl$  is lower than  $C-X-C$  in the molecule  $Me_2XCl_2$  ( $X$  = can be groups like  $Sn$ ,  $C$ ,  $Ge$ ,  $Pb$ , and  $Si$ ). Additional p characteristics are concentrated upon the fundamental atom in  $X-Cl$  bonds than  $X-C$  ones due to the highly electronegative halogen group ( $Cl$ ).

7. For option A, as the size of atom increases bond length increases.

For option B, Due to repulsion at equatorial position the bond angle is more.

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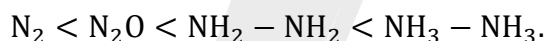
For option C: As the % s character increases bond length decreases so bond angle will increase.

For option D: Due to decrease in bond length, bond angle will increase.

8. During the formation of ammonia, one 2s orbital and three 2p orbitals of nitrogen combine to form four hybrid orbitals having equivalent energy which is then considered as an  $sp^3$  type of hybridization.

These orbitals transfer to complete the empty 5d orbitals in the process of making the  $XeF_4$ . This results in 4 unpaired hybridized electrons which consist of 2 in 5p and 2 in 5d orbitals. So, finally, we get the actual orbital used in  $XeF_4$  development, and it results in  $sp^2d^2$  hybridization.

9. The bond length of atoms in heteromolecular compounds can be determined by Bent's rule. It states that the atomic s-character concentrates in orbitals directed towards electropositive substituent. Based on this we can arrange the given compounds in following manner based on bond length.



So, the false statement is "N-N bond length in III is shorter than II.e., option C.

10. Due to larger size of chlorine there will be more steric repulsion due to which the angle increases.  
In fluorine there will be more lone repulsion due to small size but not in chlorine.