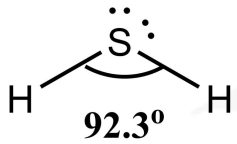
1. The increasing order of bond angles in $H_2S,\ NH_3, BF_3$ and SiH_4 is:

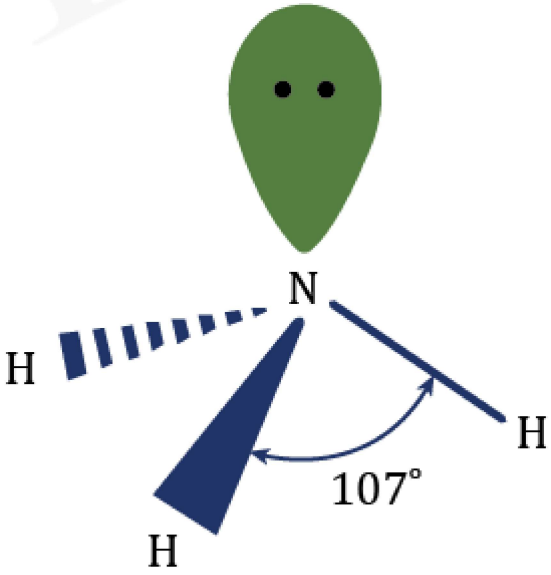
- ✔ **A.** $H_2S < NH_3 < SiH_4 < BF_3$
- ✘ **B.** $NH_3 < H_2S < SiH_4 < BF_3$
- ✘ **C.** $H_2S < SiH_4 < NH_3 < BF_3$
- ✘ **D.** $H_2S < NH_3 < BF_3 < SiH_4$

The repulsion order is:
$lone\ pair - lone\ pair > bond\ pair - lone\ pair > bond\ pair - bond\ pair$

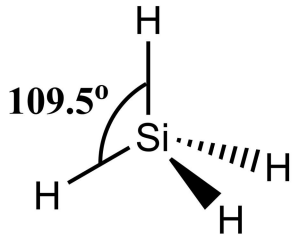
H_2S - has 2 lone pair of electrons and has a bent shape.



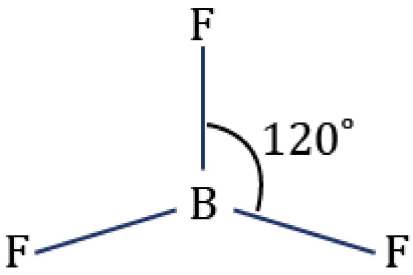
NH_3 - sp^3 hybridised, pyramidal shape



SiH_4 - sp^3 hybridised, tetrahedral shape



BF_3 - sp^2 hybridised, trigonal planar shape



2. Which of the following compounds has the smallest bond angle?

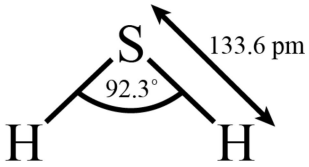
A. H_2S

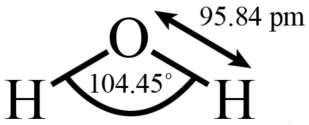
B. H_2O

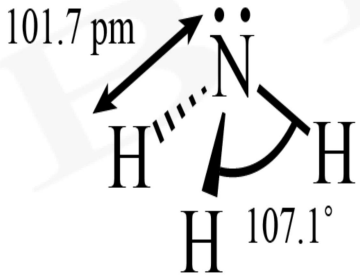
C. NH_3

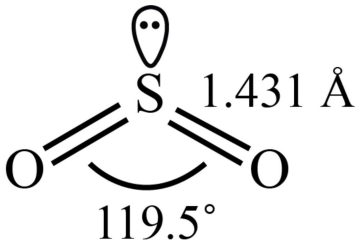
D. SO_2

Because of the larger size and lesser electronegativity of sulphur (than nitrogen and oxygen), the bond angle of H_2S is lower than that of the others.

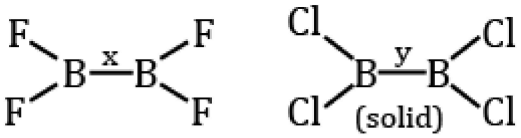








3. Compare $B-B$ bond lengths in the following molecules:



A. $x > y$

B. $y > x$

C. $x = y$

D. None of these

Fluorine is an electron negative element so as per bent's rule more electronegative element will have less % s- character therefore $B-B$ bond will have more % s- character and shorter bond length.
Similarly, in B_2Cl_6 chlorine is less elelctronegative hence will have more % s charecter hence the $B-B$ bond angle will have less % s character and hence longer bond length.
The side atom in the 1st case is F which is more electronegative than the side atom chlorine in the 2nd case.

4. Which of the following statement is incorrect regarding O_2F_2?

A. $O-F$ bond length in O_2F_2 is longer than $O-F$ bond length in OF_2

B. The oxidation state of oxygen in O_2F_2 is $+1$

C. The $O-O$ bond length in O_2F_2 is shorter than $O-O$ bond length in H_2O_2

D. None of these

(a) In the case of OF_2, a single oxygen atom is surrounded by two fluorine atoms. Hence the shared pairs of electrons from both sides of bond will be attracted more towards fluorine, creating a partial positive charge on oxygen from both sides. In the case of O_2F_2, again the electron pairs get more attracted towards F and hence, the partial positive charge does come on both oxygen atoms, but it is distributed and hence lesser in comparison to OF_2. Due to more attraction in OF_2, the bond length of $O-F$ is less in OF_2 than of that in O_2F_2.

(b) Since fluorine is more electronegative than oxygen and the oxidation state of fluorine is -1 in all its compounds. So, the oxidation state of oxygen will be $+1$ as calculated.

$\overset{-1}{F}-\overset{+1}{O}-\overset{+1}{O}-\overset{-1}{F}$

Oxidation number of $O=+1$

(c) The $O-O$ bond length in O_2F_2 is shorter than $O-O$ bond length in H_2O_2.

We know that, F is more electronegative than H. The difference in electronegativity between O and F is lesser than that between O and H. Hence, the magnitude of partial positive charge on O atoms in O_2F_2 is lesser than the magnitude of partial negative charge on O atoms in H_2O_2. Due to this, the bond pair of electrons of $O-O$ bond in O_2F_2 has less repulsion between them than the bond pair of electrons of $O-O$ bond in H_2O_2.As a result, $O-O$ bond length is shorter in the case of O_2F_2

5. Which of the following molecules do not have hybridisation?

A. AsH_3

B. H_2S

C. H_2Se

D. All of the above

According to Drago's Rule, If the central atom belongs to the groups 15 or 16 (and is from third or higher period) and is surrounded by atoms having electronegativity less than 2.5, it does not involve hybridization.
Therefore, AsH_3, H_2S and H_2Se do not have hybridisation.