

Gaining Apex Coaching Centre

(Where Toppers make..... Toppers)

Compiled By: Dapinderjeet Singh

(10+1 CHEMISTRY)

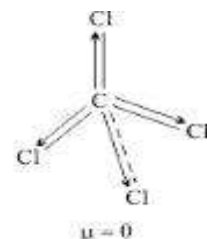
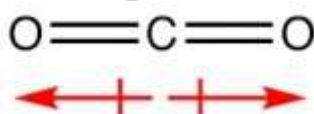
Chemical Bonding (Assignment -I)

1) Out of sigma and pi bond which is stronger and why?

Ans: It is based on the concept of strength of covalent bond which will further depends upon the extent of overlapping. Since sigma bond is formed by the axial overlapping i.e. head to head overlapping while the pi bond is formed by sidewise overlapping. Axial overlapping is always more effective than sidewise overlap, greater energy will be released in axial overlap than sidewise overlap. As a result of which sigma bond is stronger than pi bond.

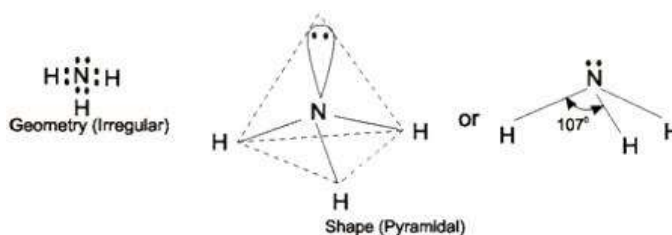
2) Why $\text{CCl}_4, \text{CO}_2$ have zero dipole moment

Ans: It is based on concept of geometry of molecules. As both CO_2 (Linear) and CCl_4 (tetrahedral) symmetrical geometries. Being of vector nature the dipoles of different bonds will cancel with a one another, although the bonds have a polar nature.



3) Explain the Geometry of water, ammonia and PCl_5 molecule

Ans: Ammonia: In NH_3 , atomic number of N is 7, has five electrons in its valence shell. Out of which three forms covalent bond with hydrogen and remaining two present as a lone pair. So according to VSEPR theory its geometry is irregular. Since there are four electron pair around the central atom nitrogen, the shape is expected to be tetrahedral but due to the presence of one lone pair of electrons distorts its geometry. As lp-bp repulsion is greater than bp-bp repulsions, as a result of which the two N-H bonds are stretched inwards, bond angle becomes 107° instead of 109.5° and its actual shape becomes pyramidal.



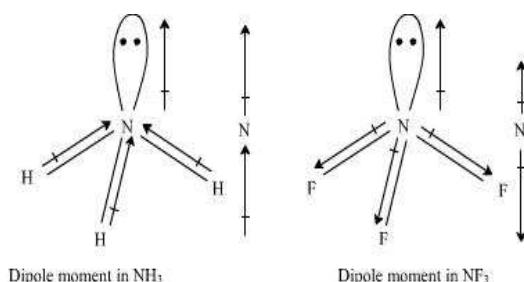
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- 4) Out of NH_3 and NF_3 which has higher dipole moment?

Ans: Both of them have pyramidal structure, yet their dipole moments are different due to the difference in the directions of the dipole moments. In NH_3 the dipole moments of three N-H bonds are in the same directions as that of the lone pair of electrons. But in



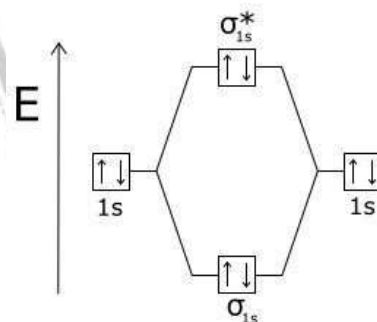
the case of NF_3 , the dipole moments of three N-F bonds are in the directions opposite to that of lone pair. As a result of which the resultant dipole moment of NH_3 is more as compared to that of NF_3

- 5) Helium molecule does not exist. Explain

Ans: It can be explained on the base of MO theory.

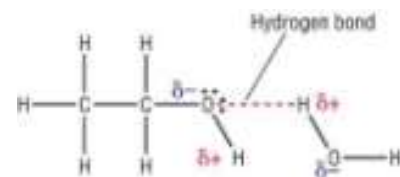
$$\text{Bond order} = \frac{1}{2} [N_b - N_a] = \frac{2-2}{2} = 0$$

Since the bond order is zero. Therefore the molecule does not exist.



- 6) Water is soluble in alcohol. Explain

Ans: It is based on the concept of Hydrogen bonding, which is present in case water and alcohol. As a result of which alcohol dissolve readily in water even at room temperature. Energy is released as a result of attractions. Since the energy of the system involving alcohol and water decreases, this factor favours the solubility



- 7) Out of NH_3 and H_2O which has higher boiling point

Ans: It is based on the concept of Hydrogen bonding, whose strength will depend upon electronegativity of an element. Intermolecular hydrogen bond is strong between H_2O molecules due to high electronegativity of oxygen as compared to that of nitrogen. As a result of which water has higher boiling point than ammonia

- 8) Ice floats on water why?

Ans: Ice floats on water, it means density of ice is less than that of water, which is based on the concept of intermolecular hydrogen bonding. In ice the water molecules are tetrahedrally arranged. Water contains hydrogen bonds (a type of intermolecular force of attraction) between the H (hydrogen) of one atom and the O (oxygen) of another

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atom. Each oxygen atom is linked to two hydrogen atoms by covalent bond and to the other two by hydrogen bond. So certain vacant spaces are left and there will be cage like structure. When ice changes to water on absorbing energy which tends to overcome the attractive forces and the molecules will collapse i.e. break the tetrahedral arrangement. So in case of water, the molecules come closer to each other and hence we can say that density of ice is less than that of water

9) Water has maximum density and minimum volume at 4°C . Explain

Ans: It is based on the two factors which are described below:

- i) We know that both ice and water are present at 0°C . But when the temperature rises the energy absorbed expected to break the tetrahedral arrangement as a result of which molecules come closer to each other and density increases. This factor is upto 4°C , till this temperature density increases
- ii) But at the same time with increase in temperature the KE of the molecules also increases. As a result of which the molecules move farther and farther and hence volume increases. This factor will dominate beyond 4°C . At last we can say that the density of water increases from 0 to 4°C and then decreases.

Note: This behaviour is helpful for the aquatic life. In severe cold the surface area of sea water freezes. But the water present beneath the surface is at 4°C . As a result of which sea animals can safely live at this temperature even when upper surface is frozen.

10) Can a non polar molecule have polar covalent bond

Ans. Yes it is possible in case of linear and symmetrical shapes. In them the bonds has polar nature but their polarities been cancelled out due to vector concept, resulting in non polar molecules. For eg CO_2 is a linear molecule having zero dipole moment.

11) NaCl gives ppt with AgNO_3 solution but CCl_4 does not.

Ans: It is based on the base of nature of molecules. NaCl has an ionic nature due to which it readily dissociates to form ions in solution. Ag^+ ions combine with Cl^- ions to give white ppt of AgCl . On the other hand CCl_4 has a covalent nature does not give Cl^- ions in solution.

12) Why HCl is predominantly covalent in the gaseous state but is ionic in aqueous solution

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Ans: It is based on the concept of electronegativity difference between the elements and also on the polar nature of water molecules. In the case of HCl the difference is 0.9 (3.0-2.1). As a result of which it is covalent in gaseous state. But when dissolved in water, which is of polar nature, there is an attraction between atoms of acid and polar water molecules. Energy is released during attraction which helps in ionization of acids. That is why HCl is ionic in aqueous solution.

13) Out of N_2 and H_2O which is polar

Ans: N_2 is homo-diatomic molecule and it is therefore is non polar. On the other hand H_2O has angular or bent shape with bond angle 104.5° . The polarities do not cancel out and it is of polar nature.

