

Task#85266

Explain various types of van der Waals forces giving the types of molecules in which they are present?

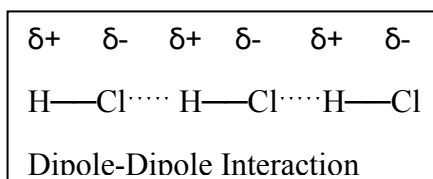
Solution: There are mainly three types of Vander Waals forces acting among molecules

(a)Dispersion force, (b) Dipole-Dipole force,(c)Hydrogen bonding,

Depending upon nature of molecules these forces are acting in among the molecules.

(a)Dispersion force: It is the weakest intermolecular force of attraction among the non-polar molecules. Example-non-polar molecules like- Cl_2, H_2 , Alkanes. This force increases with increasing surface area of the molecules ,resulting increases in boiling point of the alkanes. As for example boiling point of propane>ethane>methane ,due to increase of surface area and dispersion force with increasing number of carbon atoms.

(b) Dipole-Dipole force: It is moderate intermolecular force of attraction among the polar molecules .Example-HCl. Since there is a large electro negativity difference between H and Cl atom in HCl molecule. So, bonding shared pair of electrons is more shifted towards more electronegative Cl atom. That means Cl atom becomes partially (-)vely charged and H atom becomes partially (+)vely charged. So there is an attraction between (+)ve end of one HCl molecule and (-)ve end of other HCl molecules and vice versa .Although this type of attraction is weak compared to ionic bond.



(c)Hydrogen bonding: It is strong intermolecular force of attraction among the molecules containing H atom bonded with strong electronegative atom like-F,O,N etc.Example- HF, H_2O , NH_3 etc.Like dipole-dipole force due to electro negativity difference between bonding atoms dipole is created within molecule. So, similar to dipole-dipole interaction attraction among the molecule is observed .Strength of H-bonding depends on the electro negativity of electronegative atom bonded with H atom. The Hydrogen bonding strength: $\text{HF}>\text{H}_2\text{O}>\text{NH}_3$. This type of interaction changes physical state of molecules. Example –Molecular weight of H_2S is greater than water .But water is liquid while H_2S is gas at normal temperature due to hydrogen bonding