

Intermolecular forces from strongest to weakest.

Ionic Bonds

- The electrostatic forces between ions are greatest type of intermolecular forces. This only occurs between metal and nonmetallic atoms.
- Strong forces mean higher melting & boiling pts, higher viscosity and surface tension (if liquids), but very low rates of evaporation, vapor pressure, and volatility. Because of the high forces of attraction, the majority of these cpds will be solids at room temperature ($\text{KCl}_{(s)}$, $\text{CaCO}_{3(s)}$, $\text{RbF}_{(s)}$, $\text{HC}_2\text{H}_3\text{O}_{2(l)}$)

Ion-Dipole

- These are the forces of attraction between ionic cpds and a polar covalent cpds (like water).
- These forces are strong enough to break apart the ions and suspend them in the polar solvent (usually water). ($\text{KCl}_{(aq)}$, $\text{CaCO}_{3(aq)}$, $\text{RbF}_{(aq)}$, $\text{HC}_2\text{H}_3\text{O}_{2(aq)}$)

H-Bonding

- This type of IF only occurs if H is bonded to N, O, F (highly electronegative elements)
- When bonded the shared electrons are pulled so close to the N, O, or F atoms that it exposes Hydrogen's proton creating a very strong force between that proton and any nonbonded electron pairs occurring on another molecule. These forces are not as strong as ionic bonds and more of these tend to be liquids at room temperature, like H_2O , HF, NH_3 (ammonia), $\text{C}_2\text{H}_5\text{OH}$ (ethanol)

Dipole Dipole

- These forces occur between 2 polar covalent molecules. Shape determines polarity.
- These forces are weaker than H-bonding but stronger than London Dispersion Forces. So they tend to be very weakly held together solids, and liquids. Hence they tend to evaporate more readily with lower boiling/melting pts.

London Dispersion Forces

- This type of IF occurs in all cpds but are the primary IF in nonpolar covalent cpds such as the diatomic elements (O_2 , N_2 , Cl_2) as well as any nonpolar cpds like CH_4 , or BCl_3
- These extremely weak forces are created two ways: by mass and by temporary induced dipoles. The more massive these element/cpds, the more London Dispersion Forces will be present.
- These are the weakest of the intermolecular forces and therefore they have very low melting/boiling pts, low surface tension for liquids, hi viscosity, hi vapor pressure, hi rates of evaporation, and volatility. Many of these because of their low forces are gases at room temperature, but some will be liquids and solids.