

Summarizing Intermolecular Forces

- London Dispersion forces are weakest, but depend on size of molecules so these kind of forces dominate for large molecules
- Dipole-Dipole forces are the next strongest under the London Dispersion, although sometimes Dipole-Dipole forces sometimes can be stronger.
- Hydrogen bonding is a type of Dipole-Dipole force that is next on the line.
- The strongest attractive force is Ion-Ion forces.

The strength of force holding the molecules together is proportional to the charge magnitude of the individual parts as well as the separation between them.

Comparing Substances

(Number the Substances from lowest boiling point to highest with 1 being the lowest)

- Boiling point depends on the strength of forces (amount of energy needed to break apart the bonds) and also the size of the molecule.

1. CH₄
2. CH₃OCH₃
3. CH₃OH
4. CCl₄

- CH₄ is a non-polar molecule because its bond dipoles (which are nearly zero anyway) cancel out since the molecule is symmetrical.
- CH₃OCH₃ is a dipole because the C-O bonds are polar and are not symmetrical around the O atom, but this molecule does not have any hydrogen bonds like CH₃OH, which makes CH₃OH a stronger dipole than CH₃OCH₃.
- CCl₄ is a non-polar molecule because it is also symmetrical, so even though the C-Cl bonds are very polar, the bond polarities cancel out due to symmetry, BUT it is a larger molecule than CH₄ (which has similar properties), and therefore CCl₄ would have a higher boiling point than CH₄.

I-Clicker Questions

- H₂O: London Dispersion forces and Hydrogen bonding
- CO₂: London Dispersion forces
- NH₃: London Dispersion forces and Hydrogen bonding
- CaCl₂: Ion-Ion forces and London dispersion forces
- C₈H₁₈: London Dispersion forces