INTRA VS. INTER MOLECULAR FORCES

1. Something to think about:
   Covalent compounds have different boiling points.
   - CH₃COOH 391 K
   - CHCl₃ 334 K
   - CCl₄ 349.5 K
   All 3 compounds have different boiling points. What makes them have different boiling points?

2. If all particles of matter at room temperature have the same kinetic energy, why do we have different states of matter?

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**Intramolecular Forces**

- Forces within a molecule
- 3 types:
  - Metallic: Not a true bond, sea of electrons w/ 1 metal
  - Ionic: Metal/nonmetal
  - Covalent: 2 nonmetals, polar (overall pull), nonpolar (no overall pull)

Overall Strength:
- Metallic > Ionic > Polar Covalent > Nonpolar Covalent > H₂ bonding > Dipole-Dipole

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**Intermolecular Forces (IMF's)**

- Forces between molecules
- 3 types:
  - London Dispersion/Van der Waals
  - Dipole-Dipole
  - H₂ bonding

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Intra
TYPES OF INTERMOLECULAR FORCES

London Dispersion / Van der Waals

- Weak force (temporary)
- Exists between all particles
- More e⁻ involved in bonding, ↑ force
- Bigger molecule, ↑ force
- E⁻ in electron cloud are in constant, random motion. When 2 molecules collide, the e⁻ cloud of one molecule repels the other. For a brief moment, the electrons are not evenly distributed

Dipole - Dipole

- Occurs only in polar molecules
- Permanent
- S⁻ and S⁺ of opposite molecules interact (positive & negatives are attracted for e⁻)

Hydrogen Bonding

- Involves hydrogen and N, F, O (only one of those 3)
- Greater the electronegativity difference, the stronger the hydrogen bond
- Hydrogen bonding contributes to water's unique properties (↑ B.P., ↑ surface tension, cohesion, adhesion) AND the DNA structure

↑ IMF  ↑ B.P./↑ m.p
↑ IMF  ↑ viscosity
↓ IMF  ↑ vapor pressure