Intermolecular Forces of Attraction

The force between molecules.

When you melt/boil a covalent (molecular) substance (e.g. water, carbon dioxide)?

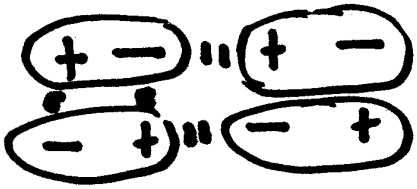
- You are **not** breaking covalent bonds within the molecule (intramolecular forces)
  - You are breaking weak attractive forces **between** molecules .
  - These are called **intermolecular forces**

- These forces are **weaker** than ionic, covalent and metallic bonds.
- Covalent molecules have low m.p and b.p because this force is weak.
- They are the **ONLY forces between covalent molecules.**

3 types of intermolecular forces

1) Dipole interactions (between polar molecules)

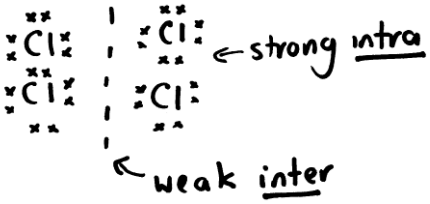
- If molecules are polar, the dipoles (positive and negative ends) are attracted to other molecules, causing molecules to be held together



2) Van der Waals forces between non-polar molecules

The nucleus of one molecule attracts electrons of neighbouring molecules
Strength of attraction is determined by:-

- More electrons = stronger force = higher melting point and boiling point



e.g. at room temperature

Smallest		Largest
Cl_2	Br_2	I_2
(gas)	(liquid)	(solid)

- These are the only intermolecular forces in non-polar molecules.

E.g.

- Iodine is a solid at room temperature
- Carbon Dioxide is a gas at room temperature but is a solid at -78^0C

3) Special Case: Hydrogen Bonding

- Intermolecular forces which only occurs when the H of one molecule is attracted to a N, O, F of another molecule. (very Electronegative atoms)
- A strong dipole is formed.
- This is the strongest of the intermolecular attractions.

Who cares about intermolecular forces?

Most molecules are not solids at room temperature.
Why?

- The intermolecular forces between molecules are so weak that they take very little heat energy to overcome. Therefore both polar and non-polar molecules have a low m.pt and b.pts.