



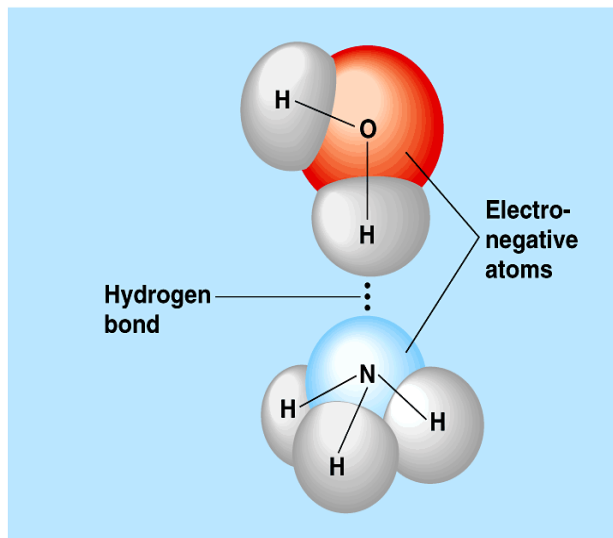
Intermolecular forces – the attractions between molecules



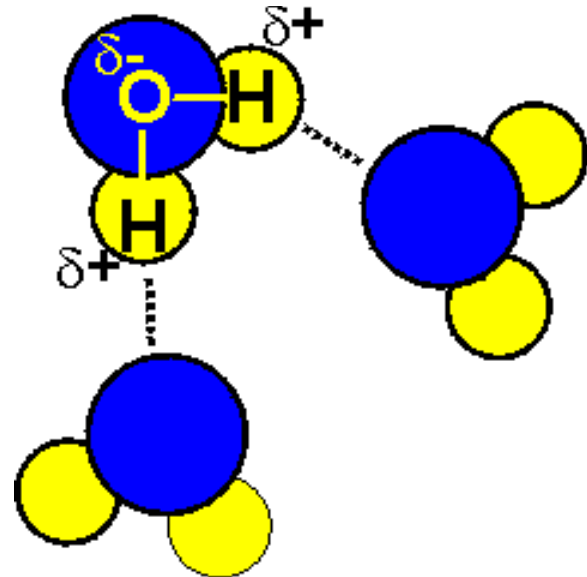
- Determine whether a compound is a solid, liquid or gas at a given temperature (determine melting and boiling points of substances)
- 3 Main Types:
 - a) Hydrogen bonding
 - b) Dipole-dipole interactions
 - c) Dispersion forces (aka London dispersion forces)

+ Hydrogen Bonding

- Attraction formed between the hydrogen atom of one molecule and an electronegative atom of an adjacent molecule (O, N, or F)
- A type of dipole interaction and the strongest intermolecular force



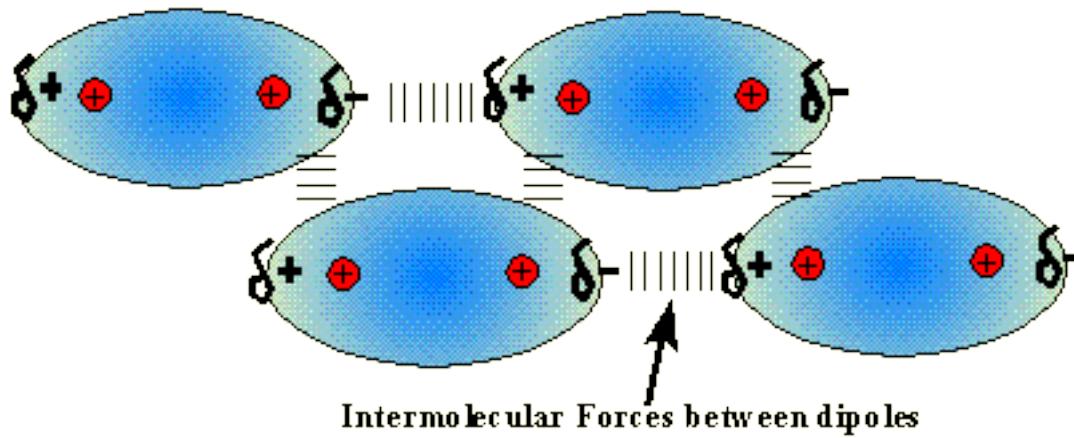
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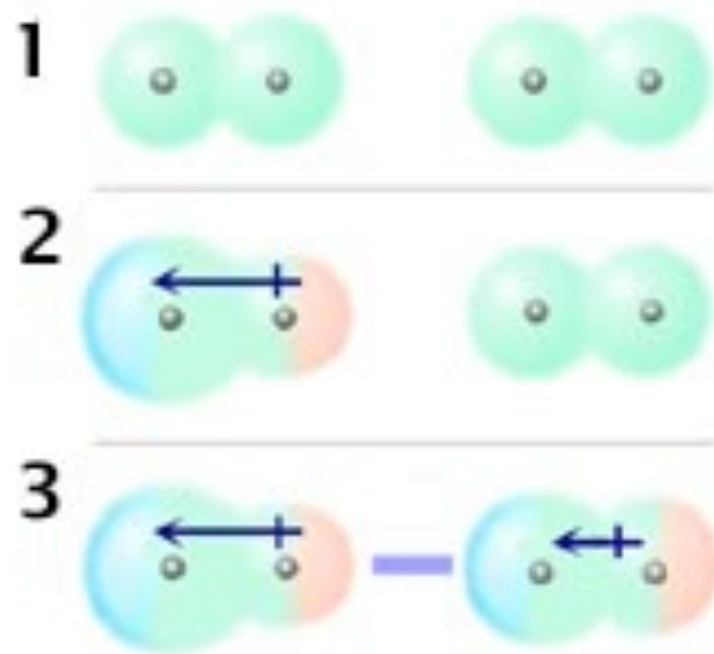
Dipole-dipole interactions

- Dipoles interact by the positive end of one molecule being attracted to the negative end of another molecule (similar to but much weaker than ionic bonds)



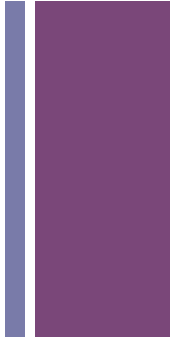
+ Dispersion Forces

- Caused by electron motion. Electrons around one molecule momentarily repel electrons a nearby molecule creating a momentary charge difference
- Can exist between nonpolar molecules as well as polar
- Weakest intermolecular force but increases as the number of electrons increases



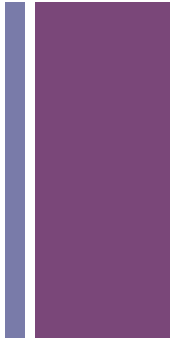


Animation of Intermolecular forces



- <https://www.wisc-online.com/learn/natural-science/chemistry/gch6804/intermolecular-forces>

+ Boiling and Melting



- What happens when a compound melts or boils?
 - It is becoming less organized, and there is less attraction between molecules- intermolecular forces have to be broken
 - Covalent bonds are ***not*** broken, just intermolecular forces.
 - Example: Ice melting: the water molecules are still intact, still H₂O
- The opposite is true for freezing/condensing.
 - Intermolecular forces are forming and the substance is becoming more organized.



Intermolecular forces and melting/ boiling point



**Stronger
intermolecular forces**



**Weaker
intermolecular forces**

ion-ion

hydrogen bonding

dipole-dipole

dispersion

**Higher
melting and boiling points**



**Lower
melting and boiling points**