Intermolecular forces and polarity
Polar bonds

- Electronegativity: the attraction a nucleus has for electrons is a bond
  - large difference in e-neg indicates an ionic bond
  - medium/small difference in e-neg indicates a polar covalent bond
  - no difference in e-neg indicates a covalent bond
Molecule polarity

- Polarity: an imbalance in the position of electrons in a bond or a molecule as a whole
- Dipole moment (dipole): a depiction of the shift in electrons on a bond or atom
Intermolecular vs Intramolecular

- Intramolecular forces: attractions that hold individual molecules together (covalent bonding, ionic bonding)

- Stronger

- Intermolecular forces: attraction between a molecule and a neighboring molecule.

- Weaker
Factors affecting strength of attraction

1. Polarity - more polar = stronger attraction,
   less polar = weaker attraction

2. Size - bigger = more surface area = stronger
   smaller = less surface area = weaker
continuum of forces

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<th>H-bonding</th>
<th>metallic</th>
<th>covalent</th>
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London Dispersion Forces

- For non-polar molecules only!
- What holds the molecule together?
- “temporarily” polar based on electrons shifting around each atom (temporary dipole)
- Large atoms/molecules these forces are stronger
- Small atoms/molecules these forces are weaker
Dipole-Dipole

- Interaction between polar molecules
- Polar - 2 poles, positive and negative (permanent dipole)
- Opposite poles attract each other
- Stronger than London
Hydrogen bonding

- Special, extra strong, type of dipole-dipole interaction
- Occurs when hydrogen is bonded to a very electronegative atom (F, O, N)
Metallic bonding

- Electron sea model – valence electrons are attracted to each positive nucleus
- Strong bond (stronger than any IMF)
  - high melting point
  - soluble in water
- Conducts electricity (electrons are free to flow)
Giant covalent network

- Repeating covalently bonded structure (graphite, diamond, fullerenes, silicon, silicon dioxide)
- Very strong bonds
  - High melting point
  - not soluble in water (non-polar)
  - does not conduct electricity well (little electron movement)
Ionic lattice

- Repeating structure of cation and anions
- Extremely strong bonds
- Very high melting points
- Soluble in water (very polar)
- Conducts electricity as a liquid and as a solution in water