Overview of Chapter 13

- Intermolecular Forces
- Liquids and their Properties
- Solids and Their Properties
- Phase diagrams

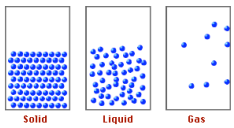
Today's Topics

- Liquids and their properties
- Heats of vaporization and condensation
- Vapor Pressure

Questions to consider:

- What are the unique properties of water that make it critical for life?
- What happens when liquids boil?
- What does the temperature of a liquid represent?

Solids, liquids, and gases



Solids have little molecular motion

Liquids have some molecular motion

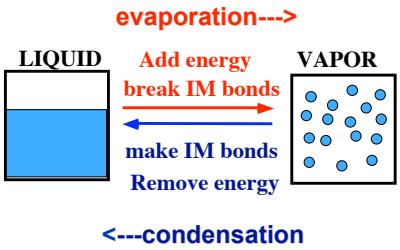
Gases have extensive molecular motion

Liquids

- Molecules are in constant motion
- Have appreciable intermolecular forces
- Molecules are close together
- Are almost incompressible
- Do not fill the container

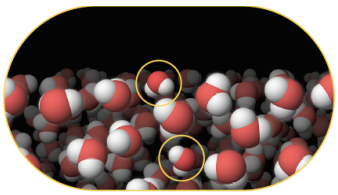
Liquids

Two key properties we need to describe are EVAPORATION and its opposite, CONDENSATION



Liquids

Molecules at surface behave differently than those in the interior.

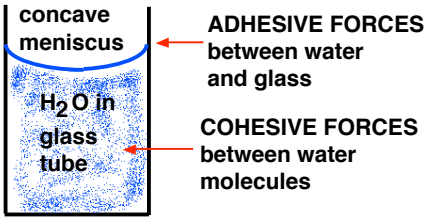


Molecules at surface experience net INWARD force of attraction.

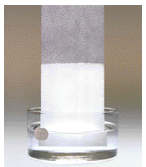
This leads to SURFACE TENSION — the energy required to break the surface.

Liquids: Capillary Action

Intermolecular forces also lead to CAPILLARY action and to the existence of a concave meniscus for a water column.

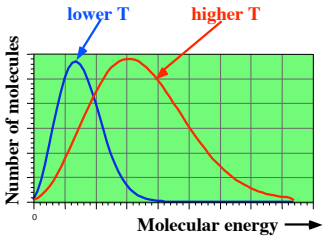


Liquids: Capillary Action



Movement of water up a piece of paper depends on H-bonds between H_2O and the OH groups of the cellulose in the paper.

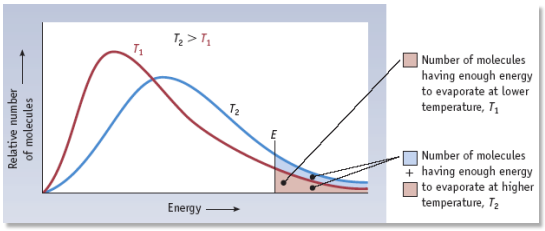
Liquids—Distribution of Energies



Distribution of molecular energies in a liquid.

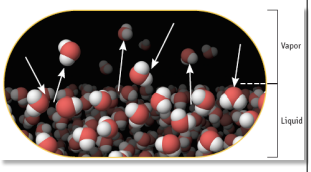
Kinetic Energy is proportional to Temperature.

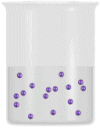
Liquids—Distribution of Energies

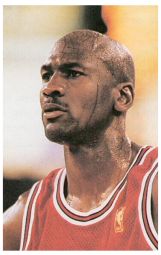
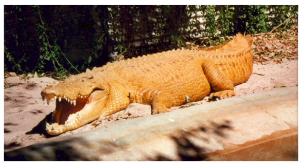


Liquids—Evaporation

To evaporate, molecules must have sufficient energy to break IM forces.





Breaking IM forces requires energy. The process of evaporation is endothermic.

What is the difference?