

Chapter 2-1 States of Matter

- Solid
 - definite shape and volume
 - particle arrangement: tightly packed, stay in fixed positions, just vibrate
 - can't be easily compressed/expanded
 - types:
 - a. crystalline solids have a regular repeating pattern and melt at a given temperature called the melting point. Ex. Sugar, salt, snow, sand
 - b. amorphous solids don't have a regular repeating pattern and don't melt at a distinct temperature, they just become softer. Ex. Rubber, plastic, glass, butter
- Liquid
 - no definite shape but definite volume
 - particle arrangement: particles are more free to move around
 - not easily compressed/expanded
 - can flow from place to place; some like honey have high viscosity (resistance to flowing), others like water have low viscosity and they can flow easily
- Gas
 - no definite shape or volume
 - particle arrangement: particles are spread out and free to move around
 - the volume of the gas is equal to the volume of its container
 - can be easily compressed

Chapter 2-2/2-3

- **Measuring Gases**

- Volume**

- space occupied
 - cubic centimeters, milliliters
 - no definite volume meaning the volume of the gas is equal to the volume of its container

- Temperature**

- measure of the average kinetic energy of the particles in matter
 - degrees Celsius
 - the faster they are the more the temperature

- Pressure**

- the force exerted by the particles on the walls of the container
 - pressure (Newtons per square meters) is equal to the force (Newtons) divided by the area (square meters)
 - gas moves from an area of high pressure to an area of low pressure until a balance is reached

- **Gas Behavior**

- Boyle's Law**

- at constant temperature, as the pressure of a gas increases, the volume decreases (inversely proportional - graph doesn't pass through (0,0) and is not linear).
 - applications: air balloon, bicycle pump

- Gay-Lussac's Law**

- at constant volume, as the temperature increases, the pressure increases (directly proportional - graph passes through (0,0) and is linear).
 - applications: tires of a truck on hot day

- Charles' Law**

- at constant pressure, as the temperature increases, the volume increases (directly proportional - graph passes through (0,0) and is linear).
 - applications: basketball

Note: graphs are charts that show the relationship between 2 variables.

Chapter 2-4 Change of State

- Thermal Energy is the total energy of the particles in matter.
- Thermal energy depends on the temperature of matter, mass of the particles, and the state of matter (arrangement of particles).
- Heat is the transfer of thermal energy from one substance to another, from hotter (thermal energy removed) to cooler (thermal energy is added).
- Thermal energy changes during change of state; solid had the least, gas has the most.

| Change of State | Process | T.E. | Other Info |
|--|--|------------------|--|
| melting | solid to liquid | added | Melting Point depends on how strongly the particles are attracted and identifies the substance |
| freezing | liquid to solid | Removed | |
| vaporization - evaporation on the surface - boiling throughout | liquid to gas | added | Boiling Point depends on how strongly the particles are attracted and identifies the substance |
| condensation | gas to liquid | Removed | |
| sublimation | solid to gas gas to solid without passing through liquid | added or removed | |