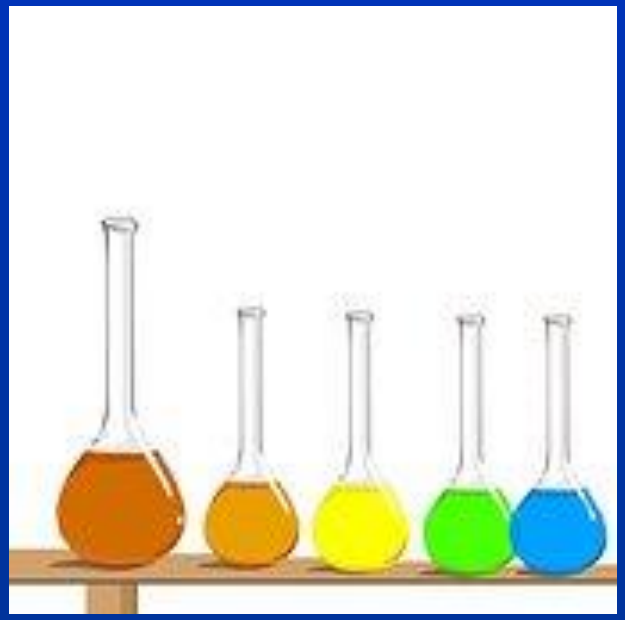
Ch 2 Properties of Matter

2.1 Matter Has Observable Properties

1. Physical
2. Chemical



Physical Properties Describe a Substance

- Physical properties—can be observed without changing the identity of the substance
  - Density—relationship between mass & volume
  - Mass
  - Color
  - Volume
  - Texture

Density=mass/volume

Density of fresh water is 1.0

d=smaller than 1.0, object floats in water

d=larger than 1.0, object sinks in water

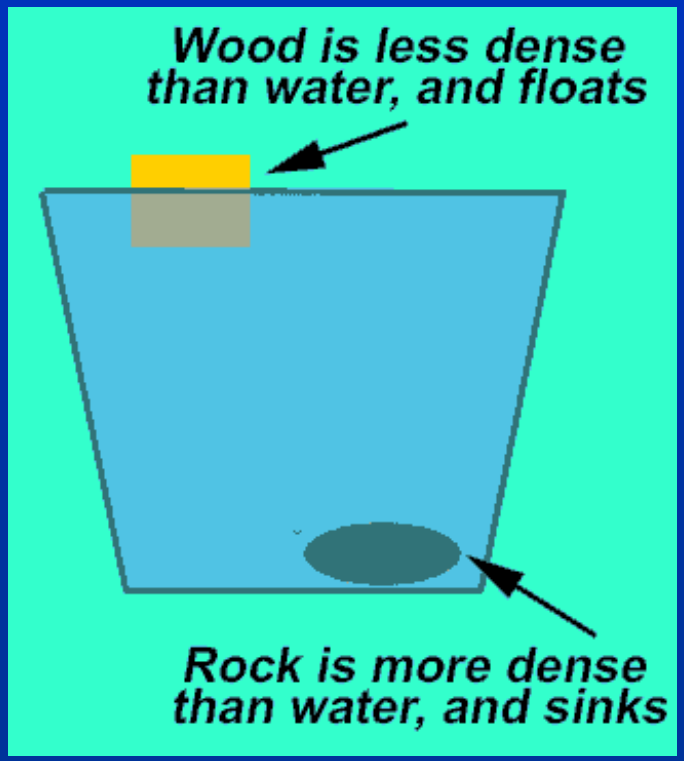
D=m/v

Calculate density & state whether the object would sink or float in water:

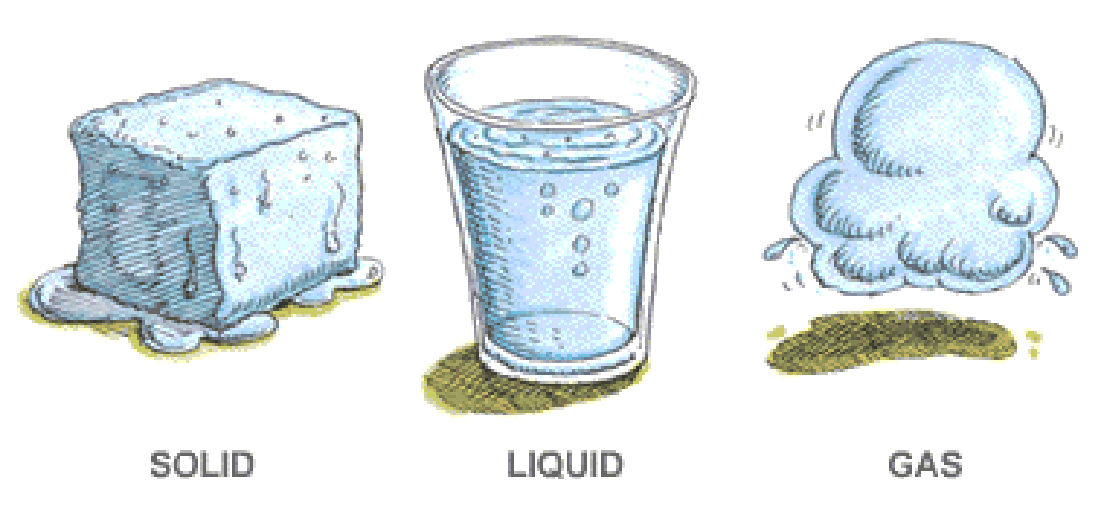
1. Mass=40 kg,
volume=2 cubic cm

2. Volume=10 liters,
mass=5 g

3. 400 liters & 100 kg



- Physical change—any change in a physical property of a substance

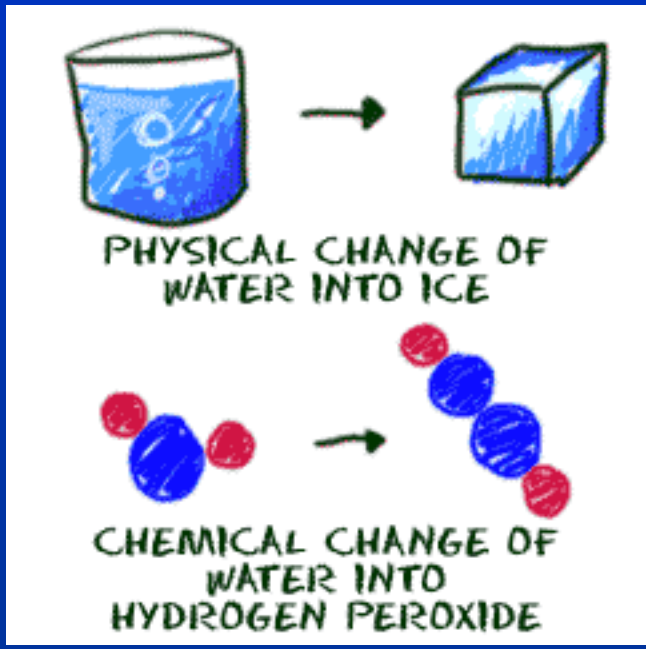


Chemical properties describe how substances form new substances

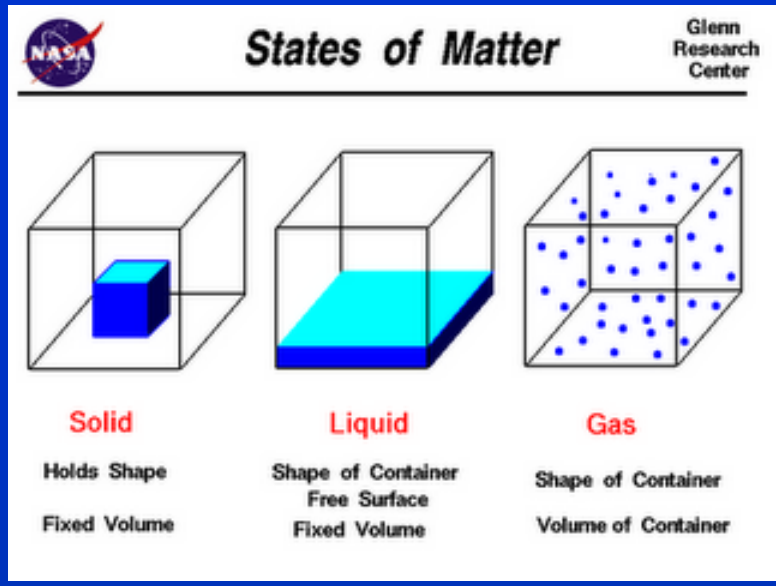
To observe chemical properties, you must observe a chemical change (bonds between atoms break & new bonds form)

Examples:

1. Anything burning (combustion)
2. Gases released
3. Temp changes
4. Rusting , corosion, tarnishing
5. Cooking
6. Decomposing

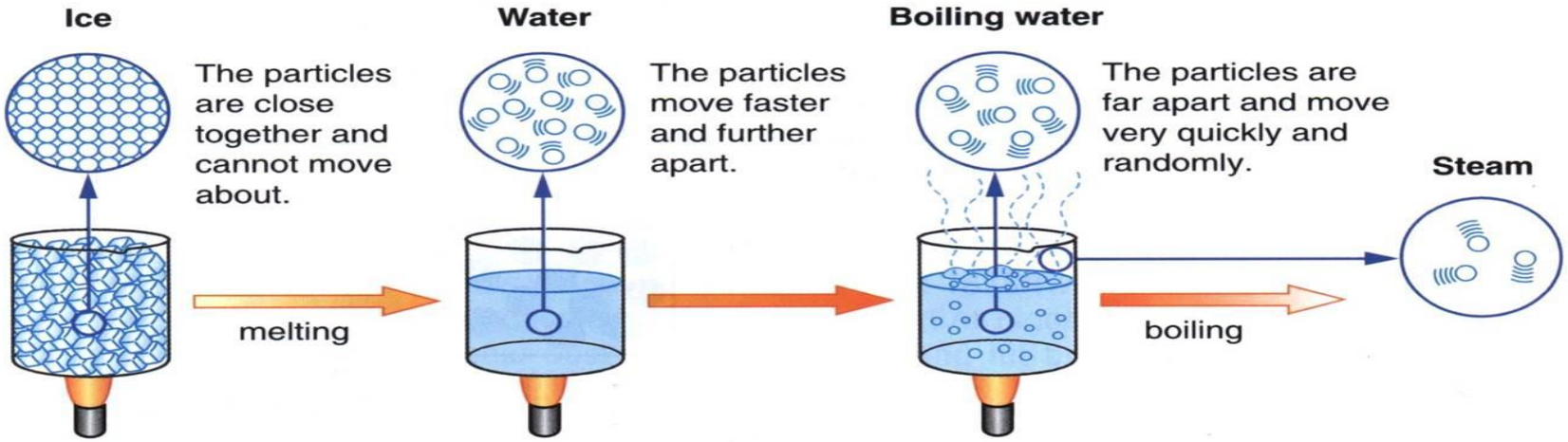


2.2 State of matter changes are physical



4 states of matter:

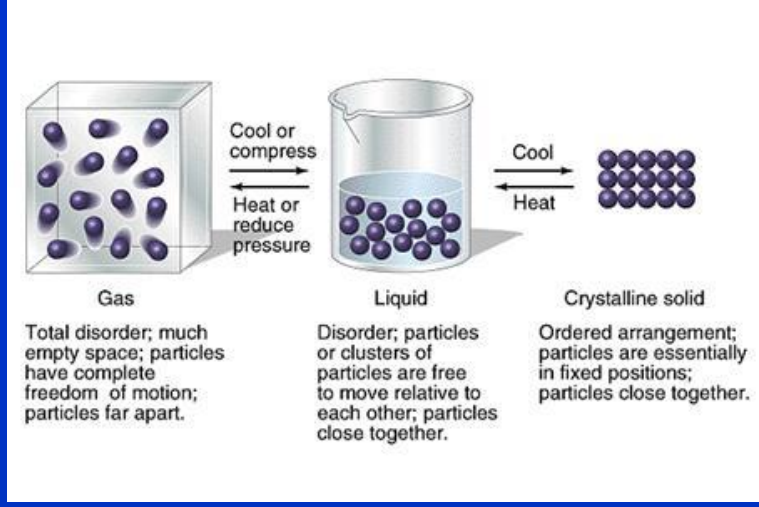
1. Solid--fixed volume & shape
2. Liquid--fixed volume but no fixed shape
3. Gas—no fixed volume or shape
4. Plasma—energized state where electrons are jumping energy levels



▲ Changes of state in matter.

Physical properties: boiling, evaporation, freezing, condensation, dissolving, sublimation, melting

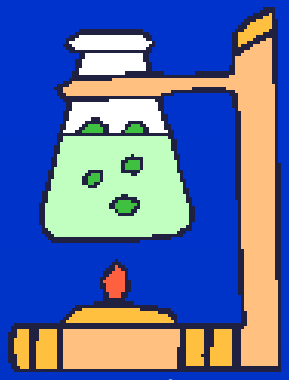
Solids can become liquids & vice versa



- Melting—added energy (heat) breaks the tight bonds between particles
  - Melting point is the temp at which a solid becomes a liquid

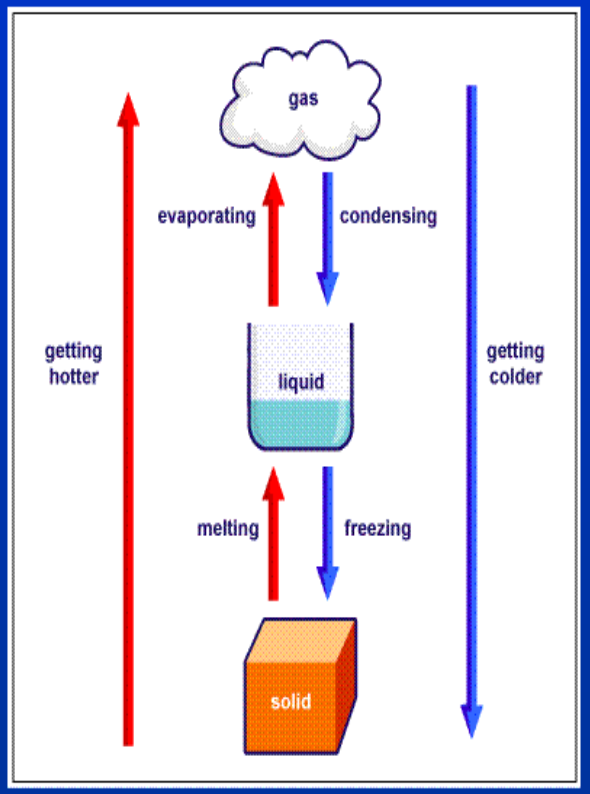
- Freezing—particles in a liquid lose energy and bond tightly to form a solid
  - Freezing point is the temp at which a liquid becomes a solid

**The melting point & freezing point of a substance is the same



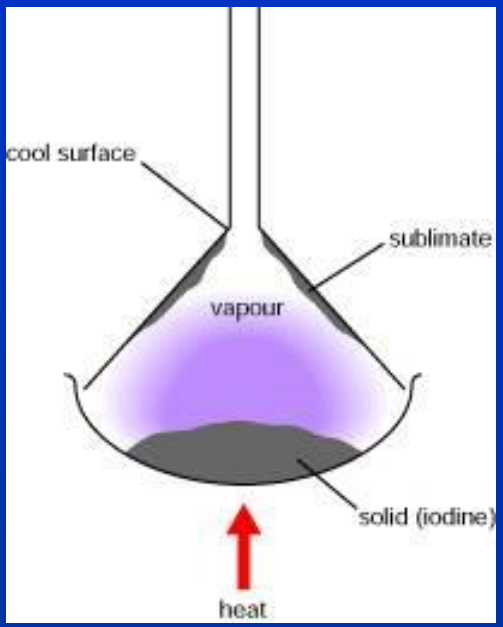
Liquids can become gases & vice versa

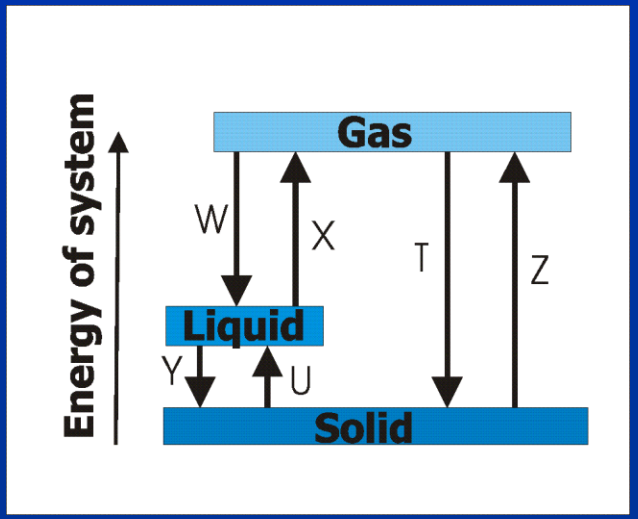
- Evaporation—high energy particles can escape from the surface of a liquid (gaining energy)

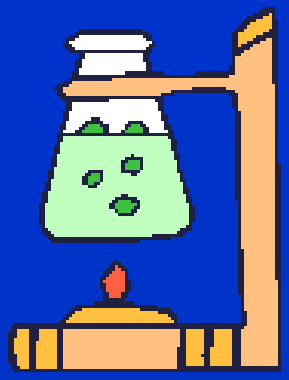


Solids become gases **directly** & vice versa only under certain temp & pressure conditions

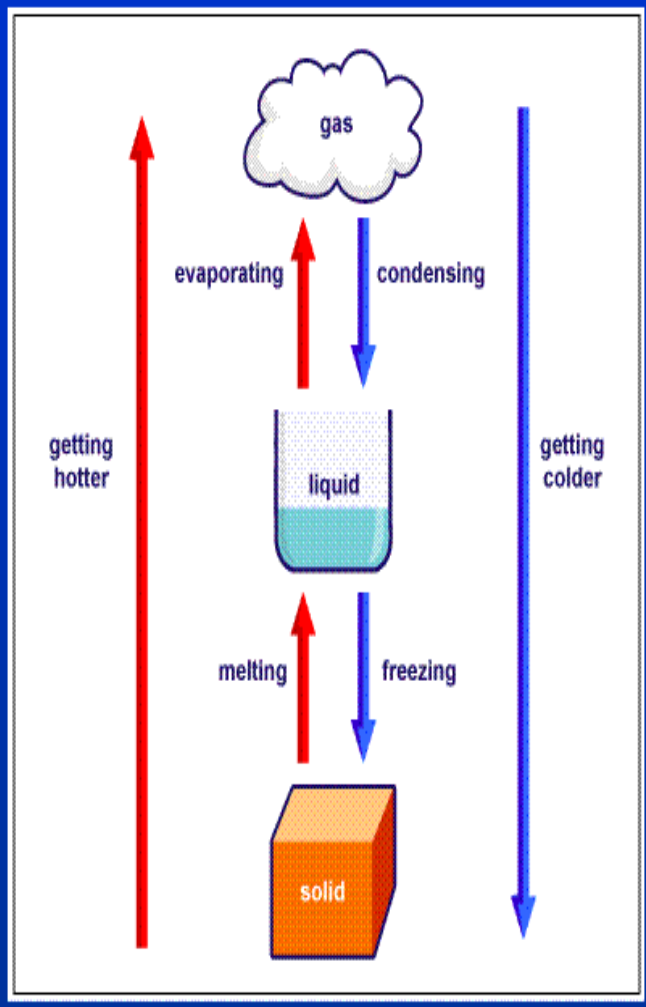
- Sublimation—solids become gases
  - Dry ice does this
- Deposition—gases become solids
  --frost



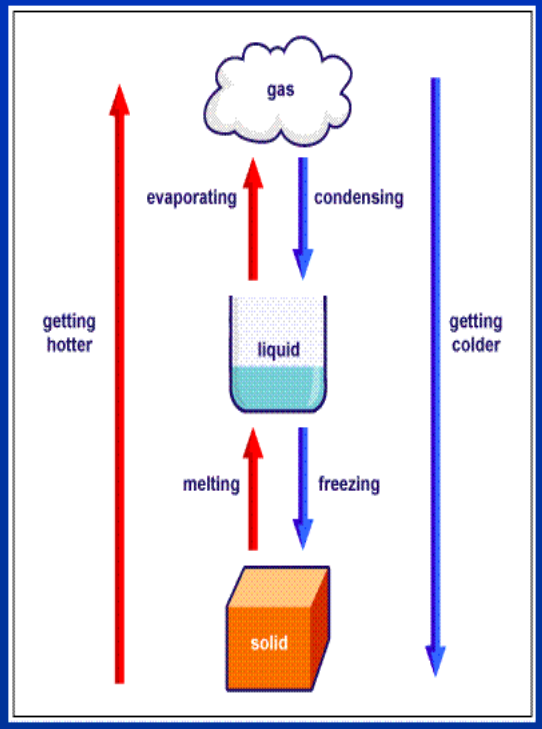




- Boiling—energy is added to a liquid; bubbles of gas can form throughout the liquid _(gaining energy)



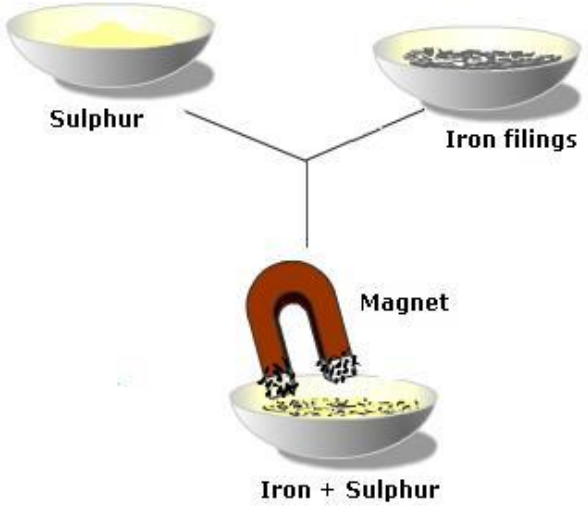
- Condensation—gas is changed to a liquid by removing energy from the liquid (losing energy)



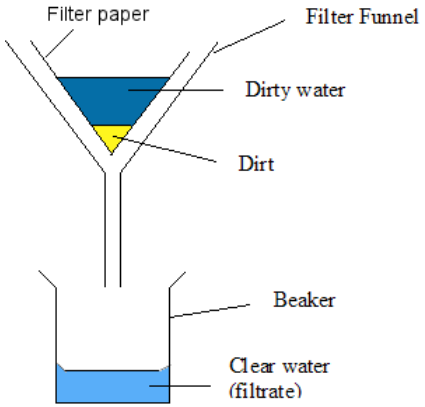
2.3 Properties are used to identify substances

- Properties are the same for every sample of a particular substance (like water)
  - Density
  - Heating properties (boiling point, melting point)
  - Solubility (able to dissolve)
  - Conductivity (able to conduct heat, electricity, etc.)
  - Magnetic properties
  - Viscosity (resistance to flow)

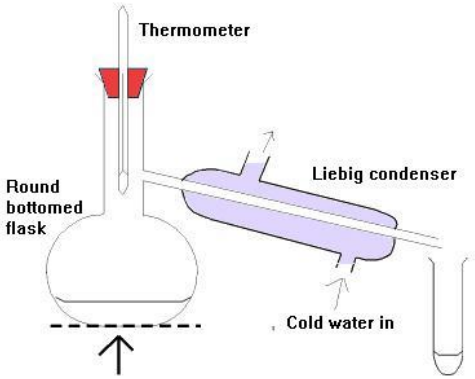
Mixtures can be separated by using the properties of the substances in them



- Magnet will separate materials with magnetic properties
- Filtration can separate solids from liquids & solids that differ in particle size



- Evaporation can separate a liquid & the substance *dissolved* in it (simple distillation)



*Density—can be used to separate mixtures