Unit 2 Morning Test Review Name ________________ Block ___

Physical vs Chemical

- Physical Property – a characteristic that can be observed without changing the substance

  Examples: color, size, shape, density, melting point, boiling point,

- Chemical Property - a characteristic that is observed when the composition of the substance changes

  Examples: flammability, toxicity, acidity, corrosiveness, combustibility

- Physical Change – a process that involves changing how a substance looks without changing what it is

  Examples: freezing, melting, boiling, subliming, ductility, solubility

- Chemical Change – a process that involves changing the composition of a substance (or substances) so it has new physical and chemical properties.

  Examples – rust, tarnish, oxidation, fermentation, electrolysis, pH indicator changing colors, burning, decomposing, formation of a gas or a precipitate

Classifying Matter

- Element – the simplest form of pure matter made of only 1 kind of atom.

  Examples: hydrogen, sodium, magnesium, iron, copper, carbon, oxygen, chlorine

- Compound – two or more elements chemical bonded together as one pure substance

  Examples: water, carbon dioxide, sodium chloride, salt, sugar

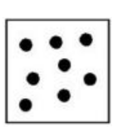
- Homogeneous Mixture – a solution that all looks uniform (the same)

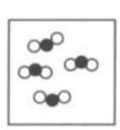
  Examples: alloys- brass, bronze, air, salt water, sugar water

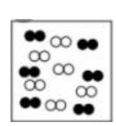
- Heterogeneous Mixture – an immiscible mixture that DOES NOT all look the same

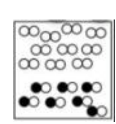
  Examples – concrete, muddy water, chocolate milk, oil & water

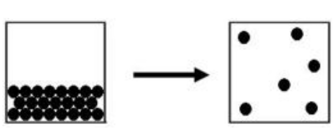
Particle Diagrams

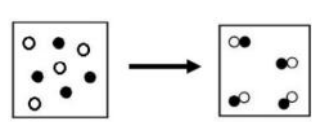

Element


Compound


Homogenous


Heterogeneous


physical change


chemical change

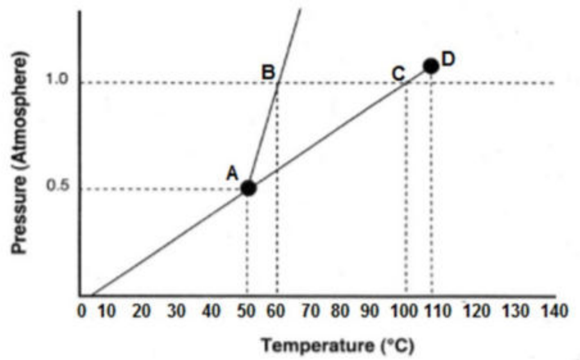
Classifying Matter

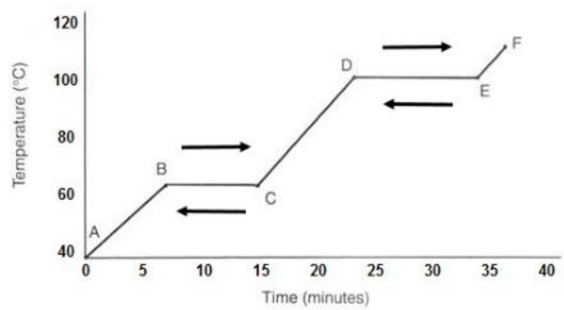
- Solid – definite shape, fixed volume, low kinetic energy – particles vibrate in place; strong intermolecular forces hold particles close together

- Liquid – no definite shape, fixed volume, medium kinetic energy – particles flow past each other but remain touching, medium intermolecular forces hold particles near each other

- Gas – no definite shape, no definite volume, high kinetic energy – particles move freely in straight paths, weak intermolecular forces have no attraction to other nearby particles

Phase Changes



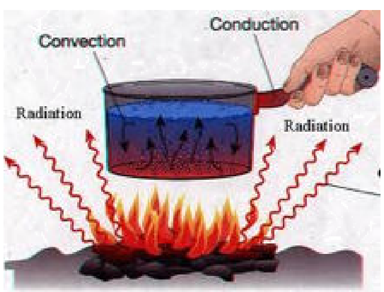


Energy

- Law of **Energy Conservation** – says energy is neither created nor destroyed.

- Heat energy travels through matter. When energy is **absorbed,** it is recorded as **positive** number (**+Q**); and when energy is **released**, it is recorded as a negative number (**– Q**)

- Heat can be transferred three different ways:



- **Conduction** – a process of transferring heat through direct contact
- **Convection** – a process where hot current rises and cooler currents sink
- **Radiation** – a process involving absorption of electromagnetic waves

- **Potential Energy** is stored energy
  Examples:
  - during phase change when temperature is constant
  - wood that hasn't burned yet

- **Kinetic Energy** involves energy in motion
  Examples:
  - when you overcome intermolecular forces to change the state of matter, you must MOVE the particles to separate them (solid → liquid)
  - wood on fire that is burning

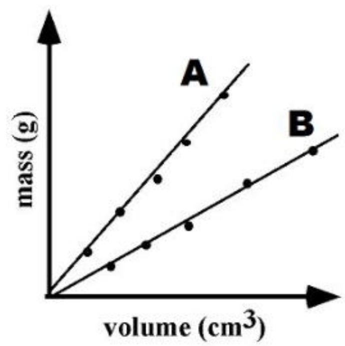
- **Thermal Energy** – involves heat; *thermal has the same root word as thermometer*

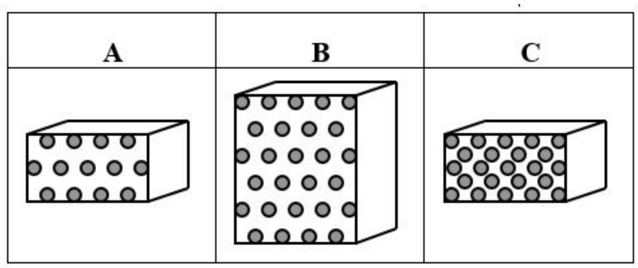
Temperature

- A measure of the AVERAGE Kinetic Energy of the particle in matter.
- The Kinetic Molecular Theory says that as particles gain heat they move faster and spread out.
- Determines the direction of heat flow
- Heat travels from HOTTER toward COOLER matter and we measure the heat flow with change in temperature (°C)

Density

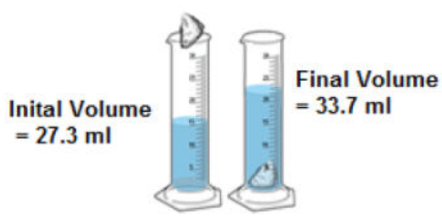
- The density of pure water is 1.00 g/ml
- Density is directly proportional to MASS and inversely proportional to Volume





Calculation:

The density of a piece of metal is determined by the ***water displacement method***. The metal had a **mass of 23.47 g.** A graduated cylinder was filled with **27.3 mL of water** and after the metal was **added the volume was 33.7 mL.**
What it its density?



$$density_{object} = \frac{mass_{object}}{volume_{object}}$$

$$D_{obj} = \frac{23.47\ g}{(33.7\ ml - 27.3\ ml)}$$

$$D_{obj} = 3.6671875 \frac{g}{ml}$$

$$sig\ figs \rightarrow 3.67\ g/ml$$

$$V_{obj} = V_{final} - V_{initial}$$

A sample of alcohol has density 0.82 g/mL. What is the mass of 75.0 mL of the liquid?

$$\frac{0.82\ g\ /\ ml}{1} = \frac{\text{mass}}{75.0\ ml}$$

mass = 62 g

A spherical ball has a radius of 0.50 cm and has a mass of 2.0 g. Will this ball float or sink when placed in water?

$$\text{Volume} = \frac{4\pi r^3}{3} = 0.52\ cm^3$$

$$\text{Density} = \frac{2.0\ g}{0.52\ cm^3} = 3.9\ g/cm^3$$

IT WILL SINK!

Specific Heat Capacity Problems: Q = m · s · ΔT or Q = m · s · (Tf – Ti)

1) Calculate the amount of energy required to raise the temperature of 145 grams of water from 22.3˚C to 75˚C. (Specific Heat of Water = 4.184 J/ g·°C)

$$q = (4.184 \frac{\text{J}}{\text{g} \cdot \text{C}}) \text{ (145 g) (75°C − 22.3°C)}$$

$$\boldsymbol{q = 31972\ Joules}$$

2) The specific heat capacity of iron is 0.45 J/ g·C. If 47 Joules of energy is required to raise the temperature of a sample of iron from 25˚C to 90˚C, what is the mass of the sample?

$$m = \frac{q}{C_p \cdot \Delta T}$$

$$mass = \frac{47\ J}{\left(0.45 \frac{\text{J}}{\text{g} \cdot \text{C}}\right) \text{(90°C − 25°C)}}$$

$$\boldsymbol{mass = 1.6\ grams}$$

3) A 35.2 gram sample requires 1251 Joules of energy to heat the sample by 25˚C. What is the specific heat capacity of the sample?

$$C_p = \frac{q}{m \cdot \Delta T}$$

$$Specific\ Heat\ Capacity = \frac{1251\ J}{\text{(35.2 grams)(25°C)}}$$

$$\boldsymbol{Specific\ Heat\ Capacity\ =\ 1.42 \frac{\textbf{J}}{\textbf{g} \cdot \textbf{°C}}}$$