

Measurement

① Scientific Notation

$$\underline{5} \times 10^{-2} = .05$$

$$3.5 \times 10^3 = \underline{\underline{3500}}$$

Compare exponents:

$$5.7 \times 10^{-27}$$

$$4.2 \times 10^{-34} \rightarrow \text{smaller value}$$

② Sig Figs

- Division & Multiplication

• report answer to fewest # of .sf

$$\text{Ex.) } D = \frac{25.0\text{g} \leftarrow 3 \text{ sf}}{5.0\text{mL} \leftarrow 2 \text{ s.f.}} = 5.0 \text{ g/mL}$$

When are zeros significant?

$$57.0 \quad 3 \text{ s.f.}$$

$$45.050 \quad 5 \text{ s.f.}$$

$$150. \quad 3 \text{ s.f.}$$

" " zeros not significant?

• Placeholders

$$1.2 \times 10^3 = 1,200 \quad \leftarrow \text{placeholders}$$

$$.00463 \quad \leftarrow 3 \text{ s.f.}$$

③ Density

$$D = \frac{M}{V} \quad (\text{Ref. Table T})$$



Ref. Table S
for elements

- Finding volume of an object w/
water displacement.

Volume of water - 15.0 mL

Volume of H₂O + object = 17.5 g/mL

Mass = 25g

$$D = \frac{M}{V} = \frac{25g}{2.5 \text{ mL}} = 10.9/\text{mL}$$

Matter + Energy

Matter

Pure Substance

- only one type of substance (O_2 , H_2O , Cu)

• homogeneous

- same (uniform) throughout

Mixture

- 2 or more substances physically combined
- variable composition
- can be separated
 - distillation (Boiling Point)
 - filtration (hetero mixtures)
 - evaporation
- each substance keeps its property

Elements

- Periodic Table
- can not be broken down chemically

Compounds

- made up of 2 or more elements chemically combined
- fixed ratios
- can be broken down chemically
- H_2O , CuH_2O_6



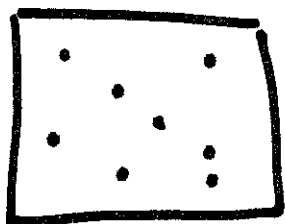
Heterogeneous

- diff. throughout

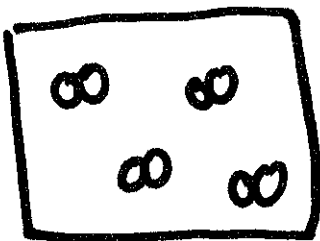
Homogen

- uniform solution
- (aq)

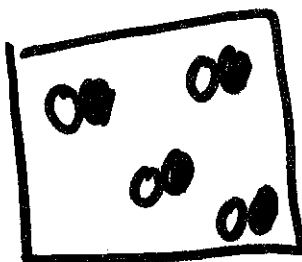
Particle Diagrams



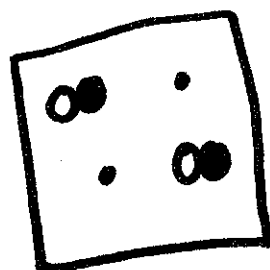
- Pure sub.
- Element



- Pure substance
- Element
- Diatomic
(Br I N Cl H O F)



- Pure substance
- Compound



- Mixture
- Element + Comp.

Chemical Change - a change that results in a change in composition



Clues

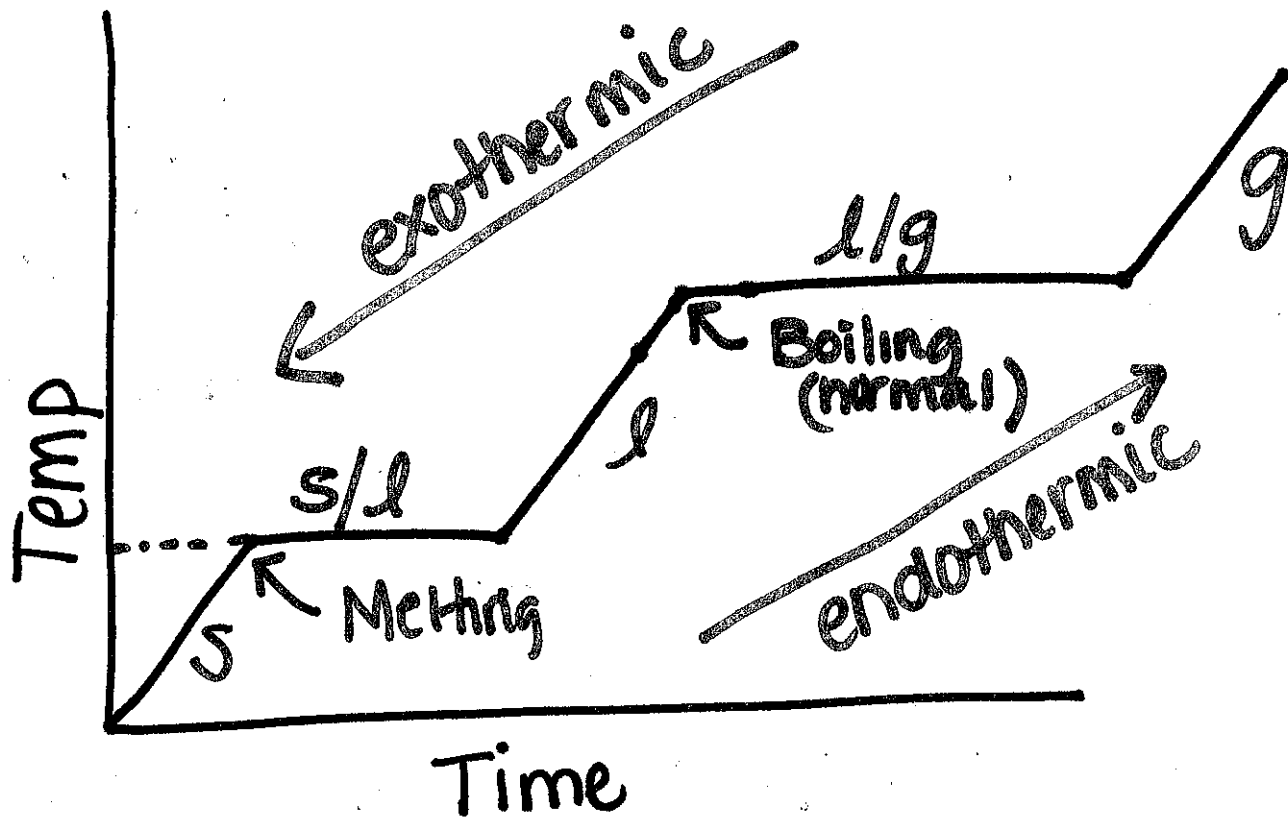
- Burning
- Rust
- React

- Formation of a gas (bubbles)
- Formation of a precipitate (solid)
- Color Change
- Transfer of energy (Light, heat)

Physical Change - no new substances made

- phase change
- dissolving (form a solution)

Heating + Cooling Curves



Diagonals

- one phase present
- ★ • Temp is changing → Kinetic Energy changes
- NO phase changes

Plateaus

- phase changes are occurring
- potential energy changes
- no temp change

Phase Change Calcs

★ Table T

★ Calculate heat

$$q = m c \Delta T$$

↑ ↑ ↖ change in temp.
mass specific heat
(Table B)

• not during a phase change

• 2 different temperature

$$q = m H_f$$

↖ Heat of fusion
(Table B)

Melting/Freezing
(s ↔ l)

$$q = m H_v$$

↖ Heat of vaporization
(Table B)

Evaporation/Condens.
(l ↔ g)

Energy

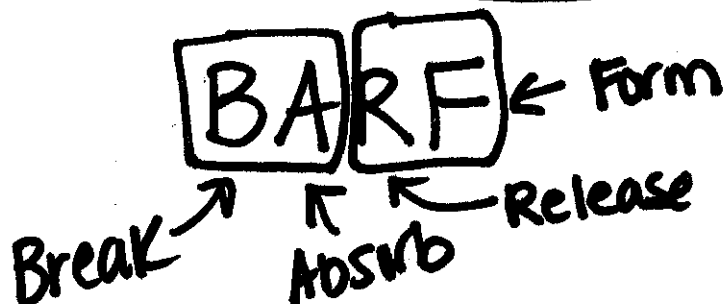
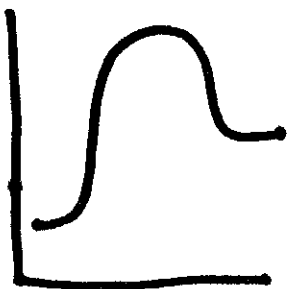
Exothermic - energy is released

- temp. of surroundings increases
- heat is a product ($A+B \rightarrow C + \text{energy}$)
- $-\Delta H$



Endothermic - energy is absorbed

- temp. decreases
- heat is a reactant ($A + \text{heat} \rightarrow B$)
- $+\Delta H$



★ Heat flows from hot to cold

★ Average KE = temp.

★ Potential Energy = stored energy (in chemical bonds)