CHEMICAL VS. PHYSICAL

chemical change (reaction): one or more substances are converted into different substances

chemical change: new substance is produced
- color change
- gas formed (bubbles)
- new solid formed (precipate) → means solid
- energy change
  - ↳ heat given off
    heat absorbed
    light

→ clues that chemical change happened

physical change: a change in a substance that does not change its identity
original substance exits only changed in form

* dissolving = physical change *
* phase changes (melt, boil, freeze) = physical change *

physical property is observed with senses and can be determined without destroying object

chemical property indicates how a substance reacts with something else
the original substance is fundamentally changed in observing a chemical property

METRIC CONVERSIONS

Mega	--	kilo	hecto	deka	Base	deci	centi	milli	--	micro	--	nano
(M)		(k)	(h)	(da)		(d)	(c)	(m)		(μ)		(n)
10^6		10^3	10^2	10		10^{-1}	10^{-2}	10^{-3}		10^{-6}		10^{-9}

grams = mass Liters = volume meters = distance/length seconds = time

SCIENTIFIC NOTATION

scientific notation: $N \times 10^n$ N = any rational number between 1 and 10
n = positive/negative integer
- n = small number (number < 1)
+ n = big number (number > 1)

Addition/subtraction: $(N_1 \times 10^{n_1}) + (N_2 \times 10^{n_2})$
make sure that the exponents are the same for each number ($n_1 = n_2$)
then add/subtract N_1 and N_2 and put the $\times 10^{n_1}$ next to it

multiplication/division: $(N_1 \times 10^{n_1}) \times (N_2 \times 10^{n_2})$
multiply/divide N_1 and N_2 and the 10 powers seperately
then put both parts together

MEASURING + PERCENT ERROR

precision: ① how close together the values are in a data set
② how sure you are of a measurement (based on measuring too)

accuracy: how close the values are to the true value

* when measuring measure to lines, then estimate extra decimal place
* the more lines measuring tool has, more precise

percent error: $\left| \frac{\text{accepted value} - \text{experimental value}}{\text{accepted value}} \right| \times 100$

measured number: value when measured by a device
exact number: number obtained by counting / definition

DENSITY

density = $\frac{\text{mass}}{\text{volume}}$ mass = volume × density volume = $\frac{\text{mass}}{\text{density}}$  : high density  : low density

intensive property: does not change based on amount Ex. density
extensive property: does change based on amount Ex. mass

* water density : 1 g/mL and 1 mL = 1 cm^3 = 1 CC CC = cubic centimeter

denser things will sink below less denser objects

If 2 objects have different densities, they must be different substances
↳ can use density to identify different metals

If 2 objects have same density → could be same substance
↳ would run more tests to be sure

SIGNIFICANT FIGURES

if decimal point is Present, approach from Pacific side - count nonzero → last digit (left to right)

if decimal point is Absent, approach from Atlantic side - count nonzero ← nonzero (right to left)

multiplication/division: limit and round to the least number of significant figures in any of the factors

adding/subtracting: limit and round to the least number of decimal places in any of the numbers that make up your answer

scientific notation: the # of sig fig of N = # of sig figs in actual number

calculations with scientific notation: calculate like normal, but make sure to follow correct addition/multiplication rules to the first number and round accordingly

* when rounding to sig figs for dimensional/density word problems, round to the least # of sig figs in measured number *

* the pink sheet is all exact measurements *
  - so do not count those sig figs when rounding the answer