Things you should have learned during

MEASUREMENT

Temperature scales: Centigrade (AKA Celsius), Kelvin, and Fahrenheit. Centigrade is metric but 0°C is normal cold for us, and a zero in a formula wrecks the math, so we avoid it in formulas. Kelvin always works, but it has "weird" temperatures of 273 K and 373 K for water's phase changes. Never say the "F" word in chem.

To covert from C to K, or K to C, use K = C + 273 formula. That's on the reference table T.

Density is a constant, which can be used to discern unknowns in lab, or at least to say this substance can't be the unknown, the density is too far off.

Density has units of grams/centimeter cubed (g/cm^3), or grams/milliliter (g/mL).

These units are interchangeable without math because 1 cm^3 = 1 mL in volume (size).

You should be able to solve for DENSITY, or MASS, or VOLUME. It helps a lot to start with a formula like this:

$$\frac{\text{Density}}{1} = \frac{\text{Mass}}{\text{volume}}$$

This will allow you to cross-multiply and divide to get an answer.

Significant figures are always important, and you must learn the rules and remember them. The rules are on the back cover of your measurement packet.

Scientific notation changes really big measurements into more manageable notation.
It does the same for super small measurements too.
To multiply: multiply the coefficients, add the exponents.
To divide: divide the coefficient, subtract the exponents.

To add: first adjust the exponents to the same value, then add the coefficients.
To subtract: first adjust the exponents to the same value, then subtract the coefficients.

In our class, the "RULE" is make sure the coefficient is at least 1, but less than 10. If your answer is outside of this range, you must adjust both the coefficient by moving the decimal, and adjusting the exponent (up or down) depending on how you adjusted the coefficient. One goes up, the other down, always.

We try to measure perfectly, but there are limits to how well we can measure. Our tools can "only go so far" and we can't fool ourselves that they might be better than they are. If your tool measures to the nearest whole number of units (degrees centigrade, or milliltiers) you must estimate to the nearest tenth of a unit. Not more, and not less.

Our mistake is called our "error" but we choose to measure how far off we are with the PERCENT ERROR formula (on Table T). That gives us a proportional boo-boo, that must be positive or negative. No sign is wrong. A positive % Error indicates we measured more than the actual value. A negative % Error means your measured value is less than the accepted value. The formula is in the reference table. Significant figures count here too. Actual values have unlimited SF and will not impact our percent error answers, but your measured values will.

BASIC UNITS	FACTOR	MEANING	MASS	LENGTH	VOLUME
KILO-	10^3	1000 x bigger than basic	1 kilogram = 1000 grams	1 Kilometer = 1000 meters	1 Kiloliter = 1000 Liters
CENTI-	10^{-2}	1 hundredth of basic unit	1 gram = 100 centigrams	1 meter = 100 cm	1 liter = 100 centiliters
MILLI-	10^{-3}	1 thousandth of a basic unit	1 g = 1000 milligrams	1 meter = 1000 mm	1 liter = 1000 milliliters
MICRO	10^{-6}	1 millionth of a basic unit	1 g = 1,000,000 micrograms	1 m = 1,000,000 micrometers	1 liter = 1,000,000 microliters
NANO-	10^{-9}	1 billionth of a basic unit	1 g = 1,000,000,000,000 nanograms	1 m = 1,000,000,000,000 nm	1 L = 1,000,000,000,000 nano mL

The gray boxes in the big chart are “correct” but rarely used units in our class. What is important is you see the patterns between the prefixes and the basic units. Only “kilo” is bigger, all other p refixes are metric decimals of the basic units.

There are many basic units in Table D. You can modify them with the metric prefixes in Table C. The only prefix that is bigger than a basic unit is the kilo– prefix.
A kilo is a 10^3 or a thousand times the size of a base unit. All the other prefixes are negative exponents, or decimals of the basic units.

Dimensional Analysis is really unit conversion math, when you start with a measurement and then covert the units over and over until you get the units you want.

All conversion factors must equal one, and the way that happens is that you use facts, like 1000 mL = 1 liter.

Because they are equal to each other, in a fraction they equal one if you have units. Without units this won’t work.

$$\frac{1000\text{ mL}}{1\text{ liter}} = 1 = \frac{1\text{ liter}}{1000\text{ mL}}$$

Logically if both of these fractions equal one, they both equal each other too. You choose the conversion factor that cancels out units you want to convert away.

1	Quantitative measures	Must have numbers and units, like 1.0 g/mL or 214 pounds
2	Qualitative measures	Use only words, like, the solution is clear, or the metal is warm
3	Accurate measures	Are measurements that are close to the actual values, close to correct
4	Precise measures	Are multiple measurements that are close together, which might be accurate or not.
5	Coefficient	Front part of a scientific notation expression, must be at least 1, but less than 10
6	Exponent	The back part of scientific notation. 2.45 x 10^4 grams has a coefficient of 2.45 an exponent of x 10^4 grams for a unit.
7	Kelvin	The absolute temperature scale. Zero Kelvin is literally absolute zero. Water's phase changes occur at 273 Kelvin and 373 Kelvin.
8	Absolute zero	A theoretical only temperature, a place with NO energy at all.
9	Centigrade	AKA Celsius, temperature scale with water's phase changes at 0°C and 100°C.
10	Fahrenheit	An odd scale that has water's phase changes at 32°F and 212°F. Avoid this; we will NOT do conversions from the F scale.
11	Density	A math construct that is equal to mass divided by volume. It is a constant for all pure substances.
12	Graphing	When the title of the graph is Mass as a function of Volume, the Y axis (up and down) is mass, the X axis (left/right) is volume.