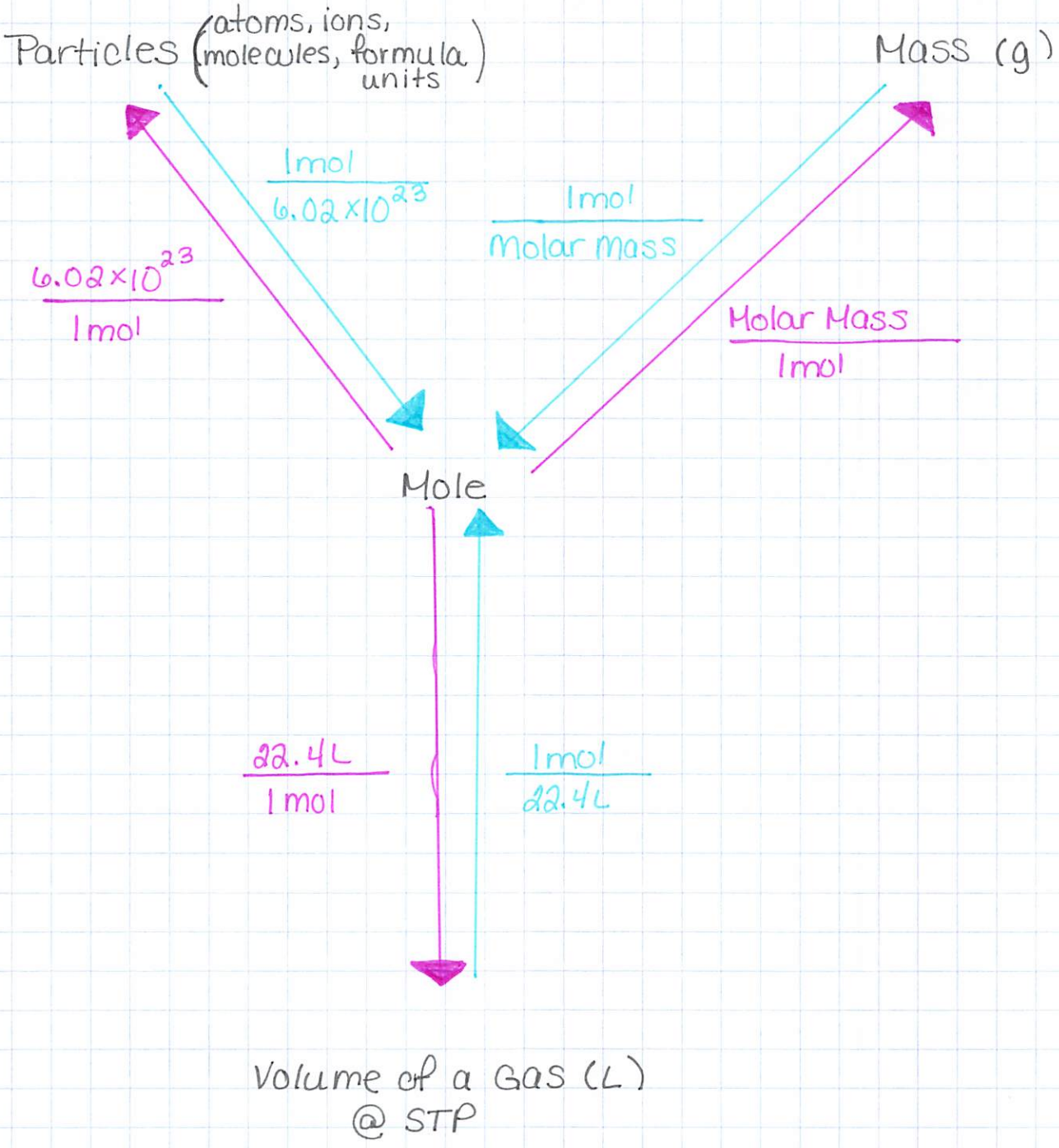
Mole Map - a graphic organizer you can use to help you remember which ratio to use when solving problems.

Always start at your given's unit from the problem and go to the unknown's unit.



Combined Mole Problems - 2 step problems

- There will be times when you need to determine the mass of a specific volume of gas at STP or the number of molecules in a specific mass of a substance. This is when you use 2 steps to solve the problem.

Examples

1. How many (molecules) are in 2.50 L of sulfur trioxide gas at STP?
   unknown — given

Notice how the question does not even mention the term, moles, anywhere. That's ok. It is very helpful to use your mole map to help solve these problems when you are starting out.

Looking at the mole map, to solve this problem, we would start at our given unit. We would start at the bottom, at L (volume). We need to finish at molecules (particles). This means you will follow the teal arrow up from Volume to Moles (step 1) & then go left from moles to Particles (step 2).

$$2.50\,\cancel{L}\ SO_3 \times \frac{1\,\cancel{mol}}{22.4\,\cancel{L}} \times \frac{6.02\times10^{23}\ \text{molecules}}{1\,\cancel{mol}} = 6.71875\times10^{22}$$

step 1 ↑ step 2 ↑

$= 6.72\times10^{22}$ molecules SO_3

$K^{1+}\ S^{2-}$

K_2S

2. What is the (mass) of 1.90×10^{24} formula units of potassium sulfide?
   unknown — given

step 1 → go from particles → moles
step 2 → go from moles → mass

$$1.90\times10^{24}\ \text{f.u.}\ K_2S \times \frac{1\,\cancel{mol}}{6.02\times10^{23}\,\cancel{\text{f.u.}}} \times \frac{110.27\,g}{1\,\cancel{mol}} = 348.0282392 = 348\,g\ K_2S$$

Molar Mass - K_2S

2 K × 39.10 g = 78.20 g
1 S × 32.07 g = 32.07 g
110.27 g

3. What is the (volume) of 50.0g of ozone (O_3) gas at STP?
unknown given

$$50.0\text{g } O_3 \left| \frac{1\text{ mol}}{48.00\text{g}} \right| \frac{22.4\text{ L}}{1\text{ mol}} = 23.33333333 = 23.3\text{ L } O_3$$

Molar Mass - O_3
$3\ O \times 16.00\text{g} = 48.00\text{g}$

4. Calculate the (mass) of 8.88×10^{-4} L of neon (Ne) gas at STP?
unknown given

$$8.88 \times 10^{-4}\text{ L Ne} \left| \frac{1\text{ mol}}{22.4\text{ L}} \right| \frac{20.18\text{g}}{1\text{ mol}} = 7.999928571 \times 10^{-4}$$
or
0.0007999928571

Molar Mass - Ne
$1\ Ne \times 20.18\text{g} = 20.18\text{g}$

$= 8.00 \times 10^{-4}\text{g Ne}$ or 0.000800g Ne