2) The percentage composition can also be determined from laboratory data. If the weight of each element present in a compound can be determined, then the percentage of each is equal to the weight of the element present in the compound divided by the total weight of the compound.
Example: A sample of an unknown gas is found to consist of 10.48g of nitrogen and 11.96g of oxygen. What is the percentage composition of this gas?

in notes.

1.5 Assignment

1) Calculate the gram molecular weight (molar mass) of the following compounds.

Formula	Molar Mass
K_3PO_4	K - 3 × 39.10 = 117.3 P - 1 × 30.97 = 30.97 O - 4 × 16.0 = 64.0 / 212.3 g/mol
$(NH_4)_2SO_4$	N - 2(14.01) = 28.02 H - 8(1.01) = 8.08 S - 1(32.07) = 32.07 O - 4(16.0) = 64.00 / 132 g/mol
$CuCO_3$	Cu - 1(63.55) = 63.55 C - 1(12.01) = 12.01 O - 3(16.00) = 48.00 / 123.6 g/mol
$Na_3PO_4 * 10\ H_2O$	Na - 3(22.99) = 68.97 P - 1(30.97) = 30.97 O - 4(16.00) = 64.00 H - 20(1.01) = 20.2 O - 10(16.00) = 160.00 / 344 g/mol.

* round molar mass only if it is your final answer *

CO_2	C - 1(12.01) O - 2(16.00) / 44.01 g/mol
$Pb(CH_3COO)_2$	Pb - 1(106.42) C - 2(12.01) H - 6(1.01) C - 2(12.01) O - 4(16.0) / 325 g/mol
MnO_2	Mn - 1(54.94) O - 2(16.0) / 86.94 g/mol
$Al(OH)_3$	Al - 1(26.98) O - 3(16.00) H - 3(1.01) / 78.0 g/mol

2) Mole Calculations using a periodic table

a. Calculate the mass of 65 L of carbon dioxide (CO_2) at STP.

2 sig figs.

$$65\text{ L} \times \frac{1\text{ mol}}{22.4\text{ L}} \times \frac{44.01\text{ g}}{1\text{ mol}} = 127.71\text{ g} \rightarrow \boxed{130\text{ g}}$$

b. Calculate the volume of 78 g of tetraphosphorus hexaoxide (P_4O_6) at STP.

2 sig figs.

$$78\text{ g} \times \frac{1\text{ mol}}{219.88\text{ g}} \times \frac{22.4\text{ L}}{1\text{ mol}} = 7.946\text{ L} \rightarrow \boxed{7.9\text{ L}}$$

c. Calculate the volume of 47 moles of nitrogen dioxide (NO_2) gas at SATP.

$47\,mol \times \frac{24.8\,L}{1\,mol} = 1165.6\,L \rightarrow$ **1200L NO_2**

d. Calculate the number of particles in 120 grams of sodium nitrate.

(each atom is a particle)

$120\,g \times \frac{1\,mol}{85\,g} \times \frac{6.023\times10^{23}\,molec.}{1\,mol} = 8.50\times10^{23}$ molecules

(x 5 particles)

$= 4.3\times10^{24}$ particles (atoms)

e. Calculate the # of molecules in 89 L of CO gas at SATP.

$89\,L \times \frac{1\,mol}{24.8\,L} \times \frac{6.023\times10^{23}\,molec.}{1\,mol} =$ **2.2×10^{24} molecules**

f. Calculate the mass of 1.35 x 10 ^{24} molecules of sulfur trioxide gas at STP.

$1.35\times10^{24}\,molec. \times \frac{1\,mol}{6.023\times10^{23}\,molec.} \times \frac{80.07\,g}{1\,mol} =$ **179g**

g. Calculate the volume of 63 moles of dinitrogen tetraoxide at STP.

$63\,mol \times \frac{22.4\,L}{1\,mol} = 1411.2\,L =$ 1400L of N_2O_4.

3) *Find the percentage composition of each compound listed below:*

a. Zinc carbonate → $ZnCO_3$

Zn – 1(65.41)g → 52.15%

C – 1(12.01)g → 9.58%

O – 3(16.00)g → 38.27%

125.42g

b. $SrCl_2$

Sr 1(87.62) → 55.27%

Cl 2(35.45) → 44.73%

158.52g

c. Barium hydroxide

Ba – 80.1%

O – 18.7%

H – 1.18%

4) A compound consisting of carbon, hydrogen, and oxygen weighs 40.85g. Analysis shows that the compound contains 10.90g of carbon and 0.90g of hydrogen. What is the percentage composition of the compound?

C – 10.90g → 26.69%

H – 0.90g → 2.20%

O – 29.05g → 71.11%

40.85g

5) Challenge: Potassium-40 is one of the few naturally occurring radioactive isotopes of elements of low atomic number. Its percent natural abundance among K isotopes is 0.012%. How many ^{40}K atoms do you ingest by drinking one cup of whole milk containing 371 mg of K?

(1) $371\text{ mg K} \times \frac{1\text{g}}{1000\text{mg}} \times \frac{1\text{mol}}{39.10\text{g}} \times \frac{6.023\times10^{23}\text{ atoms}}{1\text{mol}} = 5.71\times10^{21}$ K atoms.

(2) # of ^{40}K atoms.

$5.71\times10^{21}\text{ K atoms} \times \frac{0.012\ ^{40}K\text{ atoms}}{100\text{ K atoms}} = 6.9\times10^{17}\ ^{40}K\text{ atoms}$