NAME Key
Homework 7/

Basic Skills:

- ☐ **Go back and forth between moles and numbers of atoms/molecules**
  - Convert the following quantities using Avagadro's number:

1. 3.45×10^{-12} mol C_3H_7OH = _____ molecules C_3H_7OH

mol → molecules CF: $1\ mol\ C_3H_7OH = 6.022\times10^{23}$ molecules C_3H_7OH

$3.45\times10^{-12}\ mol\ C_3H_7OH \left(\frac{6.02\times10^{23}\ molec.}{1\ mol\ C_3H_7OH}\right) = 2.0769\times10^{12}$

2.08×10^{12} molecules C_3H_7OH

2. 7.59×10^{45} atoms of He = _____ mol He

atoms $\xrightarrow[N_A]{}$ mol

$7.59\times10^{45}\ atoms\ He \left(\frac{1\ mol\ He}{6.02\times10^{23}\ atoms}\right) = 1.26\times10^{22}\ mol\ He$

- ☐ **Calculate molar mass**
  - Give the molar mass for the following atoms:

1. Helium (He)	4.00 g/mol
2. Manganese (Mn)	54.94 g/mol
3. Mercury (Hg)	200.59 g/mol
4. Iodine (I)	126.90 g/mol
5. Carbon (C)	12.01 g/mol

* I usually use 2 decimal places for molar mass. You are welcome to use more if you prefer.

  - Calculate the molar mass for the following compounds:

1. $Ca(NO_3)_2$

$40.08\ g/mol + 2(14.01\ g/mol) + 6(16.00\ g/mol)$
$= 164.10\ g/mol$ or $1\ mol\ Ca(NO_3)_2 = 164.10\ g$

2. C_6H_{12}

$6(12.01\ g/mol) + 12(1.01\ g/mol) =$
$84.18\ g/mol$

3. SO_2Cl_2

$32.07\ g/mol + 2(16.00\ g/mol) + 2(35.45\ g/mol)$
$= 134.97\ g/mol$

☐ **Use molar mass as a conversion factor**

- Convert the following using the information you calculated in the above section:

1. 45.00 g Mn = _____ mol Mn

g → mol

CF: $54.94\text{g Mn} = 1\text{mol Mn}$

$$45.00\text{g Mn}\left(\frac{1\text{mol Mn}}{54.94\text{g Mn}}\right) = .8191\text{mol Mn}$$

4sf

2. 98.23 mol C_6H_{12} = _____ g C_6H_{12}

$$98.23\text{mol } C_6H_{12}\left(\frac{84.18\text{g } C_6H_{12}}{1\text{mol } C_6H_{12}}\right) = 8269\text{g } C_6H_{12}$$

4sf

3. 1.598g SO_2Cl_2 = _____ molecules SO_2Cl_2

$$1.598\text{g } SO_2Cl_2\left(\frac{1\text{mol } SO_2Cl_2}{134.97\text{g } SO_2Cl_2}\right)\left(\frac{6.02\times10^{23}\text{molec}}{1\text{mol } SO_2Cl_2}\right) = 7.127\times10^{21}\text{ molecules } SO_2Cl_2$$

4. 1.593×10^{32} atoms C = _____ g C

$$1.593\times10^{32}\text{ atoms C}\left(\frac{1\text{mol C}}{6.02\times10^{23}\text{ atoms}}\right)\left(\frac{12.01\text{g C}}{1\text{mol C}}\right) = 3.177\times10^{9}\text{g C}$$

☐ **Use a chemical formula as a conversion factor**

- Convert the following:

1. Determine the number of moles of O in 27.05 mol CO_2.

$1\text{mol } CO_2 = 2\text{mol O}$

$$27.05\text{mol } CO_2\left(\frac{2\text{mol O}}{1\text{mol } CO_2}\right) = 54.10\text{mol O}$$

2. How many grams of C are in 65.98g of C_6H_{12}?

$g C_6H_{12} \rightarrow mol C_6H_{12} \rightarrow mol C \rightarrow g C$

$$65.98\,g\,C_6H_{12}\left(\frac{1\,mol\,C_6H_{12}}{84.18\,g\,C_6H_{12}}\right)\left(\frac{6\,mol\,C}{1\,mol\,C_6H_{12}}\right)\left(\frac{12.01\,g\,C}{1\,mol\,C}\right) =$$

$$\boxed{56.48\,g\,C}$$

3. How many grams of $Ca(NO_3)_2$ can you produce if you begin with 75.23g Ca?

$$75.23\,g\,Ca\left(\frac{1\,mol\,Ca}{40.08\,g\,Ca}\right)\left(\frac{1\,mol\,Ca(NO_3)_2}{1\,mol\,Ca}\right)\left(\frac{164.10\,g\,Ca(NO_3)_2}{1\,mol}\right) =$$

$$\boxed{308.0\,g\,Ca(NO_3)_2}$$

4. How many grams of N are there in 25.9 g of N_2O_4?

$$25.9\,g\,N_2O_4\left(\frac{1\,mol\,N_2O_4}{92.02\,g\,N_2O_4}\right)\left(\frac{2\,mol\,N}{1\,mol\,N_2O_4}\right)\left(\frac{14.01\,g\,N}{1\,mol\,N}\right)$$

$$= \boxed{7.89\,g\,N}$$