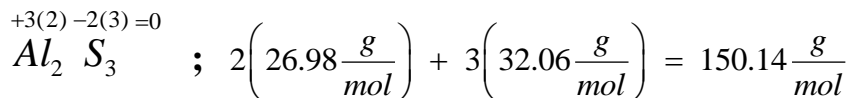HOMEWORK PROBLEMS: **Determine the percent composition for each of the elements in the compound.**

2a.   aluminum sulfide

> *Answer:* **When determining the percent composition you must first calculate the molar mass of the compound's formula (when balanced correctly)…**

$$\overset{+3(2)\ -2(3)\ =0}{Al_2\ S_3} \quad ;\quad 2\left(26.98\frac{g}{mol}\right) + 3\left(32.06\frac{g}{mol}\right) = 150.14\frac{g}{mol}$$
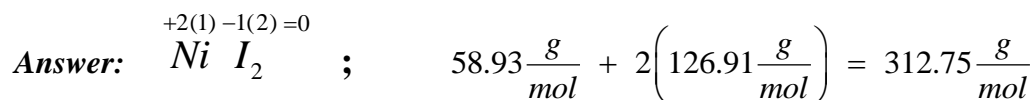
> **Next, take the total mass of each element (from the balanced formula) and divide that mass by the total mass of the compound and then multiply the value by 100…**

$$\%\ Al: \quad \frac{2\left(26.98\frac{g}{mol}\right)}{150.14\frac{g}{mol}} \times 100 = 35.9$$

$$\%\ S: \quad \frac{3\left(32.06\frac{g}{mol}\right)}{150.14\frac{g}{mol}} \times 100 = 64.1$$

2b.   nickel(II) iodide

> *Answer:* $\overset{+2(1)\ -1(2)\ =0}{Ni\ I_2} \quad ;\quad 58.93\frac{g}{mol} + 2\left(126.91\frac{g}{mol}\right) = 312.75\frac{g}{mol}$

$$\%\ Ni: \quad \frac{58.93\frac{g}{mol}}{312.75\frac{g}{mol}} \times 100 = 18.8$$

$$\%\ I: \quad \frac{2\left(126.91\frac{g}{mol}\right)}{312.75\frac{g}{mol}} \times 100 = 81.2$$

2c. calcium cyanide, $Ca(CN)_2$

Answer: $\overset{+2(1)\quad -1(2)=0}{Ca(CN)_2}$; $40.08\dfrac{g}{mol} + 2\left(12.01\dfrac{g}{mol}\right) + 2\left(14.01\dfrac{g}{mol}\right) = 92.12\dfrac{g}{mol}$

$$\%\ Ca:\quad \frac{40.08\dfrac{g}{mol}}{92.12\dfrac{g}{mol}} \times 100 = 43.5$$

$$\%\ C:\quad \frac{2\left(12.01\dfrac{g}{mol}\right)}{92.12\dfrac{g}{mol}} \times 100 = 26.1$$

$$\%\ N:\quad \frac{2\left(14.01\dfrac{g}{mol}\right)}{92.12\dfrac{g}{mol}} \times 100 = 30.4$$

Determine if the following samples are the same compound.

2d. Sample #1) 45.0 gram sample containing 35.1 grams of iron and 9.90 grams of oxygen and Sample #2) 215 gram sample containing 168 grams of iron and 47.3 grams of oxygen.

Answers: If the compound contains identical percentages of the elements, the compound is considered to be the same. Also, you do not have to determine the percentages for all the elements… If the percentages are the same for the SAME element – you have the same compound.

What is different about this problem from the previous problem is that we do not worry about molar masses – we do not know the molar mass (nor the compound to determine the molar mass)

$$Sample\ \#1\ :\ \%\ Fe:\quad \frac{35.1\ g}{45.0\ g} \times 100 = 78.0$$

$$Sample\ \#2\ :\ \%\ Fe:\quad \frac{168\ g}{215\ g} \times 100 = 78.0$$

These two compounds are the SAME… You do not need to determine the percent of the oxygen since the iron is the same… If the iron is not the same – stop, they samples are not the same.

2e. Sample #1) 75.0 gram sample containing 20.5 grams of carbon and 54.5 grams of oxygen and Sample #2) 157 gram sample containing 67.0 grams of carbon and 90.0 grams of oxygen.

$$Sample\ \#1\ :\ \%\ C: \frac{20.5\ g}{75.0\ g} \times 100\ =\ 27.3$$

$$Sample\ \#2\ :\ \%\ C: \frac{67.0\ g}{157\ g} \times 100\ =\ 42.7$$

These two compounds are NOT the same… The percent of carbon is not the same…