Chemistry 12 –Review : **Changing Moles to Grams and Grams to Moles**

The two conversion factors to remember are:

$$\frac{\text{MM grams}}{\text{1 mole}} \quad \& \quad \frac{\text{1 mole}}{\text{MM grams}}$$

(Where MM stands for the Molar Mass)

The Molar Mass is calculated by adding up atomic masses from underneath the symbol and the name on the periodic table.

eg. The molar mass of Na_2SO_4 is calculated as follows:

$2(23.0) + 32.1 + 4(16.0) = 142.1$ grams/mole

Here are some examples of converting using the conversion factors:

1. 2.60 moles of Na_2SO_4 = __?__ grams

$$2.60 \text{ moles} \times \frac{142.1 \text{ grams}}{1 \text{ mole}} = 369.46 \text{ grams}$$

Since 2.60 is only 3 significant digits, the answer should be rounded to 369g!

****If a calculation is just one step in a series of calculations, DON'T round of the answer. If possible, leave it in your calculator the way it is and go from there. Round the correct number of significant figures after all steps.

2. 1053.24 grams of K_2Se = __?__ moles

The molar mass of K_2Se is $2(39.1) + 79.0 = 157.2$ g/mole

$$1053.24 \text{ grams of } K_2Se \times \frac{1 \text{ mole}}{157.2 \text{ grams}} = 6.700 \text{ moles}$$

NOTE: The reason for the two 0's on the end of 6.700 is because the lowest # of SD's in the numbers divided is 4SD's (The 157.2) so the answer must have 4 SD's

Key #1-5

Now some for you to do: $2(1.0) + 16 = 18 g/mol$

1. 833.4 grams of H_2O = __?___ moles

$833.4 g \times \frac{1 mol}{18.0 g} = 46.3 mol$

2. 2.3×10^{-3} moles of H_2SO_4 = __?___grams

$2(1.0) + 32.1 + 4(16.0) = 98.1 g/mol$

$2.3 \times 10^{-3} mol \times \frac{98.1 g}{1 mol} = 0.23 g$

3. 3.84 grams of $(NH_4)_2CO_3$ = ___?__ moles

$2(14) + 8(1.0) + 12.0 + 3(16.0) = 96.0 g/mol$

$3.84 g \times \frac{1 mol}{96.0 g} = 0.0359 mol$

4. 2.45×10^{-2} moles of aluminum hydroxide = __?___grams

$Al(OH)_3 \rightarrow 27.0 + 3(16.0) + 3(1.0) = 78.0 g/mol$

$2.45 \times 10^{-2} mol \times \frac{78.0 g}{1 mol} = 1.91 g$

5. 0.3558 grams of nitrogen dioxide = __?___ moles

$NO_2 \rightarrow 14 + 2(16.0) = 46.0 g/mol$

$0.3558 g \times \frac{1 mol}{46.0 g} = 0.00773 mol$

****Unit 1 of Chemistry 12 deals with RATES of reactions. Rates are always expressed as a change in amount (grams, moles, litres etc.) per change in time (seconds, min. etc.)

$$Rate = \frac{\Delta \text{ amount}}{\Delta \text{ time}}$$

Here's an example of how the grams/mole conversions are used in rate expressions:
Change a rate of 0.035 grams H_2 per second to moles of H_2 per second

Solution:

$$\frac{0.035 \text{ g } H_2}{1 \text{ s}} \times \frac{1 \text{ mole } H_2}{2.0 \text{ g } H_2} = 0.0175 \text{ mol } H_2/s$$ -> rounding to correct SD's-> $0.018 \text{ mol } H_2/s$

Key #6-10

Here are some of these for you to do:

6. 2.6×10^{-2} moles of Zn/second = _?____grams of Zn/second → 65.4

$$\frac{2.6 \times 10^{-2}\ \text{mol}}{1\ \text{s}} \times \frac{65.4\ \text{g}}{1\ \text{mol}} = \frac{1.7\ \text{g}}{\text{s}} \Rightarrow 1.7\ \text{g/s}$$

7. 0.1962 grams of Zn/second = _?___moles of Zn/second

$$\frac{0.1962\ \text{g}}{1\ \text{s}} \times \frac{1\ \text{mol}}{65.4\ \text{g}} = 3.00 \times 10^{-3}\ \text{mol/s}$$

8. 0.014 moles of CO_2/s = ______grams of CO_2/s → $12.0 + 2(16.0) = 44.0\ \text{g/mol}$

$$\frac{0.014\ \text{mol}}{\text{s}} \times \frac{44.0\ \text{g}}{1\ \text{mol}} = \frac{0.62\ \text{g}}{\text{s}} \Rightarrow 0.62\ \text{g/s}$$

9. 3.718 grams of CO_2/s = ______moles of CO_2/s

$$\frac{3.718\ \text{g}}{\text{s}} \times \frac{1\ \text{mol}}{44.0\ \text{g}} = \frac{0.0845\ \text{mol}}{\text{s}} \Rightarrow 0.0845\ \text{mol/s}$$

10. 1.12 L of CO_2/s = ______moles of CO_2/s (*at Standard Temp. and Pressure*)

HINT: Recall that for gases at STP there are 22.4 L/ 1 mole so conversion factors could be:

$$\frac{22.4\ L}{1\ \text{mole}} \quad \text{or} \quad \frac{1\ \text{mole}}{22.4\ L}$$

$$\frac{1.12\ L}{1\ \text{s}} \times \frac{1\ \text{mole}}{22.4\ L} = 0.050\ \text{mol/s}$$