# Chemistry 12
# Some Review of Chem 11 - Mole Stuff

## Part 1 - Changing Moles to Grams and Grams to Moles

The two conversion factors to remember are:

molar mass

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

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

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

NOTE: In Chemistry 12 calculations, we must consider significant digits
The 2.60 has 3 SD's and the 142.1 has 4 SD's. When multiplying, the answer must be rounded of to the least # of SD's in the numbers being multiplied. So this answer must to rounded to 3 SD's.

So the answer is 369 grams

ANOTHER NOTE: 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.

2. 1053.24 grams of $K_2Se$ = _____ moles

Solution:

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

**Now some for you to do**

Work each of the following out showing the work and the units in the work and in the answer! These will be marked and counted as homework marks. (2 marks each)

1. 833.4 grams of $H_2O$ = $\frac{1}{18.0\ g}$ moles

16.0
2.0
18.0

Answer 46.3 mol $H_2O$

2. $2.3 \times 10^{-3}$ moles of $H_2SO_4$ = $\frac{98.1}{1 \text{ mole}}$ grams

4 O = 64 O
1 S = 32.1
2 H = 2.0
98.1

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

Answer 0.23 g $H_2SO_4$

$2.3 \times 10^{-1}$

3. 3.84 grams of $(NH_4)_2CO_3$ = _____ moles

$$3.84\ g \times \frac{1 \text{ mol}}{96.0\ g}$$

Answer 0.0400 mol $NH_4CO_3$

$4.00 \times 10^{-2}$

2N = 2(14.0) = 28.0
8H = 8(1.0) = 8.0
1C = 1(12.0) = 12.0
3 O = 3(16.0) = 48.0
96.0

4. $2.45 \times 10^{-2}$ moles of $Al(OH)_3$ = _____grams

$2.45 \times 10^{-2}$ mol × $\frac{78.0 \text{ g}}{1 \text{ mol}}$

(4)

Answer 1.91 g $Al(OH)_3$

5. 0.3558 grams of nitrogen dioxide ($NO_2$) = _____ moles

0.3558 g × $\frac{1 \text{ mol}}{46.0 \text{ g}}$

(3)

$7.73 \times 10^{-3}$ mol $NO_2$

Answer 0.00773

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.)

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

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:

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

Notice how the "g"s cancel out and you are left with the units of mol $H_2$/s

Here are some of these for you to do:

Zn/sec

mol -> g

6. $2.6 \times 10^{-2}$ moles of Zn/second = _____grams of Zn/second

$\frac{2.6 \times 10^{-2} \text{ mol}}{\text{sec}} \times \frac{65.4 \text{ g}}{1 \text{ mol}}$

Answer 1.7 g Zn/sec

7. 0.1962 grams of Zn/second = _____moles of Zn/second

$\frac{0.1962 \text{ g Zn}}{\text{sec}} \times \frac{1 \text{ mol Zn}}{65.4 \text{ g}}$

Answer $3.00 \times 10^{-3}$ mol/sec

8. 0.014 moles of $CO_2$/s = _____grams of $CO_2$/s

$\frac{0.014 \text{ mol } CO_2}{\text{sec}} \times \frac{44.0 \text{ g}}{1 \text{ mol}}$

Answer $6.2 \times 10^{-1}$ g/sec

9. 3.718 grams of $CO_2$/s = _____moles of $CO_2$/min

g → mol
s → min

$\frac{3.718 \text{ g}}{\text{s}} \times \frac{1 \text{ mol}}{44.0 \text{ g}} \times \frac{60 \text{ s}}{1 \text{ min}} = 5.07 \frac{\text{mol}}{\text{min}} CO_2$

3 ✓

Answer _______________

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

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

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

$\frac{1.12 \text{ L } CO_2}{\text{sec}} \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{44.0 \text{ g}}{1 \text{ mol}} \times \frac{60 \text{ sec}}{1 \text{ min}}$

Answer 132 g/min