Moles Review

- What is a mole?
- What is the difference between the mass of a mole and the number of items contained in a mole?
- What is molar mass and how do you calculate it?
- What is percent composition and how do you calculate it?
- Conversions (both in general and specifically grams to mol and mol to grams)
- What is an empirical formula and how do you calculate it?
- How is a molecular formula different from an empirical formula and how is it calculated?
- Understand stoichiometry and how to determine various quantities of substances used or produced in chemical reactions.
- What is a limiting reactant and how would you determine it?
- Be able to calculate % error.

Practice Problems -

The problems below are a brief sample of what you might be asked to do. For extra practice problems do questions in the back of chapters 9 and 10. The answers to the even numbers are in the back of the book and the solutions guide to all of the problems is in the library.

1) How many chairs are there in one mole of chairs?
2) How many molecules of H_2O in one mole of H_2O?
3) How many atoms of Hydrogen are there in the mole of H_2O molecules mentioned in #2? How many atoms of Oxygen?
4) Which is greater the number of atoms in 4.0 grams sodium or 4.0 grams of potassium?
5) What is the molar mass of the following O_2, $BaCl_2$, $NaNO_3$, $Cu(NO_3)_2$
6) Given that exactly 4 quarts = 3.7854 liters convert the following: 2.85 quarts to liters and 7.888 liters to quarts
7) How many grams are there in 4.00 moles of He?
8) How many moles are there in 15.0 g of He?
9) How many grams are there in 0.025 mol of CO_2?
10) How many moles are there in 4.02g of $Al_2(SO_4)_3$?
11) Find the percent composition of the following: K_2CO_3, $(NH_4)_2O$
12) What is the empirical formula for the following molecular compounds: H_2O_2, $C_6H_{12}O_6$, C_6H_6, CH_4?
13) Given a compound that is composed of 0.6884 g of lead (Pb) , and 0.2356g chlorine (Cl), what is the empirical formula for this compound?
14) The most common form of nylon is 63.68% carbon, 12.38% nitrogen, and 14.14 % oxygen. Calculate the empirical formula.
15) The molar mass of a particular molecular compound is 180 g / mol. The percent composition of this compound is: C = 40.00%; H= 6.714%; O = 53.29%. What is the *molecular* formula for this compound?

The burning of ethanol (drinking alcohol) can be described by the following equation:

$$2\ C_2H_5OH + 7\ O_2 \longrightarrow 4\ CO_2 + 6\ H_2O$$

All following questions refer to the previous equation.

16) If 4.00 moles of ethanol are burned how many moles of CO_2 are produced?
17) If 3.00 moles of water are produced how many moles of oxygen were consumed?
18) If 0.045 moles of oxygen were consumed how many moles of carbon dioxide were produced?
19) If 3.00 moles of water are produced how many grams of oxygen were consumed?
20) If 88.0 grams of carbon dioxide were produced, how many moles of water were also produced?
21) How many grams of ethanol would you need to produced 54.0 grams of water?
22) If 2.50 grams of carbon dioxide are produced, how many grams of oxygen were consumed?
23) Given 2.00 moles of ethanol and 6.00 moles of oxygen which would run out first? This is known as the limiting reactant.
24) Given 4.00 moles of ethanol and 16.00 moles of oxygen, which is the limiting reactant?
25) Given 4.00 grams of ethanol and 16.00 grams of oxygen, which is the limiting reactant and how many grams will be left over of the one not completely consumed?

1) 6.02×10^{23}
2) 6.02×10^{23}
3) $2\ (6.02 \times 10^{23}) = 1.204 \times 10^{24} = 2$ mol
4) # of atoms in 4.0g of sodium
5) 32.00g / mol, 208.2g / mol, 85.00g / mol,187.57g / mol
6) 2.85 quarts = 2.70 L and 7.888 L = 8.335 quarts
7) 16.0g
8) 3.75mol
9) 1.1 g
10) 0.0117 mol
11) K_2CO_3: %K = 56.58, %C = 8.690, %O = 34.73
$(NH_4)_2O$: %N = 53.80, %H = 15.48, %O = 30.72
12) HO, CH_2O, CH
13) $PbCl_2$
14) C_6NO
15) $C_6H_{12}O_6$
16) 8.00 moles of CO_2
17) 3.50 moles of O_2
18) 0.026mol of CO_2
19) 112 g of O_2
20) 3.00 moles of H_2O
21) 46.1 grams of C_2H_5OH
22) 3.18 g of O_2
23) the O_2
24) the ethanol
25) the ethanol 6.28 g of O_2 will be left