Molstoiws09.doc

Chemistry Worksheet
Mass-Moles-Particles

Name ___KEY_____ Date _____ Period _____

Concept Questions:

1. One mole is defined as _**The quantity of things as there are atoms in exactly 12.00g of the C-12 isotope (= 6.022x10^{23})**_____

2. The mole only applies to chemistry, in other words you couldn't have a mole of cars or a mole of stars. (Circle one) True / False

3. The mole is a _**Counting**_____ unit, whereas grams is a __**mass**_____ unit.

4. The coefficients in a balanced chemical equation can be used with which of the following for setting up ratios (Circle all that apply)
Moles Grams Molecules/Atoms

5. To convert from grams to moles of a substance you must __**Divide by the molar mass**_____

6. To convert from moles to grams of a substance you must _**Multiply by the molar mass**_____

7. To convert from moles to molecules of a substance you must _**Multiply by Avogadro's Number**__

8. To convert from molecules to atoms of a substance you must __**Multiply the number of molecules by the subscript of the element in question**_____

9. The molar mass of a compound is found by _**Summing the molar masses of the elements in the compound**

10. The mole has the numerical value of _**6.022x10^{23}**_____ and is known as

__**Avogadro's Number (N_A)**_____.

Problem Solving: Perform the following calculations using the example below as a guide:

Example Problem: Convert 20.0g of HCl to moles of HCl

Answer: $20.0\text{g HCl}\ \frac{1\ mol\ HCl}{36.46\ g} =$ **.55mol HCl**

Molar mass of HCl

Convert to moles:

1. 15.5g of H_2O $\left(\frac{\mathbf{1}\ \text{mol}}{\mathbf{18.016}\ \text{g}}\right)$ = **.860mol**

2. 125.0g of H_2SO_4 $\left(\frac{\mathbf{1}\ \text{mol}}{\mathbf{98.078}\ \text{g}}\right)$ = **1.274mol**

3. 16.10g of lithium nitrate

16.10g (1mol $LiNO_3$ / 68.946g)
= .2335mol $LiNO_3$

4. 100.0g of dinitrogen tetraoxide

100.0g N_2O_4 (1mol N_2O_4 / 92.011g)
= 1.087mol N_2O_4

Convert to grams:

1. .0024mol NH_3 $\left(\frac{\mathbf{17.03}\ \text{g}}{\mathbf{1}\ \text{mol}}\right)$ = **.041g**

2. $6.5\text{x}10^{-4}$ mol CO $\left(\frac{\mathbf{28.01}\ \text{g}}{\mathbf{1}\ \text{mol}}\right)$ = **.018g**

3. 4.0mol carbon tetrachloride
4.0mol CCl_4(153.823g/mol)
= 615.3 = 620g

4. 2.5mol nitrogen gas
2.5mol N_2(28.02g/mol)
= 70.03 = 70g

Synthesis Questions:

1. How many grams of HCl contain the same number of units as there are in 60.0g of $CaCl_2$?
60.0g$CaCl_2$(1mol/110.984)(36.461gHCl/1mol) = 19.7g

2. How many moles of HCl contain the same number of grams as there are in .45mol of $CaCl_2$?
.45mol $CaCl_2$ (110.984g $CaCl_2$/1mol)(1mol HCl/36.461g) = 1.4mol HCl

3. How many times more particles are there in 10.0g of H_2O than in 10.0g of CO_2?
Mol CO_2 = (10.0g)(1mol CO_2/44.01g) = .227mol **H_2O/CO_2 = .555/.227 = 2.44x**
Mol H_2O = (10.0g)(1mol H_2O/18.016g) = .555mol

4. If you wanted a 2 to 1 ratio of H_2O molecules to CO_2 molecules and you had 50.0g of H_2O, how many grams of CO_2 would you need (Hint: It isn't 25!)?
(50.0gH_2O/18.016g/mol)(1molCO_2/2molH_2O)(44.01gCO_2/1mol) = 61.1g CO_2

5. Which element has a molar mass of 126.9g/mol?
Iodine, I

6. For which element does 2.5 moles have a mass of 518g?
Molar mass is in grams per mole 518g/2.5mol = 207.2g/mol, lead (Pb)

7. You performed an experiment on a diatomic element and found that .25g of the substance contained $6.58\text{x}10^{-3}$ moles. What is the element?
.25g / 6.58x10-3mol = 37.99g/mol, since the element is diatomic you must divide by 2 to get the single atom mass 37.99/2 = 19.0g/mol = Fluorine (F)