Chemistry 11
Mole Percent Composition Name ______________________________ Date _______________Blk ____

Percent Composition 3.5

Determining Formulas – Compositional Analysis 3.5

Look at your periodic table:

- Do any elements share the same __________ (atomic mass)?
- No – so you can identify an element from its molar mass
- You can also identify a _________ from its mass
- This is what a mass spectrometer does (as seen on CSI)

Percentage Composition:

- Percent of a compound's _____contributed by each type of atom in the compound.
- You can find it from its formula

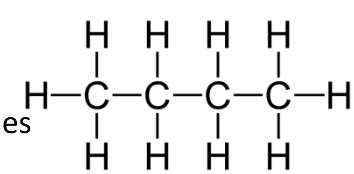
Example: Percentage Composition of H_2O:

- Calculate the __________:
  - 2H + 0 = 2(1.01) + 16.0 = __________
  - Thus there is 2.01 g H and 16.0 g O
- Find the percentage of each part $\frac{\text{mass of one}}{mass\ of\ total}$
  - %H = $\frac{2.02\text{g}}{18.02\ g}$ x100 = _____
  - % O = $\frac{16.0\ g}{18.02\ g}$ x100 = _____

WORKBOOK PAGE 143: complete the problems

Types of Formulas: Example Butane

- Every compound has _____ formulas
  - _________formula- how the compound actually exists
    - Butane is C_4H_{10}
  - ________formula – the simplest ratio
    - Butane simplifies to C_2H_5
  - ________ formula – a diagram showing the arrangement of molecules



Finding Empirical Formulas from % Composition:

- Step 1- change % to _____
  - Assume there are a 100g of the substance so the conversion is easy
- Step 2 - Convert grams to _____
  - Use molar masses from the periodic table
- Step 3- Find the _____of the elements
  - Divide by the ________value
- Step 4- Make sure the ratios are whole numbers
  - Write formula- $C_{1.5}O_2$ would become C_3O_4

Example: Determine the empirical formula for a compound composed of 80.0% C and 20.0% H

- Step one: Change to grams
  - 80.0% C and 20.0% H becomes _____ C and 20.0 g H
- Step 2: Convert to moles
  - 80.0 g H x $\frac{1\ mol}{12.0\ g\ H}$ = _________
  - 20.0 g H x $\frac{1\ mol}{1.0\ g\ H}$ = _________
- Step 3: Find the ratio of elements
  - ÷ by smallest which is Carbon with ____ moles
  - $\frac{6.67}{6.67}$ = 1 C
  - $\frac{20.0}{6.67}$ = ___
- Step 4: Make sure the ratios are _____ numbers
  - 1C: 3H – yup whole numbers
  - CH_3

WORKBOOK P. 145- Complete Practice Problems 1-3

Determining the Molecular Formula

- Recall that the molecular formula is the actual number of each type of atom in a molecule

Molecular formula = ____

- Step one: calculate the ______mass of the empirical formula
- Step two: divide molar mass of molecular formula (usually given in question) by the molar mass of the ________ formula
- Step three: _______ the empirical formula by this factor $(\text{empirical formula})_{\text{factor}}$

Example: The empirical formula of glucose is CH_2O and its molar mass is 180.0g. Determine the molecular formula.

- Step one- molar mass of CH_2O
  - $\underline{\qquad\qquad + 2(1.01)g + 16.0g = 30.0g}$
- Step two- divide molar mass by empirical molar mass to get the factor
  - $\frac{180.0g}{30.0g} = 6$
- We need 6 times as much of everything!!
  - $(CH_2O)_6$ = ________

WORKBOOK P. 147 Practice Problems 1-3

<u>**HOMEWORK: Workbook**</u>-

- **3.5 all practice problems 3.5**
- **Review Questions p.149 1-7, 9, 11**

Molar Concentration- 3.6

Concentration

- The __________of a chemical in a solution or the amount of solute per volume of a solution
- g/mL , mg/L , or parts per million
- High Concentration Low Concentration

Molarity M

- It is a measure of the amount of _____ of solute in solution per____ of solvent
- Allows us to compare number of _______ in the same volume of different solutions
- Units are _____ which is called M
- Also called ______concentration
- Square brackets [ ] are used to indicate it

Examples:

- 1 M HNO_3 means______of HNO3 per liter of solution
    - 6.02x1023 molecules per liter
- 2M HNO_3 means _____ of HNO3 per liter
    - 2(6.02x1023) molecules
- So one liter of 2M HNO_3 has _____ as many molecules as one liter of 1m HNO_3

To Convert

- Multiply or divide by M
- If you have moles x by ________1L____________
- If you have L of solution x by ____number of mol__________

Examples: **1.23 L of 3.00 M KCl = ___?____ mol KCl**

- 1.23L x $\frac{\mathbf{3.00}\ mol}{1\ L}$ = ____ mol KCl

WORKBOOK P. 153- Practice Problems 1-4

Preparing Solutions:

- A **standard** solution is a term for a solution with a known concentration
- To prepare it you mix a mass of _____ and a volume of water
- Prepare ___ $CaCl_2$*(aq)*
    - Measure out 1 mol of CaCl2 which is 110.94 g and add water until the solution _____ one liter

Try it! Describe how to prepare 0.055L of 0.20 M KCL from the solid

- 0.055L x _________________ x _________________ = g KCl

Example Problem: **What molar concentration (M) of KCl is produced by measuring out 1.0 g KCL and adding water up to 0.350L of solution?**

- First we need to convert grams to moles
  - 1.0 g KCl x
- Now find molar concentration (mol/L)
  - .

WORKBOOK P. 154- Practice Problems 1-3

Multi- step Conversions:

- We know how to use molarity (M) to convert from a volume of solution to _____ now we will determine the number of atoms or vice versa
- 1 mol = _________ atoms or molecules or ions

Example: How many chlorine ions are in 0.025L of 0.30 M $AlCl_3$?

- 0.025 L x

WORKBOOK P- 157: Practice Problems 1-5

<u>HOMEWORK:</u>

- **3.6 Review Questions 1-9, 12,13,17**