WODSS SCIENCE Name: _____

SCH 3UI Date: _____

Empirical and Molecular Formula

John Dalton stated that _____

_____

Water has the chemical formula H_2O. In terms of mass, its molecule is always made up of _____ hydrogen and _____ of oxygen.

Empirical Formula (_____):

Is the lowest _____ of atoms in a compound.

Example: CH_2O or MgF_2

Problem 1. What is the **empirical formula** of the compound $C_8H_4O_2$ _____

Limitations

Does not tell you _____.

Only tells you the _____. Different molecules could have the same percent composition but contain different numbers of atoms in the molecule.

Example: Acetylene and Benzene

Problem 2. Determine the empirical formula using the average percent composition values from a combustion analyzer

%C= 38.71 %H= 9.71 %O=51.58

Basis: **Assume you have a sample of 100g**

	C	H	O
% →			
Mass →			
Moles →			

To find the ratio: Divide the # of moles of each element by the smallest number and round to the nearest whole number.

Ratio →

Exception: when one element has 0.5mol then multiply all by two.

Empirical formula →

Problem 3. What's the empirical formula of a molecule containing 65.5% carbon, 5.5% hydrogen, and 29.0% oxygen?

Molecular Formula: shows the _____

_____

Example: $C_6H_{12}O_6$; MgF_2
It is possible for _____

_____

Example: Benzene MF C_6H_6 EF _____
Acetylene MF C_2H_2 EF _____

Can the **molecular formula equal the empirical formula**? _____
Example: Carbon monoxide MF CO EF _____
Water MF H_2O EF _____
Example:

Substance	**Formaldehyde**	**Acetic acid**	**Glucose**
Empirical formula	CH_2O	CH_2O	CH_2O
Molecular formula	CH_2O	$C_2H_4O_2$	$C_6H_{12}O_6$
Use	preservative	vinegar	sweetener

To _____

_____

We need:

1. Molar Mass (M) → use a Mass Spectrometer to get the molar mass
2. Empirical Formula

Example: The empirical formula of a compound (COMPOUND A) is CH_3O and its molecular mass, as determined by mass spectrometer is 93.120 g/mol. What is the molecular formula?
Molar mass of empirical formula ($M_{E.F}$) =
Molar mass of molecular formula ($M_{M.F}$) =
Scale up factor = _____
Molecular formula = Empirical formula x Scale up factor

Problem 1: A compound with an empirical formula of C_2OH_4 and a molar mass of 88 grams per mole.

Problem 2: A component of protein called serine has an approximate molar mass of 105 g/mole. If the percent composition is as follows, what is the empirical and molecular formula of serine?
C = 34.95 % H= 6.844 % O = 46.56 % N= 13.59 %

Homework: page 270 – Q# 9, 11, 12 page 273 – Q# 31, 32, 33, 39 page 275-76 – Q# 41, 45, 46, 47 Read Mass spectroscopy - page 281