**Molecular Formula**

**Station #4**

How to Calculate the Molecular Formula:

Example: An unknown sugar is found to have a formula (molecular) mass of 180.18 g/mol. If its empirical formula is CH2O, calculate its molecular formula.

**You must have the empirical formula before you can calculate your molecular formula. If you are given percentages or masses instead, you must find the empirical formula first.**

1. Calculate the empirical molar mass from the empirical formula. The empirical formula is CH2O.

1 mol C x 12 g/1mol C = 12 g

2 mol H x 1 g/1 mol H = 2 g

1 mol O x 16g/1mol O = 16 g

Empirical molar mass =

12 + 2 + 16 = 30 g/mol

1. Divide the empirical molar mass by the formula (molecular) molar mass to get x. Mathematically:

X = molecular molar mass/empirical molar mass

Molecular molar mass = 180. 18 g/mol (given in question)

Empirical molar mass = 30 g/mol

x = $\frac{180 g/mol}{30 g/mol}$ = 6

1. Multiply x by the subscripts (numbers at the bottom) of the empirical formula.

6 x (CH2O) = C6H12O6

1. The empirical formula of a compound is given to be ZnO2. Analysis reveals that the compound has a formula mass of 291 g/mol. Determine its molecular formula. Show all your steps.

2. A compound is 24.7% calcium, 1.2% hydrogen, 14.8% carbon, and 59.3% oxygen. Its formula mass is shown to be 648 g/mol. Determine its molecular formula. (Hint: You must calculate its empirical formula first.