CONCEPT: LAW OF MULTIPLE PROPORTIONS

- In 1804, the English chemist John Dalton, originated the **Law of Multiple Proportions** based on his Atomic Theory.
  - □ "When 2 elements (A & B) form different compounds, the mass of Element B that combine with 1 g of A are a ratio of whole numbers."

EXAMPLE: Illustrate how nitrogen monoxide, NO, and nitrogen dioxide, NO_2, obey the Law of Multiple Proportions.

STEP 1: Find the **atomic masses** of each element from the Periodic Table.

7	8
N	**O**
Nitrogen	Oxygen
14.01	16.00

STEP 2: Multiply together the **number** of each element with their **atomic masses** from the Periodic Table.

NO ___ N x 14.01 g/mol =
___ O x 16.00 g/mol =

NO_2 ___ N x 14.01 g/mol =
___ O x 16.00 g/mol =

STEP 3: Determine the mass ratio of each compound.

- □ Recall, for the mass ratio you should place the element with the _____ **atomic mass** on the top.

NO Mass Ratio = $\frac{\text{g O}}{\text{g N}}$ =

NO_2 Mass Ratio = $\frac{\text{g O}}{\text{g N}}$ =

STEP 4: If the Law of Multiple Proportions is being followed then the ratio of both mass ratios should give a whole number.

_____ =

PRACTICE: Which of the following is an example of the Law of Multiple Proportions?

a) A sample of chlorine is found to contain three times as much Cl-35 as Cl-37.

b) Two different compounds formed from carbon and oxygen have the following mass ratios: 1.33 g O to 1 g C and 2.66 g O to 1 g C.

c) Two different samples of table salt are found to have the same ratio of sodium to chlorine.

d) The atomic mass of bromine is found to be 79.90 amu.

e) Nitrogen dioxide always has a mass ratio of 2.28 g O to 1 g N.