

Nuts & Bolts Activity – Chapter 3

Objective: To use models as a way of explaining the Law of Definite Proportions and the Law of Multiple Proportions

Materials: $\frac{3}{4}$ -inch bolt (3) $\frac{1}{4}$ inch nut (3) balance

Law of Definite Composition

The law of definite composition says that for every compound there is a ratio of the masses of the elements that does not change.

1. Find the mass of a (large or small) bolt: _____ g
2. Find the mass of a $\frac{1}{4}$ -inch nut: _____g
3. Put the nut on the bolt and find the mass of them together. _____ g
4. Put together another bolt and nut and find the mass of two nuts and bolts. _____ g.
5. Calculate the % mass of nuts in the 1 nut and 1 bolt $\frac{\text{mass of 1 nut}}{\text{mass of 1 nut} + \text{mass of 1 bolt}} =$
6. Calculate the % mass of nuts in the 2 nuts and bolts to 2 nut $\frac{\text{mass of 2 nuts}}{\text{mass of 2 nuts} + \text{mass of 2 bolts}} =$
7. Does the % mass of the nuts stay constant?
8. Explain how the results of this experiment relate to the Law of Definite Proportions.

Law of Multiple Proportion

The law of Multiple Proportion states that if two elements form more than 1 compound the ratio of their masses are in simple whole number ratios.

With our nuts and bolts 1 nut on a bolt would be one compound labeled BN, 2 nuts on 1 bolt would be a compound labeled BN₂

1. Find the mass of B: _____ g
2. Find the mass of a compound BN: _____ g
3. Find the mass of a compound BN₂: _____ g
4. Find the mass of compound BN₃: _____ g
5. Find the ratio of nuts to B for each of the three compounds we have modeled.

$$A. \frac{\text{Mass of BN} - \text{Mass of B}}{\text{Mass of B}} =$$

$$B. \frac{\text{Mass of BN}_2 - \text{Mass of B}}{\text{Mass of B}} =$$

$$C. \frac{\text{Mass of BN}_3 - \text{Mass of B}}{\text{Mass of B}} =$$

6. Divide the results of Calculation B above by the results of Calculation A.

7. Divide the results of Calculation C above by the results of Calculation A.

8. Does this confirm the Law of Multiple Proportions? How do you know?