

One of the problems with discussing the atom is that we cannot see it. To help overcome this we use models, which help explain the behavior of atoms. In this laboratory you will use nuts and bolts as models of atoms, and use them to visualize and study some of the properties of atoms and compounds.

**Equipment**

1.5 in bolt (2)

2 in bolt (1)

1/4 in nut (3)

1/4 in stop nut (1)

1/4 in wing nut(1)

Centigram balance.

**Isotopes**

One of the concepts that we can see with nuts and bolts is isotopes and average atomic mass.

1. There are three types of nuts. Find the mass of each

Mass of Regular Nut \_\_\_\_\_ g    Mass of Stop Nut \_\_\_\_\_ g    Mass of Wing Nut \_\_\_\_\_ g

2. Find the mass of all 5 Nuts. \_\_\_\_\_ g

3. Find the average mass of the nuts.

4. Since there are 5 nuts 20% are stop nuts, 20% are wing nuts and 60% are regular nuts. Find the average mass of the nuts using the formula we use for finding average atomic mass.

5. Compare the two answers for the average mass of nuts.

6. Repeat the above Data gathering and calculations for the 3 bolts. (Label your data and calculations.)

7. How does this lab model the concept of isotopes and average atomic mass.

### 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 1.5 inch bolt \_\_\_\_\_ g
2. Find the mass of a regular bolt \_\_\_\_\_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 ratio of 1 nut and bolt to 1 nut  $\frac{\text{Mass of 1 nut and bolt}}{\text{Mass of 1 nut}} =$
6. Calculate the ratio of 2 nuts and bolts to 2 nut  $\frac{\text{Mass of 2 nuts and bolts}}{\text{Mass of 2 nuts}}$
7. Does the composition stay constant?
8. Compare your results to the Law of Definite proportion

### 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 labelled BN, 2 nuts on 1 bolt would be a compound labelled BN<sub>2</sub>

1. Find the mass of B \_\_\_\_\_ g
2. Find the mass of a compound BN \_\_\_\_\_ g
3. Find the mass of a compound BN<sub>2</sub> \_\_\_\_\_ g
4. Find the mass of compound BN<sub>3</sub> \_\_\_\_\_ g
5. Find the ratio of nuts toB for each of the three compounds we have modeled.
  - A.  $\frac{\text{Mass of BN} - \text{Mass B}}{\text{Mass of B}} = ?$
  - B.  $\frac{\text{Mass of BN}_2 - \text{Mass B}}{\text{Mass of B}}$
  - C.  $\frac{\text{Mass of BN}_3 - \text{Mass B}}{\text{Mass of B}}$
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 Proportion? How do you know?