Chem 1 Hour\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Wexler/Steinhorst  
Estimating the Size of a Mole of Split Peas  
Date\_\_\_\_\_\_

**Brief Background:**   
Avogadro’s number is the number of particles (atoms, molecules or other unit) that are in one mole of a substance. If the volume of one particle is known, then it is possible to calculate the volume of Avogadro’s number of that particle. Avogadro’s number is 6.022 x 1023

The mass of 1 mole of a substance is called its “molar mass”. From the periodic table, the molar mass of an element is the same thing as its atomic mass. The molar mass of a compound is the sum of the masses of the atoms it is composed of. For example, the molar mass of H2O is 2(1.008) + 15.999 = 18.015

You can also determine how many moles of a compound you have from its mass. For example, if you are given 100g of H2O, you have 100g ÷ 18.015g/mol = 5.55 moles.  
  
**Objectives:**Determine the average mass of a split pea  
Determine the average volume of a split pea.  
Calculate the mass and volume of a mole of split pea.  
 **Special Materials:**Split peas  
Weigh boat  
Graduated cylinder  
Funnel  
Digital Scale

**Pre-Lab:**1. How many split peas do you need for 1 mole of split peas?

2. Determine the molar mass of: (show calculations for B and C)  
A. Gold (Au) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

B. Aluminum chloride (AlCl3) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

C. Glucose (C6H1206) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

3. If you had 24.65g of aluminum chloride, how many moles would that be? (show your calculations)

**Procedure:**  
Fill in the following table. Write the results in the data table.

|  |  |
| --- | --- |
| **Data Table** | |
| **Find the mass of one split pea:** | Note: express each value in the appropriate unit |
| A. Mass of 25 split peas (use weigh boat) |  |
| B. Mass of one split pea (A÷25) |  |
| **Find the volume of one split pea:** | |
| C. Mass of 100mL split peas (use graduated cylinder) |  |
| D. Number of split peas in 100mL (C÷B) |  |
| E. Volume of one split pea (D÷100) |  |
| **Find the mass and volume of a mole of split peas:** | |
| F. Mass of one mole of split peas (B x 6.022 x 1023) |  |
| G. Volume of one mole of split peas (E x 6.022 x 1023) |  |

**Discussion:**1. Why was the mass of 25 split peas measured rather than the mass of one split pea?

2. In general, how does the mass of a mole of split peas compare with the molar masses of gold, aluminum chloride, and glucose you calculated in the pre-lab?

3. Why do we use moles as a quantity rather than atoms when referring to amounts of an element or compound?