Name _____

Chemistry 117 Laboratory
University of Massachusetts Boston

MASS AND DENSITY

In Experiment "Length and Volume" you did some simple measurements and calculations. Today we will do some more sophisticated measurements and calculations.

Learn the techniques of pipetting and determining mass with a triple beam balance and an analytical balance from your instructor. Each measurement and calculation should be recorded with the appropriate unit and the correct number of significant figures.

IN THE LABORATORY

Part 1

Measuring Mass on the Triple Beam Balance.

1. Determine the mass of a clean small 50-mL beaker on a triple beam balance: _____ g

2. Place one polystyrene sphere in the beaker. Determine the mass of the beaker + the sphere on the triple beam balance: _____

   a. *Calculate the mass of one sphere on the triple beam balance:* _____

3. Add 9 more spheres to the beaker (10 total). Determine the mass of the beaker + 10 spheres on the triple beam balance: _____

   b. Calculate the mass of 10 spheres on the triple beam balance: _____

   c. Calculate the average mass of a sphere by dividing the mass of 10 spheres by 10: _____

Measuring Mass on an Analytical Balance.

4. Determine the mass of the beaker on an analytical balance: _____

5. Place one polystyrene sphere in the beaker. Determine the mass of the beaker plus the polystyrene sphere on an analytical balance: _____

d. Calculate the mass of one sphere on an analytical balance: _____

6. Add 9 more spheres to the beaker (10 total). Determine the mass of the beaker plus 10 spheres on the analytical balance: _____

e. Calculate the mass of 10 spheres on an analytical balance: _____

f. Calculate the average mass of a sphere by dividing the mass of 10 spheres by 10: _____

7. Record the calculated volume of a polystyrene sphere from last week (From your Lab Instructor): _____mL

Calculate the density of the polystyrene sphere from each of the four masses above:
density = mass/volume (Units will be g/mL)

Measurement method	**1 ball/ triple beam**	**1 ball / analytical**	**10 balls/ triple beam**	**10 balls/ analytical**
Your densities:				
From members of your lab, obtain five values for each of the four methods:				
Labmate #1:				
Labmate #2:				
Labmate #3:				
Labmate #4:				
Labmate #5:				
Calculate the mean and standard deviation of these calculations.				
Mean:				
Standard Deviation:				

Part 2

8. Take a polystyrene sphere and place it in a test tube with about 2 mL of water. Notice that the polystyrene sphere sinks to the bottom. This is because the polystyrene is denser than water.

9. Carefully add glycerol (also called glycerin) to the water a drop at a time, shaking the test tube with a stopper after each drop. Adding more glycerol increases the density of the liquid. When the densities are the same, the polystyrene sphere will be perfectly suspended in the liquid. [If you add too much glycerol, the polystyrene sphere will float on the liquid].

10. Carefully pipette 2.00 mL of this solution to the same beaker you used in part 1. Measure the mass of this solution plus the beaker on a triple beam balance: _____

    g. Calculate the mass of the 2 mL of solution from the triple beam balance: _____

    h. Calculate the density of this mixture from the triple beam balance [density = mass/volume]: _____g/mL

11. Measure the mass of this solution plus the beaker on an analytical balance: _____

    i. Calculate the mass of the 2 mL of solution from the analytical balance: _____

    j. Calculate the density of this mixture from the analytical balance [density = mass/volume]: _____

You now have two different measurements of the density of a polystyrene sphere from the triple beam balance (h) and the analytical balance (j). From members of your lab, obtain five values for each of the two methods:

	From the triple beam balance	**From the analytical balance**
Your densities:		
Labmate #1:		
Labmate #2:		
Labmate #3:		
Labmate #4:		
Labmate #5:		

Calculate the mean and standard deviation of these calculations.

Mean:		
Standard Deviation:		

Part 3

Significant Figures

Perform the following calculations with your calculator.
Write down the answer exactly as your calculator reports it.
Then write the number to the correct number of significant figures.

	Calculator	**Correct**
$(6.23 \times 7.2)/65.24$		
$0.4543 \times (46.387 - 2.0 \times 10^{1})$		
$0.5 + 0.27648 \times 10^{2}$		
$5.97 - 2.0$		
$(76.2)^{-1} + 2.30$		
$3.34 \times 10^{-19} + 4.2 \times 10^{7}/0.1 \times 10^{26}$		
$7.23231 \times (45.3287 - 3.014 \times 10^{2})$		
$(1.92/76.2) + 2.30 - 0.00002$		
$2.334 \times 10^{-11} + 23.021 \times 10^{-12}$		
$5.1 /(9.333244432 \times 0.0000228)$		