SNC1 Name: _____

Measuring Density

Introduction

Density is defined as the mass per unit volume of a substance. It is characteristic physical property of a substance. This means that, under the same conditions, all objects made out of the same substance will have the same density, no matter how big or heavy they are. Density is a useful way of telling similar-looking substances apart. For example, Chromium and Nickel are similar looking metals, but the density of Chromium is 7,100 kg/m^3 while Nickel has a density of 8,900 kg /m^3.

Density is calculated as: **D = mass ÷ volume**

Mass can be calculated using a balance.

Volume can be calculated my measuring the volume of water displaced by an object.

Purpose: 1) Is density a characteristic of a substance, i.e., do all objects of that substance have the same density?
2) Is density a diagnostic characteristic, i.e., do different substances have different densities?

Hypotheses: Answer the questions posed in the purpose with one short sentence each.

Materials (copy from the board onto the back of this sheet or onto a separate page)

Procedure

1) Measure the mass of all the objects to be tested using an electronic balance.
2) Record the masses in your observation chart.
3) Fill the overflow can completely with water.
4) Set the overflow can on the counter beside the sink and wait until it stops draining into the sink.
5) Carefully add the object to be tested to the overflow can and catch the water in the graduated cylinder as it drains out.
6) Record the volume of water for each object in the observation chart.
7) Repeat steps 1 to 6 for the other objects.

Calculations

1) Calculate the density for each object in grams per mL and record in your chart.

Observation Chart

Object								
Mass (g)								
Volume (mL)								
Density (g/mL)								

Discussion: Answer on the separate sheet of paper with the materials list.

1) List any sources of error in this experiment that might have affected your results.
2) On a separate sheet, draw a diagram of the apparatus used in the experiment. Label all parts and give the diagram a title.
3) Ideally, should all the rubber stoppers have had the same density?
4) Did all the rubber stoppers have exactly the same density? Why do you think that this is?
5) Construct a graph and plot the mass versus volume for each of the rubber stoppers. Put mass on the vertical axis and volume on the horizontal axis. Label the axes, including units. Make the scale such that the points are well spread out. Give the graph a good title.
   a) draw a best fit line through the points.
   b) calculate the slope of the best fit line and relate this slope to the density of the stoppers.
   c) why is this a better approximation of the density of the rubber?
6) What is the density of water?
7) Based on what you know about what happens to wood and metal when placed in water:
   a) What must the density of an object be if it is going to float in water?
   b) What must the density of an object be if it is going to sink in water?

Conclusion (Write a short sentence that addresses the correctness of your hypotheses)