Density Lab

Purpose:

To use density to identify two unknown metals.

Procedure:

Odd numbered lab stations should begin with Part A. Even numbered lab stations should begin with Part B. You should then do the other part after you are finished with the part you are supposed to start with. All lab groups should gather their own data do not share your values with any other group).

Part A:

1. Determine the mass in grams of the metal block. Write the value down on scratch paper for now. Do not round off the value. Be sure to include units.
2. Determine the length, width and height (in centimeters) of the metal block. Do not start your measuring from the end of the ruler, but start at some other whole number in the middle part of the ruler and adjust your reading accordingly. Be sure to estimate to one spot beyond certainty (one uncertainty point). It does not matter which sides you designate as the length, width or height as long as you end up with three measurements going in different direction (ie. x, y, and z axes). Record these values on the same scratch paper that has the mass written down on it.
3. Have Mr. Erlenbeck check your data for accuracy and precision. After they have been approved, ***record*** these values in **non-erasable ink** on your data sheet.

Part B:

4. Obtain the number of pellets assigned to your lab station (leave any extra you might have in the beaker). **Make sure they are all dry.** Determine their mass and record the mass in the appropriate column of the class data table at the front of the room. Do not round off the value.
5. If you're at stations 1 through 6 perform steps 6 and 7. If you're at stations 7 through 14, perform steps 8 and 9.
6. Get out your small graduated cylinder. Place 6.5 mL of de-i water (+/- .2 mL) in it. Record your exact starting volume (read the bottom of the meniscus) on the data table at the front of the room. Make sure you estimate to the nearest .1 mL.

7. Place the number of pellets assigned to your lab group into the graduated cylinder. Make sure they are all immersed below the water and that there are no air bubbles trapped among the tacks. Record the final volume on the data table at the front of the room. Make sure you estimate to the nearest .1 mL. Proceed to step 10.
8. Get out your large graduated cylinder. Place 50.0 mL of deionized water (+/- 2 mL) in it. Record your exact starting volume (read the bottom of the meniscus) on the data table at the front of the room. Make sure you estimate to the nearest 0.5 mL.
9. Place the number of pellets assigned to your lab group into the graduated cylinder. Make sure they are all immersed below the water and that there are no air bubble s trapped among the pellets. Record the final volume on the data table at the front of the room. Make sure you estimate to the nearest .5 mL.
10 Put back all the equipment you used. Be sure to dry the tacks before returning them to the beaker. Do not lose any in the trash or down the drain. Shake out any excess water from the graduated cylinder and dry the outside. Thoroughly clean your lab area.
11 Once Mr. Erlenbeck has approved the class results on the data table at the front of the room, record the values onto your data sheet. Once completed take the data sheet to Mr. Erlenbeck to have it stamped.

Calculations:

Be sure each calculation has each of the following:

- set-up
- correct scientific units attached to each number
- each number is written with the proper number of significant figures
- answer is boxed or circled

Part A:

- volume of the metal block
- density of metal block
- percent error

Part B:

- volume that the metal pellets occupy for each lab station
- plot the mass and volume information for the pellets on a graph. The vertical axis should be for volume and the horizontal axis for the mass. Arrange your scales so that as much of the graph paper as possible is used. Draw a straight line (line of best fit) through the middle of the plot

points. Be sure your line begins at 0,0. Give the graph its correct title (see notes as needed).

- Pick an arbitrary point on your line in the graph and mark it with an "X". Use the mass and volume that correspond to this point to calculate the experimental density of the metal.
- Percent error

Questions:

1. Why should you start at the straight line at 0,0?
2. Why didn't the plot points from the class line up in a straight line?
3. Why should a person use the "X" point on the line to calculate the density of the pellets instead of using one of the original plot points (representing one set of data from one of the lab stations)?
4. Suppose the pellets were wet when you determined their mass. Explain how this would affect the calculated density.
5. Suppose that some air bubbles were trapped with the pellets in the graduated cylinders when the volume of your tacks was being determined. Explain how this would affect the calculated density?