LAD B2 (pg 1 of 2) Using Liquid Displacement to Determine Volume & Calculating Percent Error

Name_____

Each partner should pick one of the two rectangular-shaped blocks and DO NOT CHANGE BLOCKS while doing questions 1, 2, 3, & 6

1. Use the ruler to carefully measure the length, width, and height of your rectangular metal block. Record the measurement and units:

   length _____ width _____ height _____

   calculate the volume _____ (units?)

2. Archimedes "discovered" the volume of liquid displaced by an object is the volume of that object. Use the graduated cylinder with alcohol to measure the alcohol displaced by your same rectangular-shaped metal block. Record the data below:

   volume of alcohol in cylinder _____

   volume of alcohol in cylinder after block is put in _____

   volume of alcohol displaced by the block _____ (units?)

3. Use the graduated cylinder with water to measure the water displaced by your same rectangular metal block. Record the data below:

   volume of water in cylinder _____

   volume of water in cylinder after block is put in _____

   volume of water displaced by the block _____ (units?)

4. Consider the volumes of your block measured in parts 1, 2, and 3?
   - Should the volumes be the same or different?
   - Obviously the size of your block did not change, suggest some factors that could make the volumes slightly different?

5. Without making any measurements, predict what volume of oil would be displaced by your same metal block?
   - Explain why you made the prediction that you did.

6. Measure the mass of your same metal block _____ (Be sure and puts units on your answer.)
   - Using the volume that you decide is the most accurate, (or an average of two or all three values, whichever you think would be most appropriate) calculate the density of the metal block.
   - Show the calculation set-up complete with units in the space below.

7. Percentage error is a calculation that allows a comparison of the accuracy of the experimental value compared to the theoretical value. In effect it tells us how "wrong" we are.
   - Percent always means part out of total. More specifically % error means: part wrong / total value

% error FORMULA**:** $\frac{Experimental\ -\ Theoretical}{Theoretical} \times 100$

Look up the theoretical density of aluminum on your density reference sheet.

- Determine the % error in the measured/calculated value from #6. Show the calculation work below.

8. Error Analysis (3-part analysis) – Stating "valid" sources of error or imprecision in measurements.
   A. After stating the source of the error, (*this has been done for you in the questions below*)
   B. state which data and how it would be affected (or unaffected) (higher or lower?).
   C. then state how the calculated value(s) would be affected (higher or lower?).

- If some of the water in the cylinder splashed out while placing the object into the cylinder, would the calculated density of that object be too large, to small, or unchanged?

- If a student opted to measure the volume before measuring the mass of their object, and as a result, the object was wet when measuring the mass, would the calculated density of that object be too large, to small, or unchanged?

9. Measure the mass of the remaining cube-shape piece of metal on your tray. _____ (Don't forget units.)
   - Learn to use the overflow cup to determine the volume of the very large cube that is too big to fit in the graduated cylinder.
   - Volume using the overflow cup _____ (units)
   - Calculate the volume using L × W × H _____(units)

Should these two volumes be the same or different?

   - Calculate the experimentally measured density of the piece of metal. Use the volume that you think might be more accurate. Show the calculation work complete with units.
   - Calculate percent error. Your block is either iron or aluminum.