# Density by Displacement Lab, done right.

Use this as a guide for this lab (and all the other labs). You need to learn to write these better, review this against your work.

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Cover includes a title for lab. This must be scientific, so Density Lab, Penny Density Lab, or Density by Displacement Lab would be good.

A funny sub title is optional. The main scientific title goes in bigger letters.

Add a picture, drawing, diagram, poem, etc. You only get graded on the NON-optional material.

Also the cover gets your name and your class period (1, 3, 6, or 8).

Objective: needs to be short and to the point. No more than a few sentences. Use the lab objective for a guide.

For this lab: the point of this lab was to measure densities of old and new pennies, and to use the data to determine the unknown metal in the newer pennies.

Everything else in the objective is extra (fluff).

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Data tables: write neatly. measure mass to the 100th gram as provided to you by our fantastic electronic balances. Measure mL to the 10th place (each line is one mL, so you measure one more place by estimating how many tenths of an mL are present). You MUST measure to the 10th mL with our graduated cylinders.

Since you're measuring correctly, use proper Significant Figures. In this lab, you always get at least 2 SF, which limits your math later on to just 2 SF. Sig figs count, and from now on big X's will be placed where your significant figures don't jive with your data.

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Your Graph:

Your title must be descriptive. Density of old and new pennies, or, Mass and Volume Comparison with old and new pennies, or, something smart like that. Penny Graph is not good. Old and New Pennies is just as vague.

Most of you had good labels and units, which are MANDATORY.

The lines must be straight. Straight lines here represent constant density of two different metals. They must be straight, or else density is no longer a constant.

The lines should not cross, or miss the 0,0 point on the graph. They might, but they shouldn't. If the lines cross that means that at some point one density = a different density, which it can't. If you miss 0,0, that means that you might have no volume with a mass, or the reverse, no mass taking up volume. Any mistakes in your measurements will allow for both of these errors. Use your data, do not fudge around this.

Use different colors, as the directions call for. At least properly label lines and data points. If all the points are the same (dots, for example), how will anyone (I) know which dots go to which line? Neat this up.

The lines must each be BEST FIT, which means if your dots are not perfectly lined up, your line is the best representation of your dots. Some dots are off the line due to your errors in measurement. Sometimes NO DOTS hit the line, but your line must be drawn to be the "average" line for your data. The only way around this problem would be to re-measure properly.

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Questions...

1. The slope of the old penny line is to be calculated from two points on your line. Hopefully you will use your data points that are ON the line. Don't use points of yours OFF the line, they won't give the slope of a line if they're not part of that line. If you use points on the line, but not in your data table, use proper SF or else you give away your accuracy. Proper SF and units always count. You must do the slope math, not some density averages, not using just one point of data.

Show this slope math on the graph.

Show a formula, show data points you are subtracting and dividing. Do the math.

2. Same as question one. Label answers too. This one should start out with: "Slope of new penny line". Slope = measured density here (if your graph is correct with mass as function of volume).

3. Label this Percent Error between density of old pennies and copper, or rather "%E old vs. Cu" for short. Now do the math right there, with proper SF and units! Make sure it has a SIGN!!!

4. Make a chart of 6-8 ELEMENTS with a density close to your new penny slope (which equals the measured density value for the new pennies).

5. Decide which metal is closest to your measured value. It might not be zinc, and if not, it's YOUR fault. It's probably due to measuring wrong with the graduated cylinder. It was not because of calculation mistakes which you are not allowed to make, or the fact that the pennies are not 100% copper or zinc. It was you, just admit it.

6. Do your percent error and remember it MUST be a + or a - number. No sign = no thinking. ---

7. If you splash your pennies you would lose water and get the wrong volumes.

8. Learn this formula. Practice the algebra. Significant figures here are NEVER GIVEN AWAY. 84.00 mL does not equal 84 mL. Use 4 SF, the density ha unlimited SF.

Your answer gets 4 SF, be careful here with this stuff, this is the third lab report already.

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Conclusions are the hardest part. You are required to think, condense your thoughts, sound smart, sound interested, and conclude. I looked up "conclude" and this is what I got:

1. To bring to an end; close.
2. To bring about (a final agreement or settlement).
3. To reach a decision or form an opinion about.
4. To arrive at (a logical conclusion or end) by the process of reasoning; infer on the basis of convincing evidence.

This means you need to state things such as:

Density  Penny Lab Conclusion

In this lab I measured the mass and volume of 25 old (pre-1982) pennies and put that data onto a graph showing mass as a function of volume.  The data points allowed me to draw my "best fit line" through 0 grams and 0 $cm^3$, which represents the "average" of my data points measured with my eyes and mind.  When I calculated the slope of this line, that would equal the approximate measured density of these old pennies.  My slope, or my measured density for the old pennies was _____ $g/cm^3$.  Since the pennies are nearly all copper and copper has density of 8.96 $g/cm^3$, I calculated my percent error for this density measurement to be _____ % (make sure it's positive or negative!)

I did the same for the new pennies (post 1983), but that slope, which was _____$g/cm^3$, is almost equal to the density of the unknown metal inside the coins.  Looking over table S carefully, I can say my data points to the metal _____ as the unknown metal.

Since I know it's really zinc, I can calculate my measured density to the actual density of zinc (7.134 $g/cm^3$) and I got _____% error (positive or negative)  Both of my percent errors were likely due to my inability to measure carefully with the graduated cylinders, the scales were spot on, as was all of the metal used.  It was me, but I am still a good person.

In conclusion, I can state that I know density is a constant that can be measured, and I can use density to help me discover some unknowns in lab if I'm careful.  I love chem, the end.

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No one is perfect (including me, first).  You need to learn, you need practice, you need to see what you've done wrong so you can do it right in the future.  The start of every year is like this, hard for us all.

Please come see me if you don't understand my comments.  I go to great lengths to point things out, so I can highlight for you what I think you're missing.  If you miss my comments, or find them confusing, no learning is going on.

If I mark your work with an X and deduct points, but you think you're right anyway, you're invited into defend your thoughts.  I make mistakes sometimes too.  I love the challenge, and so should you.  I hope if I misunderstand your work, you can still be right if you show me what I missed.

This is a long and drawn out learning process.  I will work hard as I can to help you learn chemistry.  You need to keep up your end too, and don't just accept back what I give you without a good going over.  Learn, that's your job.  Teach, that's mine.  It's a complementary process.  See you later, alligators.