Measurement Lab

Objective: To learn to accurately measure lengths and volumes using the metric system; and to learn how to calculate percent error, and to learn to measure density.

<u>Part 1</u>. Measure the volume of the classroom door. (we will assume it is solid even though it has a window).
Measure in centimeters, to the NEAREST 10th cm.

<u>Part 2</u>. Measure the volume of the blue chemistry textbook. We will measure the cover, and assume it is a solid object.
Measure the book in centimeters, to the nearest 10th cm.

<u>Part 3.</u> Measure the mass and volume of lead metal (Pb). First mass the dry metal labeled Pb (lead) on the scale, write ALL of the numbers down, they are all significant—to the 100th of a gram. To measure the volume of irregular shaped hunks of lead, we use the water displacement method. That means getting a graduated cylinder and putting in about 50 mL of water into it. CAREFULLY measure that water volume to the nearest 10th mL. Slide the four pieces of metal into the water—without splashing, and measure the NEW volume of water. The difference in these volumes = lead volume. Dry the metal off and return to the beaker for other students.

<u>Part 4.</u> Measure the mass and volume of bismuth the same way. Mass to nearest 100th gram. Measure the starting volume of water, carefully add the metal, remeasure the volume to the NEAREST 10th mL. The difference is the volume of the metal. Dry it off and put back into beaker.

Do not do any math HERE, all calculations are the "questions", which are done on white paper you will attach.

Data for Parts 1, 2, 3, and 4

Measuring the Door

Length _____ cm

Width _____ cm

Height _____ cm

To the nearest 10th cm

Measuring the Text book

Length _____ cm

Width _____ cm

Height _____ cm

Measuring BISMUTH metal

mass _____ grams

Volume _____ ml or cm^3

To the nearest 100th gram

Measuring LEAD metal

mass _____ grams

Volume _____ ml or cm^3

Part 5 NON METALS Getting a good look at the Periodic Table. With your partner, open up your periodic table and also table S at the same time.   These 22 elements are the nonmetals. Each number matches the ATOMIC NUMBER of a nonmetallic element. Hydrogen is first and it's already in the box. Do the other 21 nonmetals just the same.

1 H Hydrogen	2	5	6	7	8	9	10
14	15	16	17	18	33	34	35
36	52	53	54	85	86	These are ALL of the non metals. All other elements are metals.	

The nonmetals include all of the elements on the right side of the black staircase, plus H.
All the rest are metals. Below are just some of my favorite metals.
The first one is already filled in, fill in the rest of the table.

Atomic Number	Name	Symbol	Atomic Number	Name	Symbol
13	Aluminum	Al	80		
20					
74			47		
79			92		
11			29		
26			50		

Lab Questions to be done on separate paper.

Make sure that you do them in order. Leave space between the questions so that I can write you comments. Use lots of paper please. Paper is Cheap, Knowledge is Valuable.

Show formulas and units whenever possible.
Do not do math in calculators, SHOW YOUR WORK on the paper.

1. Calculate the volume of the classroom door. (formula on front page of lab handout)
2. The door's actual volume is 91,930 cm^3. Calculate your % Error. Round answer to 2 digits only.

3. Calculate the volume of the textbook.
4. The text's actual volume is 2400 cm^3. Calculate your % Error. Round answer to 2 digits only.

5. Calculate your measured density of the lead. Round answer to 3 digits.
6. The actual density of lead is listed in table S. Calculate your % Error. Round answer to 3 digits.

7. Calculate your measured density of the bismuth.   Round answer to 3 digits.
8. The actual density of bismuth is listed in table S. Calculate your % Error. Round answer to 3 digits.

9. In one sentence, describe where the metals and nonmetals on the Periodic Table are located.
   Add a sentence that accounts for element number 1.

10. The units for density for solids or liquids can be in g/mL or g/cm^3. Show why these units are interchangeable. (a simple equality will do this).
11. Calculate the volume of 622.5 g Lead.   Use density formula, show your work. Round answer to 4 digits.

12. Calculate mass of 133.0 cm^3 of copper. Use density formula, show your work. Round answer to 4 digits.
13. Always skip this one, okay?

14. If you had to explain to a friend the apparent "first letter rule" and "second letter rule" for all of the symbols on the periodic table of the elements, what would the two rules be?

15. Water has density of 1.00 g/mL or 1.00 g/cm^3. Ice can float on water. Quantitively estimate the density of ice. (that means write a number and a unit, don't tell a story).

→ → → → → → DO NOT GO ONTO THE INTERNET. I will know and not be happy.

→ → → → → → → Only use your reference tables, we use OUR constants, not internet junk.
Do not round any numbers on the reference tables, the are "perfect".

PAGE Order	INCLUDES THIS:	POINTS
Cover	A science title, (a smaller, funny title is optional), your name, class period, and a well worded complete sentence stating the objectives of this lab.	2
This handout	This lab handout, fill in all of the boxes	4
white paper	14 questions from lab handout	14
Another sheet of white paper	Conclusion: Start with a general plan of the lab: what was it that we were trying to learn? Then, tell what did you do - what did you measure and what did you calculate? What were your percent errors and why did you get them? Then summarize the science in a few sentences A conclusion should summarize what you did, and show that you grasp the overall meaning of what you did. (big ending okay?)	5
This lab due date is:		25