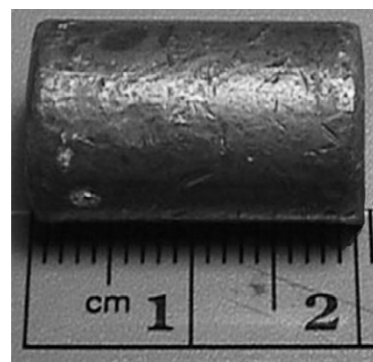
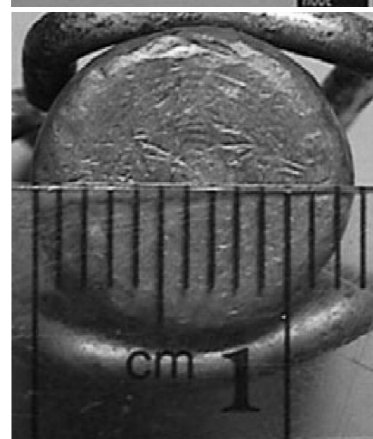
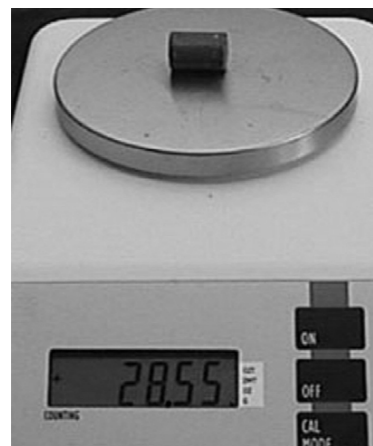


Part I: Density of an Unknown Metal

1. Use the pictures to the right to answer the following questions.
 - a. What is the mass, in g, of the cylinder?
 - b. What is the diameter, in cm, of the cylinder? What is the radius, in cm, of the cylinder?
 - c. What is the length, in cm, of the cylinder?
 - d. Based on your measurements, what is the volume, in cm^3 , of the cylinder?
 - e. What is the density, in g/cm^3 , of the cylinder?
 - f. Use the table at the bottom of the page to identify the unknown metal. Choose the metal closest to the density you calculated.
 - g. A sample of the same metal is found to have a volume of $9.06 \times 10^2 \text{ in}^3$. How much does the sample weigh, in pounds?



Metal	Density (g/mL)
Aluminum	2.7
Iron	7.9
Copper	8.9
Silver	10.5
Nickel	8.9
Lead	11.3
Bass	8.7

Part II: Additional Density Problems

2. A copper refinery produces a copper ingot weighing 150 lb. If the copper is drawn into a wire whose diameter is 8.25 mm, how many feet of copper can be obtained from the ingot?

3. Aspirin has a density of 1.40 g/cm^3 . What is the volume, in in^3 , of an aspirin tablet having a mass of 250 mg?

4. A bag contains a mixture of copper and lead BBs. The average density of the BBs is 9.70 g/cm^3 . Assuming that the copper and lead are pure, determine the relative % of each kind of BB. *Hint:* What type of problem have we already done this semester that dealt with weighted averages?

CHEM 4 PAL— Density and More Conversion Factors

5. The photo to the right shows a graduated cylinder with water in it. Use the photo and the densities in the table provided to answer the following questions.

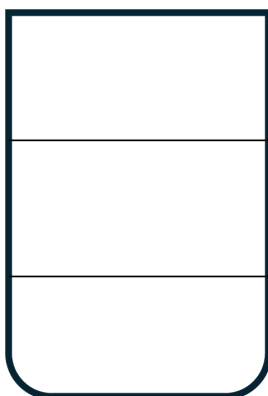
- What is the volume of the water? *Note:* the markings on the graduated cylinder are in mL.
- What is the mass, in g, of the water in the graduated cylinder?
- What would you expect the new volume to be (in mL) after the water was left in a freezer overnight?



- How does the answer to the previous question explain why a can of soda might burst if left in the freezer too long?

Metal	Density (g/mL)
Water	1.00
Ice	0.917
Cyclohexane	0.774
Mercury	13.6

- Now, three different liquids, water, liquid mercury, and cyclohexane were added to the same container. Use the table to label where you think each layer will end up once they are mixed together assuming they will form separate layers.



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- f. How many mL of mercury would you need to add to equal the mass of the water in the graduated cylinder?

Metal	Density (g/mL)
Water	1.00
Ice	0.917
Cyclohexane	0.774
Mercury	13.6

- g. How many mL of cyclohexane would you need to add to equal the mass of the water in the graduated cylinder?

- h. What is the total volume of all three liquids added together such that each layer has the same mass?

Part III: Density Calculations with Unit Conversions

6. A large container holds 2.0106 gallons of the chemical ethyl acetate. What is the mass of ethyl acetate within the container if the density of ethyl acetate is 0.897 g/mL.
7. If your car has a 12 gallon tank and the density of gas is 0.7489 g/cm^3 , how many pounds is a full tank of gas?

8. A random recipe online calls for you use 2 tbsp of honey (1.42 g/mL) and 1.5 cups of milk (1.020 g/mL) along with other ingredients which are given in units of grams. You have misplaced your measuring cup set and need to weigh out the honey and milk by mass (the superior way to measure baking ingredients anyway). Using the unit conversions provided below, determine how many grams of honey and milk you must weigh out for your recipe. (16 tbsp = 1 cup; 16 cups = 1 gallon)
9. A blood sample of 7.72 milliliters is collected from a patient to be analyzed for a platelet count. Human blood should have around 64.9 lb./ft³ platelets. What is the expected mass in grams of platelets in the blood sample?

CHEM 4 PAL— Density and More Conversion Factors

Non-Metric to Metric Conversions *	Equations
<p>1 kilometer (km) = 0.6214 miles (mi)</p> <p>1 inch (in) = 2.54 centimeters (cm) (exact)</p> <p>1 meter (m) = 1.094 yards (yds)</p> <p>1 kilogram (kg) = 2.205 pounds (lb)</p> <p>1 pound = 453.59 grams (g)</p> <p>1 ounce (oz) = 28.35 grams (g)</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>centimeters (cm³)</p> <p>1 US gallon (gal) = 3.785 liters (L)</p> <p>1 liter (L) = 1.057 quarts (qt)</p> <p>1 hour = 60 minutes</p> <p>1 minute = 60 seconds</p>	$D = \frac{m}{V}$ $^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32)}{1.8}$ $\text{Kelvin} = ^{\circ}\text{C} + 273.15$ <p><i>mass percent:</i></p> $m \% = \frac{\text{mass of } X}{\text{mass of sample}} \times 100$ $n = \frac{mm_M}{mm_E}$
	<p>$\% \rightarrow \text{mass} \rightarrow \text{moles} \rightarrow \begin{matrix} \div \text{ by} \\ \text{small} \end{matrix} \rightarrow \begin{matrix} \times \text{ 'til} \\ \text{whole} \end{matrix}$</p>
$\text{Average Atomic Mass} = \left[\left(\frac{\text{percent abundance}}{100} \right) \times (\text{mass of isotope 2}) \right] + \dots$	