NAME & DATE

DATE WORK DUE

Science Worksheet #2 - "Dimensional Analysis, Volume and Density"

Directions: Complete the following work on separate sheets of paper. Use correct significant figures, and don't forget units! Show all your work. Must show dimensional analysis for full credit.

Useful information: Speed of Light = 3.0×10^8 m/sec, 1 in = 2.54 cm, 1 kg = 2.2 lbs, $V_{sphere} = 4/3\ \pi\ r^3$, $C_{circle} = 2\ \pi\ r$, $A_{circle} = \pi\ r^2$, 1 gallon = 3.786 liters = 128 ounces

1. (20 points) While touring Canada, I bought some gas. I paid $20 Canadian dollars for 40.1 liters of gasoline. The exchange rate is $1.40 (Canada) = $1 (US).
   a) How much did I spend in U.S. dollars?
   b) How many gallons did I purchase?
   c) How many milliliters (ml) of gas did I buy?
   d) How many liquid ounces of gas did I buy?
   e) What was the price of the gasoline in U.S. dollars per gallon?

2. (20 points) The other day, I visited a Pepsi plant. They had a big vat full of syrup for making Pepsi. The head technician said it took 2.0 ml of syrup to make one 12 ounce Pepsi, and that there was enough syrup in the vat to make 500 cases (24 cans each) of Pepsi.
   a) How many 20 oz "Pepsi Slam" bottles could be made using the syrup in the vat?
   b) What was the volume of the vat in liters?
   c) What was the volume of the vat in gallons?
   d) What was the volume of the vat in cubic feet?

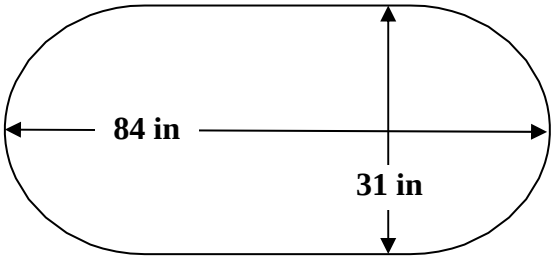
3. (20 points) I weighed a 2.00 inch diameter stainless steel ball bearing. It weighed 534 g.
   a) What was the volume of the bearing? (cm^3)
   b) What was its density? (g/cm^3)
   c) Later, I submerged the bearing in a graduated cylinder and measured the volume increase. Before submerging the bearing, the water volume in the cylinder was 125 ± 1 ml. After submerging it, the volume was 195 ± 1 ml. What was the density of the bearing based upon this experimental volume? (Don't forget to include the experimental tolerance in your answer.)

4. (20 points) In class, we weighed 100 ml graduated cylinder filled with 70% (by volume) isopropyl alcohol. The empty cylinder weighed 42.45 ± 0.05 g, and the full cylinder weighed 129.9 ± 0.05 g.
   a) What was the weight of the liquid?
   b) What is the density of 100% isopropyl alcohol?
   c) The density of isopropyl alcohol listed in the CRC is 0.7855. What is the % error versus your answer in (b)?

(continued on back)

5. (20 points) The other night after a hard day at work, I decided to take a bath. First, I stripped and weighed myself. I weighed 198 lbs. Then, I climbed into the tub. Boy, did it feel good! I noticed that the water level increased by 2.36 inches. This is the shape of my tub:

   a) What is my volume (cm^3)?
   b) What is my density (g/cm^3)?
   c) Did I sink or float?
   (The density of 30°C water is 0.996 g/cm^3).



6. Extra credit (10 points).
   (a) How many breaths would you have to take to breath an amount of air equal to the volume of the earth? (Hint: assume a volume for your lungs, and remember the definition of a meter)