**Measurements and Sig Figs lab handout (Air problem)**

Name and date submitted (3 pts):

 (12 questions, 5 pts each, 60 points total)

Problem 1: Calculate the weight of air in the laboratory

1. Guess what the air in this laboratory weighs, in approximate pounds \_\_\_\_\_\_\_\_\_\_\_\_\_
2. Calculate the volume of the laboratory (the garage-lab in this case) in cubic meters (m3). Report your answer using the correct number of significant figures. (sig figs for multiplication are limited to the least # of sig figs in the numbers being multiplied)

Sketch it:

Calculate it:

1. Use the density equation D = m/V to calculate the mass of the air in the room in kilograms. The density of air is 1.22 kg/m3. Report your answer with the correct significant figures.
2. How much does the air weigh in pounds? Convert the kilograms in the last question to pounds. Use the conversion factor of 2.20 lbs/kg. Use the correct significant figures.
3. How close was your guess on page 1? Are you surprised?

Problem 2: Steel spheres

In problem 1 you calculated the volume of the laboratory in m3. Now you will calculate how many steel spheres you can pack in this space.

1. Using the Vernier caliper provided, measure the diameter of the steel sphere in cm. Report your answer to the nearest 1/100th of a cm. (for example 2.25 cm)
2. Using the formula Vsphere = 4/3 πr3, compute the volume of the sphere in m3. Use the correct sig figs and scientific notation.
3. Guess how many spheres will fit in the classroom. There is no wrong answer. \_\_\_\_\_\_\_\_\_\_\_\_
4. Use the formula (#spheres = Vroom/Vsphere) to compute the number of spheres that can be packed into the classroom. Use scientific notation, and the correct sig figs.
5. Technically speaking, this was a simplification because we did not consider the ‘void space’ of the balls. When tightly packed, empty space in between them probably averages about 35% (so you would fill the laboratory with 65% balls and 35% air). To include the ‘void space’ in your calculation, modify your formula as follows: #spheres = $\frac{V\_{room}}{V\_{sphere}}x 0.650$

Taking into account the void space, how many can you pack into the classroom? Use scientific notation and correct Sig Figs

How close was your guess in #8?

1. Mass of each sphere: Look up the density of steel in kg/m3. Using the volume of each sphere in m3 which you calculated above, compute the mass in kg of each steel sphere. Use the density formula D = m/v. Use the correct Sig Figs.
2. Using a gram-scale, measure the mass of a single sphere in kg. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

How close was your calculated mass to the actual mass? Calculate your % error: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

% error = $\frac{\left|measured-calculated\right|}{measured}$ , then convert to a percentage