Homework 1

Phys 1140, Fall 2012 Prof. Markus B. Raschke
Due: Tuesday, September 18, 4 pm, in your TA's hw box in G2B66

1) (5 points) For each of the following quantities, determine how many significant figures are given. Or, if the situation is ambiguous, write "ambiguous."

a) 1000 N
b) 0.05002 A
c) 15 mph
d) 0.0704 m/s
e) 6.000×10^{-24} kg

2) (5 points) Calculate the following, and round to the correct number of significant figures. Include units where given.

a) 1.0003+300.4 =
b) (1.22 m + 3.2 cm)/(2.2334 s)=
c) (5.13 g) / (2.692 g/cm^3) =
d) 1.3 s + 2.46 s + 188.44 s =
e) 0.425 kg * 6.33 m/sec^2 =

3) (5 points) Write each of the following quantities and their uncertainties in "standard format".

Example #1: for 5.7203×10^{12} m +/- 3.81×10^{10} m,
write $(5.72 \text{ +/- } 0.04) \times 10^{12}$ m

Example #2: (the "uncertainty starts with a one" exception)
for 5.6319 volts +/- 0.0137 volts,
write 5.632 +/- 0.014 V

a) 5.915 +/- 0.0462 kg
b) 2.81425×10^{-8} s +/- 6.2×10^{-11} s
c) 27.300 +/- 1.49 cm^2
d) 7000 s^{-1} +/- 400 s^{-1}
e) -0.00323 +/- 0.005 V

4) (5 points) The power P delivered to a resistance R by an electrical current I is supposed to be given by the relation $P = RI^2$. To check for this relation and possible deviations from this law at high currents (e.g., due to temperature dependence of R) you measure the dissipated power through a resistor at variable current. You perform this measurement by immersing a resistor (electrically isolated ☺) in a bath of water of known amount and measure the temperature rise. The following table summarizes the results of your measurements:

Current I (A) (negligible uncertainty)	Power P (W)
1.5	270±50
2.0	380±50
2.5	620±60
3.0	830±60
3.5	1280±70
4.0	1600±70

Use these results to make a plot of P vs. I and P vs. I^2, including error bars (use a program of your choice, preferably the one you plan to use for your lab reports, e.g., mathcad). Use the second plot to decide if your experimental results are consistent with the expected proportionality of P and I^2.