TAKE-HOME QUIZ
TREATMENT OF ERRORS and USE OF SPREAD SHEETS
Due: Monday, September 28, 2015 (P. Chem. hand-in box)

1. Measure the area of the rectangular box. Use a two-repetition approach: the highest and lowest possible bounds. The standard or accepted value is 9.80 cm^2. Give the percent relative and absolute errors. Discuss the sources of these errors. Which dimension contributes greatest to the relative error?

2. What is the standard deviation of this set of data? What is the average uncertainty of these data: $83 \pm 2, 86 \pm 2, 90 \pm 2, 94 \pm 4, 86 \pm 3, 85 \pm 4, 79 \pm 2, 87 \pm 4, 98 \pm 4$. Is 79 an outlier? Report the average and its most appropriate uncertainty.

3. Successive dilution problem. A 10-ml transfer pipet and a 200-ml volumetric flask (TC) are used to make 0.100 M and 0.0050 M solutions from a stock solution of 2.000 ± 0.005M. Calculate the percent relative error for the three solutions if perfect technique is used. (See *Garland* p. 639-642) Report the two new molarities.

4. Derive the uncertainty ΔA for the function $A(x,y,z) = x^3y + \ln(z)$, where $x = 3.1 \pm 0.2$, $y = 3.6 \pm 0.3$, $z = 2.61 \pm 0.47$. Which measurement contributes most to the relative error?

5. Plot the ordered pairs (x,y):

18 ± 1,	6 ± 1	4 ± 2,	18 ± 2
6 ± 1,	13 ± 2	8 ± 1,	10 ± 2
10 ± 1,	5 ± 2	26 ± 2,	12 ± 2
14 ± 2,	5 ± 1	8 ± 2,	7 ± 1
24 ± 2,	7 ± 1	22 ± 1,	8 ± 1

At what value of x and y is the minimum of this curve? Also report the uncertainty of the minimum position; report the result as: $x_{min} \pm \Delta x_{min}$, $y_{min} \pm \Delta y_{min}$. (There is no known functional form of this curve.)

Practice using Spread Sheets:

6. In Experiment H, which you will be performing in the next few weeks, a student obtained the following data:

n	λ	$\Delta\lambda$
3	659.5 nm	5.0 nm
4	483.2	4.0
5	434.9	3.0
6	407.1	2.0
7	398.1	1.0
8	389.6	0.5
9	384.1	0.2
10	379.6	0.2

The data is described by the equation $1/\lambda = R_H(1/4 - 1/n^2)$. Fill in a spreadsheet, which has the following columns: