Chemistry 236 -- Quiz 1

September 15, 2010 — Statistics and KaleidaGraph Basics

Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

1. (4) State each of the following numbers with unambiguous precision and with the minimal number of digits needed to achieve 1% precision: (a) 1.234 (b) 876500

2. (3) A pressure is measured to be 456.250 Torr and is estimated to be uncertain by 0.45 %. Using the 10% rule for uncertainties, state this pressure and its uncertainty.

3. (3) Using KaleidaGraph, you carry out an unweighted least-squares fit of 15 data points to a quadratic polynomial containing the adjustable parameters *a*, *b*, and *c*. The fit results box gives a value of 849.3322 for Chisq. Give numerical values for the estimated variance and standard deviation in y. (Use extra precision here, *i.e.*, not the 10% rule.)

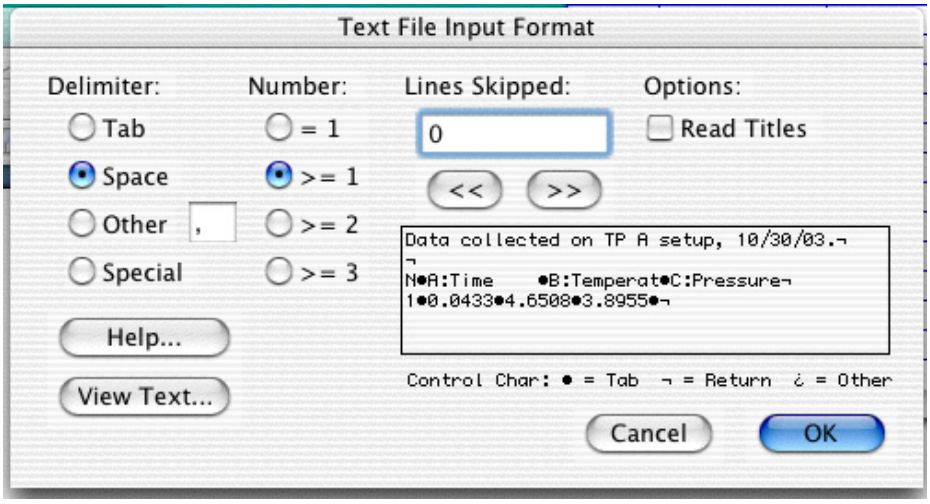
4. (3) What, if anything, is "wrong" with the following stated results? Fix to the extent that you can.

   a. 789.1234 ± 3 b. 789.1234(7)

5. (4) Use error propagation to obtain expressions for σ_z in terms of σ_x and σ_y, in each of the following cases: (No other quantities are uncertain.)

   a. $z = \exp(ay^2)$ b. $z = ax^2 - by$

6. (4) You have recorded a boatload of data in the P Chem lab and now seek to plot and analyze them using KaleidaGraph. When you "Open" the file, you see:



Precisely what do you select or enter in order to ensure that the resulting KG data sheet will contain all your data, in numerical format, with column headings?

Delimiter: _____ Number: _____ Lines Skipped: _____

Options: (Check or don't check?)

7. (4) You have data that should follow the equation, $y = a\,x - b\,x^3$, with x being error-free.

   (a) How should you define X_i and Y_i in terms of x_i and y_i, in order to fit these data to the relation, $Y = a + bX$?

   (b) If the original data have constant uncertainty, $\sigma_y = 1$, the latter fit should be a weighted one. What quantities should you enter in the σ_Y column to carry out this weighted fit?

8. (2) In a KG data sheet, you have three columns (c0−c2 = A − C) containing 100 numbers each. You wish to compute the corresponding 100 values of $(A + 1/B^3)/C^2$ and put them in the 4th column (D). Write the expression you must enter in the Formula Entry window to carry out this operation.