Chemistry 236 -- Quiz 1

September 10, 2008 — 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. (2) Consider the number 2. If this represents a rounded experimental result, what are its absolute and percent uncertainties?

2. (3) A pressure is measured to be 654.15 Torr and is estimated to be uncertain by 0.85 %. Using the 10% rule, state this pressure and its uncertainty.

3. (5) Marge Inovera measures a quantity 32 times and obtains an average and a sum of squared residuals. If the latter is 489.155,

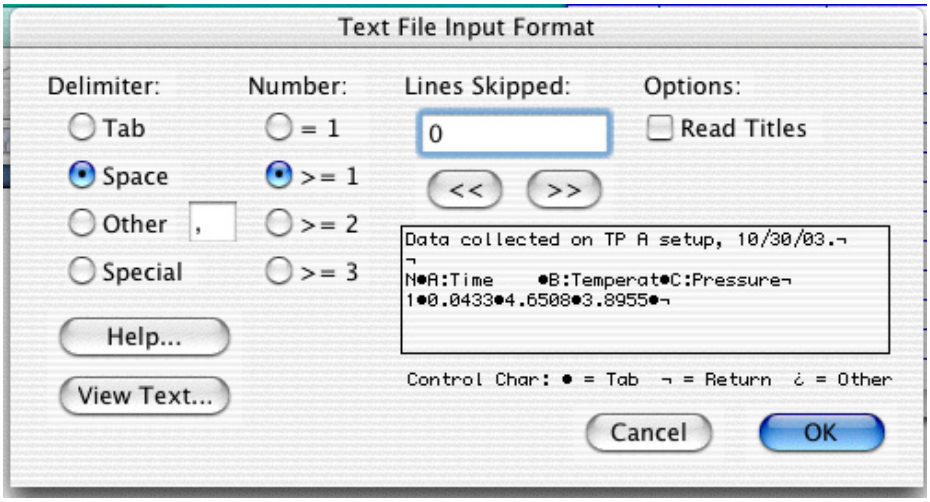
   a. Give Marge's estimated variance, standard deviation, and standard deviation in the mean. (Give precision commensurate with the provided information.)

   b. Use the 10% rule to restate the latter two values.

4. (2) State the following quantities unambiguously to 5 significant figures:

   a. 12000001 b. 66.123500

5. (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?)

6. (5) Having Fits. You encountered your first truly nonlinear least-squares fitting problem in Problem Set 3, where you fitted first-order kinetics data to a delining exponential function of time plus a background. The resulting function contained three adjustable parameters.

   1. Write the fit relationship in mathematical form. Identify the independent and dependent variables and the adjustable parameters.

   2. Suppose you carry out the fit by defining the fit relationship in the "Define Fit" box of the **General** fit routine. Write below EXACTLY what you must enter there, using a, b, and c as your adjustable parameters.

7. (3) 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.)

   1. $z = \exp(ay)$ 2. $z = y/x$ 3. $z = ax - by$

8. (2) Give two reasons why Excel cannot (easily) satisfy the data analysis requirements of this course while KaleidaGraph can.