Chemistry 236 -- Quiz 1

January 29, 2013 — 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 1.17. 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 0.14 %. Using the 10% rule for uncertainties, state this pressure and its uncertainty.

3. (4) Marge Inovera measures 25 values of a quantity y for a range of x values from 0 to 11. When she uses KaleidaGraph to carry out an unweighted fit of these data to a 4th-order polynomial (5 adjustable parameters), she obtains Chisq = 0.0015799. She then repeats the fit using weights and obtains Chisq = 1334.45.

   a. Calculate Marge's estimated variance and standard deviation in y for the unweighted fit. (Give precision commensurate with the provided information.)

   b. In Marge's weighted fit, the s_y values she enters in the column used for weighting are known in only a relative sense. If the fit yields for the error in a, $s_a = 0.00075518$, what is the appropriately adjusted value of this error estimate?

4. (5) a. If y has uncertainty 0.012, what is the percent uncertainty in $z = e^{3y}$?

   b. In thermodynamics, the standard Gibbs free energy change for a reaction is related to the equilibrium constant $K°$ by $\Delta G° = -RT \ln K°$. If $K°$ is uncertain by 4.0% at $T = 308.15$ K, what is the uncertainty in $\Delta G°$? [$R = 8.3245$ J mol^{-1} K^{-1}]

5. (2) A quantity x is uncertain by 1.0% and y is uncertain by 3.0%. Give the % uncertainties for z in each of the following cases:

   a. $z = \sqrt{5\ y}$ b. $z = 5\ x^3/y$

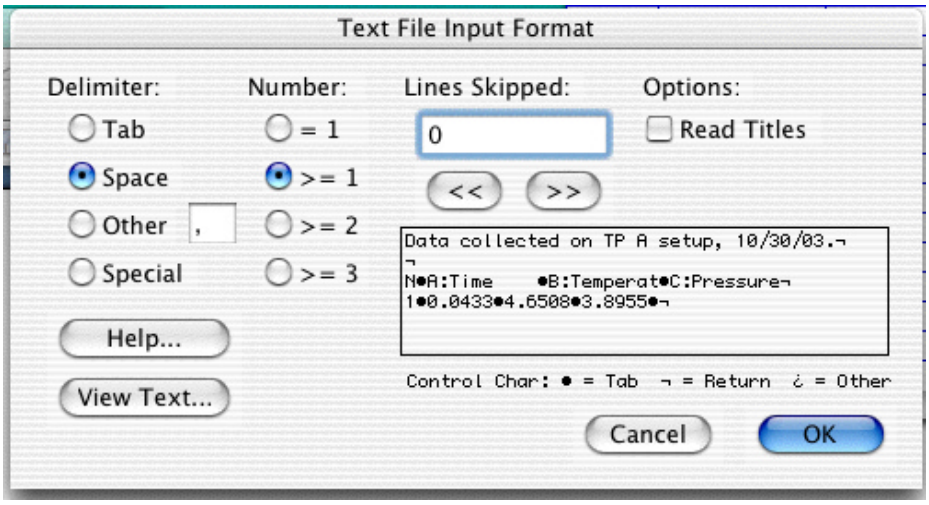
6. (2) A quantity x is uncertain by 1 and y is uncertain by 2. Give the uncertainties for z in each of the following cases:

   a. $z = -3y$ b. $z = 11 + 9x - 4y$

7. (1) Using Formula Entry in KaleidaGraph, you enter `3*2 + 1.0/2*3^2 - 7/2^3` and press Run. What result do you get?

8. (2) You want to fit your data to the function $y = ax + b/x^3$. Using a, b, and x to represent the appropriate quantities, write exactly what you must enter in the Define box of the General routine.

9. (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?)

10. (2) Give two reasons why Excel cannot (easily) satisfy the data analysis requirements of this course while KaleidaGraph can. (Hint: What are the chief virtues of the General routine?)