Chemistry 236 -- Quiz 1

January 31, 2012 — 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 0.3 % precision: (a) 1.2345 (b) 8767500

2. (5) Marge Inovera measures a quantity 25 times and obtains an average and a sum of squared residuals. If the latter is 189.155,

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

   b. Marge also finds that the sum of her measured values is 204.715. Using the 10% rule, properly state her average and its uncertainty.

3. (2) If y is uncertain by 3.2%, what is the uncertainty in $z = \ln(3y)$?

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

   a. $z = 5/y$

   b. $z = 11x^{1/3}$

   c. $z = 5\,x/y^2$

5. (3) A quantity x is uncertain by 2 and y is uncertain by 3. Give the uncertainties for z in each of the following cases:

   a. $z = -3 - y$

   b. $z = -9x$

   c. $z = 11 + 4x + 9y$

6. (3) You have recorded a boatload of data in the P Chem lab and now seek to plot and analyze them using KaleidaGraph. You have opened the text data file with WordPad and you see that you have three columns of data that you need to put in a KG data file. You decide to save time by just selecting the data in the WordPad file, copying (CNTRL C), and pasting into the KG file. Under what special circumstances will this work properly, and what is the outcome otherwise?

7. (4) You have data that should follow the equation, $y = a/x + b\exp(3x)$, 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) You have prepared a KG "Scatter" plot of your data, and you wish to fit these to a straight line, $y = a + b*x$, where both a and b are physical quantities of interest. You open the **Curve Fit** menu and see **General**, **linear...**, **polynomial...**, and several other options. Why would you <u>not</u> pick **linear...**? (Give two reasons — one always valid, the other sometimes.)