Chemistry 236 -- Quiz 1

September 16, 2009 — 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 41. If this represents a rounded experimental result, what are its absolute and percent uncertainties?

   ±0.5 1.2_2%

2. (3) A pressure is measured to be 654.15 Torr and is estimated to be uncertain by 0.35 %. Using the 10% rule for uncertainties, state this pressure and its uncertainty.

   654.2 ± 2.3 Torr

3. (5) Marge Inovera measures a quantity 43 times and obtains an average and a sum of squared residuals. If the latter is 789.155,

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

      s^2 = 18.7894 s = 4.33467 s_{mean} = 0.661032

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

      4.3 and 0.7

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

   a. 12000071 1.2000×10^7 b. 66.122500 66.122

5. (6) An unweighted fit of 37 thermistor calibration correction values yields the results shown here.

   y = a + b*(x-25) + c*(x-25)^2

	Value	Error
a	0.050861789	0.001247068
b	0.0036498518	0.0002037433
c	-0.00074572609	3.839555e-05
Chisq	0.00049905721	NA
R	0.96765516	NA

   a. Calculate s_y^2 and s_y. (Give at least four significant figures.)

      1.4678×10^{-5} & 0.0038312

   b. Suppose this were a weighted fit, but with the weights known in only a relative sense. Calculate the corrected values for the errors in *a* and *b*. (Again, at least four significant figures.)

      (multiply Errors by s_y)

      $s_a = 4.7778\times10^{-6}$ & $s_b = 7.8058\times10^{-7}$

6. (5) A quantity x is uncertain by 2.0% and y is uncertain by 3.0%. Give the % uncertainties for z in each of the following cases:

a. $z = 5/y$

3.0%

b. $z = 11x^4$

8.0%

c. $z = 1/\sqrt{3}y$

1.5%

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

$(40)^{1/2}$ %

e. $z = x\sqrt{4}y$

2.5%

7. (4) 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. $z = 5 + y$

3

b. $z = -9x$

18

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

28.2

d. $z = 15\,x + y^2$ [Take $y = 7$.]

51.6