Chemistry 237 -- Quiz 1

January 20, 2010 — Tellinghuisen

Pledge and signature:

1. (8) Millikan found the following data for the photoelectric effect in Na:

K_{max} (10^{-12} erg)	3.41	2.56	1.95	0.75
λ (Å)	3125	3650	4047	5461

where K_{max} is the maximum kinetic energy of emitted electrons and λ is the wavelength of incident radiation. Describe briefly how you would analyze these data to estimate Planck's constant h and the work function Φ for Na. Also calculate the values you would plot for the first point.

2. (4) Use the "10% rule" to properly state the following: (a) 987.234 ± 1.234; (b) 1.25 ± 0.555.

3. (4) Suppose that a quantity x is uncertain by 1.5% and y is uncertain by 3.0%. Under the usual assumption of random (uncorrelated) error in x and y, what is the <u>percent uncertainty</u> in z in each of the following cases? [Give numeric answers in those cases where you can, which is most; otherwise give expressions. <u>Hint</u>: Use the concept of relative error propagation to the extent possible. Work on the back if necessary.]

   1. $z = 9y$
   2. $z = 5x^2$
   3. $z = \ln(3y)$
   4. $z = 4x/y^2$

4. (4) If $s_x = 1.3$ and $s_y = 2.2$, calculate s_z when: (a) $z = x - y$; and (b) $z = 3x - 2y$.