

Analytical Chemistry
Problem Set 8
Due Friday, April 17, 2009 (at 4:00 p.m.)
Total Number of Points = 54

Note: (1) When computing pH values, you should always use the “streamlined” (non-systematic) methods Harris describes in Chapters 9, 10, and 11. However, you are responsible for understanding the approximations underlying Harris’s approach. (2) Unless you have an electronic titrator (like the Mettler instrument we are using for Experiment 4), pH readings will typically be precise to only two significant figures. Therefore, you should report all the pH values below to two decimal places, regardless of the precision to which you may know initial concentrations and equilibrium constants.

1. (8 points) Harris 9-39, parts (a) and (b) only (don’t do part (c)). The point of part (b) is to test the assumption that using the formal concentrations of weak acid and weak conjugate base (after stoichiometric reactions have been dealt with) gives an accurate prediction of the pH.
2. (3 points) Harris 11-5
3. (7 points) Harris 11-8
4. (18 points) Harris 11-17
5. (18 points) (Based on Harris 11-24) A 100.00-mL solution of the diprotic acid H_2A ($\text{p}K_1 = 4.00$; $\text{p}K_2 = 8.00$) was titrated with 1.000 M NaOH. The initial concentration of H_2A is 0.1000 M. Find the pH at the following volumes of base added: 0, 1.00, 10.00, 15.00, 20.00 mL.

Also note: While I am not assigning a problem in which you compute the entire titration curve for a weak acid + strong base (cf. Harris 11-6), you are responsible for knowing how to do these kinds of calculations on the final. (Remember that we did a weak acid + strong base calculation in class.)