

AP Chemistry Final Exam  
Version J  
Spring 2005

3 Free Response questions, 45 minutes

**CALCULATORS MAY BE USED.** You will also have a periodic table, equation sheets, and the standard reduction potential table.

Clearly show the method used and the steps involved in arriving at your answers. It is to your advantage to do this, since you may obtain partial credit if you do and you will receive little or no credit if you do not. Attention should be paid to significant figures.

Note: For all questions, assume that the temperature is 298 K, the pressure is 1.00 atmospheres, and solutions are aqueous unless otherwise specified.

Record all your work on this exam; you will only be given credit for answers showing work.

NAME:

PERIOD:     5       6       7

April 29, 2005

SCORE:  $\frac{\quad}{\text{FR}}$  +  $\frac{\quad}{\text{MC}}$  =  $\frac{\quad}{\text{Raw Score}}$

+  $\frac{\quad}{\text{Curve}}$

|                                |
|--------------------------------|
| $\frac{\quad}{\text{Overall}}$ |
|--------------------------------|

**Version J**

**1. (14 pts) Consider aniline,  $C_6H_5NH_2$ , a weak base for which  $K_b = 1.7 \times 10^{-6}$ . Its conjugate acid form is  $C_6H_5NH_3^+$ .**

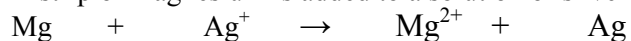
- a. Write the chemical equilibrium equation for the aqueous hydrolysis of this base.
  
  
  
  
  
  
  
  
  
  
- b. Write the base-dissociation constant expression for this base in water.
  
  
  
  
  
  
  
  
  
  
- c. Calculate the value of  $[H^+]$  in a solution of aniline that has a pH of 8.78.
  
  
  
  
  
  
  
  
  
  
- d. A solution of  $H_2SO_4$  (aq) is used to titrate an unknown solution of aniline.
  - i. When 20.5 mL of 0.124 M  $H_2SO_4$  (aq) is added to 202 mL of the base, the equivalence point is reached. Calculate the concentration of the unknown base in this titration.
  
  
  
  
  
  
  
  
  
  
  - ii. Calculate the pH of this solution at the equivalence point of the titration.
  
  
  
  
  
  
  
  
  
  
- e. A certain experiment calls for a buffer solution containing the weak base aniline. How must this solution be changed to create a buffer solution? Briefly explain, in 2-3 sentences.
  
  
  
  
  
  
  
  
  
  
- f. Draw the Lewis structure of aniline. Hint: aniline is a derivative of benzene.



3. (10 pts) ANSWER FIVE OF THE EIGHT STATEMENTS BELOW. Only five will be scored. Indicate which five you want scored by circling the letter of the statement. If none are circled, the first five will be scored.

Give the formulas to show the reactants and products for the statements. Each of the reactions occurs in aqueous solution unless otherwise indicated. Represent substances in solutions as ions if the substance is extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction. In all cases a reaction occurs. You need not balance nor include states of matter.

Example: A strip of magnesium is added to a solution of silver nitrate.



- a. A solution of hydrogen peroxide is warmed.
- b. A solution of barium chloride is added to a solution of mercury (II) sulfate.
- c. A solution of concentrated ammonia is added to a solution of aluminum nitrate.
- d. Potassium metal is added to distilled water.
- e. Ethanediol is burned in oxygen,
- f. Dichlorine pentoxide gas is bubbled through water.
- g. A bar of calcium is added to a solution of copper (II) acetate.
- h. 1 mole of hydrochloric acid gas is bubbled through a 1 L solution of 1.0 M sodium phosphate.