In Class Exam Ch 14-17 Name:
AP Chemistry *I have neither given nor received any aid on this exam.*
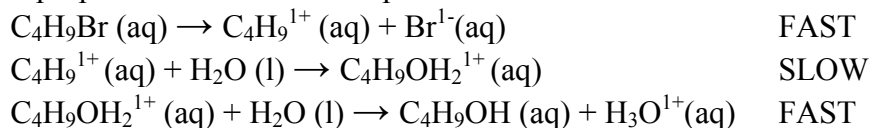**Version E (60 pts)** Period: 5 6 7 Date: 3/19/04

Show your work for all problems and be sure to box your final answer and include sensible units.
No work (i.e., reasonable justification) = no credit.

1. (24 pts) $2 NO (g) + Br_2 (g) \leftrightarrow 2 NOBr (g)$; at 298 K, the equilibrium constant, K_p, is 109.

   a. (8 pts) If the equilibrium partial pressure of Br_2 is 0.0159 atm and that of NOBr is 0.0768 atm, calculate the partial pressure of NO at equilibrium.

   b. (8 pts) If the temperature in the container is raised to 400 K and the overall pressure is observed to increase, what can be said about the enthalpy of this reaction? Briefly explain.

   c. (8 pts) If the volume of the container were decreased, how would the equilibrium position shift? Briefly explain.

2. (8 pts) A proposed mechanism for a particular reaction is:
   $C_4H_9Br (aq) \rightarrow C_4H_9^{1+} (aq) + Br^{1-}(aq)$ FAST
   $C_4H_9^{1+} (aq) + H_2O (l) \rightarrow C_4H_9OH_2^{1+} (aq)$ SLOW
   $C_4H_9OH_2^{1+} (aq) + H_2O (l) \rightarrow C_4H_9OH (aq) + H_3O^{1+}(aq)$ FAST

   a. (2 pts) Write the overall, balanced reaction for this reaction.

   b. (6 pts) Write the expected rate law if this proposed mechanism is correct.

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3. (12 pts) A sample of a certain monoprotic weak acid was dissolved in water and titrated with 0.125 M NaOH in the presence of phenolphthalein. After the addition of 2.00 mL of NaOH, the resulting pH of the colorless solution was 6.912; after the addition of 16.00 mL of NaOH, the solution took on a slight pink color. Calculate the K_a of this weak acid.

4. (16 pts) Given the following solubility-product constants measured at 25°C.

$$Al(OH)_3 \qquad 2 \times 10^{-32}$$
$$AgOH \qquad 2.0 \times 10^{-8}$$
$$Cd(OH)_2 \qquad 5.9 \times 10^{-15}$$

a. (4 pts) Rank the solids in order from most to least soluble:

_____ > _____ > _____

b. (12 pts) If saturated solutions are created of each of the above solids, which will have the greatest concentration of hydroxide ions?