CHM 152LL Equilibrium Worksheet Name:_____

Show all work and watch significant figures.

1. In the equilibrium experiment being conducted, what is the purpose of titrating the first two bottles (1a and b)? (What information is gained?)

2a. If it took 17.50 mL of 0.6792 M NaOH to titrate a sample containing 5.00 mL HCl, how many moles of HCl were in the bottle? (Start with a balanced equation)

b. What was the molarity of the HCl solution? (note: The average molarity from bottles 1and 1a will be used to calculate the moles and grams of HCl in your bottles 2-5)

c. How many grams of HCl were in the bottle?

d. If the density of the HCl solution was found to be 1.030 g/mL, how many grams of water were in the 5.00 mL of HCl solution? (Remember to take "2c" into account.)

e. How many moles of water were in the HCl solution?

f. If 5.00 mL of water were added to the solution, and the density of water was found to be 0.995 g/mL, how many moles of water were added?

g. How many total moles of water were in the bottle?

3. Given the following information about an ester, determine how many moles are initially present in a 3.00 mL ester sample. (molar mass 62.55 g/mole; density 0.702 g/mL)

4. Given the following information about an alcohol, determine how many moles are initially present in a 1.00 mL ester sample. (molar mass 60.1 g/mole; density 0.792 g/mL)

5a. A second bottle contains the same number of moles of HCl as in 2a, plus some carboxylic acid that was formed in the hydrolysis reaction. If it required 38.25 mL of the base used in 2a to neutralize both acids, how many moles of acids were present?

b. How many moles of carboxylic acid are present in the sample?

c. How many moles of alcohol were formed?

d. How many moles of ester disappeared?

e. How many moles of water disappeared?

6. Use the reaction stoichiometry and the moles of carboxylic acid formed in #2 to determine how may moles of ester remain at equilibrium. (R'COOR" + H_2O <---> R'COOH + R"OH)

7. Use the reaction stoichiometry and the moles of carboxylic acid formed in #2 to determine how may moles of water remain at equilibrium. (R'COOR" + H_2O <---> R'COOH + R"OH)

8. Use the equilibrium molarity values to determine K_c .