

CHM 152LL Equilibrium Spring 2012 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. How many grams of HCl were in the bottle?

c. What was the molarity of the HCl solution?

d. The density of the HCl solution was found to be 1.030 g/mL. How many grams of water were in the 5.02 mL of HCl solution? (Remember to take "2b" 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?

3a. 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 takes 38.25 mL of the base used in 2a to neutralize the acids, how many moles of acids are present in the sample?

b. How many moles of carboxylic acid were formed?

c. How many moles of alcohol were formed?

d. How many moles of ester disappeared?

f. How many moles of water disappeared?

4a. 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)

b. Use the reaction stoichiometry and the moles of carboxylic acid formed in #3a to determine how many moles of ester remain at equilibrium. ($R'COOR'' + H_2O \rightleftharpoons R'COOH + R''OH$)

c. Use the reaction stoichiometry and the moles of carboxylic acid formed in #3a to determine how many moles of water remain at equilibrium. ($R'COOR'' + H_2O \rightleftharpoons R'COOH + R''OH$)