Name_____

Pre-Laboratory Assignment

1. Explain what an ester is.

2. Draw the structural formula for acetic acid.

3. Draw the structural formula for ethyl alcohol.

4. Write an equation using structural formulas for the esterification reaction of acetic acid with ethyl alcohol. Name the product.

5. Why are the reflux and distillation setups always open to the atmosphere?

6. How is distillation used to purify an ester?

7. The theoretical yield of a product is the maximum amount of product that can be formed from a given amount of reactants. In this esterification reaction, 12 mL of 17.4 M acetic acid are combined with 10 mL of absolute ethyl alcohol. The density of ethyl alcohol is 0.79 g/mL.

    a. Calculate the number of moles of each reactant.

    b. Compare the ratio of reactant moles used in this experiment to the ratio of reactant moles in the balanced equation. Are both reactants completely consumed? If not, which one is consumed? How much of the excess reactant is left over?

    c. The reactant that is completely consumed in the reaction is called the limiting reactant, because its amount limits the amount of product that can be formed. Once the limiting reactant is consumed, the reaction stops. Determine the limiting reactant for this experiment and calculate the theoretical yield of ethyl acetate, in moles and grams.

Data Table

Boiling point range — ethyl acetate (°C)	
Boiling point — beginning of distillation (°C)	
Boiling point — end of distillation (°C)	
Mass of Erlenmeyer flask (g)	
Mass of Erlenmeyer flask plus ethyl acetate (g)	
Mass of ethyl acetate (g)	
Theoretical yield of ethyl acetate (g)	
Percent yield of ethyl acetate (%)	
Fragrance	

Post-Laboratory Review Questions

1. In Pre-Lab question 6c, the theoretical yield of ethyl acetate, in grams, was calculated. Enter this value in the Data Table.

2. Use the mass of the ethyl acetate collected from the distillation and the theoretical yield to calculate the percent yield of ethyl acetate. Record this value in the Data Table.

3. Look up the literature value of the boiling point of ethyl acetate in a reference book, such as the *Merck Index* or the *CRC Handbook of Chemistry and Physics*. Compare the experimental and literature values of the boiling point.