

Organic Chemistry Laboratory
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Fractional Distillation

In this experiment, you will calculate the amount of ethanol in an ethanol-water solution of unknown composition by distilling the ethanol from solution as an ethanol-water azeotrope.

New techniques:

Simple and Fractional distillation
Measuring boiling points
Setting up glassware

Reading (in Pavia):

Simple distillation: chapter 14, pp. 201-209
Fractional distillation: chapter 15, pp. 220-232, 234-237
Boiling points: chapter 13, pp.190-191, 195-196
See also chapter 6 on heating methods.

Before lab:

At what temperature(s) should you expect to find a constant boiling point(s) for your sample? How will you calculate the proportion of ethanol present in your original solution?

For the lab report: Present a hand-drawn plot of volume of distillate vs. temperature (computers don't know what to do with distillation charts). Be sure that you use an entire sheet of graph paper. From this plot, calculate the volume of 95% ethanol in your original sample. Show your calculations.

Procedure: Obtain around 100 mL of ethanol/water solution of unknown proportions. The precise amount is unimportant, but measure and record the amount you do get. Add it to your round bottom flask (250 mL—don't forget the boiling chips) and construct your distillation apparatus according to the diagram given in the textbook and recitation, making sure to clamp the setup securely to the rods on your bench and making sure that the column is vertical in all directions. Have me check it if you are uncertain. Heat the flask in the heating mantle, raising the temperature gradually and steadily until it reaches the thermometer. Record the temperature as the first drop leaves the condenser, and collect the distillate at a rate of about one drop every three seconds. Record the temperature at regular intervals, every mL at the beginning, but more frequently when the temperature is increasing rapidly. When you have collected 5 mL of liquid at the highest expected temperature, you can stop the distillation. *Important:* do not distill to dryness!

Cleanup: any ethanol/water mixtures can be poured down the drain.