

Experiments to be covered in the Introduction Section

Expt. 3 PART 3x: Determine Boiling Point of Reference Liquid and of an Unknown Liquid

Expt. 5.1A: Simple Distillation of Cyclohexane:Toluene Mixture

Expt. 5.2A: Fractional Distillation of a Cyclohexane:Toluene Mixture

1. Explain what is meant by the term “the boiling point of a liquid.”
2. Explain the three types (ignore ion-ion) of intermolecular attractive forces.
3. There are three main factors you need to think about when confronted with a question about boiling points. 1) what intermolecular forces will be present in the molecules? 2) how do the molecular weights compare? 3) how do the symmetries compare? **Using the above criteria** determine in each of the following pairs of compounds which has the higher boiling point and why it has the higher boiling point.
4. a. t-butyl alcohol (2-methyl-2-propanol) or n-butyl alcohol (1-butanol) [both are $C_4H_{10}O$ alcohols]
b. butanoic acid (a $C_5H_{10}O_2$ carboxylic acid) or pentanoic acid (a $C_6H_{12}O_2$ carboxylic acid).
5. In distillation and especially fractional distillation, liquid can be seen running from the bottom of the distillation column back into the distilling flask. What effect does this returning condensate have on the fractional distillation?

NOTE: Remember, this lab report includes both the distillation and the boiling point labs.

1. Footnote when appropriate.
2. You need not include in your report the raw data table of Temperature/drops from your lab notebook.
3. Make sure to include a graph of your data relating Temperature in $^{\circ}C$ on the Y-axis and Volume of distillate IN DROPS on the X-axis. **Put the data for both the Simple Distillation and the Fractional Distillation on the same plot.** The combined graph can be done by hand on graph paper if you can't figure how to put both sets of results on the same graph in Excel.
4. In the Results and Discussion section, make sure to comment on/discuss (not just restate in words) your results.
 - Footnote where appropriate.
 - Make sure to compare/contrast the fractional and simple distillation results in relation to extent of separation and compare your results to your expectations as expressed in the introduction. Remember, your discussion should answer the following question: from the two plots, what can you conclude about the purity of the distillate as it is collected over time?
 - Include, refer to, and cite the table of possible unknowns.