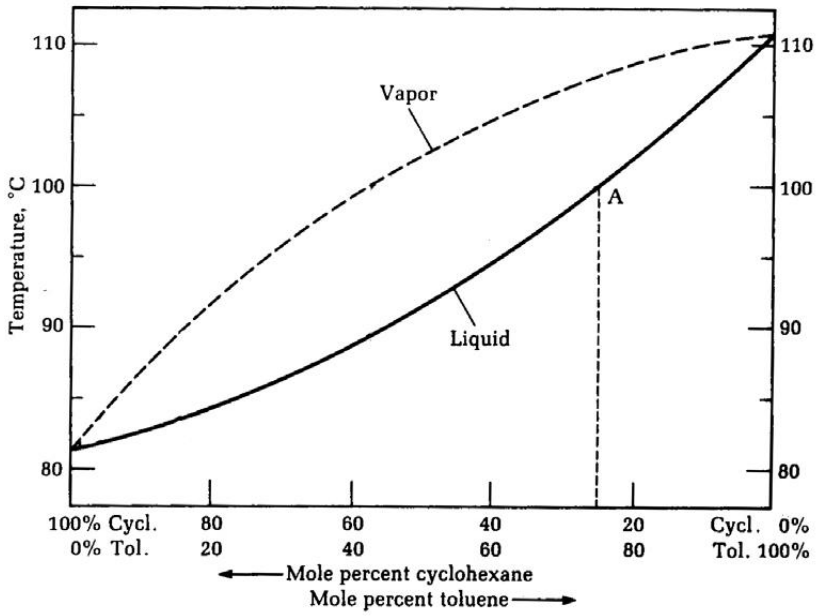
Chem 231 Distillation Theory and Technique Assignment Fall 2020

Instructions: Please provide your answers to the following questions in the spaces provided. Once all of your answers are provided you can save the file and upload it to the "Distillation Assignment" Module in Canvas (Available in the "Week 4 Module" or in the "Assignments" section). This assignment should be done on your own. Students turning in similar reports may receive a reduced score for the assignment.

1. Which method would you expect to give a better separation of a mixture of two liquids: *simple distillation* or *fractional distillation*? Provide a brief explanation for your choice.

2. Explain why, during the course of a distillation, you may see a dramatic drop in vapor temperature when there is still a significant amount of liquid that needs to be distilled. If this happens, what would you need to do to ensure that the rest of the liquid is distilled?

3. Use the temperature-composition diagram for a cyclohexane-toluene mixture to answer the questions below.



a) What is the boiling point for pure cyclohexane based on the diagram?

b) Assume we have a mixture containing 25% cyclohexane and 75% toluene. What is the approximate boiling point of this mixture? (Illustrate how you determined this on the diagram).

c) Suppose you do a series of two simple distillations on the mixture from part b). Assuming each distillation results in a single vaporization/condensation cycle, what will be the approximate composition of the distillate after the second distillation? (Illustrate how you determined this on the diagram).

4. Explain why the boiling point (temperature of vapors) of a two-component mixture rises gradually throughout a simple distillation when the boiling point differences between the two liquids are not very large.

5. Assume you have 20.0 mL of a liquid mixture that contains 30% methanol (b.p. = 65 ^{o}C) and 70% ethyl acetate (b.p. = 77 ^{o}C). In the space below, draw what you would expect a plot of *temperature* vs. *distillate volume* to look like for an ideal fractional distillation of this mixture.