

CHAPTER 14	Investigation 14.C: Separate an Organic Mixture	BLM 14.4.4
HANDOUT		

Fractional distillation is one of the most critical steps in separating and purifying mixtures of organic compounds. The principle behind fractional distillation is simple in theory—two compounds do not have exactly the same boiling point. In this investigation, you will make use of this fact as you design an experiment to separate a mixture of compounds into its individual components.

Question

How can you separate a mixture of corn oil, vinegar (ethanoic acid and water), and cyclohexane?

Safety Precautions



- Organic solvents are flammable. Extinguish all flames in the laboratory area. Use a hot plate.
- Organic solvents are toxic. Avoid inhaling or ingesting them.
- Iodine is a severe skin irritant; avoid contact with skin and mucous membranes. Iodine will stain skin and clothing. Use a wood splint or microspatula to obtain and deliver two small crystals.
- Your instructor will introduce you to the distillation apparatus that is available to you in advance of performing this investigation.
- There is no need to exceed 130 °C in this experiment.

Materials

- corn oil
- ethanoic acid
- commercial grade cyclohexane
- iodine crystals, I₂(s)
- distillation apparatus (varies)
- boiling chips
- cobalt chloride paper
- litmus paper
- wood splint or microspatula
- 5 test tubes or 50 mL beakers
- test-tube rack
- reference tables and access to library resources or the Internet

Experimental Plan

1. A mixture of corn oil, vinegar, and cyclohexane has been prepared for you. Using reference tables or the Internet, determine the boiling points for each component of your mixture.
2. Design a procedure that would allow you to separate those components. In your procedure, be sure to specify the steps that you are to follow.

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3. Have your instructor check and approve your procedure before you start.

Analysis

1. Check the effectiveness of your separation by testing each distillate for the presence of the various compounds. Cyclohexane turns magenta with the addition of iodine. You can test for water by using cobalt chloride paper. Litmus paper tests for the presence of an acid.
2. Based on your tests, were the components completely separated?

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3. How did you determine when to switch collection containers?

4. How could you improve the efficiency of your procedure?

Conclusion

5. How effective was your distillation procedure?