

B. Distillation of Nail-Polish Removers

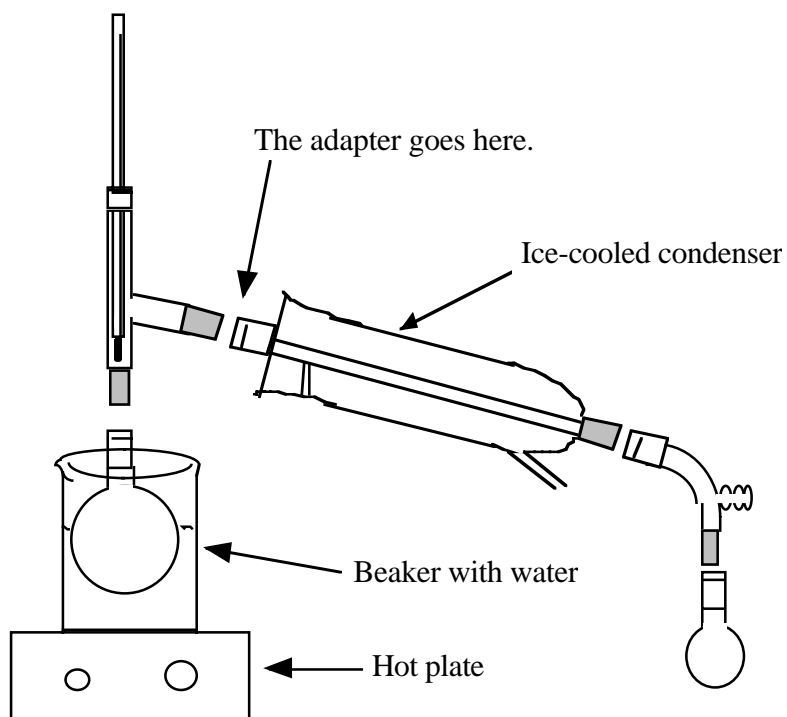
Purpose: Distillation is used to separate acetone from a nail polish remover product.

Introduction

Distillation separates the components of a mixture according to their boiling points. The lowest boiling liquid comes off first. The nail polish remover product you will distill contains acetone, water, yellow dye, fragrance, and some other solid substances. Acetone has the lowest boiling point (56 - 57°C) and is readily separated from water, the other liquid component, which boils at 100°C. A hot water bath provides the heat source.

Apparatus

A distillation setup is shown on the right. The heating is done by placing the large round flask in a beaker of water on a hot plate. The liquid vapor is cooled by a condenser packed with ice.



Safety/Waste Disposal

Wear safety glasses and gloves. A container will be available for the acetone produced and for the residue left in the distillation flask.

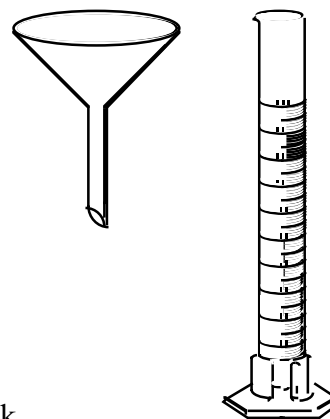
Procedure

1. Assemble the distillation apparatus as shown in the figure. Use ring stands and clamps to support the apparatus. Place a glass extender, an adapter with one end male and one end a female joint, between the condenser and distillation head. See the figure on page 1. This is needed to prevent the condenser from hitting the water-bath beaker. Use the plastic clamps (small yellow rings) to secure the joint connections. You should have five of these.

CAUTION: The thermometer is in a holder with a rubber tube. It should be already assembled. If not, be sure to insert the thermometer into the holder slowly and carefully to avoid breakage.

2. Measure about 5 mL nail polish remover into the graduated cylinder. Pour into the larger round bottom flask. To do this, remove the thermometer assembly and use a funnel. Fill the jacket around the condenser with ice (doesn't need filled to the top)

Note: One filling with ice is enough to perform this experiment.



3. Place water in the 250 mL beaker for the heating bath. The beaker should be about 2/3 full when the round bottom flask is immersed.

4. Heat the hot water bath using the highest setting on the hot plate until water is near boiling, then turn it down a little. The water need not be at a full boil

5. Record boiling temperature (or range of temperatures) of acetone. Using the graduated cylinder measure the volume of acetone that is obtained. Record on data sheet.

Data and Results (Distillation of nail polish remover)

Name(s) _____

Brand Name of Nail Polish Remover Product _____

Volume Nail Polish Remover distilled _____ mL

Volume acetone recovered _____ mL

% Acetone recovered (of the volume of nail polish remover) _____ %

$$\% \text{ Acetone} = \frac{100\% \times \text{Volume acetone}}{\text{Volume nail polish remover}}$$

Temperature range (during condensing of acetone) _____ °C

Question:

Instructor's Guide
Distillation

Brand Name of Nail Polish Remover Product _____

Volume Nail Polish Remover distilled 5.0 mL

Volume acetone recovered 2-3 mL

% Acetone recovered (of the volume of nail polish remover) 40-60 %

Temperature range (during condensing of acetone) 56-57 °C

Question:

Instructor's Guide
Distillation (cont'd)

Time: 1 hour

Equipment and Materials (5 groups)

Items	Number	Comment
Stir/hot plates	5	
Microscale apparatus	5	
Extender adapter	5	to prevent condenser from hitting water bath beaker
250-mL Beakers	10	for water heating bath and collecting melted ice
Nail polish remover	50 mL	2 x minimum
Thermometers	5	
Ring stands	10	
Clamps	10	
Funnels	5	
10-mL Graduated cylinder	5	
Plastic clamps (yellow)	25	5 per setup
ice		

Ideas/ Information