

17B: Distilling Aromatic Hydrocarbons

How are aromatic compounds isolated? What do they have in common?

Many of the “natural flavors” and “fragrances” that we find in food, perfumes, creams and other products come directly from natural products by a process called distillation. In this experiment, you will isolate some common fragrances and natural flavors using completely natural processes to create familiar smells using objects you can find in the kitchen or in the garden.

Materials

- Lab-Master with heater and condenser
- Crushed ice
- 250 mL beaker
- Plenty of salt
- 25 mm test tubes
- Stirring rod
- Mortar and pestle
- Pipettes
- Boiling chips or rocks
- One or more of the following spices: rose petals, vanilla beans, cloves, cinnamon, nutmeg, cardamom, anise, powdered or whole allspice, caraway seed, lemon peel, orange peel, turmeric, and cumin

Part 1: Setting up the experiment

1. Crush enough ice to fill a 250 mL beaker.
2. Fill a test tube 1/4 of the way with your spice. If your spice is powdered, just add it in. If it is whole, crush it first using the mortar and pestle.
3. Put 30 mL of hot water into the test tube. Drop a boiling chip or rock into the test tube. Stir your spice mixture well for 30 s.
4. Place the test tube into the heater.
5. Fill the cold side of the condenser with crushed ice. Pour salt over this crushed ice. Place the condenser on top of the test tube and heater apparatus.
6. Set your Lab-Master's heater to 125°C in **Heater Feedback** mode. Your setup should look like the picture on the right.

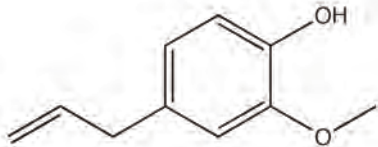
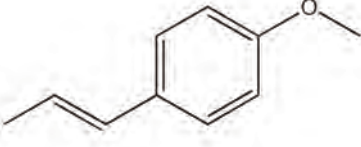
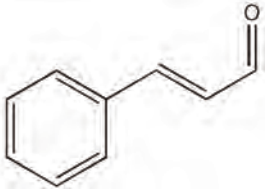
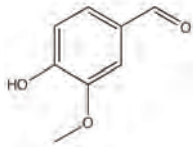
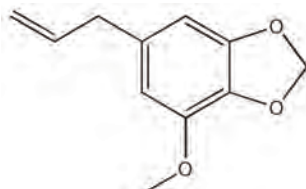
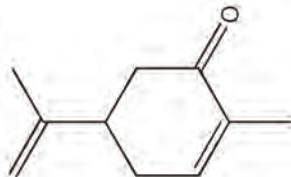
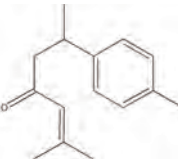


Part 2: Distilling your spice

1. Begin heating the spice–water mixture. Allow the mixture to come to a boil.
2. Notice how the spice mixture boils and how steam rises out of the test tube and is condensed in the condenser. This condensed steam is your distillate.
3. Continue distilling this mixture for 30 minutes. While distilling, watch the setup carefully. You will have to do two things to keep the mixture distilling properly:
 - i. If the water level drops to 1/2 of its original level, add 15 mL of hot water.
 - ii. If the ice in the condenser melts, remove the melted water with the pipette and then add more fresh crushed ice. Pour salt over this ice as before.

Part 3: Thinking about what you have learned

- The Lab-Master can heat to 150°C. Why did we set it to 125°C? Why did we add a boiling chip? What could a very high temperature do to our aromatic compounds?
- Why do we add salt to the ice?
- Study the main aromatic compounds (essential oils) found in the spices used in this investigation. What similarities do you notice about all these molecules? What can you say about many aromatic compounds based on this similarity?

Spice	Molecule	Spice	Molecule
			
Allspice	Eugenol	Anise	Anethole
			
Cinnamon	Cinnamaldehyde	Cumin	Cuminaldehyde
			
Vanilla	Vanillin	Nutmeg	Myristicin
			
Caraway	Carvone	Turmeric	Turmerone