

# Distillation & Water Purification

## OVERVIEW

Water is a precious resource, but not all water is potable and ready for consumption. Since water is a “the universal solvent,” it can dissolve many substances. Luckily, the physical and chemical properties of water and the solutes allow for purification if the water has been polluted. One method of water purification uses distillation and condensation.

In distillation, as the “dirty” water boils, steam evaporates. The steam then hits the underside of the cold Condenser top and condenses from the gaseous state back into a liquid. Once in liquid form it collects in the black bottom of the Condenser.

## MATERIALS

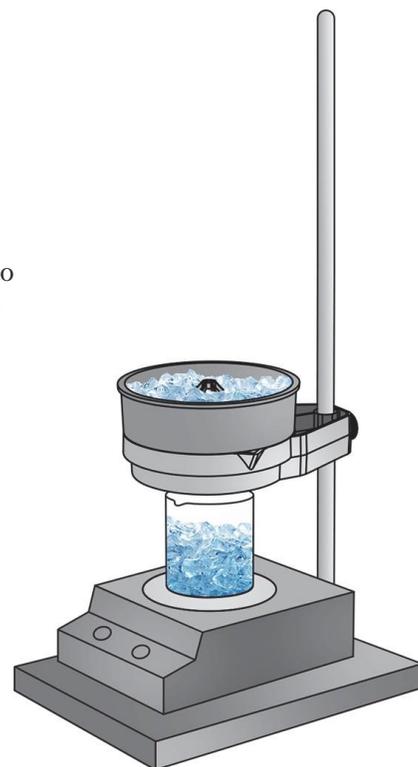
- Condenser
- Condenser rod
- Heater stirrer
- 100 – 150 mL beaker
- Ceramic fiber square AND cloth towel
- Ice
- 50 mL "polluted" water sample
- *Salt (optional)*

## SAFETY

Follow regular lab safety procedures; do not allow the sample to evaporate completely while heating. Keep a cloth towel out on the lab station to use as a hot mitt to hold or move hot things. Do not let the Condenser touch the hot plate.

## PROCEDURE

1. Assemble the condenser as shown. Make sure the temperature sensor opening is closed with a stopper. Add ice to the top. (*Optional - pour salt over the ice.*)
2. In a 100 mL or 150 mL beaker, add about 50 mL – 60 mL of the “dirty” water sample. Make observations of the color and odor of your sample and record them in the Data Table.
3. Place the beaker containing your sample on the hot plate. Turn on the hot plate to high heat and allow the distillation process to proceed. Make note of the time so that you can record the total time of your distillation.
4. If the ice in the condenser melts, remove the melted water with the pipette and then add more crushed ice. (*Optional - pour salt over the ice as before.*)
5. Stop distilling when either most of the water in the beaker has evaporated or when the bottom of the fill line under the spout of the condenser indicates approximately 10 mL, whichever comes first. Do not allow the sample to evaporate completely while heating
6. Allow the sample to cool and then pour the distilled sample (distillate) into a small graduated cylinder. Make observations of the color, odor, and volume of your sample and record these in the Data Table.
7. Wash and thoroughly rinse the condenser (both parts) and the beaker.



Name & Period \_\_\_\_\_

 **OBSERVATIONS** 

Table 1: Water quality before & after distillation and condensation

Total time of distillation:		
	Original Sample	Distillate
Color		
Odor		
Volume of pure water	-----	

 **CONCLUSIONS & THINKING FURTHER** 

1. Sketch two labelled diagrams below to illustrate the distillation and condensation process that you observed in this lab BEFORE and DURING/AFTER (2 drawings total).

Draw your whole set up AND draw what was happening at the molecular level. Use open circles to represent water molecules and use shaded circles to represent the contaminants in the water. (Hint: re-read the lab Overview.)

2. Was the process you just observed a physical change or a chemical change? Explain why.

3. Suppose you had to purify water at your home or on a camping trip. Using the experiment today as inspiration, design a method to distill water using only common materials you would find in your kitchen or that you might take on a camping trip. Sketch and label your setup, and describe your method in the space below.

SKETCH & LABEL your setup:

DESCRIBE how it works: