

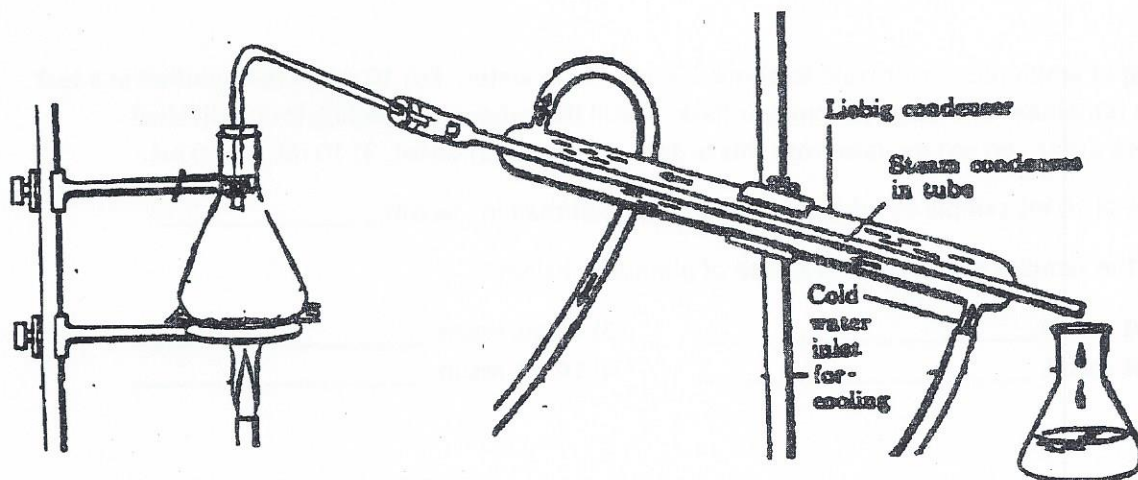
Distillation lab

Name _____

Introduction: Distillation is the process of vaporization of a liquid followed by the condensation of the vapors produced. Chemists often use distillation to separate solvents from solids in solutions or separating liquids from each other. They also use it to separate gases from solvents.

Objective: To purify water by the distillation process. You will work with two different types of "contaminated" water to fully understand the mechanisms behind distillation.

Materials needed: Liebig condenser, burner, buret clamps, Erlenmeyer flask, rubber stopper, rubber hoses, glass bends, copper (II) sulfate, solutions of: ammonium hydroxide, barium chloride, and phenolphthalein.



Procedure: GOGGLES AND APRONS MUST BE WORN. FLASK MUST BE HELD IN PLACE BY CLAMP.

PART 1

Set up the apparatus as illustrated above. Fill the Erlenmeyer flask about one-third full of tap water. Add one level spoon of copper (II) sulfate. Put about 5 mL of this solution into each of two test tubes **before** you start the distillation process.

Test tube #1: Add about 2 mL of ammonium hydroxide solution. Result _____

This result is due to the presence of copper and the formation of an insoluble product. Complete and balance the equation below, and using your solubility rules **identify the insoluble product by labeling it with (s) in the reaction.**



Test tube #2: Add about 2 mL of barium chloride solution. Result _____

This result is due to the presence of the sulfate ion. Complete and balance the equation below, and using your solubility rules **identify the insoluble product by labeling it with (s) in the reaction.**



Begin the distillation process by heating the copper (II) sulfate solution to a gentle boil. Keep it boiling slowly until you have collected about 10 mL of distillate. Divide the sample into two test tubes and perform the same tests as above.

Questions:

Does the distillate contain copper? _____

Does the distillate contain sulfate ions? _____

What was the purpose behind this distillation? What did you distill out: the contaminant or the water?

PART 2

Add one drop of ammonium hydroxide to about 150 mL of tap water. Put 10 mL of this solution in a test tube and the remainder in a clean Erlenmeyer flask. Distill this mixture, collecting four individual samples in this order - **do not deviate from this order!**: 1) 20 mL , 2) 10 mL, 3) 10 mL , 4) 10 mL.

Test the original 10 mL sample by adding 1 drop of phenolphthalein. Result _____

Test each of the samples collected with 1 drop of phenolphthalein.

1) 20 mL result _____

3) 10 mL result _____

2) 10 mL result _____

4) 10 mL result _____

Questions:

Explain the change in colors from the original sample through the 4 collected samples. What did you distill out: the contaminant or the water?

How did your results from part 2 differ from part 1 of this experiment?

Analysis:

- 1) Explain how water can be purified by distillation if small amounts of ammonium hydroxide are dissolved in it. Where is the contaminant and where is the pure water at the end of this particular procedure?
- 2) How can water contaminated with a solid, such as sea water, be purified using the technique of distillation? As with the question above, where is the contaminant and where is the pure water at the end of this particular procedure?