

Contaminated Water

Introduction:

Water is a very significant compound in our lives and in our world. Humans are composed of about 80% water and the earth is covered by 75% water. We use water to cook, clean, shower, wash dishes and do laundry. The water is the home of many animals, reptiles and fish. Therefore, the quality of this water is very important to chemists and environmentalists. If the water is contaminated it can pose a threat to humans and fish. Contamination can occur so a chemist needs to be ready to purify the water. A chemist will have to use their knowledge of mixtures and separation techniques to “clean up” this contaminated water.

Purpose:

The purpose of this experiment is to purify a contaminated water sample and determine the percent of recovery of purified water.

Equipment/Materials:

“Contaminated water”	filter paper
100 mL graduated cylinder	125 mL Erlenmeyer flask
2-150 mL beaker	decolorizing charcoal
funnel	sand
ring stand & ring	gravel
triangle	rubber tubing
pinch clamp	conductivity apparatus
clear plastic cup	paper clip
butane lighter	

Safety:

Wear an apron and goggles.

Procedures:

1. Obtain approximately 100 mL of contaminated water.
2. Measure and record the volume of the contaminated water precisely.
3. Observe the contaminated water for color, clarity, odor and presence of oil and/or solids.
4. Separate the oil (if present) from the water by pouring the water into a funnel that has rubber tubing attached to the stem of the funnel and a pinch clamp attached to the rubber tubing.
5. Allow the water to sit for about a minute in the funnel until the liquid layers separate.
6. Carefully, open the rubber tubing to release the lower layer into an empty beaker.
7. Drain the top layer into a different beaker.
8. Record the volume of the water layer and observe the water again for color, clarity, odor and presence of oil and/or solids. Also, test the conductivity of the water layer.
9. Save the water layer for steps 10-15.
10. Using the wire from a paper clip, heat the clip to poke a few small holes into the bottom of clear plastic cup.
11. Place a layer of wet gravel in the bottom of the cup to a depth of about 1 cm.
12. Place a 2 cm layer of sand on the top of the wet gravel layer.
13. Place another 1 cm of wet gravel on top of the sand layer.
14. Gently pour the water from step 9 into the cup catching the filtered water in a clean beaker as it drains.

15. Record the volume of the water and observe the water again for color, clarity, odor and presence of oil and/or solids. Also, test the conductivity of the water.
16. Save the filtered water for steps 17-21
17. Set up a filtration apparatus using a funnel and filter paper.
18. Place about 1 teaspoon of charcoal in an Erlenmeyer flask.
19. Add the water from step 16 to the flask and swirl the flask vigorously for about 10 seconds.
20. Pour the liquid into the funnel, repeating if necessary to remove all charcoal from the water sample. (Remember to use a clean piece of filter paper each time the sample is filtered.)
21. Record the volume of the water and observe the water again for color, clarity and presence of oil and/or solids. Also, test the conductivity of the water.
22. Record the color, clarity, odor and presences of oil and/or solids of distilled or pure water.

Data:

	Volume (mL)	Color	Clarity	Odor	Presence of Oil	Presence of Solids	Conductivity
Before Treatment							
After oil-water separation							
After sand filtration							
After charcoal adsorption and filtration							
Distilled water	XX						

Calculations:

1. Calculate the percent of the contaminated water that was purified.
2. Calculate the volume of water lost during the whole purification process.
3. Calculate the percent of the contaminated water that was lost.

Questions:

1. What separation techniques and/or physical properties were used to purify the contaminated water?
2. What was the purpose of using the layers of gravel in the sand filtration?
3. What was the purpose of mixing charcoal in the water sample before filtering?
4. Explain the results of the conductivity test of the purified water and how could this be corrected?
5. Would evaporation be effective in removing dissolved solids in an effort to purify a sample of water? Why or why not?
6. What are some of the ways that water becomes contaminated?
7. How could the purification methods used be improved to increase the percent of purified water recovered?
8. Analyze the cost factor of purifying large quantities of water using a similar process?
9. How does your local water facility purify its water during water treatment?