Clean and pure water is something many of us may take for granted. Simply turn on the faucet and water that’s fit to drink comes gushing out. Much of the water that reaches our faucets has been used for other purposes and has passed through various treatments to purify it for human consumption. You may have used some products to purify water while camping or hiking, such as a pump and filter or tablets that you add to the water. In this Activity, you will make your own water filtration column to filter impure water and examine its filtering ability and convenience.

Try This

You will need: clean, empty 2-liter plastic bottle, ruler, scissors or knife, cheesecloth, rubber band, sand, gravel, activated charcoal, soil and leaves, cooking oil, large spoon, steel wool, household vinegar (5%), disposable cup and plastic fork, measuring cups, two large clear, colorless containers, two sheets of white paper, tap water, ring stand and ring.

1. Place a steel wool pad in a disposable cup. Saturate the pad with household vinegar and leave exposed to the air. Stir or turn daily with a disposable plastic fork for 2–3 days until only rust is visible.

2. Measure 4 cups (960 mL) of tap water into a large clear, colorless container. Add these items to the water and then stir thoroughly with a large spoon:
   - 1/2 teaspoon (2.5 mL) of the rust prepared in step 1;
   - 1/2 teaspoon (2.5 mL) soil;
   - 2 or 3 small leaves;
   - 1 tablespoon (15 mL) household vinegar (5%);
   - 1 tablespoon (15 mL) cooking oil

3. Place a sheet of white paper under the container of water from step 2. Observe and record the properties of the water. How does it look? How does it smell? Using pH paper, measure and record its pH.

4. Prepare a water filtration column by cutting off the bottom 5 cm of a clean, empty 2-liter plastic bottle with a pair of scissors or a knife. Remove and discard the bottle label. Cut two 7-cm × 7-cm squares of cheesecloth. Layer the two squares one on top of the other. Use the layered squares to cover the mouth of the bottle where the cap is normally attached. Secure the cheesecloth over the mouth of the bottle with a rubber band. Invert the bottle (mouth pointing down) and mount it in a ring stand with an empty, large, clear, colorless container beneath it to collect filtered liquid.

5. Place 2 cups (480 mL) of activated charcoal into the water filtration column (this layer will fill the neck and shoulders of the bottle).

6. Place 2 cups (480 mL) of sand into the water filtration column as the next layer.

7. Place 2 cups (480 mL) of gravel into the water filtration column as the final layer.

8. Pour 3–4 cups (720–960 mL) of tap water onto the layer of gravel so the water passes through the column and cleans out any small particles of dirt and charcoal. Discard the water that drains into the collection container.

9. Measure and pour 3 cups (720 mL) of the unfiltered water from step 2 into the column, pouring it onto the layer of gravel. Observe the water as it passes through the filter. Place a sheet of white paper under the container of filtered water. Observe and record the properties of the filtered water. Using pH paper, measure and record its pH. Compare its appearance with the water that remains from step 2. Measure how much filtered water was collected. Is it the same volume that you placed into the filter?

Questions

1. Which impurities did the water filtration column remove? Which were left behind? How could you tell?
2. What are some of the drawbacks of this method? Suggest some ways that the filtration column could be improved.
3. Would this type of filter remove harmful bacteria from water? What processes remove harmful bacteria from water?
4. How many liters of water do you think could be purified with this column? Explain your answer. How could you test the column to find out?
5. Some participants in a camping group are taught to dig a hole in the ground next to a stream if they are in the wilderness without a means to filter water. How would this method work?


Emergency disinfection of drinking water. [http://www.epa.gov/ogwdw000/faq/emerg.html](http://www.epa.gov/ogwdw000/faq/emerg.html)

Water treatment cycle. [http://www.epa.gov/OGWDW/kids/treat.html](http://www.epa.gov/OGWDW/kids/treat.html)

What is activated charcoal and why is it used in filters? [http://www.howstuffworks.com/question209.htm](http://www.howstuffworks.com/question209.htm)

Home drinking water treatment systems. [http://www.bae.ncsu.edu/programs/extension/publicat/sequem/be419.htm](http://www.bae.ncsu.edu/programs/extension/publicat/sequem/be419.htm)