

CLEANING WATER

INTRODUCTION

When rain falls on the ground, some will evaporate. Some soaks into the soil. Some runs off directly into streams. The water that soaks into the soil will often find its way into streams. Soil and rocks can help clean water before it reaches streams. Sands and gravels help clean water. In this activity, you will build and test a water cleaner.

OBJECTIVES - - Upon completion of this activity, the student should be able to . . .

1. Describe soils, sands and gravels can clean water
2. Build and test a device to clean water

STATE STANDARDS ADDRESSED

- 11.B.2c -- Build a prototype of the design using available tools and materials
- 11.B.2d -- Test the prototype using suitable instruments, techniques and quantitative measurements
- 11.B.3d to record data
- 11.B.2e -- Assess test results and the effectiveness of the design using given criteria and noting
- 11.B.3e possible sources of error.
- 13.B.3f -- Using available technology, report the relative success of the design based on the test results and criteria

MATERIALS NEEDED

- | | |
|--|---|
| 1 screen (to fit over one end of can) | 1 roll of water-proof tape |
| 1 beaker (50 mL) | coarse sand (about 100 mL) |
| 1 catch pan (500 mL or larger) | fine sand (clean, about 200 mL) |
| dirty or muddy water (550 mL) | small pebbles (pea gravel, 100 mL) |
| charcoal (ground or powdered, 100 mL)* | 1 canister (fruit/vegetable can with both ends removed, or section of soda bottle with ends removed. The clear soda bottle will help students see what is happening inside the canister.) |
| 1 stir stick | |
| 1 ring stand | |
| 1 ring clamp (4" or 6" to match canister size) | |
| alum (5 gm) | |

* **SAFETY NOTE:** If you use ground or powdered charcoal, avoid inhaling it. Have students wear dust masks whenever they handle it. If the teacher prepares charcoal by breaking larger chunks into small pieces, place the charcoal in a plastic sealable bag and insert that into a cloth bag – then crush the charcoal using a roller or hammer. Use appropriate caution. Not recommended is fine activated charcoal. At all times, both students and teacher should wear eye protection.

PROCEDURES

BUILDING THE WATER FILTER

- A. Be sure the sand is clean before using it in the filter you make.
- B. Take the filter canister and attach the screen to one end. It can be attached using water-proof tape.
- C. Place small pebbles in the can so they rest on top of the screen. The layer of pebbles should make a layer about 1-2 cm deep (about 100 mL worth of pebbles).
- D. Pour clean, coarse sand on top of the pebbles. Make the layer of coarse sand about 1-2 cm deep.
- E. Add a layer of fine sand on top of the coarse sand. Make the layer of fine sand about 1-2 cm deep.
- F. Next, add a layer of ground up charcoal on top of the fine sand. Make the charcoal layer about 1-2 cm deep. Remember the safety note above!

- G. Finally, add a layer of fine sand on top of the charcoal layer. This layer of sand should be about 1-2 cm deep.
- H. When you have finished adding all the layers, you are done making your water filter. It should look something like the one shown in Figure 1 below.

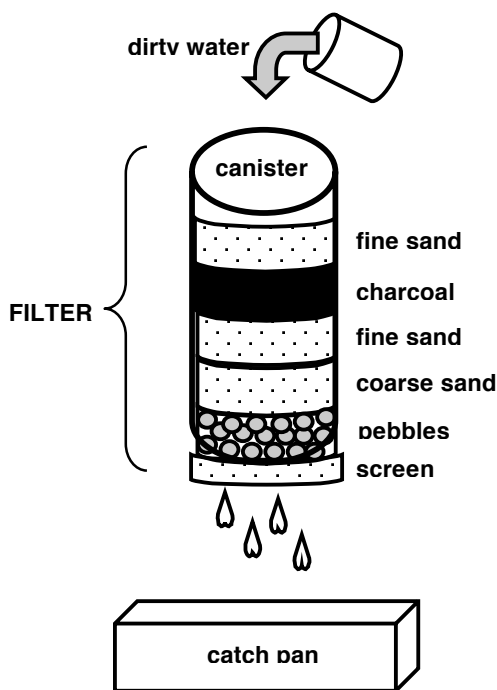


Figure 1

USING THE WATER FILTER

- I. Attach the ring clamp to the ring stand. (You can substitute something else for the stand if needed, but the bottom must be open to allow water to drip through it.) Place the filter on top of the ring clamp.
- J. Place the catch can beneath the filter.
- K. Take a sample of dirty or muddy water (about 500 mL). Record some observations about the water. Be sure to observe the darkness of the water and its clarity. Write your observations in the data table below:

Data Table

	MY OBSERVATIONS
What I observed about the dirty water:	
What I observed about water filtered once:	
What I observed about water filtered twice:	
What I observed about water filtered more times:	
What I observed about water with alum in it:	

- L. Pour the dirty water slowly into the top of the filter.
- M. Allow the water to soak through the layers of the filter. It should eventually begin dripping out the bottom of the filter and into the catch can.
- N. CAUTION: Do not drink any of the water that comes out of the filter!
- O. Compare the water that is in the catch pan with the dirty water you started with. Write your observations in the data table.
- P. Try re-pouring the water into the filter a second time. Compare the quality of the water this time to its quality from the first pouring. Do it again a third time if you like. Be sure to record your observations each time. Record them in the data table.

A FINAL CLEANING

- Q. In water treatment facilities, water is often in need of more cleaning. Besides filtering, this can include the addition of chemicals. So, in this last procedure, add 5 grams of alum to the water in the catch pan. Gently stir the alum into the water. Then let the water sit undisturbed. Observe what happens, and record your observations in the data table.

QUESTIONS

1. Compare the muddiness of the water before it was poured into the filter and after it came out of the filter. Describe any change you observed in the water.
2. What role do you think the charcoal had in cleaning the water?
3. Would the filter worked as well if you used clay soil instead of sand? Explain why you think so.
4. Where did the extra dirt go that was in the original muddy water?
5. What happened to the water when you added the alum to it?
6. In what way was Procedure Q different from Procedures L through P?
7. In the ground, we find pebbles and sands in layers called aquifers. Explain how the pebbles and sands might help improve the quality of the water in an aquifer.
8. Do you think it is important having clean aquifers around rivers and streams? Explain your answer.