



Filter In A Bottle

BACKGROUND:

Most untreated, unfiltered surface water contains bacteria and other organisms that can cause disease. Purification is necessary for safe, healthy drinking water. This requires the use of a filter and some chemicals. We will not use chemicals in this experiment because we do not have that expertise to add the correct amount needed. Two of the chemicals we use at the filtration plant are chlorine and fluoride. Aquarion uses chlorine at the end of the filtering process to kill off bacteria that might still remain in the water. Fluoride is added for the protection of teeth, as recommended by dentists.

KEY VOCABULARY:

Filtration - The act or process of filtering; the mechanical separation of a liquid from the undissolved particles floating in it. (Undissolved - retaining a solid form; "undissolved sugar in the bottom of the cup")

Filter - A porous material through which a liquid or gas is passed in order to separate the fluid from suspended particulate matter. A device containing such a material, especially one used to extract impurities from air or water.

Organism - An individual form of life, such as a plant, animal, bacterium, protist, or fungus; a body made up of organs, organelles, or other parts that work together to carry on the various processes of life.

Disinfect - To cleanse so as to destroy or prevent the growth of disease-carrying microorganisms

Conservation - The protection, preservation, management, or restoration of wildlife and of natural resources such as forests, soil, and water

Media - Something, such as an intermediate course of action, that occupies a position or represents a condition midway between extremes. An intervening substance through which something else is transmitted or carried on.

MATERIALS:

A 2-liter plastic soda bottle with the bottom cut off (see diagram below)

Screening

Rubber bands

Container for dirty water



AQUARION

Water Company

FILTERING WATER

**** Charcoal (aquarium stock is best)-this can make the water take on a gray look – Only use it if you a significant amount of time to refilter the water. (1 Tablespoon)
Sand (3/4 to 1 cup)**

Pebbles (gravel used in fish tanks) (3/4 to 1 cup)

Plastic Bags to cover work area

Materials to make the water dirty (twigs, leaves, paper, salt, soil)

Main Focus:

You will demonstrate how a water filter works, and the importance of filtering and disinfecting drinking water.

- ◆ Discuss the time it takes to get the water cleaned.
- ◆ Discuss the amount of water you started out with compared to the amount of water you have after filtering.
- ◆ Discuss the additional amount of energy needed to filter water in a filtration plant if the water is extremely polluted.
- ◆ Discuss how unchecked, water that has been polluted may not be able to be cleaned completely.
- ◆ Looking at the time it takes to clean water, how we must conserve as well as not pollute in order to ensure enough safe, clean drinking water for the future.

PROCEDURE:

1. Have a container with clear tap water ready.
2. Discuss how things get into the water from nature and man. (Examples: leaves, soil from erosion, pieces of animals, road salts) As the class discusses various items, add some of the following to the tap water, soil, twigs, feathers, small rocks, salt, shredded paper (be creative but do not add food coloring).
3. Shake the water with the debris until you have it well mixed together.

Ask: What is the problem with this water? (It is polluted)

What can we do about it? (Clean it)

How can we clean it? (Filtration)



AQUARION

Water Company

FILTERING WATER

4. Discuss what a filter is, what is media and how the process works at a filtration plant.
(If you have the video Wonders of Water at your school – you may want to show it prior to this lesson. All middle schools were sent a video free of charge. If you need a free copy for your school contact – Kathleen D’Amico at kdamico@aquarionwater.com)
5. Explain to the class you will now create a filter. Cut the bottle as depicted in the diagram below. Retain the top and bottom portions of the 2-liter bottle. (This can be done ahead of time.)
6. Remove cap from bottle and put nylon screen over the outside of the opening. Fasten it with elastic bands.
7. Discuss the media you are about to use. (Remember you are assembling it in the opposite direction then the unclean water will filter through it.)
8. Pour in a layer with charcoal. (This media is used to take out some small particles, reduce odor, and taste issues).
9. Pour in a layer of sand on top of the charcoal. (This media is finer than the charcoal and is used to trap the very fine particles in the unclean water.)
10. Pour a layer of gravel. (This media will trap between the spaces the bigger particles.)

****When the dirty water pours through the filter you will see each of these layers change. The space between the gravel will become filled with larger particles in the dirty water. The sand will get wet (darker color will be indicator of water being absorbed) and soil will be trapped between the sand. These are the small particles from the unclean water. The charcoal may also have items trapped and will appear darker as the water travels through it. The charcoal is really to reduce odor issues.**
11. Make sure you place the filter over a basin (use the bottom of the bottle or another container/cup) so the filtered water will be caught as it is drained through the various media.
12. Take a full glass of the dirty mixture – be sure a little of everything gets into the glass. If necessary scoop some dirt containing twigs, grass, etc and actually add it to the cup. Be sure to show everyone the dirty water. **DO NOT DRINK THIS WATER. IT HAS NOT BEEN DISINFECTED FOR DRINKING!**

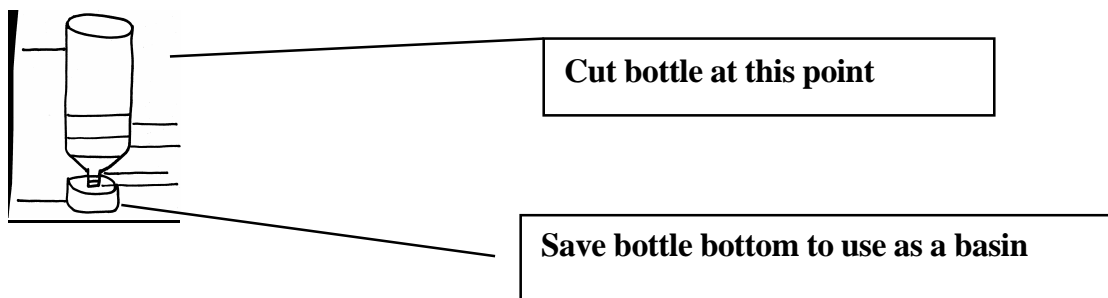


FILTERING WATER

13. Observe the water as it passes through the filtering process. Is the water coming through the filter media cleaner than when it entered? If so, why? How much came out? Is it safe to drink? Why not?

Extension Discussion:

1. The possible uses for non-potable water.
2. Human requirements for safe, purified water (drinking, cooking, bathing, swimming, brushing teeth, food preparation).
3. Discuss reasons for water conservation even though we can filter water.
4. **WHY THIS WATER SHOULD NOT BE CONSUMED!**





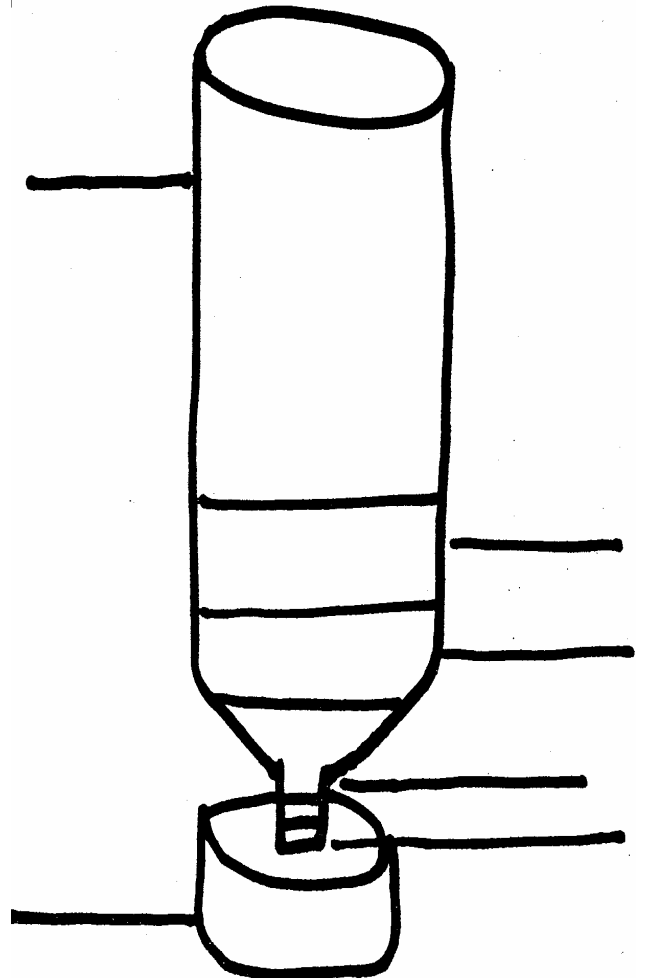
STUDENT NAME: _____

PROBLEM:

HYPOTHESIS:

PROCEDURE:

OBSERVATIONS:



CONCLUSION