

Build Your Own Water Filter

AT HOME SCIENCE EXPERIMENT

How do you clean dirty water? One way water is cleaned, in nature and by people, is through filtration. Filtration is the process in which solid particles in a liquid or gas are removed by the use of a filter material. The filter allows the fluid to pass through but retains the solid particles.

In this experiment, you will build your own filter to separate different size pollutants from water.

You Will Need

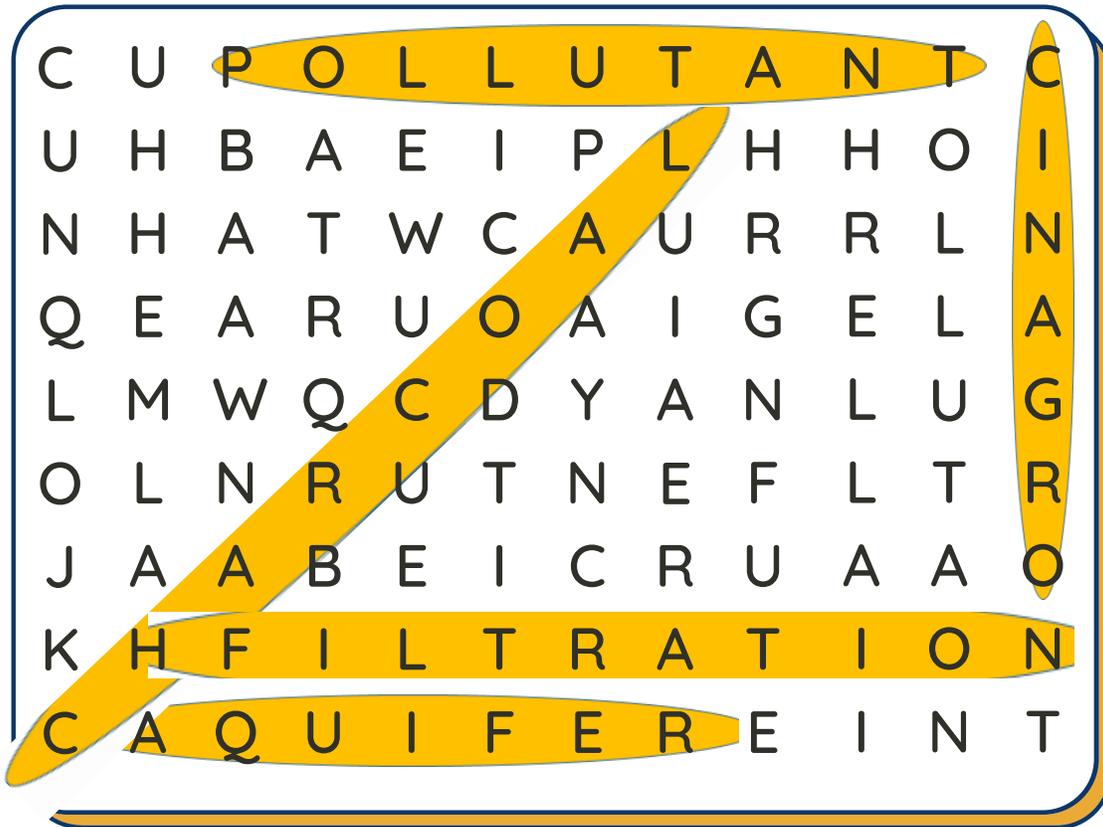
- Clean, clear plastic water or soda bottle
- Utility knife and/or scissors (and an adult)
- Rubber band
- Cotton ball and coffee filter (paper towels or napkins work too)
- Sand (aquarium sand works great)
- Pebbles or gravel, (aquarium gravel works great)
- Activated charcoal/carbon (can be found in the fish section of the pet store)
- Dirty water
 - Small pieces of plastic or paper
 - Glitter (black pepper, oregano, or similar will work too)
 - Food coloring (gelatin powder or fruit punch powder will work too)
 - 2 cups of tap water
- Clear cup or container and spoon to mix dirty water



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VOCABULARY WORD SEARCH



Aquifer – An aquifer is a collection of wet, underground rocks that allows water to pass through it slowly. A well can be used to pump water from an aquifer so people can use the water for drinking, watering crops, and other purposes.

Filtration– Filtration is the process in which solid particles in a liquid or gas are removed by the use of a filter material.

Organic– Organic matter (or organic material) is matter that has come from a recently living organism. It is capable of decay, or is the product of decay; or is composed of organic compounds.

Charcoal– Activated charcoal, or activated carbon, readily adsorbs a wide range of small, dissolved or suspended solids in water. If you use a water filter pitcher or have a water filter on your faucet, fridge, or fish tank, it likely has activated charcoal in it.

Pollutant– A substance that makes something (like air or water) impure and often unsafe.



Build Your Own Water Filter

Before the experiment

Think about *how* and *why* water gets filtered. Our drinking water comes from natural water sources like lakes, rivers, and aquifers.

Where does YOUR drinking water come from?

This question is specific to your home. Find out where your tap water comes from. Do you have a well? Does it come from a nearby lake? Is there a water treatment facility that cleans the water before it comes to your tap?

What kind of materials need to be filtered or removed from your water before it reaches your sink? Think about what might be in lakes and rivers that you wouldn't want in your drinking water.

Natural water may have things like rocks, dirt, organic matter like leaves and animal waste, dissolved nutrients, pollution like human created trash, chemicals, etc.

In this experiment, the filter we build has several different layers of material. When treating our drinking water and wastewater, treatment facilities filter out larger solids first and smaller solids later. If they are not removed, large solids can break down and become smaller, more difficult to remove, particles. To remove larger solids first, would you filter your dirty water through rocks or sand first? Why?

You would filter the water through rocks first. Since the rocks are larger than the sand particles, the spaces between the rocks are also larger, allowing medium and small sized pollutants to pass through but filtering out large sized pollutants.

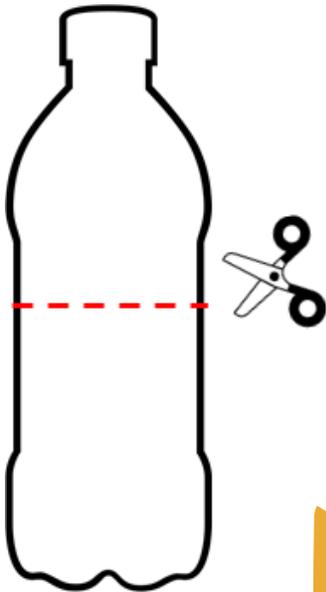
Name 3 examples of filtration that you can find in your home.

- 1) Coffee filter, water filter on faucet or fridge, strainer for pasta and vegetables,
- 2) sink drain cover, vacuum cleaner filter, air filter, swimming pool filter, fish tank
- 3) water filter, a slotted spoon

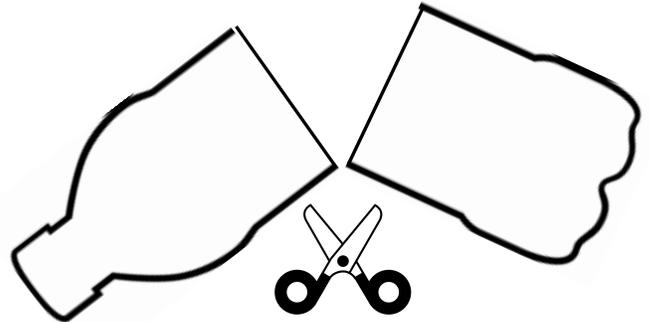


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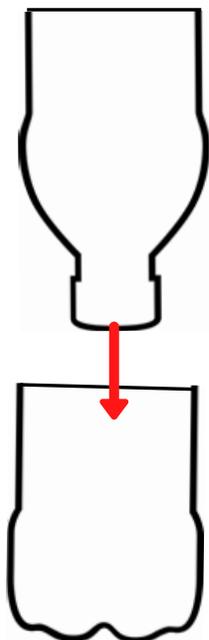
1



2



3



Step 1. Have an adult help you cut your bottle in half. Invert the top half of the bottle and place it in the bottom half. We will use the top half of the bottle to create the filter and the bottom half to catch the filtered water.

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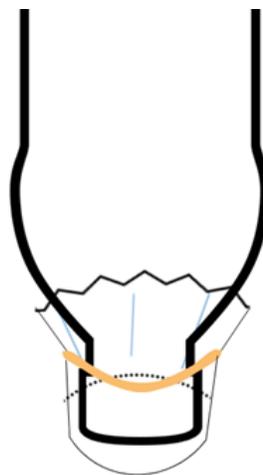
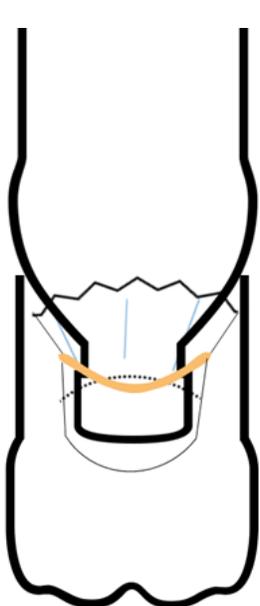
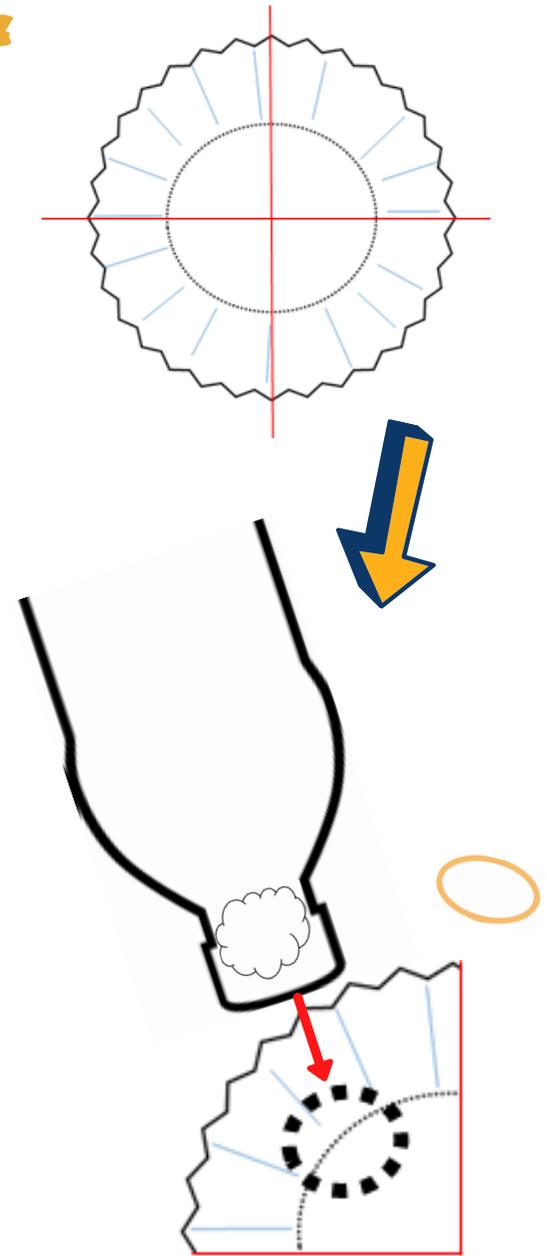


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Step 2.

A) Remove the cap from your bottle and place a cotton ball inside.

B) Fold a coffee filter in half and then in half again. Cover the mouth of the bottle with the folded filter and secure it with a rubber band. Set the top part back inside of the bottom part of the bottle.



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Step 3.

Build your filter! Sketch out your layers here. What order will you put your materials if you want to filter solids from largest to smallest?

Material

Pebbles

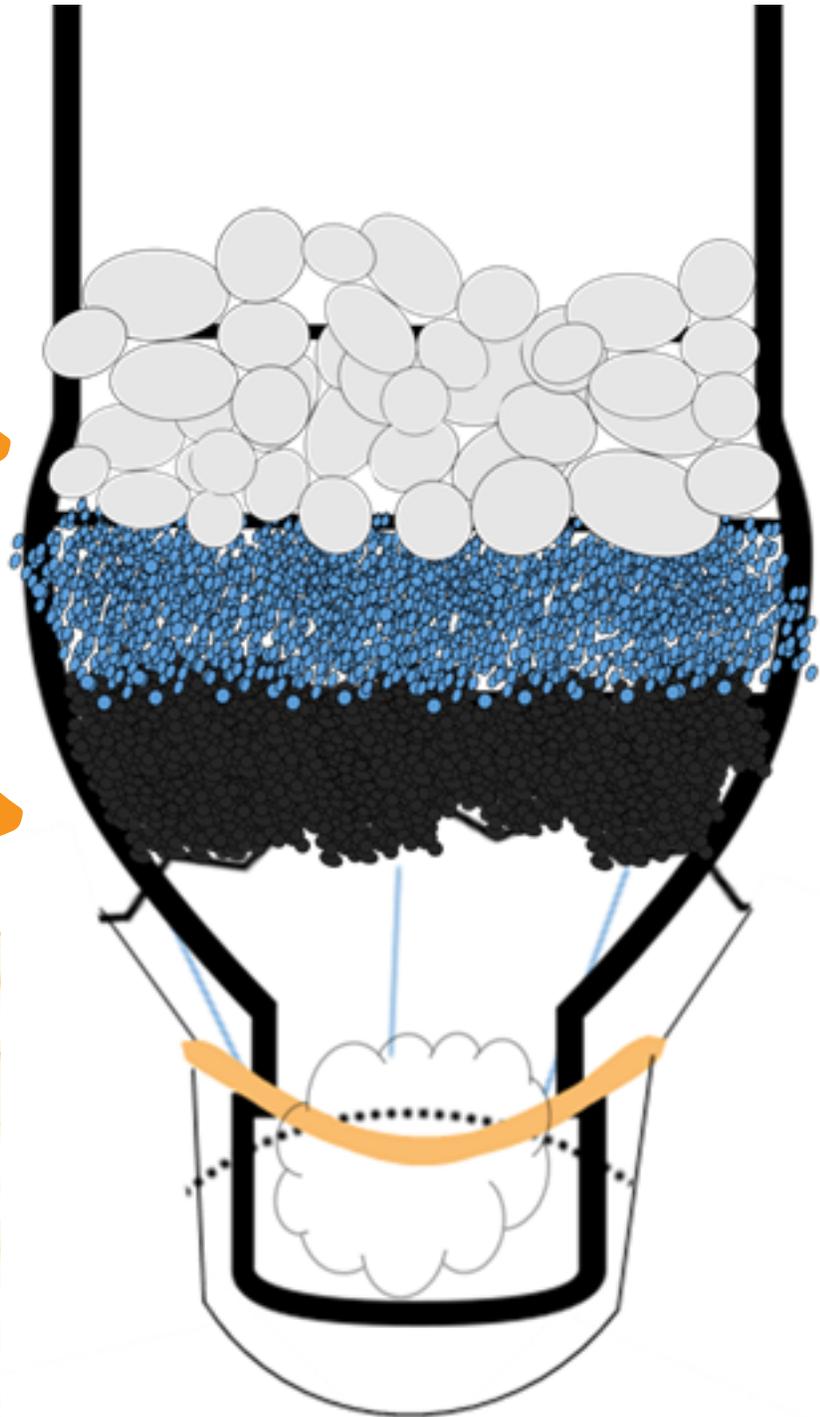
Layer 1

Sand

Layer 2

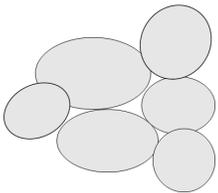
Activated Carbon

Layer 3

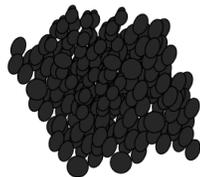


Materials

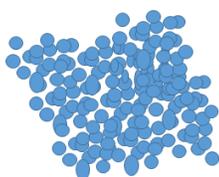
Pebbles



Activated Carbon



Sand



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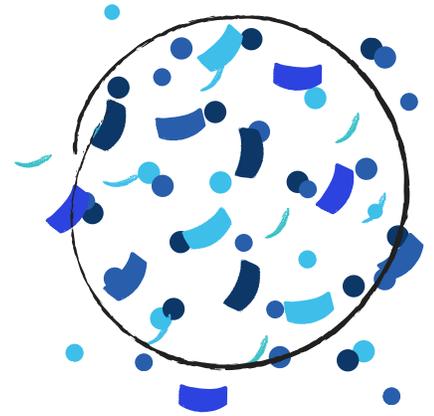
Step 4. Create your dirty water

Add two cups of tap water to a clear cup or container. To the water, add pollutants that are large, medium and small size particles. Mix well with a spoon.

Large Pollutants

Add torn pieces of paper, confetti, or cut up bits of plastic to represent larger matter that you may find in water. Which of the following large size pollutants may need to be filtered from water?

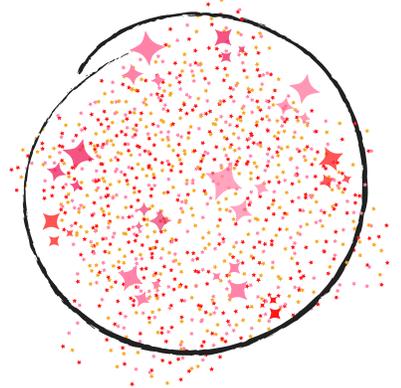
- A. Leaves
- B. Rocks and pebbles
- C. Man-made pollution (trash)
- D. All of the above



Medium Pollutants

Add glitter, pepper or another spice to represent medium size pollutants. While these look very small, even smaller pollutants can be found in water! Many medium and small sized pollutants found in water are made of organic matter, give 3 examples of organic matter that might be found in polluted water.

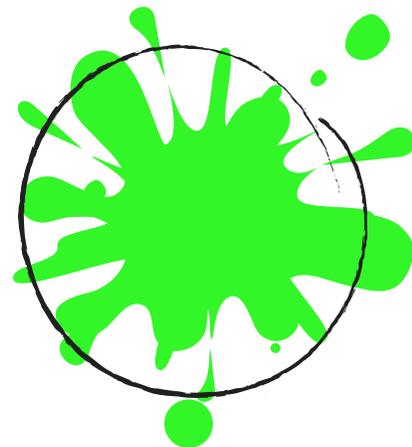
- 1) Leaves, sticks, plant material,
- 2) Bacteria, fungus, algae,
- 3) Animal waste, insects



Small Pollutants

Add food coloring, gelatin powder, sugar or fruit punch powder to represent small size pollutants. Many small pollutants are so small they can't be seen by the naked eye! Which of the following would *not* be considered a small size pollutant?

- A. Dissolved nutrients (like salts)
- B. Chemicals
- C. Micro-organisms (like bacteria)
- D. Gummy worms



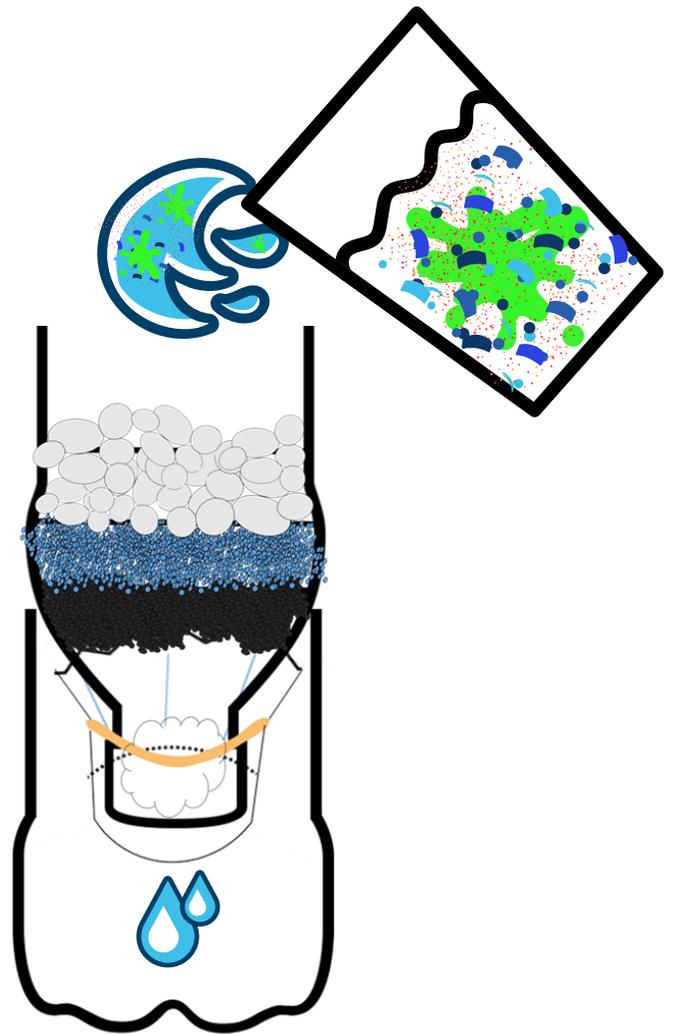
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Before you filter your "dirty" water, predict which "pollutant" will be most difficult to remove from the water. Why do you think so?

Small and dissolved pollutants will be difficult to filter due to their size, they are able to pass through many types of filter material.

Step 5.

Filter your water! Mix well and pour HALF of your "dirty water" into your filter. Set the other half to the side to compare to your filtered water.

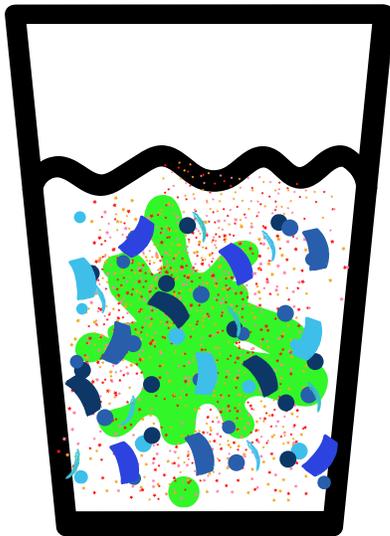


Warning! The water you filtered is NOT safe to drink! A house plant might enjoy it though!

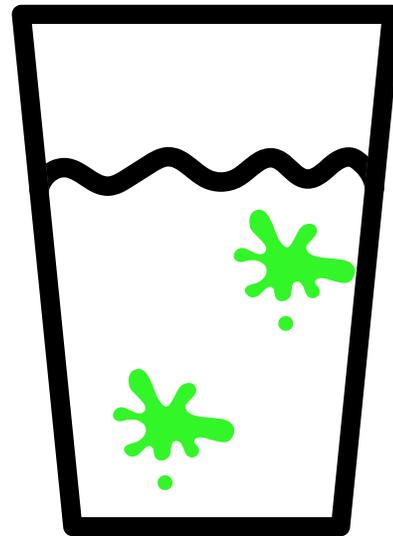
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How does your filtered water look compared to the water you didn't filter? Sketch and describe your water before and after filtration.

Before Filtration



After Filtration



Many large and medium pollutants. Small pollutants have made water a different color, cloudy

Large and medium pollutants have been filtered out. Only some of the small pollutants have been removed.

Was your prediction correct? Which pollutant was the most difficult to filter?

Small and dissolved pollutants were only partially filtered out of the water.

What is one way you could improve your filter?

Add another filter material for small particles. More activated carbon or another material.

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After the experiment

Try designing your own water filter using any combination and quantity of filtering materials you think would work best!

- Paper towels
- Cheesecloth
- Sponge
- Rocks
- Dried beans
- Uncooked pasta
- Pebbles
- Sand
- Activated charcoal
- Cotton balls
- Socks
- Mesh or screen
- Clay

