

# Make your own water filter

## What will I learn?

- Filtration
- Adsorption chemistry

## What do I need?

- A 2 litre plastic pop bottle
- A coffee filter
- An elastic band
- A pair of scissors
- Various sizes of rocks and sand
- Burned wood

## What do I do if I get stuck?

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## If I don't have those items?

Read through the entire project and see where you can adapt it.

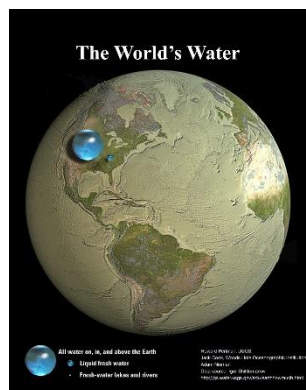
**SAFETY FIRST!!!! DON'T DRINK THE WATER YOU FILTER. WHY NOT?**

(New science terms are coloured **RED** and are underlined. The glossary for these words is on the last page.)

### Why filter water?

*Contaminated water leads to millions of deaths per year. In sub Saharan Africa, only 36 percent of people have access to adequate sanitation. If you consider that the average person in Canada requires 1 litre of clean drinking water a day, ask yourself what would be required in hotter countries. Many people round the world do not have potable water piped into their homes; some must walk many kilometres to carry unclean water to their home.*

**\*\*Extra Reading: [Invisible Water Crisis](#)\*\***



*This picture shows how much water is on earth. Total. What you probably can't see is the tiny bubble to the right of the water droplet. That's how much potable water there is.*

*The volume of the largest sphere, representing all water on, in, and above the Earth, would be about 1,386,000,000 cubic kilometers.*

*The smaller sphere represents Earth's liquid fresh water in groundwater, swamp water, rivers, and lakes. The volume of this sphere would be about 10,633,450 km<sup>3</sup>. It is fresh water, which we all need every day, but much of it is deep in the ground, unavailable to humans.*

*The tiniest bubble represents fresh water in all the lakes and rivers on the planet. The volume of this sphere is about 93,113 km<sup>3</sup>. And over 7 billion people must share it.*

*Water can contain dirt, minerals, chemicals and other impurities that make it smell and taste bad. ... Filtering water can help purify water, removing these impurities and making it safe to drink, while often improving its taste.*

**Instructions:**

1. Watch the following short videos  
[The Invisible Water Crisis](#)
2. Go to [Water Worldometer](#)

Scroll down the page a little, under the graph, till you reach the table of water use per country.

QUESTION 1: Why is it unrealistic to compare the yearly water used per country?

QUESTION 2: Find the country using the LEAST water per capita. Why might this be the case?

QUESTION 3: Look at Turkmenistan. Can you think of why they might be using so much water per capita? Click on Turkmenistan to take you to its info page for a graph that will help you.

3. Cut off the bottom of the plastic soda bottle using scissors or a knife.
4. Place the open end of the bottle upside down into bottom of the bottle.
5. Place cotton balls or a cloth inside the bottle as the first layer. The first layer should be about one to two inches thick.
6. Fasten a coffee filter over the small opening of the soda bottle with an elastic band.
7. Add an inch of crushed charcoal (burned wood or coal) as the second layer on top of the cotton layer.
8. Over the charcoal, add about two inches of gravel or small stones as the third layer.

9. Add about three to four inches of clean sand on top of the gravel.
10. Add gravel to the bottle as the final layer. Leave about a half inch of space from the top of the upside down bottle.
11. Add dirt to a glass of water to create muddy water. Alternatively, get creative and add other things like glitter, beads, cooking oil or other materials to make dirty water.
12. Pour the glass of muddy water on top of the homemade water filter and watch the water drip clean into the glass below.



Many of the materials used to make a homemade water filter can be found around the house and recycled for this project. If gravel is not available, small pebbles or stones can be used. If a plastic soda bottle cannot be recycled, a large funnel can also be used instead.

### How the Filter Works

Each layer of the homemade water filter has a purpose. Gravel or small stones are used to filter out large sediments, like leaves or insects, whereas sand is used to remove fine impurities. Finally, the activated charcoal removes contaminants and impurities through chemical absorption.



### How charcoal removes impurities...The SCIENCE!

**EXTRA**

Test different materials to determine which materials produce the cleanest water.

Instead of using sand and gravel, try rice and sponges.

Build several water filters using different materials to determine which materials filter "dirty" water into clean water.

Does it matter which way up you pack the filter? Eg large rocks first?

**What are the physical properties of a material that would make it useful as a filter?**

- Physical properties include, but are not limited to: color, size, shape, texture, density, flexibility, conductivity, magnetism, opacity, mass, odor, melting point, boiling point, solubility, polarity, and state.
- Reflect for a moment on what you have learned about physical properties.
- Which of the physical properties are important to consider?

13. Answer questions 1,2 and 3. Take photos of the filters you made. Try to stand them in front of a card that is labelled with what you filled your water filters with. Email everything to me at [khorn@sd74.bc.ca](mailto:khorn@sd74.bc.ca)

EXTENSION WORK

Closer to home

Canada has up to 20% of the world's fresh water supply (depending on which website you look at) and less than 1% of the world's population. This would suggest that we all have access to potable water right?

Research the water situation in Canada. Write a short 250 word piece on the answer to the question above.

### Glossary

|            |  |
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| Sanitation | conditions relating to public health, especially the provision of clean drinking water and adequate sewage disposal                                    |
| Potable    | safe to drink; drinkable   |
| Minerals   | a solid <u>inorganic</u> substance of natural occurrence   |
| Impurities | a constituent which impairs the purity of something  |
| Purify     | remove contaminants from   |
| Per capita | for each person  |
| Inorganic  | not consisting of or deriving from living matter<br>relating to or denoting compounds which are not organic (broadly, compounds not containing carbon) |