



Name:

Class:

STEM Project

Chapter 2: Mixtures

Pages 29–46

The solution is the problem ...

Hundreds of millions of people around the world do not have access to clean drinking water, a problem that can have serious health consequences. Engineers are continually seeking new and efficient ways to separate contaminants from water; to create devices that can turn a dirty water solution into clean drinking water.

In this task, you will create a water filter with a selection of filtering materials to separate various contaminants from a dirty water solution. You will then compare your water filters to see if conclusions can be drawn about which filtering materials are effective for which contaminants.

Experiment

Aim: To observe how effective different filtering materials are.

Materials:

- bucket
- water
- 2 large beakers
- 2 L plastic bottle with cap
- Stanley knife
- hammer and nail
- digital camera
- a collection of filter materials, such as: coffee filter paper, crushed activated charcoal, sand, gravel, sponges, cotton balls, pantyhose, mesh or cheesecloth
- dirty water solution contaminants, such as: food colouring (chemical contaminant), soil/dirt (top soil contaminant), cooking oil (motor oil contaminant), small pieces of scrap paper (rubbish contaminant)

Method:

- 1 As a class, create a large bucket of dirty water by combining the dirty water ingredients together.
- 2 In small groups, collect a beaker of at least 200 mL of the dirty water solution making sure you include a little bit of all the contaminants. Take a photo of this dirty water solution for comparison.
- 3 Carefully cut off the bottom of a 2 L bottle using the Stanley knife. Your teacher may do this for you.



Name:

Class:

- 4 Remove the bottle cap from your bottle and create a small hole in it using the hammer and nail. Replace the bottle cap on the bottle.
- 5 Turn your bottle upside down and rest it inside the other beaker.
- 6 Select three filtering materials from the options provided and place them in layers in the bottle. Note down in the Data and results page which materials you chose and in which order they were layered.
- 7 **Slowly** fill the bottle with your 200 mL sample of dirty water solution.
- 8 Once the dirty water has filtered through your bottle, take a photo of the resulting water. Make some observations about the quality of this water (how much of the contaminants have been removed) in the Data and results section.
- 9 Repeat this process two more times, filtering the same water again. Photograph the resulting water solution each time and note down your observations.



Data and results

Filter materials used (in layer order):

Paste your original dirty water sample photo here:



Name:

Class:

	Filtered water photo	Observations of filtered water How clean is it? What has been filtered out? What, and how much, still remains?
After first filtration		
After second filtration		
After third filtration		

Discussion and reflection

Join up with another group and compare your filtration results. Make sure the group you compare with used different filtration materials from yours. Note down any patterns you see in which of the materials filtered which of the contaminants.

Swap groups and compare your filtration results again. Again, note down any patterns you see in which of the materials filtered which of the contaminants.



Name:

Class:

Discuss your results as a class. Based on your results, can you draw any conclusions together about which materials filtered which contaminants?

Water filters do not remove viruses. Why do you think this is? How could you make water that is contaminated with viruses safe to drink? Do some research to find out!

Extension research activity – Werribee Water Treatment Plant

At Werribee in Victoria, there is a large water treatment plant that turns water from sinks, drains and toilets into clean water that gets pumped into Port Phillip Bay or used for the irrigation of crops.

Your task is to find out how the Werribee water treatment facility works. Use the following questions to help guide your research:

- What are the processes the water goes through from when it enters the plant to when it leaves the plant?
- How long do these processes take?
- How clean is the water at the end of these processes?
- What similarities and differences exist to your plastic-bottle filtration system?