


Your team is building an off-the-grid home in the American Southwest, so all resources (water and electricity) will come from the environment. These homes are specially designed to collect and reuse water. You will need to create a process that filters enough water to reuse in the toilet.

 **Did You Know?**
Sources of drinking water on Earth include rain, groundwater, lakes, rivers, and springs. Off-the-grid homes—even the ones in the driest deserts—don't have to be as efficient as NASA space missions because they can get more water from these sources.



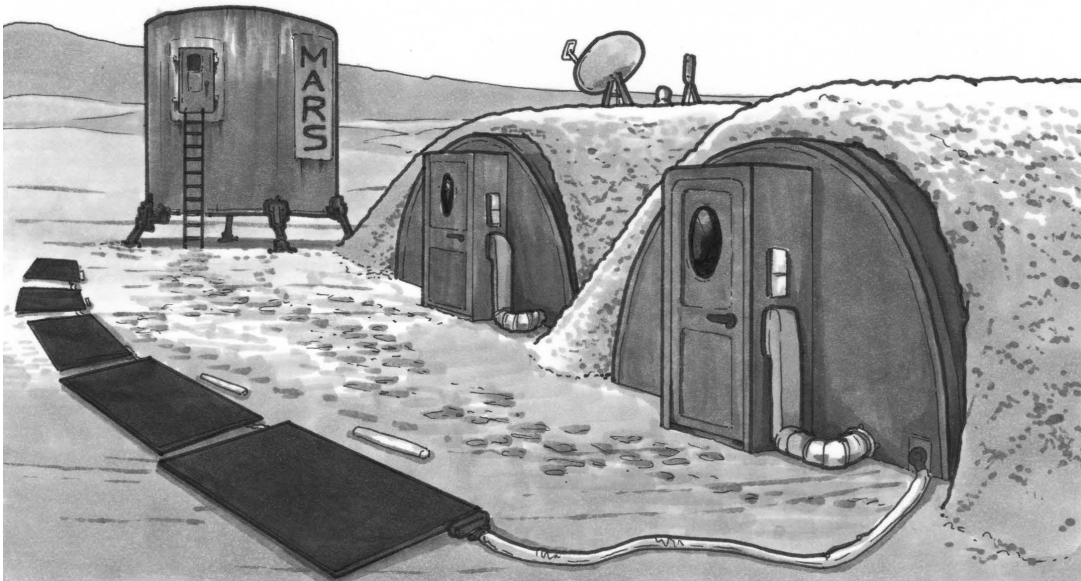
Criteria	Constraints
Must filter water from each source: <ul style="list-style-type: none"> • bathroom sink • shower 	You can use two Filter Bases.
Must produce: <ul style="list-style-type: none"> • greywater for use in toilet 	

Your team is designing a process for reusing water on Mars. This process needs to reuse as much water as possible and still produce enough water for the plants in the greenhouse.



Did You Know?

Most of the surface of Mars is almost completely dry. There are reservoirs of ice in the north and south polar regions and under the surface near the poles.



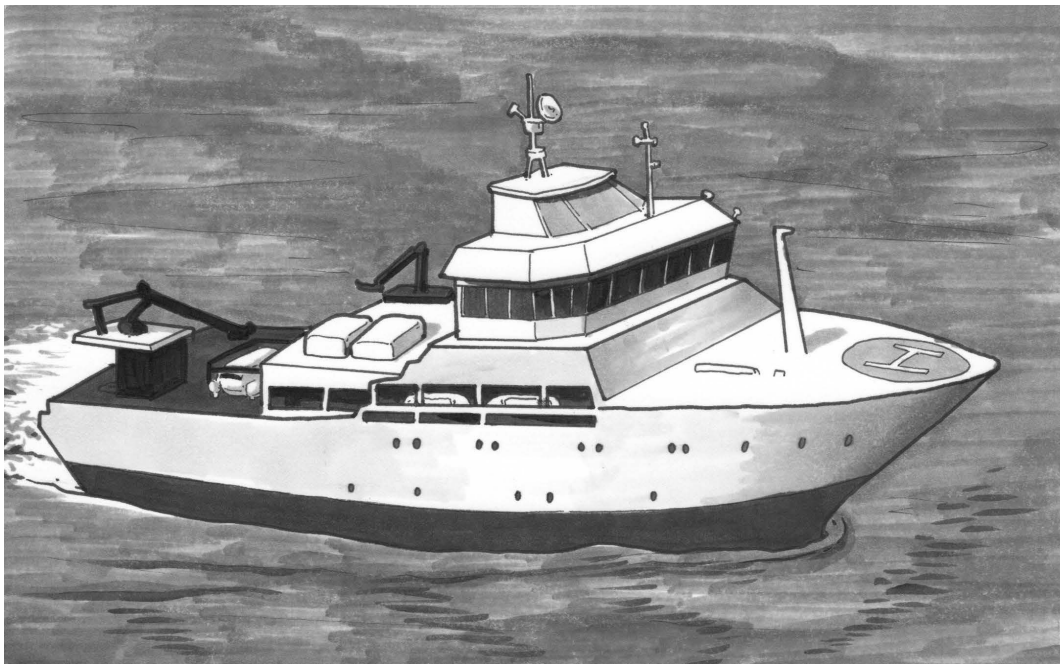
Criteria	Constraints
Must filter water from each source: <ul style="list-style-type: none"> • laundry • shower • space toilet 	You can use two Filter Bases.
Must produce: <ul style="list-style-type: none"> • greywater for watering edible plants 	

Your team is living on a boat. You will have to filter and reuse as much water as you can on-board, or you'll risk polluting the surrounding waters.



Did You Know?

Ocean water is not usable to sailors on most ships. The Navy is working with NASA to *improve* its ability to use and reuse ocean water for human activities.



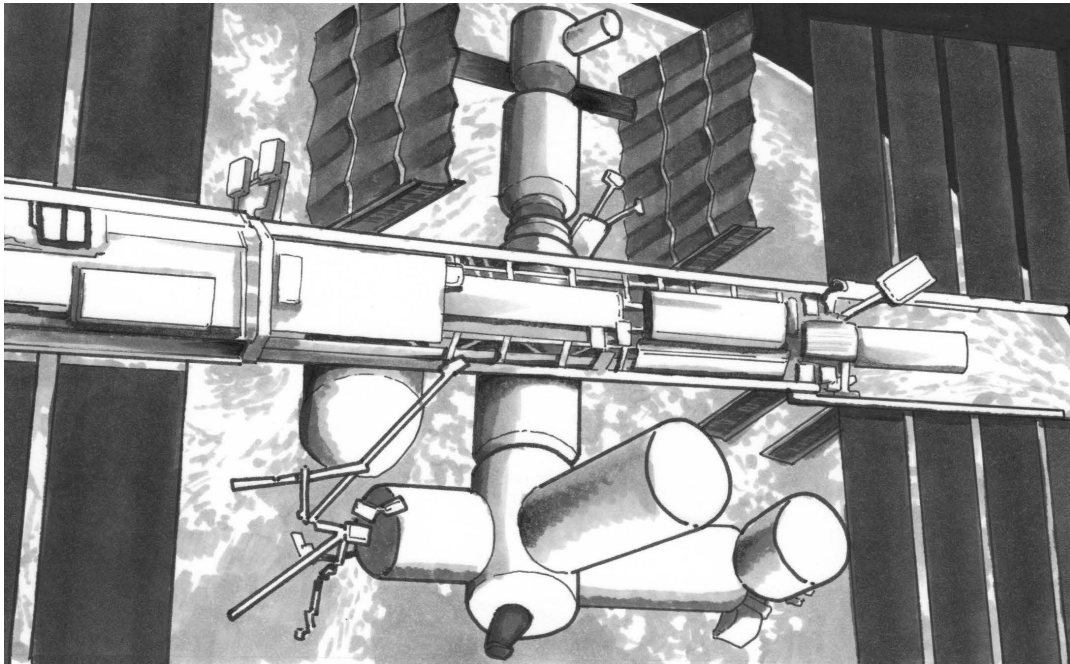
Criteria	Constraints
Must filter water from each source: <ul style="list-style-type: none"> • bathroom sink • laundry • shower 	You can use two Filter Bases.
Must produce: <ul style="list-style-type: none"> • greywater for toilet 	

Your team is creating a process for reusing water for the International Space Station. You need to reuse all the water you use on board. The next shipment of freshwater won't arrive for another 3 months!



Did You Know?

A space toilet is different from a toilet on Earth because solid waste is disposed of separately, while liquid waste is collected for reuse.



Criteria	Constraints
Must filter water from each source: <ul style="list-style-type: none"> • bathroom sink • laundry • shower • space toilet 	You can use two Filter Bases.
Must produce: <ul style="list-style-type: none"> • greywater • pure water 	

Extreme Environment: _____

The goal is to produce:

_____ cups of greywater _____ cups of pure water

How will you order your water samples and Filter Bases? Consider these questions when *planning* your water reuse process:

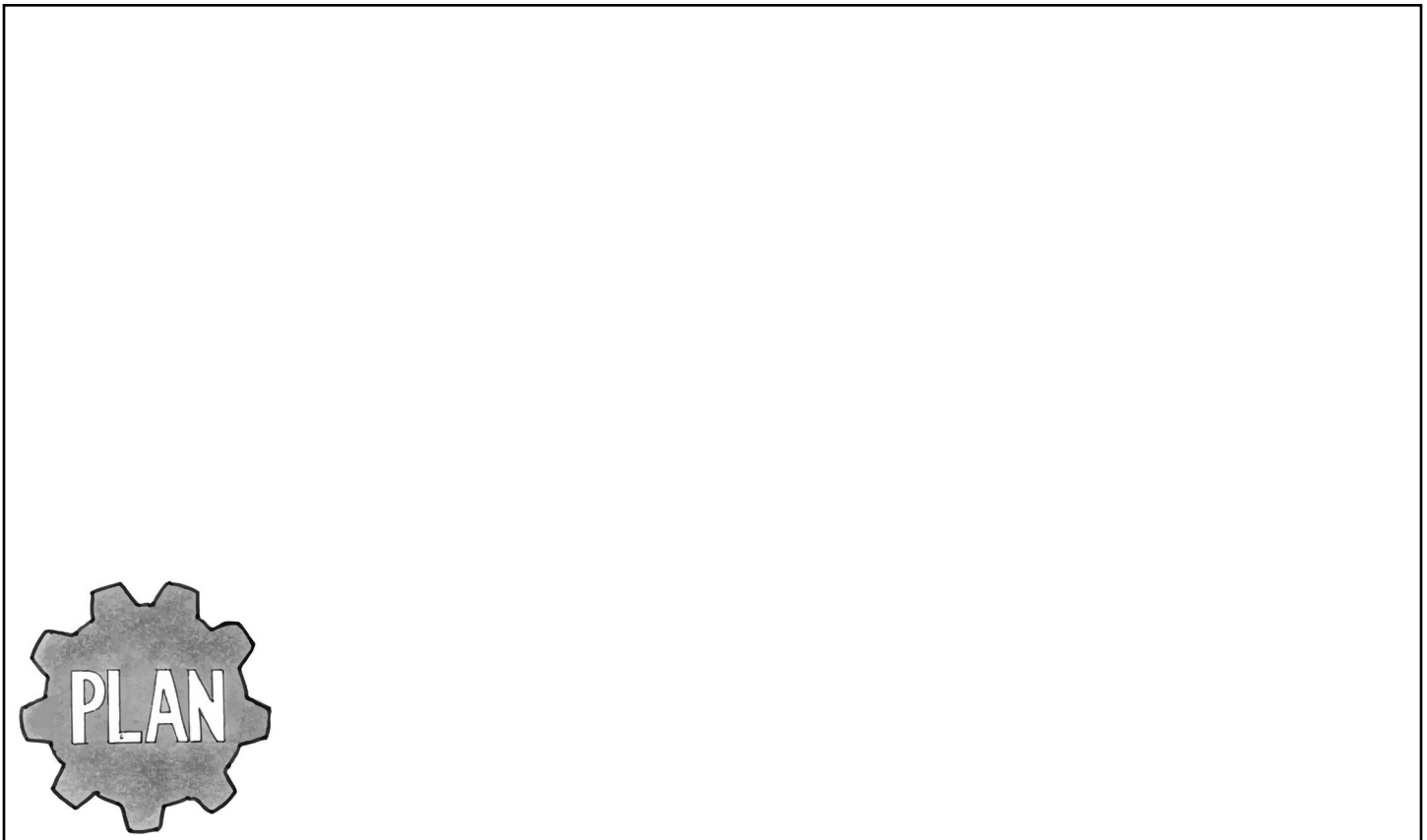
Which water sample(s) should go into the first filter?

Which water sample(s) should go into the second filter?

Which materials should be used in the first filter?

Which materials should be used in the second filter?

Draw a detailed *plan* of your group's water reuse process. Make sure to label the locations in your drawing and the materials you would like to use in your filter(s).

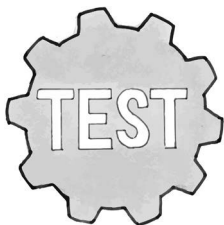


Activity 4

Testing a Process

Record the results of your water reuse process here. If you only used one filter, record the results in the first column. If you used a second filter, record the results after filtering the water a second time in the second column.

Test	Water Quality (After Filter 1)				Final Water Quality (After Filter 2)			
	Clarity	Color	pH	_____	Clarity	Color	pH	_____
1				Optional				Optional
2								
3								



Does the **final water sample** meet the water quality goal?

How can you *improve* your process?