

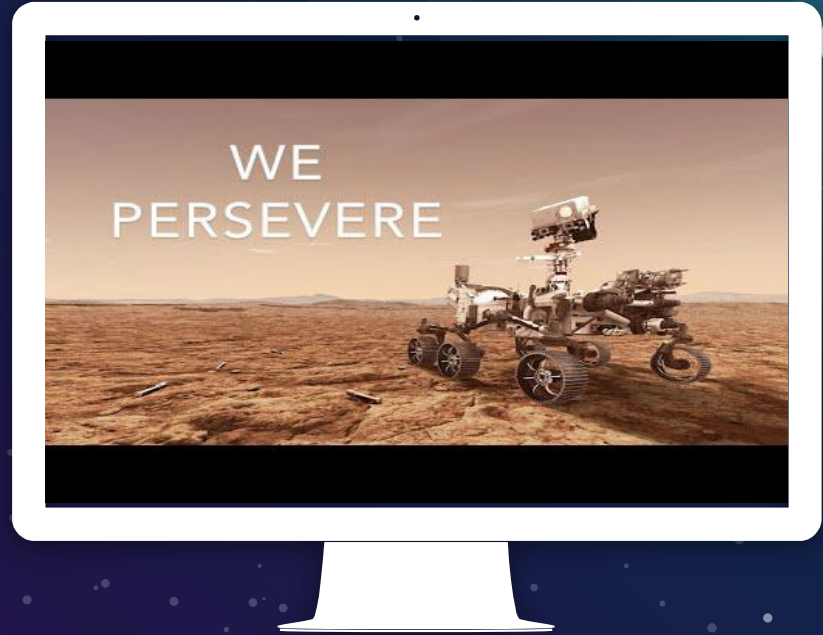
The background is a deep purple and blue space scene. In the top left is a large planet with horizontal stripes. To its right is a smaller planet with a ring. In the bottom left, an astronaut in a white suit floats with a coiled tether. In the bottom right is a large, cratered moon. The sky is filled with numerous small white stars and larger, four-pointed starburst patterns. Abstract, flowing shapes in shades of purple and blue are scattered throughout the background.

HANDS ON Δ ACTIVITY WATER FILTRATION

WE PERSEVERE

February 18, 2021

Perseverance Rover
Mars Landing



WATER FILTRATION MATERIALS



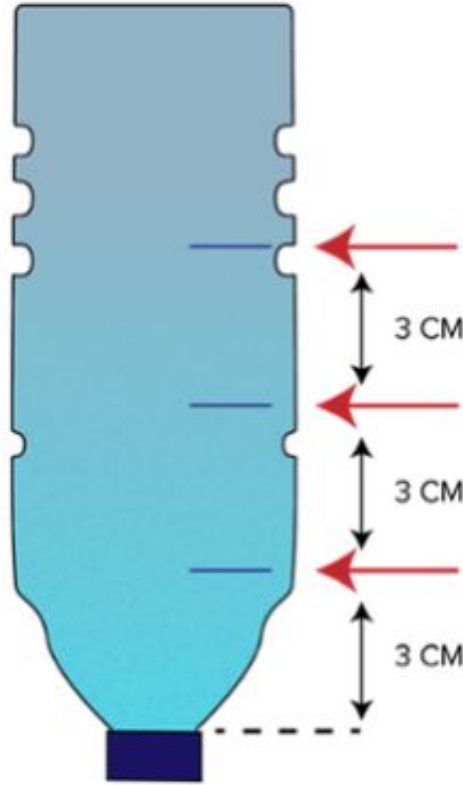
Safety: goggles & gloves

- ★ 1-2 empty 16 oz plastic water bottles
- ★ Any materials you think will make a great filter:
 - ★ Cotton balls
 - ★ Coffee filter
 - ★ Activated Charcoal
 - ★ Baking soda
 - ★ Uncooked pasta
- ★ Paper towels
- ★ Cheesecloth
- ★ Rubberbands
- ★ pH paper/copy of pH table
- ★ Scissors
- ★ Permanent marker



Step 1

Using a permanent marker, mark the top half of the bottle with three lines that are 3 cm apart starting from the small bottle opening.

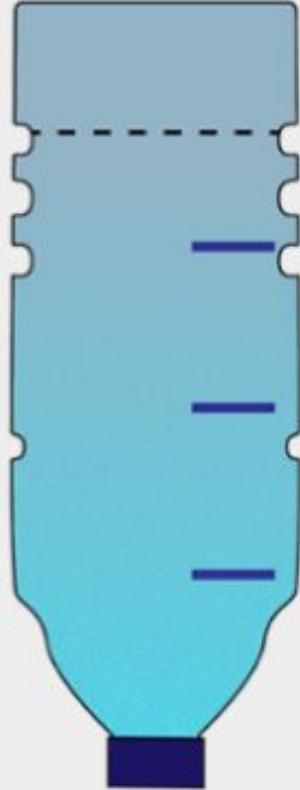


STEP 2

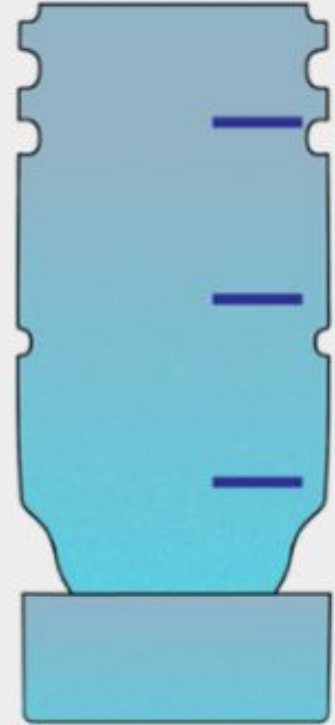
Cut the bottle
into two
parts.



The bottom half
will appear taller
than pictured.
*Increased
stability is ideal.*



Water Bottle Cut into Sections



Top Section Inverted into
Bottom

Step 3

Attach cheesecloth to the bottle opening using a rubberband.



Step 4

Invert the “filter column” in the bottom of the bottle.



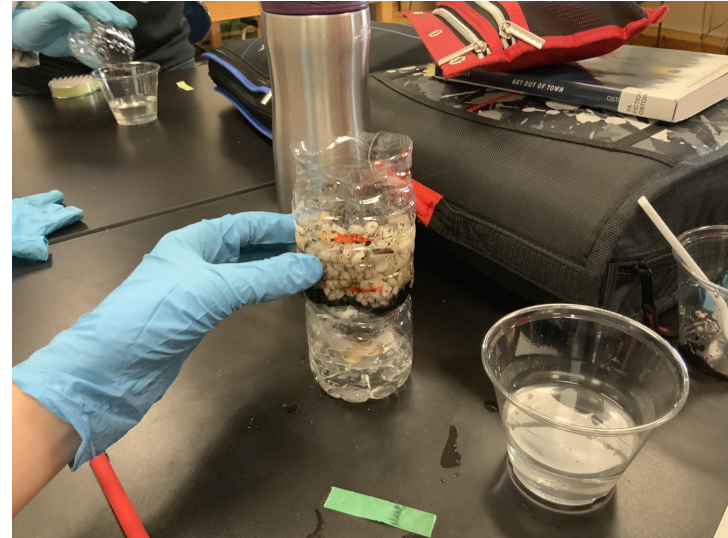
Step 5

Choose three different filtering materials from the materials provided.



Step 6

Pack each chosen filtering material into one of the 3 cm layers, as indicated by the lines drawn on the bottle.



Step 7

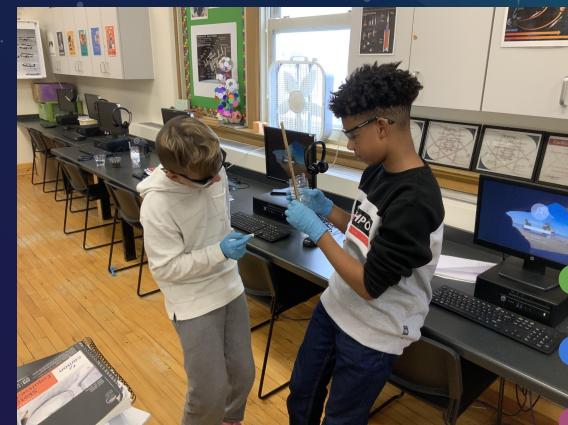
Obtain a supply of clean and dirty water. Filter. Use the pH strips and pH table to test the pH level in both water samples.





STEP 8 - DATA COLLECTION

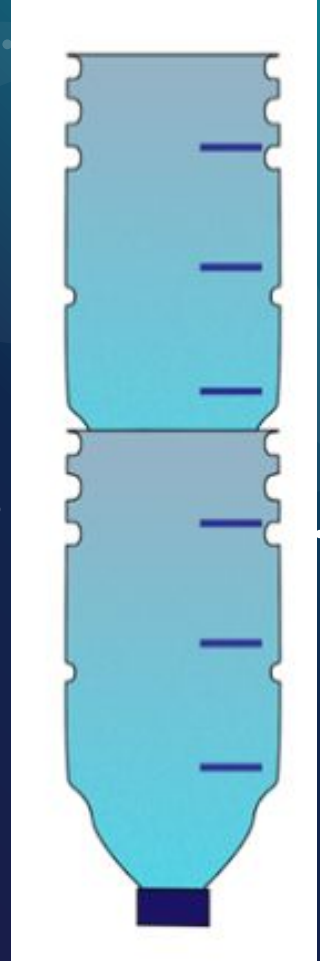
	Clarity	Odor	pH (1–14)
Clean water			
Dirty water before filtering			
Dirty water after filtering			
Dirty water after COMBINED filtering			





EXTENSIONS:

- Budget - most economical design that filters effectively
- Combined Filters - Combine your filter with another team's filter by stacking one on top of the other.
- Present Findings
 - *What worked well today?*
 - *What was challenging today?*
 - ★ ○ *What would I do next if I had more time?*
- Create a hydrolysis graph in Google sheets
- [Conductivity Test](#)



STEM To go Bags
Make it a unit.



STEM TO GO BAGS ARTEMIS MISSION ACTIVITIES



- [JPL Straw Rockets](#) - Going to the Moon
- [Design Squad/NASA Lunar Lander](#) - Landing on the Moon
- [JPL Water Filtration](#) - Living on the Gateway Lunar Orbiting Platform
- [Design Squad/NASA Roving on the Moon](#) - On to Mars! (Perseverance)

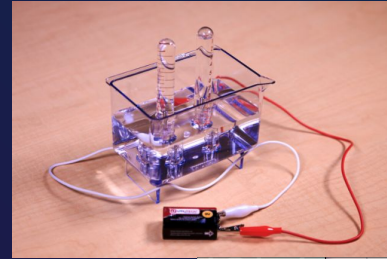
STEM TO GO BAGS

MATERIALS

Item	Quantity to order	Individual Size To Bag	Activity
Gallon Ziploc Bags	30	1	Storage
Cheesecloth	1 yard	10 cm x 10 cm	Water Filtration
Water Bottles	30	1	Water Filtration
Paper Towel	1 roll	tear individually	Water Filtration
Rubber Bands	180	6	Water Filtration, Touchdown, Roving on the Moon
Cotton Balls	90	3	Water Filtration
Coffee Filter	30	1	Water Filtration
Uncooked Macaroni	2 - 12 oz boxes	scant 1/4 c.	Water Filtration
Waste Water Sample	<i>I had students make their own</i>	1	Water Filtration
sharpened pencils	30	1	Straw Rockets, Roving on the Moon
straws	300	10	Straw Rockets, Touchdown, Roving on the Moon
cardboard	30	6" square	Roving on the Moon
cardboard	60	2 - 5" squares	Roving on the Moon
thin cardboard (cereal box)	30	4" x 5"	Touchdown
white breath mints individually wrapped	60	2	Touchdown
small cup	30	1	Touchdown
index cards	90	3	Touchdown
Large marshmallows	60	2	Touchdown
Small marshmallows	300	10	Touchdown

PLTW ACTIVITY 2.6

- ★ Not just about making a water filtration system
- ★ Learn about how resources are not unlimited and that they need to be recycled to sustain life aboard a spacecraft
 - ★ Water Recovery System
 - ★ Oxygen Generation System
 - ★ Sabatier System
 - ★ Waste Management System
- ★ Apply knowledge about living on Earth to living in Space



A CLASSROOM THAT FUELS AN INTEREST

Create a visual display that tracks which astronauts are on the International Space Station and shows a diagram of each module on the station.



How fast is the ISS moving?

★ 17,130 mph

How high is the ISS above the earth?

★ 254 miles

How long is the ISS?

★ 357 feet (football field)

Can I see the ISS from earth?

<https://spotthestation.nasa.gov/>

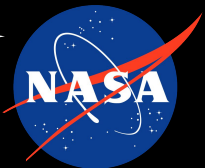
Live footage from the ISS:

<http://www.ustream.tv/channel/iss-hdev-payload>

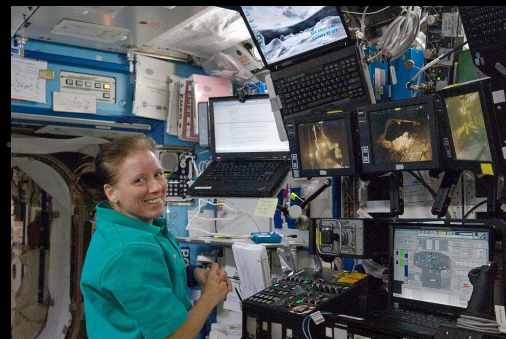


20 Years on the International Space Station

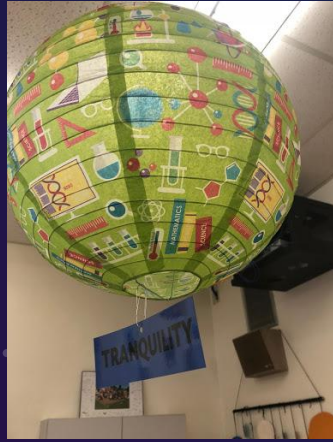
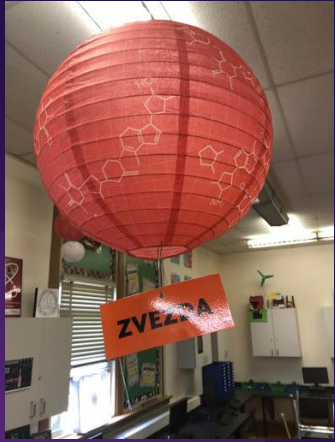




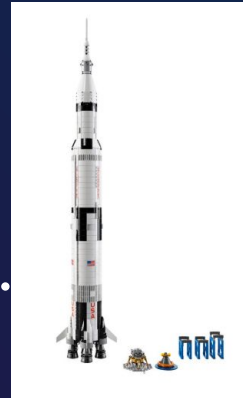
Current Astronauts/Cosmonauts On Station



CLASSROOM GROUPS - ISS MODULES



1. Kibo, JAXA
2. Zvezda, Roscosmos
3. Columbus, ESA
4. Tranquility, ESA & ISA
5. Destiny, NASA
6. Harmony, NASA



PROFESSIONAL DEVELOPMENT

- ★ [Space Academy for Educators](#)
- ★ [Space Center University](#)
- ★ [Abrams Space Across the Curriculum Educator Training](#)
- ★ [Lift Off](#)
- ★ [Dayton Air Camp for Educators](#)
- ★ [USNA SET Sail STEM Educator Training](#)

SUGGESTED SPACE RESOURCES

- [NASA STEM Engagement](#) - [BEST activity guide](#) & [Train Like an Astronaut](#)
- [NASA Opportunities & Tools for Educators & Students](#)
- [NASA Spinoff](#) - highlight NASA technologies that benefit life on earth
- [Chris Hadfield Master Class](#) - \$15/month or \$90/class
- [Orion's Quest](#) - authentic research for today's youth
- [Space Station Explorers](#) - sign up to be a space station ambassador
- [Lunar & Meteorite Sample Disk Program](#) - borrow sample disks for your class
- [International Space Station](#) - STEM on Station, your connection to the ISS
- [ISSabove](#) - raspberry pi that enables live feed of the ISS (\$147.50)
- [Spotthestation.nasa.gov](#) - text notifications of upcoming sightings in your area
- [Skyview app](#) - point your device at the sky to identify stars, constellations, etc
- [Afterschool Universe](#) - free curriculum for an afterschool astronomy program
- [Ship the Chip](#) - engineering design to safely ship a product
- [GE Additive Education Program](#) - Dremel 3D45 and Polar3d account
- NASA Express weekly email sign-up <https://www.nasa.gov/stem/express>
- Prime Video: [Xploration Outer Space](#) hosted by Emily Calandrelli, @TheSpaceGal



THANKS!

ANY QUESTIONS?


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REFERENCES

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- ★ Educator guide: Water filtration challenge. (2020, December 31). Retrieved February 04, 2021, from <https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/>
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