MEP PROGRAM

MASTER ACTIVITY DAILY SCHEDULE

Daily 9 to 2:30

Two groups- K-6 and 7-12

TUESDAY-SOLAR- DESERTS

9:00 Breakfast	Activities	Supplies Needed
9:30-10:15 Group Projects	Introduction to the Desert- Share videos of choice/ Desert Intro PowerPoint Saving Water in the Desert Can Be a Challenge Discussion	PowerPoint
10:15-11:00 Experiment Time	Water Filter Experiment Water Purification Discussion Desert Animals Discussion- PowerPoint of interesting facts	Rock, cotton balls, sand, scissors, plastic cup, plastic bags, plastic soda bottles PowerPoint
11:00 Lunch		
11:30-12:00 Physical Activity	Recess	
12:00-2:15 Art/Experiment Time/Group Projects	• Finding Something Camouflaged Activity • How Hot is the Sun/How to Survive in the Desert • Solar Powered Projects • Heat Hunt Explore More • Understanding Cactus Experiment • Watering Cactus Experiment • Cactus Art Projects • Ongoing- 3 D Printing Projects- Share 3-D PowerPoint	M&Ms/ Skittles Papers Solar powered projects Laser temperature taker Batteries Cucumbers, flashlight, sponge, knife, plates, green construction paper, tissue papers of different colors
2:15-Wrapping Everything up		
2:30 School Ends	Dismissal	

WEDNESDAY- DESERTS CONTINUED

9:00 Breakfast	Activities	Supplies Needed
9:30-10:15 Group Projects	Magic Sand- Sounds of the Desert- Experiment Desert Dough Diorama Water Water Everywhere- Not a Drop to Drink- Desalination Experiment	Magic sand, Cornstarch, baby oil, plastic wrap, tennis ball, salt, bowl, smaller bowl, super absorbent polymer
10:15-11:00 Experiment Time	Magic Soil Soakers Experiment	
11:00 Lunch		
11:30-12:00 Physical Activity		

12:00-2:15 Art/Experiment Time/Group Projects	Sun Print Paper Activity Learning to Drive A Drone Activity Continued 3 D Printing	sun print paper, container for water, drones
2:15 Wrapping Everything Up		
2:30 School Ends		

THURSDAY- INTRO TO OCEANS

9:00 Breakfast	**Activities**	**Supplies Needed**
9:30-10:15 Group Projects	Intro Videos Learn About Coral Reefs 3-D Printing of Coral Reefs	Powerpoint
10:15-11:00 Experiments	Bubbles of the Sea Bubbles Experiments Dough Creation of Coral Reefs	Bubble activities materials, glycerin, pipettes, distilled water
11:00 Lunch		
11:30-12:00 Physical Activity		
12:00-2:15 Art/Experiment Time	Bubbles Experiments Continued. Storm in a Glass Experiment Air and Water Pressure Experiment Oceans PowerPoint Drone Use in the Ocean Drone Practice Continued 3D Printing	Shaving cream, spoon, plastic bottles, pushpins, pan to do the experiment, create PowerPoint,
2:15 Wrapping Everything Up		
2:30 School Ends	Dismissal	

FRIDAY- STEAM PROJECT DAY

9:00 Breakfast	**Activities**	**Supplies Needed**
9:30-11:00 Group Projects	Marble Run Lego Zip Lines Create your Own Circuits	Marble Runs Lego parts, Circuit parts Fishing lines batteries
11:00 Lunch		
11:30-12:00 Physical Activity		
12:00-2:30 Art/Experiment Time/Projects	Coding the Drone- Older ones Art Hour 3 D Printing Creation Experiment Station- Walking Water Snowstorm in a Bottle	Watercolors, paintbrushes, cups, paint, baby oil, Alka-Seltzer tablets
2:30 School Ends	Dismissal	

STEM PROGRAM DAILY CURRICULUM

INTRODUCING DESERTS- DAY 1

Deserts cover twenty percent of the territory on Earth. They are found on every continent. The land features of deserts vary widely. They could consist of mountains, bare rock, rocky plains, and moving dunes. Contrary to popular belief, dunes are not as common in deserts. For instance, they only account for 10% of the Sahara in northern Africa. Some deserts don't even have sand.

It can be hot or freezing in deserts. In scorching deserts, summertime midday temperatures are frequently exceeding 100 °F (38 °C). At night, the temperature lowers significantly. The Sahara is the biggest hot desert on earth. Other scorching deserts include those in the southwest of the United States and the Kalahari in southern Africa. The tropics are home to the majority of hot deserts. On either side of the equator is this strip of Earth.

Farther from the equator than hot deserts are cold deserts. Despite being extremely dry, the fact that it is so cold there is the main cause of the lack of plants there. Much of Antarctica is covered by a chilly dessert. An additional chilly desert is the Gobi in central Asia.

INTERESTING FACTS- USE POWERPOINT TO COVER THIS INFORMATION

- 1/3rd of the world is covered in deserts.
- The largest cold desert on Earth is Antarctica.
- The largest hot desert on Earth is the Sahara.
- Less than 40cm (16in) of rain falls on deserts on average each year.
- One-third of the Earth's surface is barren land or desert land.
- The word "desert" means an abandoned place.
- Polar deserts are a term used to describe many of the ice-free areas of the Arctic and Antarctic.
- Sand is only present in about 20% of the world's deserts.
- When compared to "hot deserts" in hotter regions, locations covered with ice or snow are sometimes referred to as "cold deserts."
- Although it is considerably smaller than the Sahara, the Arabian Desert in the Middle East is the second-largest hot desert on Earth.
- The largest desert in the world is the Antarctic Desert. It covers an area of 13.8 square kilometers around the North Pole. The second-largest is the Arctic Desert which covers an area of 12.7 square kilometers around the North Pole.

- The largest hot desert in the world is the Sahara. It covers an area of 9.4 square kilometers and spans 12 North African countries.

- The driest desert in the world is the Atacama Desert in Chile. Parts of this desert have received no rainfall since records began. Scientists believe that parts of the Atacama have been in extreme desertification for over 40 million years.

- Although it is one of the driest places on earth (with less than 20mm of rain per year), the Antarctic Desert contains about 90% of the earth's fresh water. This water is found in Antarctica's permanently frozen ice sheet.

- The first dinosaur eggs were discovered in Gobi Desert in 1923. Gobi Desert is located in parts of northwestern China and southern Mongolia. It is the fifth-largest desert in the world. It was created in the shadow of the Himalayas as the tall mountains prevented rain from reaching Gobi.

- Despite being the driest place on earth, the Atacama Desert supports around 1 million inhabitants. These inhabitants mostly survive by tapping water from aquifers (underground streams) for growing crops. They also raise animals like llamas and alpacas

- The Namib Desert has the tallest sand dunes in the world. Some of these sand dunes are up to 300 meters high. Besides being high, the sand dunes are also extremely spectacular and are a popular attraction for nature lovers.

- The Mojave Desert is the driest desert in the United States. It has an annual rainfall of around 5 inches. It is also home to the Death Valley – considered the hottest, driest and lowest place in North America.

- One of the most resilient desert animals is the tortoise. The desert tortoise is found in the Mojave Desert. An adult tortoise can tolerate temperatures in excess of 50°C and can survive without water for up to one year.

- The Bushmen in the Kalahari desert (in Namibia) have adapted to the extreme lack of water. They use a specific root called "Bi!" which as a source of hydration. The Bi (also known as the milk root) is a bulb which has a milkfish liquid. People drink the liquid to keep themselves hydrated in the extreme temperatures.

- The most dangerous desert insect is the Killer Bee. Also known as Africanized Honey Bees, these insects move in swarms consisting of up to 900,000 bees. They are also quite temperamental – and have been known to sting humans to death. When attacked by Killer Bees, the best option is to cover the face and run into the nearest shelter.

- The largest desert bird is the Ostrich. Found in the deserts of Africa, Australia and Arabia, the ostrich is also the most dangerous desert bird. This may sound surprising given that ostriches are generally known to be gentle and shy. However, they can get aggressive especially when their

eggs or young ones are threatened. Ostriches have a powerful kick. They also have 30 cm long claws which are thick and strong. These claws can easy disembowel an animal.

- The most ravenous predator in the desert is the African wild dog. Found in the deserts of Africa, these animals hunt in packs of up to 40 animals. They mostly take down ostriches, foxes, wildebeest, warthogs, and antelopes. Although they rarely attack humans, they have been known to do so especially when extremely hungry. Surviving an African wild dog attack is almost impossible – they are swift, vicious and ravenous.

- During the Summer in the Arctic Desert, the sun doesn't set for 60 days. It just keeps hovering over the horizon. This means that even at midnight, you can see the sun. This has given the Arctic Desert the nickname "The Land of the Midnight Sun."

- The Sidewinder is one of the most unique snakes in the desert. Found mostly in the Sahara desert, this horned viper is renowned for its legendary sideways movements. This movement is an adaptation to move fast over the desert sand.

- The deathstalker is the most venomous scorpion species in the world. This yellowish, translucent scorpion (which is also known as the Naqab desert scorpion and Palestinian Yellow scorpion) is found in the deserts of Naqab, Arabia, Sahara and numerous US deserts. The deathstalker almost exclusively hunts at night. Its sting is extremely painful, and the venom is toxic enough to kill a child, or elderly person.

- The Scarab Beetle is perhaps the most unusual insect in the desert. Known to most people by its less-glamorous name, the dung beetle, this insect lives almost exclusively on animal waste. It is best known for rolling animal waste into round balls. These balls are what it feeds on. In some cases, they simply burrow a hole into a pile of dung and make it their home. This means that whenever they feel hungry, they simply munch away.

- Antarctica is the only continent in the world which is entirely covered by a desert. The Antarctic Desert covers the entire continent.

VIDEOS ABOUT THE DESERT

National Geographic Video Overview- https://youtu.be/n4crvs-KTBw
Going Deeper- National Geographic- https://youtu.be/E2RzuoQ1t7k?si=b-XY1sQyKstjG55R
Follow a host of remarkable animals surviving in the planet's hottest habitats as the deserts continue to get event hotter, drier and bigger.
African Wild Dogs- BBC Video https://youtu.be/h4SlAc2U1A4?si=m_5lcOzy20BF0J4h
The Most Successful Hunter In Africa- African Wild Dogs- https://youtu.be/DAflT-GTMk4?si=9KKW8MVTmDMrINbc
Short Video- Worlds Deadliest- Wild Dogs- National Geographic- https://youtu.be/82kQTkWnKwg?si=TtirynKOaBEeKSGO
Use of Technology- Spy Pup- Video- Wild Dogs- https://youtu.be/bfJUciAxxyo?si=iK1BQZ0CNneAU7OL
Sidewinder- Hunts Gecko- short video- https://youtu.be/5YR2eFq29_k?si=C3rOrDYn38Njrtk0
Gliding at speeds of up to 18 mph, our starving sidewinder searches the desert for his next meal. With lizards like banded geckos on the menu, the sidewinder will stop at nothing to track down his feast.

Dung Beetle-Short video https://youtu.be/I1RHmSm36aE?si=dlXNP1Fo2GfLC02n
Another Short Dung Bettle- Holy Beetle- https://youtu.be/ZRN-Lu-m-oY?si=JO8qCTN8nTLtireG

SAVING WATER IN THE DESERT CAN BE A REAL CHALLENGE.

People in the desert get water from a variety of sources, including groundwater, wells, springs, and atmospheric water harvesting. Dehydration can set in quickly in the desert. If you are lost in a barren landscape you can actually extract water from soil or plants through the process of condensation, using the techniques described below. It's not really "making" water, but it'll be lifesaving nonetheless.

If you were in the desert and needed to get water you could try the following:
1. Dig in a dry riverbed. Outer bends and depressions are best, since they're the last places water would have evaporated.
2. Search for potholes (tinajas) in shady areas, especially at the bottoms of cliffs and ravines. With binoculars, look for distant shiny spots and bright green foliage.
3. Look for honeybees and songbirds, which are good indicators of water.
4. Keep an eye out for trees on the horizon. Willows, sycamores, and cottonwoods can indicate that water is near the surface. Dig near the base of a tree trunk to find water.
The morning dew can also serve as an emergency water source if you wake up early enough. Try to find cacti before the sun evaporates the dew, using a piece of absorbent fabric (your T-shirt will do in a pinch) to transport the dew once you find it. Half-covered stones may also contain non-evaporated dew if they're turned over early enough in the day.

Other ways- https://www.wikihow.com/Make-Water-in-the-Desert

- Dig a few holes 19 in (50 cm) deep in a dried river bed, or until you reach moist soil.
- Fill the holes with nearby, non-poisonous plants and place a cup or canteen in the center of each hole.
- Stretch a bit of plastic wrap over the holes and weigh it down at the edges with dirt. Then place a rock in the center to channel condensation into the cup.

MAKING A WATER FILTER EXPERIMENT

What would you do if the water was dirty? How could you get it to be cleaned or purified?

Brainstorm some ideas of what you could do.
https://www.generationgenius.com/activities/water-quality-and-distribution-activity-for-kids/

GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

Water Quality & Distribution Activity for Kids

Water Filtration DIY

Duration: **30-60 min** Difficulty: **Easy** Cost: **$0 to $15**

Make your own water filtration system to make muddy water clean again!

Material List

- 1 Large plastic soda bottle
- 2 Cotton balls
- 1 Cup of sand
- 1 Cup of rock/gravel
- 1 Cup of activated charcoal
- 1 Pair of scissors
- 1 Plastic cup
- 1 Mallet and a plastic bag optional
- 1 Liter of muddy water make your own by mixing dirt or mud into water

Instructions

1. Cut off the bottom of the plastic bottle with scissors (keep the cap on).
2. Stuff cotton balls into the neck of the bottle.
3. Crush the activated charcoal (optional, but it will work best this way).
4. Pour it into the bottle.
5. Next add the sand to the bottle.
6. Then add the gravel.
7. Loosen the cap and set your water filtration system on top of the plastic cup
8. Gently add muddy water into the top.
9. Observe what happens as the muddy water is filtered.

Warning: Do not drink this water, it is not filtered enough for that.

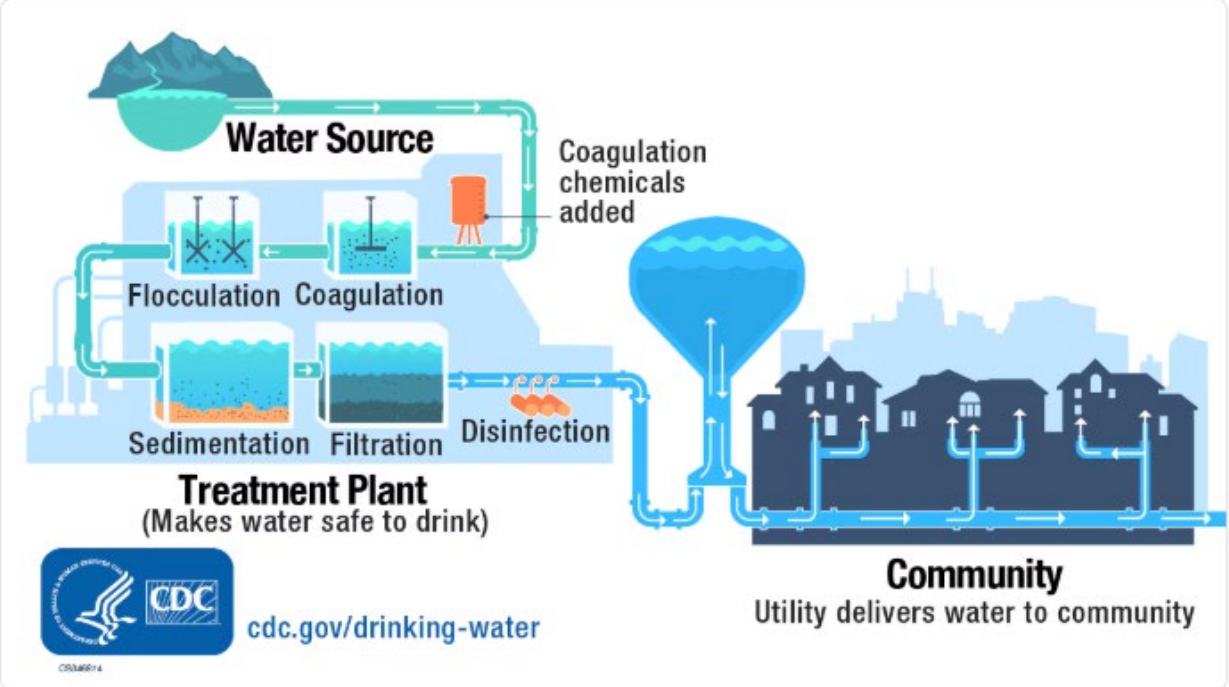
Tip: Activated charcoal is available at pet stores or can be bought online.

How It Works

Muddy water goes through three different stages of filtration in our system. First, large particles are separated from the water as they pass through the rocks. Then, smaller particles are removed when they pass through the sand. Finally, the water passes through the activated charcoal, where the smallest particles are removed and some chemicals are removed as well. The cotton balls make sure that the activated charcoal stays in the bottle. By going through each of these steps, the muddy water gets cleaner and cleaner. However, in order to make drinking quality water it has to go through more steps, so don't drink this water.

WHAT WOULD YOU NEED TO MAKE IT FULLY DRINKABLE?

What happens in the regular system that cleans our water.
https://www.cdc.gov/drinking-water/about/how-water-treatment-works.html



WHAT HAPPENS IF YOU WERE IN THE DESERT? HOW COULD YOU GET YOUR WATER PURIFIED.

- **Boiling:**
  - Build a fire.
  - Place the water in a suitable container.
  - Bring the water to a rolling boil for at least one minute.
  - Allow the water to cool completely before drinking.

Other purification methods (with considerations):

- **Chemical treatment (iodine tablets):**

Follow package instructions carefully as too much iodine can be harmful.

- **Water filtration:**

Use a dedicated water filter designed for outdoor use to remove particles and some microorganisms.

- **Solar disinfection:**

Fill clear plastic bottles with water and expose them to direct sunlight for several hours to kill bacteria.

- **Distillation:**

A more complex method that involves boiling water and collecting the condensed vapor, useful in situations with high mineral content.

REMEMBER OUR DESERT ANIMALS- HOW DO THEY NOT GET DISCOVERED?- USE POWERPOINT

Desert animals camouflage themselves by matching their color and pattern to their environment, or by attaching natural materials to their bodies.

Color and pattern

- Many desert animals are brown or sandy in color to blend in with the sand and rocks
- Zebras have wavy stripes that help them blend in with grasses
- Egyptian nightjars have sand-colored plumage that helps them blend in with the sand

Attaching natural materials

- Some desert spiders attach sand to their bodies to blend in with their habitat

Other camouflage techniques

- Disruptive coloration: Breaks up an animal's outlines, making it harder to see
- Minimizing shadows: Some animals, like horned lizards, flatten their bodies to minimize shadow
- Olfactory camouflage: Some animals, like the California ground squirrel, mask their smell with rattlesnake skin
- Concealment posture: Some animals, like owls, change their shape to appear less recognizable

LET'S TRY OUR HAND AT FINDING SOMETHING CAMOUFLAGED

Have you ever wondered how predators, like wolves, lions, and hawks, are able to find their prey? And what can an animal do to stay off of a hunter's menu? To survive, some animals have developed specific camouflage tactics to fool their predators. One strategy some animals use is to look very similar to other animals that are poisonous or that the predator doesn't like to eat. This camouflage tactic is called mimicry. In this science activity, you will be the hungry predator and you will hunt for M&M's candies. But it may not be as easy as it sounds — some candies might not be what they seem! Will you be able to avoid picking the wrong ones? To find out, work up an appetite and go hunting for some candy!

MATERIALS

Plain M&M's candies (20 of each color). Make sure 10 red and 10 yellow M&M's are included in the mix.
Skittles (10 red and 10 yellow)
Plastic bags (2)
Metal pie tin or sturdy white paper plate
Timer or stopwatch
Volunteer predators (kids) who like to eat M&M's (2–4)

Image Credit: [Svenja Lohner, Science Buddies / Science Buddies]

Prep Work

1. Everyone should wash their hands so that the candies can stay germ-free and be enjoyed later.
2. Prepare two plastic bags with M&M's. Place 10 M&M's of each color into each bag. This means you should have two plastic bags with 10 yellow, 10 blue, 10 green, 10 brown, 10 red, and 10 orange M&M's candies in it (making a total of 60 candies in each bag). The M&M's represent different kinds of animals in the wild.

Image Credit: Svenja Lohner, Science Buddies / Science Buddies

3. Mix 10 red Skittles to one of the bags with M&M's. The red Skittles represent poisonous animals that the predator does not want to eat.

Image Credit: Svenja Lohner, Science Buddies / Science Buddies

4. Mix 10 yellow Skittles to the second bag with M&M's. The yellow Skittles also represent poisonous animals that the predator does not want to eat.

Instructions

1. Explain to your pack of two to four volunteer "predators" that they should pretend to be M&M's birds. The M&M's are their prey. They should make a "beak" using their pointer finger and thumb for collecting M&M's animals. Explain that they will have 20 seconds to use their beak to quickly pick up M&M's and quickly put them in their other hand. To encourage the volunteers to be fast, tell them that when they are done with the activity, they can eat the same number of candies as they picked up. But they should not eat the candies until you are all done with the activity.
2. Also tell the volunteers that they should avoid picking up any red or yellow Skittles animals because the Skittles animals are poisonous and make the M&M's birds sick.

   How do you think the mimicry tactic will work out for the red and yellow M&M's?

3. After explaining these rules, pour the first prepared bag of M&M's with the red Skittles into a metal pie tin or sturdy paper plate. There should now be 10 M&M's of each color and 10 red Skittles on the plate. Put the pie tin in the middle of your group of M&M's birds. Make sure everyone can reach the pie tin.

   Which M&M's do you think have the best chance of survival?

4. Tell the predators that you will now start the 20 second timer, so they can start hunting their prey. Remind them to avoid the red or yellow Skittles animals. Then set your timer for 20 seconds. Say "Go!" and start the timer. When the timer beeps, make sure everyone stops picking up M&M's.

HOW HOT IS THE SUN IN THE DESERT?

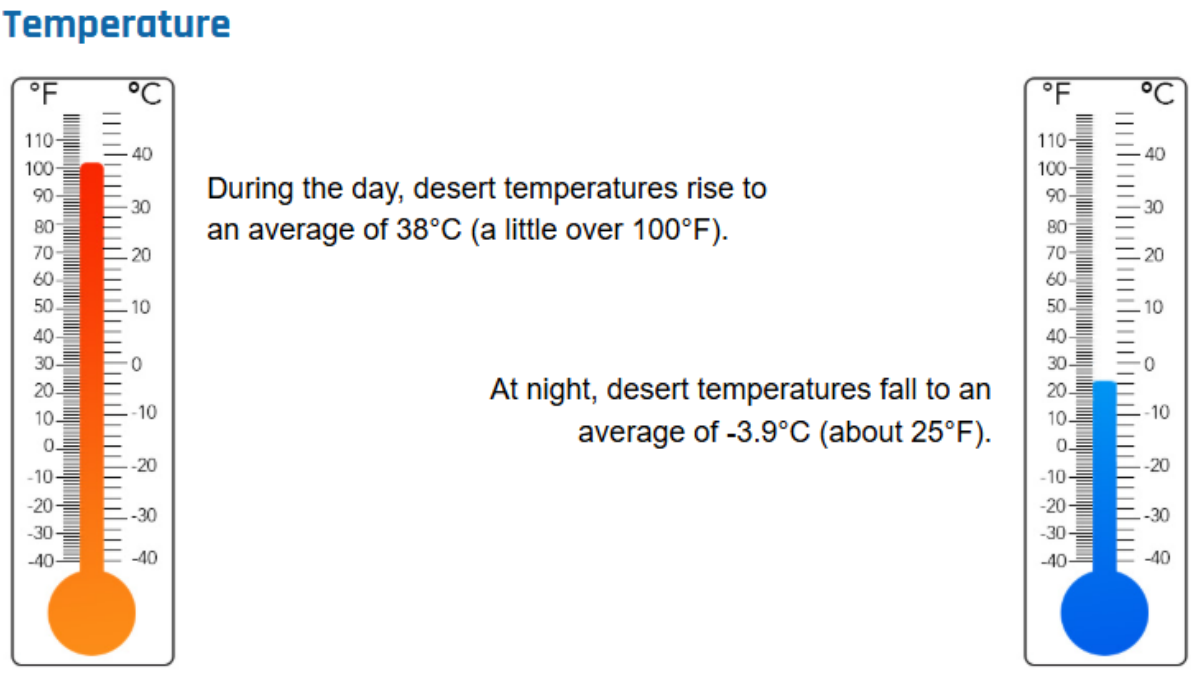
The sun itself doesn't get hotter in the desert, its surface temperature remains around 10,000 degrees Fahrenheit (5,500 degrees Celsius), but the desert can become extremely hot due to the intense sunlight hitting the dry ground with minimal shade, causing surface temperatures on things like sand to reach much higher temperatures, sometimes exceeding 170 degrees Fahrenheit depending on the conditions.

Key points:

Sun's surface temperature: Around 10,000 degrees Fahrenheit.

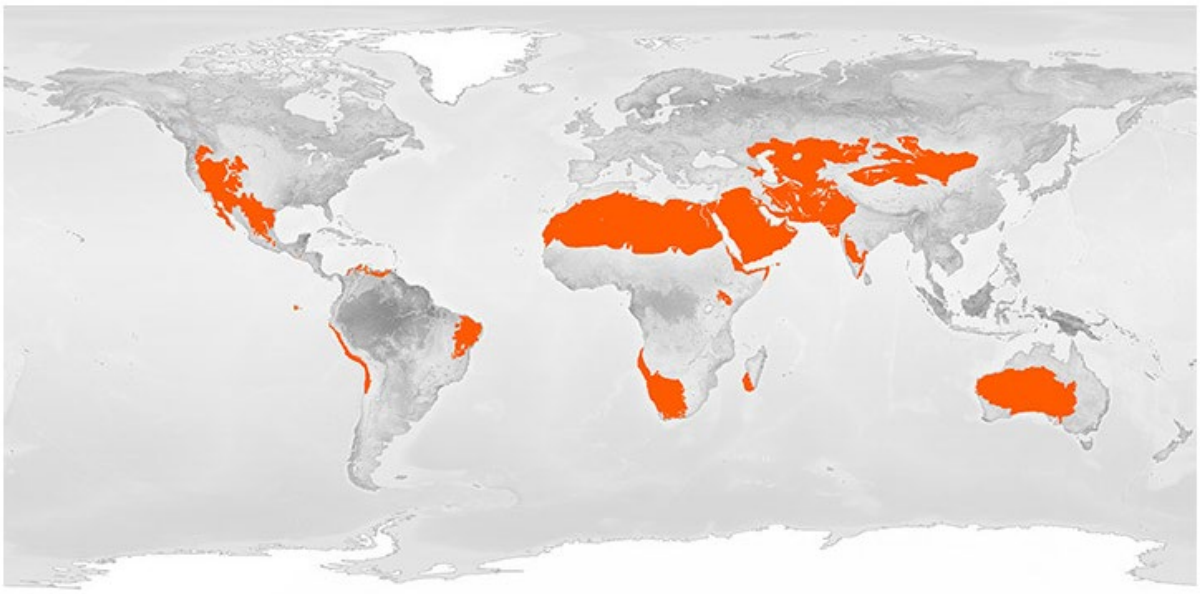
Desert surface temperature: Can reach significantly higher depending on the time of day and surface material, sometimes exceeding 170 degrees Fahrenheit.

Reason for high desert temperatures: Low humidity and direct sunlight exposure.



Source- Earth Observatory- Nasa

Location



Between 15° and 35° latitude (North and South of the equator); examples are Mojave, Sonoran, Chihuahua, and Great Basin (North America); Sahara (Africa); Negev (Middle East); and Gobi (Asia)

Description

Desert biomes are the driest of all the biomes. In fact, the most important characteristic of a desert is that it receives very little rainfall. Most deserts receive less than 300 mm a year compared to rainforests, which receive over 2,000 mm. That means that the desert only gets 10 percent of the rain that a rainforest gets! The temperature in the desert can change drastically from day to night because the air is so dry that heat escapes rapidly at night. The daytime temperature averages 38°C while in some deserts it can get down to -4°C at night. The temperature also varies greatly depending on the location of the desert.

Since desert conditions are so severe, the plants that live there need to have adaptations to compensate for the lack of water. Some plants, such as cacti, store water in their stems and use it very slowly, while others like bushes conserve water by growing few leaves or by having large root systems to gather water. Some desert plant species have a short life cycle of a few weeks that lasts only during periods of rain.

We can view some of these places with the NASA Earth Observatory. Share the site with students.

SHARE- [How to Survive in the Desert Video]

THE POWER OF THE SUN

Solar power is a renewable energy source that converts sunlight into electricity and heat. Solar panels are used to generate solar power.

How does solar power work?

1. Solar panels are made of silicon or another semiconductor material.
2. When sunlight hits the panels, it releases electrons, creating an electric charge.
3. This electric charge is captured by wiring in the panels.
4. The wiring produces direct current (DC) electricity.
5. An inverter converts the DC electricity to alternating current (AC) electricity, which is used in homes and most appliances.

Benefits of solar power

- Solar power is a clean energy source that doesn't produce harmful greenhouse gas emissions.
- Solar power can be used to heat, cool, and light homes and businesses.
- Solar power can be stored in batteries or thermal storage.

Solar power in the future

As concerns about climate change grow, solar power is becoming a more popular choice for homeowners and businesses.

HAVE STUDENTS PUT TOGETHER SOME OF THE SOLAR POWERED PROJECTS.

Have them see how much sun is needed to make the projects move.

Roll over image to zoom in

Have them test out the best location to make the projects move the best.

HEAT HUNT

Have them go on a hunt to find the hottest objects outside. Discuss why some things appear to be hotter than others? Why is that?

Dark-colored, non-reflective materials absorb the most heat from the sun. These include brick, stone, asphalt, and carbon-based materials.

Explanation

Dark colors

Dark-colored materials absorb and emit energy more easily than light-colored materials.

Flat surfaces

Flat, non-reflective surfaces absorb the most solar energy.

Carbon-based materials

Carbon materials are often used as solar absorbers because of their natural black color and high broadband light absorption.

Thermal mass

Materials like concrete, bricks, and tiles have high thermal mass, meaning they absorb and store heat.

Other materials that absorb heat

Moist soil: Dark soil absorbs 86% of sunlight, while gray soil absorbs 80%.

Salt: Salt absorbs heat from solar energy.

Related concepts

The atmosphere absorbs most of the solar radiation.

Much of what reaches the Earth's surface is radiated back into the atmosphere to become heat energy.
The more light an object absorbs, the more heat it absorbs. Heating Things Up

HEAT HUNT EXPLORE MORE

Working in small groups, students will explore the energy transfer of different earth materials when they are heated up and cooled down. The students graph the changes in temperatures that occur over a 15-minute period of heating the earth material up and a 15-minute period of the earth material cooling down.
Materials Required

- 5 plastic containers of the same size
- Hand-Held Infrared Thermometer (IRT) or 5 thermometers
- Sand
- Soil
- Grass
- Water
- Gravel or Rocks
- A sunny day or 5 desk lamps or clip-on shop lights with 100-watt light bulbs
- Stopwatch or timer

Preparation
Put equal amounts of each earth material in separate containers.
Procedure
Engage

1. Ask students to think about a hot sunny day at the beach when they are barefoot.
2. What surfaces would you walk on and why? Why are some surfaces cool to your touch? Why are some hot to your touch? From where did the hot surfaces get their energy? [Sun]

Explore

1. Tell the students that today they are going to investigate what happens to air and different earth materials when they are exposed to the Sun. Mention some of the materials the students may have told you earlier such as sand, grass, rocks, etc. Try to get the students to mention water, bare soil, and air.
2. Each group will record the temperature change of each earth material. Each container should have about the same amount of material. If it is a sunny day, this activity can be done outside. If not, desk lamps or shop lights can be used to simulate the sun’s energy.
3. If you are using thermometers, place them in the earth material.
4. For each earth material, designate a recorder that will record the temperatures and person that will measure the temperature in degrees Celsius.
5. Record the beginning temperature of each material. Start the timer. The timekeeper will tell the students when they should measure the temperature with the IRT or read the thermometers. If you are using one IRT, try to have the students take the measurements as close together in time as possible.

6. Students will record the temperature of the earth material in the sun or under the light every 3 minutes for a total of 15 minutes. After 15 minutes, the earth materials are shaded or the lights are turned off. Measure the temperature every 3 minutes for the next 15 minutes. The total elapsed time is 30 minutes with 11 temperature measurements.
7. See the example of a data table that students can fill in or have the students create the data table in their science notebooks.
8. Each group shares their data and results.

What do these results mean for us if we were going to live in the desert?
What should be think about and take into consideration if we were building a house?

Things to think about.
When building a house in the desert, key considerations include using thick walls with high thermal mass materials like concrete, adding substantial insulation, choosing light reflective colors for the exterior, incorporating proper window placement for cross-ventilation, and utilizing solar energy to minimize reliance on traditional cooling systems.
Key points for desert housing construction:

- Thick walls and thermal mass:

Opt for thick concrete walls or masonry construction which absorb heat during the day and release it slowly at night, helping to regulate temperature.

- Insulation:

Properly insulate walls, ceilings, and floors to prevent heat gain during the day and heat loss at night.

- Light reflective colors:

Choose light-colored paint or roofing materials to reflect sunlight and keep the house cooler.

- Window placement:

Position windows strategically on opposite walls to allow for cross-ventilation and natural cooling.

- Roof design:

Consider a shaded roof or overhangs to minimize direct sunlight on the walls.

- Solar energy:

Integrate solar panels to generate electricity and reduce reliance on grid power.

- Desert-adapted landscaping:

Plant native cacti and succulents that require minimal water and provide shade.

- Ventilation strategies:

Utilize ceiling fans to circulate air and promote cooling.

UNDERSTANDING CACTUS EXPERIMENT

Cactus Coating Exploration
Activity Developed by the University of Colorado Museum of Natural History
Description/Learning goals:
Explore the physical properties of wet and dry; spiky and squishy.

Participants will create hypotheses and test their ideas.

Participants will get an idea of the physical properties that protect cacti in their natural environment.

Supplies:
2 Cucumbers or pickles
Toothpicks
Flashlight
Sponge
Knife
2 plates
Activity Instructions:

Peel one of the cucumbers.
Have the kids feel the outside of the regular cucumber, and then the peeled cucumber. How do they feel different? How do you think the skin of the cucumber protects the vegetable?
Shine your flashlight onto the cucumbers and imagine it is the sun. How can a cactus protect itself from the sun?
Poke toothpicks into the cucumbers and then shine the flashlight on the cucumbers again. How has the cactus created shade for itself?
Leave the two cucumbers out overnight. Has one dried out more than the other?
Science Concepts
Survival in arid climate: Cacti live where it is hot and dry – both conditions that lead to evaporation of water. Cacti have special features for conserving water.

1. Spines instead of leaves. They are smaller and don't have pores through which water leaves the plant (like we have pores for sweating)

2. The cactus's waxy surface helps keep water from escaping its center throughout the day.

3. Transpiration, which moves water up from the root through the plant, only occurs at night when it's cooler, to reduce the amount of water lost.

Spines: Cactus spines help protect the plant from the sun, as well as guarding against animals. The spines are actually modified leaves, and contain very little water, helping to prevent evaporation. In the morning if there is cool air, the spines can help collect condensation or dew, which then drips from the spines onto the ground by the cactus – available to be absorbed by the roots. The spines also stick out from the body of the cactus to cast shadows; do you feel cooler when you sit under the shadow of a shady tree in the summer?

Early Learning 101:

Develop hand strength and dexterity.

Through the use of poking toothpicks into the pickle, kids practice holding tools and controlling their hand movements.

Recognize cause-and-effect relationships.

By observing the pickle before and after it has been peeled and set out to dry, have kids think of why the “cactus” may need its skin, based off the environment it lives in.

Use senses to gather information about objects, living things, and Earth materials.

Practice describing what you feel as you do this experiment. Is the pickle cold, slimy, dry? How does this change when you peel the skin, and again when you leave it out to dry?

How do the “spines” of the cactus feel?

INTERESTING FACTS ABOUT CACTUS

Here are some interesting facts about cacti:

- **Cactus rain**

During extreme drought, mature cacti release their segments, or pads, in a rare phenomenon called "cactus rain".

- **Water storage**

Cacti have thick stems that store water and are covered in a waxy skin to prevent evaporation.

- **Root systems**

Cacti have extensive but shallow root systems to absorb as much rain as possible before it evaporates.

- **Saguaro cactus**

The saguaro cactus is the largest cactus in the United States and can grow to be over 60 feet tall.

- **Christmas cacti**

Christmas cacti need 14 hours or more of continuous darkness per day to set flower buds.

- **Health benefits**

Cacti are rich in water, fiber, calcium, and potassium.

- **Habitat**

Cacti can be found in many environments, including deserts, tropical or temperate dry forests, chaparral habitats, and rocky hillsides.

- **Species**

There are around 1,500 different species of cactus.

Additional Facts

Some cacti can live up to 200 years, despite harsh desert conditions!

Cactus spines are not thorns; they’re highly modified leaves!

Those wicked spines are designed to protect the desert cactus from predators, such as rodents, birds, bears, insects … and yes, man!

The spines are able to collect hints of water from the wind!

The spines also provide shade to help slow evaporation!

Some types of cacti can survive one or two years without water!

The saguaro cactus may be the slowest grower ever, taking up to ten years to grow 1 ½ inches — yet it eventually can grow as much as 80 feet tall!

The cactus is the only plant with areoles—those small, fuzzy bumps on the exterior—from which flowers, spines, and branches spout. Each areole produces only one flower in its lifetime!

The cactus plant actually needs to rest! During the cactus's inactive season of October through February, keep the sunlight bright but reduce water, food, and temperature (the latter to around 45 degrees F).

The cactus plant can be classified as either a desert or jungle cactus. Your Christmas cactus is a prime example of a jungle dweller, so now you know why it needs less light and more water than typical desert cacti.

Almost all cacti are native to the western Americas—not Africa, Europe, or Asia—which explains why some call it a "New World" plant!

A thin, leggy cactus does not equate to being water deprived! It's probably just situated too far from a light source, which requires it to stretch its way to the sunshine it requires.

The cactus may seem like a simple plant, but its flowers are complex! They're also spectacular in color and form -- but there won't be flowers unless there's enough light.

Some cactus fruits and pads are delicious, plus nutritious! Then again, others are toxic, so make sure you know the difference before you boil or fry them.

When you have more than one cactus, it's correct to call them cactuses or cacti! And all this time, you assumed "cactuses" was a typo.

The water a cactus holds is far from clear and pure! It's thick and sticky, yet still drinkable. So all those western movies about cactus juice saving lives are true!

A cactus appears on Mexico's national coat of arms, along with an eagle and snake. That's because Mexico City's original name translates as "place of the cactus rock."

The cactus produces a fruitlike berry that holds lots of seeds. In fact, one cactus plant can produce a million seeds! Natural pollinators include typical butterflies, as well as bats and moths.

ALIENS! ESCAPE FROM EARTH

WATERING CACTUS

MATERIALS:

- Sponge
- Scissors
- Clear or Glass Cup
- Water
- Permanent Marker
- Optional: Food Coloring

SET UP EXPERIMENT

1. Cut your sponge into the shape of a cactus.
2. Pour about an inch of water into your cup.
3. Optional: Add a couple drops of food coloring.
4. Set your cactus standing up in the water and start your timer.
5. Leave your cactus in the water, checking on it once an hour. Mark the water level with a permanent marker and note the time.

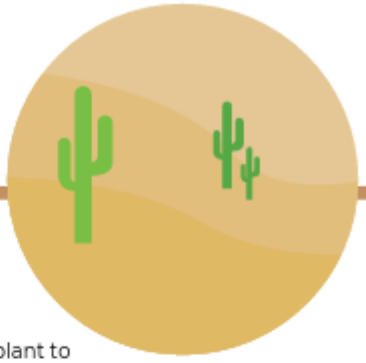
MAKE A HYPOTHESIS

- Watch the water disperse and rise up the cactus.
- How far up did the water rise after you placed the cactus in the cup?
- Do you think the water will reach the top of the cactus?
- How long do you think it will take for the whole cactus to receive the water?

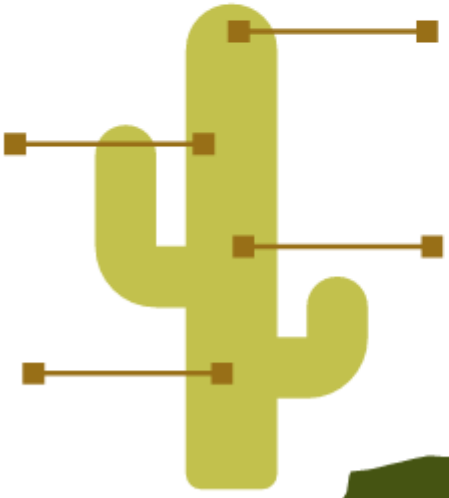
ALIENS! ESCAPE FROM EARTH: WATERING CACTUS

Grades K-5

SCIENCE EXPLANATION:



Water is essential to the life of plants, including cacti. In order for a plant to access water, it needs a **system** to move water from the ground to the different plant parts. Plants drink water through a process called **osmosis**. Osmosis is the movement of a liquid into a living thing, creating a balance of that liquid. For example, when a cactus needs water it will use osmosis to pull water through the roots until it has enough water to **photosynthesize**, or make food. Cacti take the water up to the top of the plant through **capillary action**. Water sticks to itself and climbs up and down the plant through tubes called the **xylem** and **phloem**, which are similar to our **veins**.



RESULTS

- Was your Hypothesis correct? Did the water travel all the way up the cactus?
- How long did it take the water to disperse throughout the entire cactus?
- Write down on the lines how long it took the water to rise to each level.

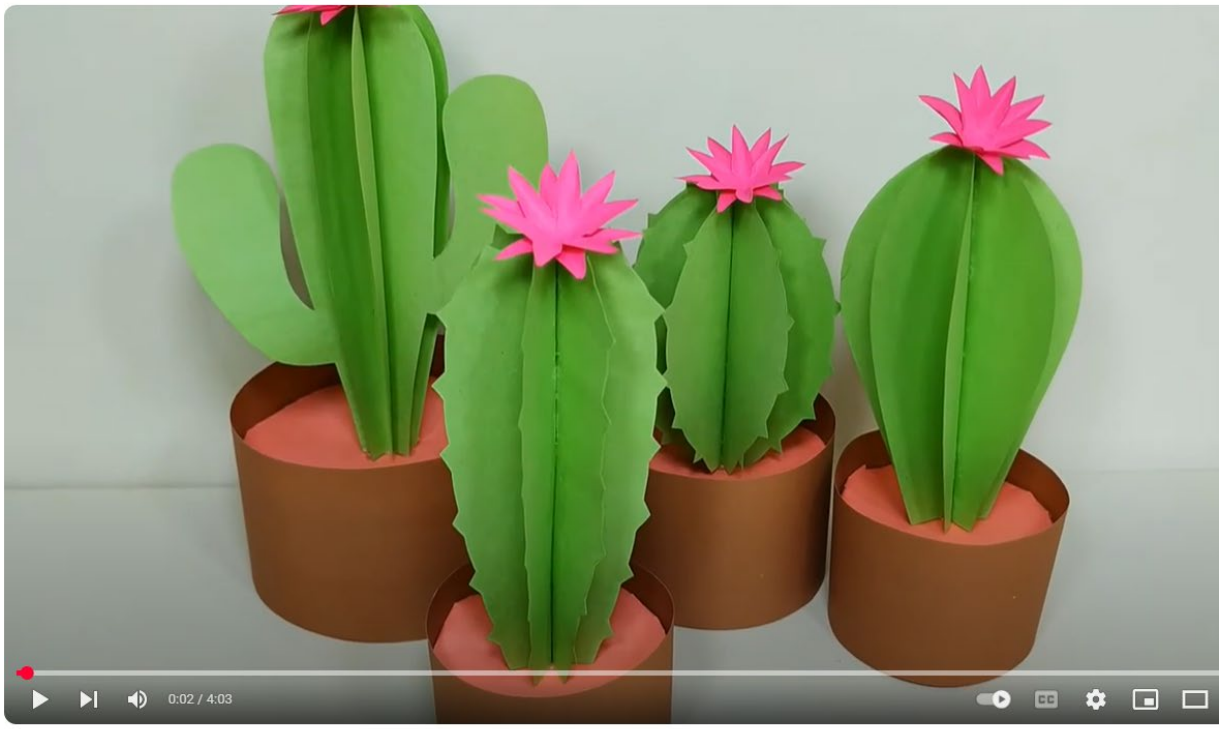
GOING FURTHER

- Leave your cactus in the cup for a couple days. How long does the sponge hold on to the water for?
- Experiment with different size sponges and different amounts of water.

3-D CACTUS ART PROJECT

STUDENT PROJECT

Will cut out their shapes, color and decorate them and add on their tissue paper flowers with glue.



Easy Paper Craft Ideas | DIY Paper Cactus Tree | 3D Paper Cactus Making | Origami Crafts

ADDITIONAL ART PROJECT- STUDENTS CAN CHOOSE TO FOLLOW VIDEO AND STEPS.

Source- https://www.youtube.com/watch?v=pQK006_upy0

3 D PRINTING PROJECT

Students have the challenge to make anything through 3 D Printing that can be found in the desert or anything they would need to survive in the desert.

Throughout the week we will have students entries to be placed to be judged on Friday. Any art projects, 3-D printing can all be entered in for a prize.

Students Can use the following sites to find designs

https://www.thingiverse.com/
https://cults3d.com/
https://www.printables.com/
https://www.yeggi.com/
https://thangs.com/

Encourage students to pick projects that won't take too long to create or discuss as a class what projects they want to create.

PROVIDE INFORMATION ABOUT 3-D PRINTING

Short slides Available here about What 3 D printing is

https://docs.google.com/presentation/d/1ibfqqQKw8IXeVlKEYnuFrpULqASFCBMzuT-jejcWS2U/edit?usp=sharing

DESERTS CONTINUED- DAY 2 PLAN

MAGIC SAND
THE SOUNDS OF THE DESERT

https://tn.pbslearningmedia.org/resource/hew06.sci.phys.maf.boomsand/booming-sands/
https://youtu.be/uX-_9IEiFSg?si=Iy6CTDF4N7Taz7UE

Many scientists have puzzled over the curious phenomena in the past, identifying various conditions important to produce the eerie tunes. The sand must be extremely dry and made up of round and silica-rich grains between 0.1 millimeters and 0.5 millimeters in diameter.

https://youtu.be/4yFaMsUawi4
Although sand is solid, a whole mass of tiny grains moving together acts a lot like a liquid, Ouellette writes. They suspect that the grains together act as a speaker that amplify vibrations during a sand avalanche.

EXPERIMENT OF MAGIC SAND

Have students try out the magic sand. Do they think it is like normal sand? What is the difference? How did it get that way?

Magic Sand - Sand that is Always Dry!

What could possibly make it stay dry when we pull it out?
https://youtube.com/shorts/6oJVDtnPLNQ?si=azv2K8XGQwiZhKHg

How Does the Magic Sand Never Get Wet?
Magic Sand begins as normal, free-flowing sand before it is dyed and coated with a hydrophobic polymer that keeps it dry. Ordinary sand cannot form a structure that holds its shape independently. The hydrophobic sand's water-repellent properties allow it to retain its shape when Magic Sand is poured into water.

DESERT DOUGH DIORAMA

You have learned a bit about Deserts so far. We want to see your creative juices for a group Art Competition. We are going to make some Desert Dough and you will get a chance to make your own desert creation as best as possible.

DESERT DOUGH

A fun recipe for cloud dough that the kids will love to make!
Prep Time 10minutes minutes
Total Time 10minutes minutes
Servings 4 Small balls
Ingredients
❑2 cups corn starch
❑1 cup baby lotion
❑Food coloring (optional)
Instructions

In a bowl, mix the lotion and cornstarch together until combined with a rubber spatula. It will be sticky at first then pick it up with your hand and knead it together.
Roll it into a big ball then separate it into 3-4 small balls (depending on how many colors you want). Squish them flat then press your thumb in the middle. Put them on parchment paper to protect your table.
Drop 1-2 drops of food coloring into the thumbprint part. Put on gloves and mold the dough until there is no white showing. Take off gloves and it's time to play!
Notes-Store in a ziploc or tupperware container to keep fresh.

Share printed pictures with students and challenge them to make their own version of the pictures with the clay.

GROUP COMPETITION FOR THE BEST DESERT SCENE.

[VIEW SAHARA DESERT ANIMALS HERE]

WATER WATER EVERYWHERE AND NOT A DROP TO DRINK!

Lets Look at Water a Bit More- Desalination

There are many places where the Desert is right next to the ocean- Check out these photos- https://www.fodors.com/news/photos/10-stunning-places-where-the-desert-meets-the-ocean

Science Is Everywhere: Fresh Water from Salt Water — Desalination

https://youtu.be/3h49i1iDNP4?si=GLadTNyK7P0EDbCg

Desalination Experiment

Oceans as well as some lakes and ponds contain salt water, which isn't very good to drink. So how do people living near salty water bodies find drinking water? Join us and learn how to make a tool to desalinate water (remove salt from water) and make it drinkable!

Materials Needed: Bowl, small container that fits inside a bowl, plastic wrap, rubber band, glass, tennis ball, tablespoon, salt, sun, and food coloring (optional)

Research Questions:

- What occurs during the water cycle?
- How is the water cycle used in the desalination process?
- How is salt water turned into fresh water?

Water is a very important natural resource. Earth is covered with water but around 97% of that water is the salt water of the ocean. This means that most of the water on Earth cannot be used for drinking and other important things that require fresh water. Thankfully there is a process called desalination which removes salt from water providing fresh water. Desalination plants are scattered across the world and are vital in reducing water shortages.

Experimental Procedure:

1. Pour 2 spoonfuls of salt into the water and stir. Use a straw to taste the salt water mixture. (Note: You should never taste anything from an experiment unless you are told to do so.)
2. Flatten a small piece of clay in the bottom of the bowl.
3. Pour salt water into the bowl until it is about 1 inch deep.
4. Place the small container on top of the clay in the bowl of salt water so the small container will not move. (Note: The small container should be taller than the depth of the water. There should be no water in the small container.)
5. Stretch plastic wrap over the top of the bowl so that the plastic wrap hangs down slightly into the bowl yet doesn't touch the water. Place a rubber band around the plastic wrap and the bowl to hold the wrap in place.
6. Place a small clay ball on top of the plastic wrap so it's hanging over the small container inside the bowl.
7. Place the container in a sunny location for a day.
8. Make a prediction of what you think will happen.
9. The next day, look closely at the bowl, the plastic wrap, and the small container. Write down your observations.
10. There should now be water in the small container. How did that water get there? Using a clean straw, taste the water in the small container. Does it taste salty or fresh?

11. How did this happen? It was the water cycle at work! Water evaporated from the mixture leaving the salt behind and condensing on the plastic wrap. The fresh water then fell into the small container as precipitation.
12. Draw an illustration of your water cycle labeling where the salt and the fresh water went.

Terms/Concepts: Desalination; Water cycle; Evaporation; Condensation; Precipitation

THE MAGIC OF SOIL SOAKERS– FARMING IN THE DESERT

Water is everywhere – in the sky, in the ground, and in our homes. However, caring for this vital resource is often a challenge for each of us. Conservation means using water wisely. Protecting our groundwater is important because it is a source for drinking and irrigation. Consequently, scientists and engineers have developed amazing, superabsorbent polymers, called hydrogels, that can help.

In this series of investigations, you will start by looking for a particular polymer at work. Once you discover what this type of polymer can do, you will experiment with other uses for the same polymer. A final step can be taken to consider solutions for water conservation and groundwater contamination.

Objective

Create and evaluate how three different biodegradable hydrogels help soil retain moisture.

Introduction

Water is crucial to farming: too little water and seeds do not germinate, plants wilt and turn brown, and the harvest is small or even non-existent. Too much water, on the other hand, can wash away important plant nutrients and cause roots to rot, damaging the plants and leaving them more susceptible to disease. That is why scientists and engineers involved in agriculture are always looking for better ways to make sure crops get just the right amount of water at the right times. One interesting solution being investigated is hydrogels.

Hydrogels are a type of material that easily absorbs and holds on to water. On a molecular scale (too small to see even with a light microscope) hydrogels are a network of polymers. The polymers are long chains of large, repeating molecules. The polymers intersect and attach chemically to each other; these regions are called crosslinks. Together, the crosslinked polymers form a sort of cage that traps the water molecules (see Figure 2). This ability to hold on to water makes hydrogels useful for many products like baby diapers, hydrating face masks, and soft contact lenses.

In agriculture, hydrogels can be added to soil to help the soil retain more moisture. When it rains or the crops are irrigated (watered), the hydrogel pieces in the soil absorb the water, reducing water runoff and evaporation. Over time, the hydrogel slowly releases water to the plants, thus reducing the amount and frequency of irrigation. These actions by the hydrogel help conserve water, which is a goal in farming, as agriculture is one of the biggest uses of water worldwide. Agricultural water conservation is particularly important in areas that are arid (naturally dry) or experiencing drought.

Many of the commercially available hydrogels are made of polyacrylamide or polyacrinolintrile. Neither is fully biodegradable, and they contain trace (extremely small) amounts of acrylamide, which is a neurotoxin and carcinogen (cancer-causing chemical at high enough doses). While it is unclear if the acrylamide or any other unwanted chemicals accumulate in the soil from these polyacrylamide and polyacrinolintrile hydrogels, researchers are working on developing environmentally friendly hydrogels made of ingredients which break down harmlessly in the soil.

Sun Print Paper

We have discussed water, sand, the desert and let's do one more project focused on the sun.

Sun print paper is a special type of paper coated with a light-sensitive chemical that allows you to create images by placing objects on it and exposing it to sunlight; when exposed to UV rays, the areas not covered by objects change color, essentially "printing" the

silhouette of the object onto the paper, often producing a blue-toned image; also known as cyanotype paper.

Key points about sun print paper:

How it works:

The chemical on the paper reacts to sunlight, causing a color change in the exposed areas.

Common use:

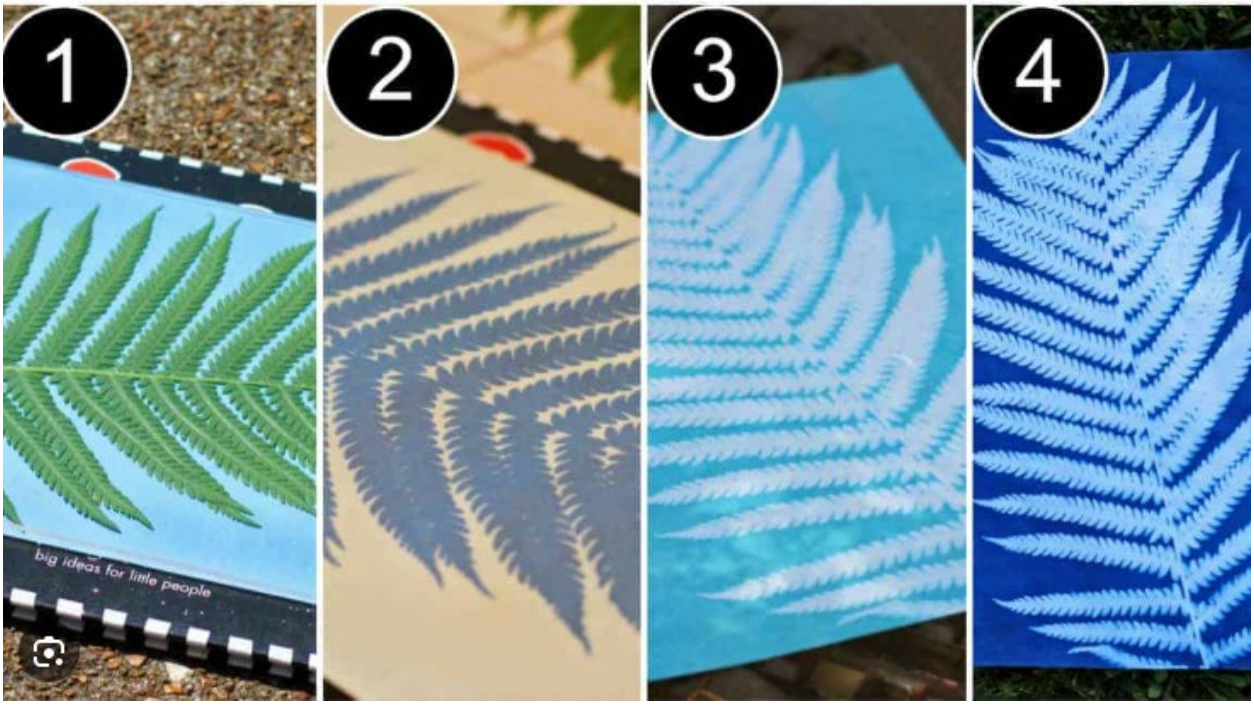
People often use sun print paper to create nature-themed art by placing leaves, flowers, or other flat objects on the paper before exposing it to sunlight.

Appearance:

The resulting image is usually blue or cyan in color.

Development process:

After exposure, the paper is typically developed by soaking it in water to set the image.



There are two exciting things happening to the paper while it is underwater. First, the original blue compound is water soluble, so that when you immerse it in the bath, the water carries it away, leaving only the white paper base in those areas. Second, the colorless compound whose formation was caused by the sun's energy is *not* water soluble, so it cannot wash away in the water bath. It *is* sensitive to the water in another way. Just as the sun's light stimulated a chemical change in the previous step, the water

stimulates another chemical change in this one. The water causes an oxidation reaction that turns the colorless compound into the deep blue of a finished sun print.

LEARNING TO DRIVE A DRONE

Introduce Students to the Drones. Explain the are used all over the world in various applications. These can be in areas such as:

Disaster response

Drones can be used to help with disaster response in the desert.

Drones can be used to detect improvised explosive devices (IEDs), landmines, and unexploded ordnance (UXO).

Search and rescue

Drones can be used for search and rescue operations in the desert.

Artificial rain

Drones can be used to create artificial rain by releasing an artificial electrical charge into clouds.

Conservation

Drones can be used to capture photos and videos of the landscape, which can be used to identify non-native plants. This can help prevent wildfires.

Drones in the desert: Challenges

Traditional battery-powered drones can have reduced lifespan and risk of battery fires in high temperatures.

Air-cooled engines on drones can overheat.

Drones are more vulnerable to weather conditions than traditional aircraft.

During the day have students get the chance to learn to drive the drones. Each student should have some simple drone skills they need to master.

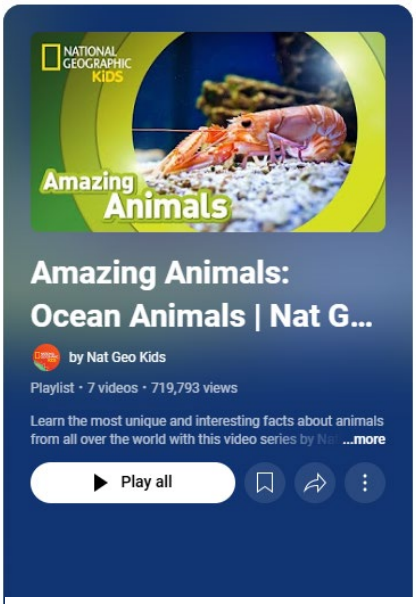
1. Going forward, backwards, side by side, up and down.
2. Following a specific prescribed direction or route in a room.

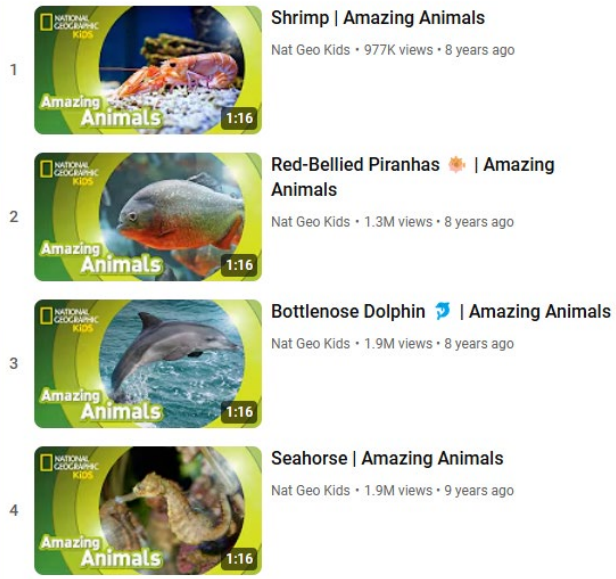
Students should also continue to get the chance to create 3-D printing projects related to deserts continue throughout the day.

INTRODUCTION TO OCEANS- DAY 3 PLAN

Share interesting Videos about the Oceans to start the day

https://www.youtube.com/playlist?list=PLQlnTldJs0ZTLL3_CbqRfzyBeXQOQrw2d





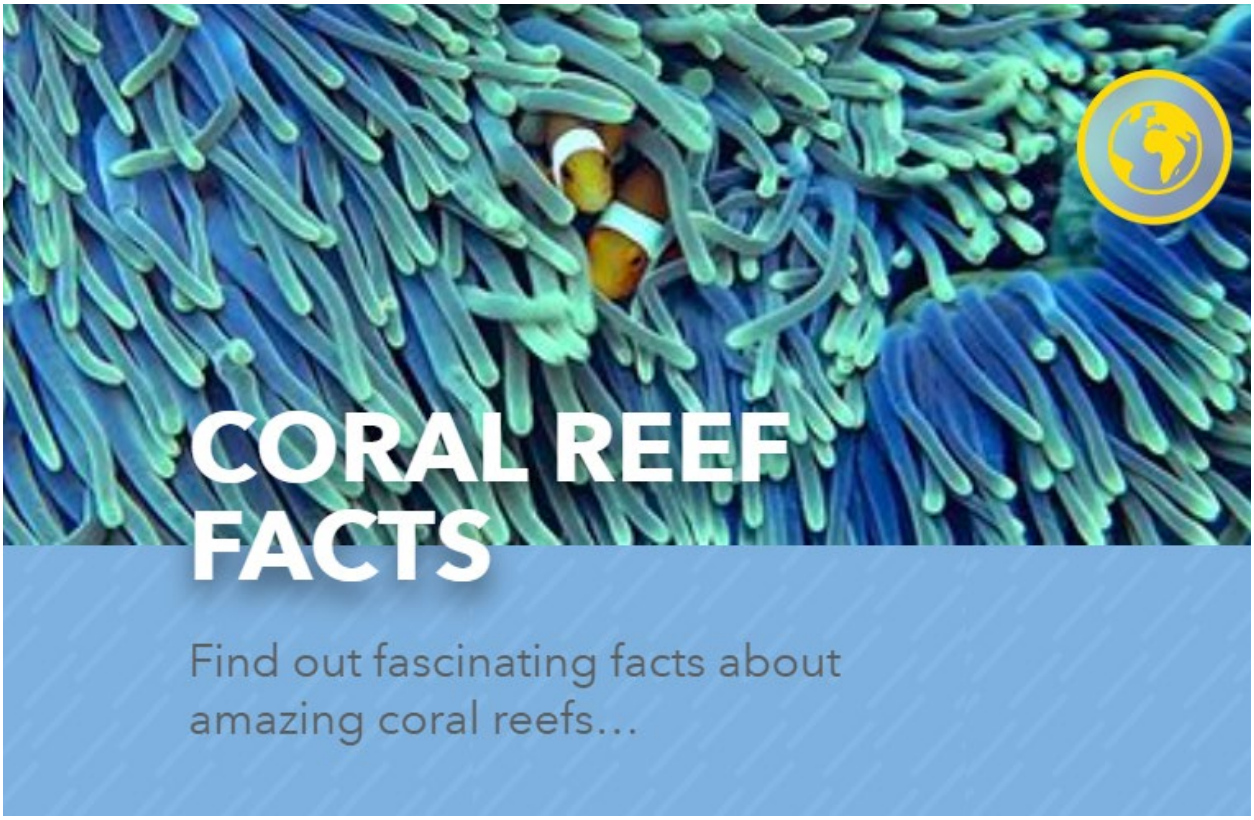
Climate change

United Nations • Climate change refers to long-term shifts in temperatures and weather patterns. Human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas.

Oceans 101 | National Geographic

National Geogr... Subscribe 24.2M subscribers 4.2K Share

CORAL REEFS- MAKE POWERPOINT



Did you know that more wildlife lives around coral reefs than in any other part of the ocean? Find out more about these important ecosystems in our coral reef facts…

What are coral reefs?

When you look at a coral reef, you might think that you are seeing a group of colourful rocks. But don't be mistaken! Reefs are actually made out of living creatures called coral.

Where are coral reefs found?

Coral reefs can be found all over the world! However, most coral reefs grow in shallow, clean ocean waters on either side of the Equator, because they need sunlight and warm temperatures all year to survive.

Some famous coral reefs include the Great Barrier Reef in Australia, the Amazon Reef in Brazil and French Guiana, the Tubbataha Reef in the Philippines and the Miami Terrace Reef in the United States.

Quick facts about coral reefs…

– Coral have growth rings, just like trees!

– The first coral reefs formed on Earth 240 million years ago. That's before the dinosaurs were alive!

– Most coral reefs today are between 5,000 and 10,000 years old.

– There are more than 800 different types of hard coral around the world.

– The Great Barrier Reef is the largest reef system on Earth. You can even see it from space!

Life in coral reefs

Lots of different types of sea creatures call coral reefs their home – giant clams, starfish, sea turtles, seahorses, eels, cuttlefish and many, many more. The reefs provide this diverse range of animals with everything they need, including food and shelter.

A lot of animals who live on the reef camouflage themselves to blend amongst the coral, either to stay safe from other animals or to hide as they hunt.

Plants also live on reefs. Algae live inside soft coral, using sunlight to provide food and help the coral grow. In other areas, sea grass provides food for sea animals like dugongs and turtles.

Why are coral reefs endangered?

The biggest threats to coral reefs are pollution spilling into the oceans, damage from ships and boats, and climate change, which makes the water warmer and more acidic.

3-D PRINTERS AND THE OCEAN

What do 3 D Printers have to do with the Oceans?

https://www.3dnatives.com/en/how-are-3d-printed-coral-reef-projects-revitalizing-marine-biodiversity-10-08234/

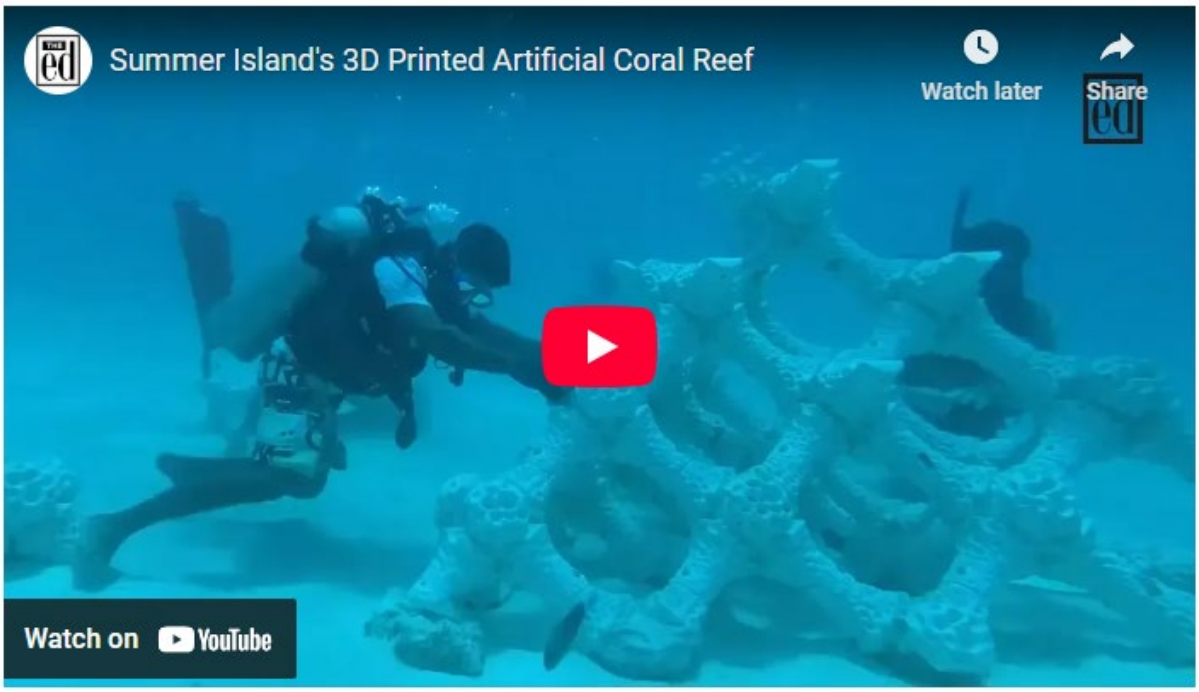
According to a study conducted by the European Parliament, between 4.8 and 12.7 million tonnes of plastic find their way into our oceans. This alarming statistic poses a significant threat to both our planet and the species inhabiting it. The Ellen Macarthur Foundation warns that by 2050, there could be more plastic in the oceans than fish.

In response to this pressing issue, numerous initiatives are emerging worldwide to safeguard our seas and oceans, with some leveraging 3D technologies. Indeed, 3D printing presents several advantages in waste recycling, such as repurposing fishing nets into printing materials and preserving marine biodiversity by creating artificial coral reefs. A multitude of projects employing additive manufacturing techniques are underway to protect our oceans, and today, we'll explore a few of them.

https://youtu.be/Bm_Cg2G3C5k

3 D PRINTING FOR FOOD?

BUILDING CORAL REEFS THROUGH 3 D PRINTING



https://youtu.be/Nc5SBCw_DJo

https://youtu.be/48PxHyaK3GA

Your 3 D Printing challenge today is to choose something from the ocean or coral reefs to be printed. You will work in groups to choose your project. Throughout the day you will get a chance to make your item.

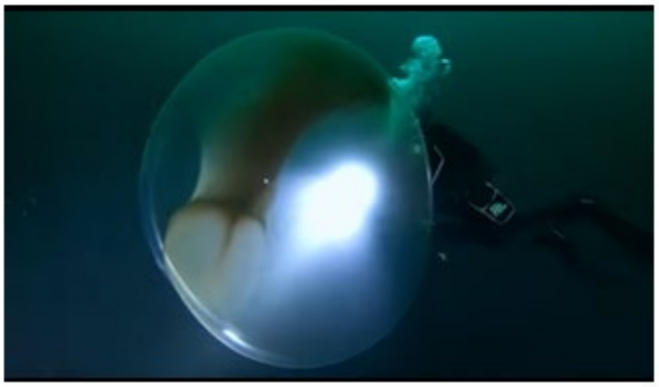
7 Cool Articulated Ocean Animals to 3D Print | Anycubic Kobra Max

Sample 3-d projects- https://www.youtube.com/watch?v=he0qXxRq1lY

BUBBLES IN THE SEA

https://youtu.be/wJMHsi0HBUo

Bubbles in the sea can be caused by breaking waves, sea foam, or methane from the ocean floor.



This bubble was filled with a giant squid egg.

Breaking waves

When waves break, the surface reconnects, trapping air and creating bubbles.

Breaking waves are the main cause of bubbles in the upper ocean.

Sea foam

When seawater is churned, dissolved organic matter traps air, forming bubbles.

Algal blooms are a common source of organic matter that can create sea foam.

Sea foam is usually not harmful to humans.

Methane from the ocean floor

Methane bubbles can be seen as plumes of small bubbles rising from the seafloor.

The bubbles are created when organic matter that has settled on the seafloor decomposes and compresses.

The bubbles indicate a high concentration of methane near the seafloor.

Bubble rings

A bubble ring is a vortex ring in the ocean where an air bubble is at the core.

The ring spins as it moves through the water.

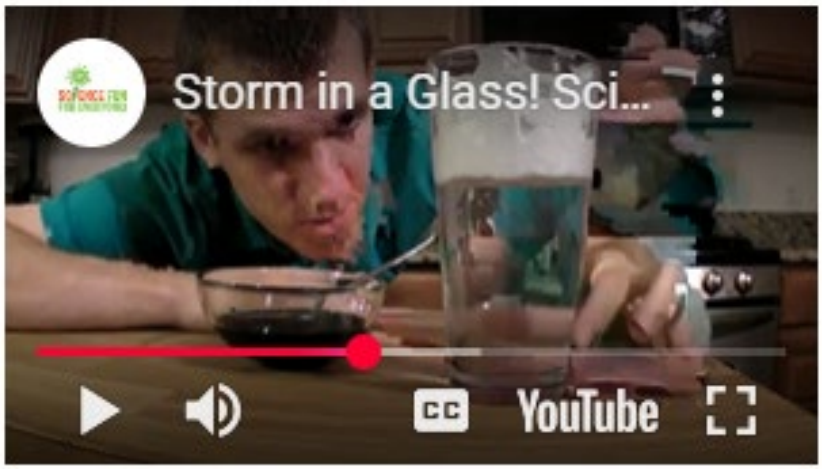
BUBBLES EXPERIMENTS

USE THE RESOURCES FROM THE STEVE SPANGLER BUBBLES EXPERIMENTS AND TRY THESE OUT WITH YOUR STUDENTS.

WATER CYCLE- FRESH WATER

STORM IN A GLASS

https://youtu.be/gvw5qqexqxm?si=hhvh-yn_snymcboi



Materials

- Shaving cream
- A large glass
- Water
- Food coloring
- A spoon

Instructions:

Fill the glass 1/2 full with water

Spray some shaving cream on top of the water to fill the glass to ¾ full.

Use your finger or a spoon to spread the shaving cream evenly over the top of the water. The top of the shaving cream should be flat.

Mix ½-cup water with 10 drops of food coloring in a separate container. Gently add the colored water, spoonful by spoonful, to the top of the shaving cream. When it gets too heavy, watch it storm!

How does it work?

Clouds in the sky hold onto water. They can hold millions of gallons! The layer of shaving cream is our pretend cloud in this experiment. The shaving cream layer can also hold onto water. Clouds can't keep storing more and more water forever, eventually they get too heavy. When that happens, the water falls out (precipitates) as rain, snow, sleet, or hail.

Further Experiments

Try more water and less shaving cream, or less water and more shaving cream. Which one looks more like a drizzle, and which one looks like a downpour?

AIR AND WATER PRESSURE
HOLES THAT DO NOT LEAK!

Summary

Active Time

10-20 minutes

Total Project Time

10-20 minutes

Introduction

Did you know that at sea level there are about 15 pounds of air pressing on each square inch of your body? This air is very helpful in our daily lives. For example, this layer of air helps to keep the Earth from getting inhospitably cold or hot. It can even help keep a bottle with holes in it leak-free! Try the activity to find out how.

Materials

- Sturdy plastic bottle with tight-fitting lid, 750 milliliters to 2 liters works well
- Water, enough to fill the bottle
- At least four pushpins
- Work area that can get wet
- Baking sheet with a rim
- Sink
- Towel or cloth for cleanup
- Optional: food coloring
- Optional: More sturdy plastic bottles
- Optional: More water

Materials needed to do a science activity that explores when holes do and do not leak.

Image Credit: Sabine De Brabandere, Science Buddies / Science Buddies

Prep Work

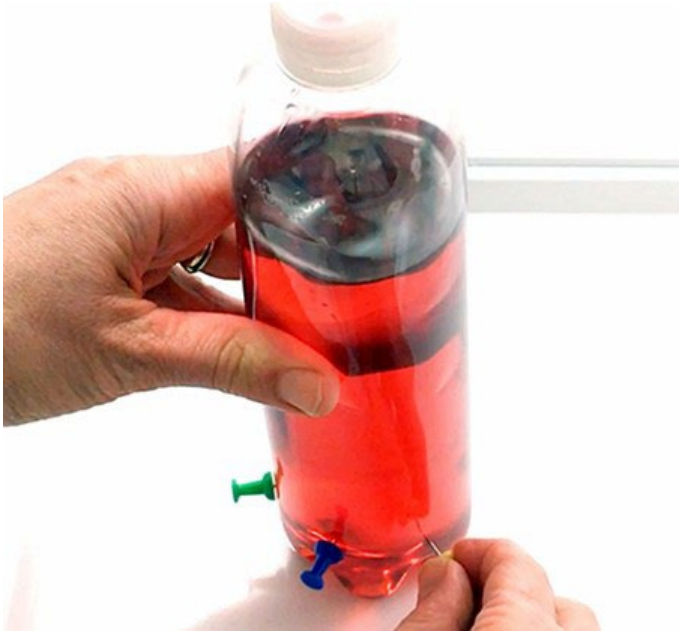
Fill the bottle with water, add a drop of food coloring (optional), and close the lid tightly.

Place the bottle on the baking sheet. The sheet will catch any water that might flow out.

Instructions

1. Push at least four pushpins into the body of the bottle, about one inch from its bottom.

Does water leak out? Why do you think this is so? What do you think will happen if you pull the pins out?



Carefully pull the first pin straight out so you leave a small round hole in the bottle.

Do you see a stream of water flowing out or just a trickle? Why do you think that is so? What do you think will happen when you pull the other pins out?

2. Carefully pull the other pins out of the bottle. Try not to press on the bottle while you pull the pins out.

What happens? Is this what you expected? Why do you think this happens?

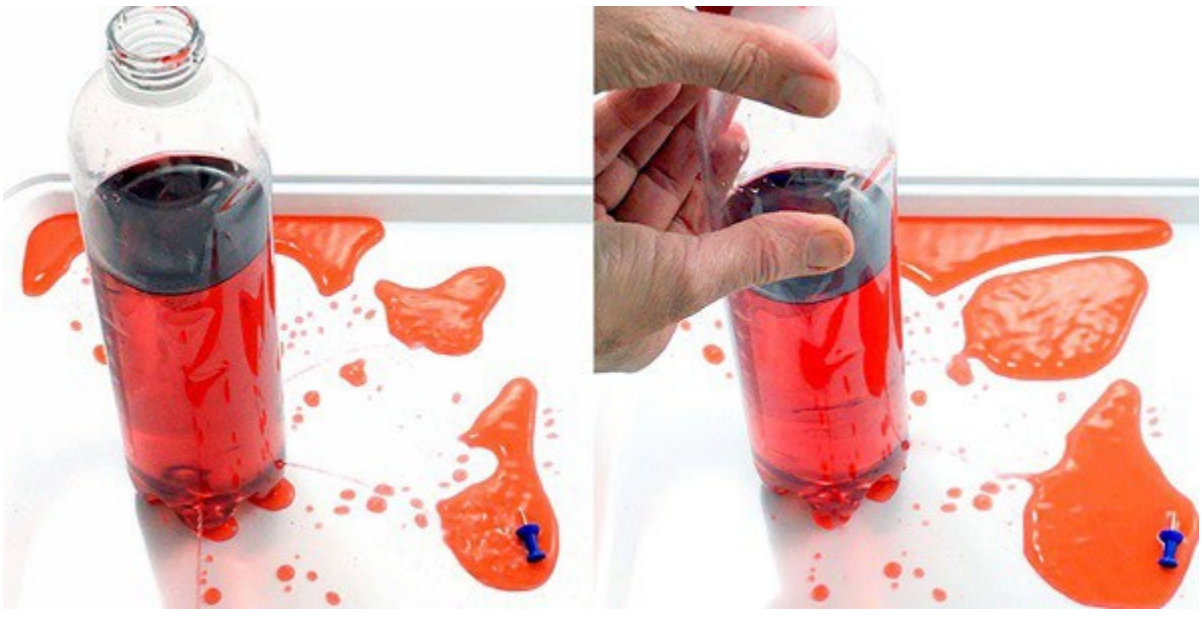
3. Squeeze the bottle and release it. Repeat this a few times.

What happens when you squeeze on the bottle? What happens when you release it? Why do you think this would happen?

Carefully move the bottle to a sink. Hold atowel underneath to catch any drips. Hold the bottle over the sink and open it.

What happens? Why would this happen? Can you find a way to stop the streams of water?

4.

5. 

What Happened?

It is likely that only a trickle dripped from the holes when the bottle remained closed and no pressure was applied—and that streams poured out when the bottle was opened or pushed in.

Water likes to stick together, so it takes effort to separate a stream of water from a body of water. Unless you press the bottle—or unless the air in the atmosphere pushes on the top surface of the water—no streams will flow out from tiny holes.

Air outside the bottle also presses against the water near the holes. If there is a place for air to flow in (such as an opening at the top of the bottle), the entering air could allow water to drip out of the holes. But in an airtight bottle no air can enter to fill the space of any water that dripped out. So if any bit of water leaves the bottle, it reduces the air pressure inside the bottle, keeping the water from pouring out. If you squeeze the bottle, however, you increase the air pressure, and water can squirt out.

If the holes are small enough, the water sticks together just enough to stop air from bubbling in. If you tried making larger holes, you probably noticed that air bubbles manage to creep in as water flowed out of them. If you made a small hole near the spout of the bottle as explained in the further exploration section, you undoubtedly noticed that even a tiny hole can allow enough airflow in to get the water flowing.

Digging Deeper

Earth is covered by the atmosphere, which is a blanket of gas that is 60 miles thick. Although we usually think of air as not being full of anything, all air is made up of tiny particles, which have a small amount of mass. We—and anything else around us—experience the weight of this layer of gas as pressure; this is called atmospheric pressure. We are so used to this pressure, however, that we rarely notice its existence. But if you have ever felt your ears "pop" while driving up a mountain, you noticed it changing. As you drive up in elevation, fewer layers of air press on you. The air inside your eardrums remained at the air pressure from a lower elevation—at least, until they "popped."

Water is also made up of tiny particles that have mass. When something is underwater, it feels the pressure of all the layers of water above it. Because water is much denser than air it is also much heavier. A layer of about 10 meters of water creates approximately the same pressure as the 60-mile-thick layer of air surrounding the earth. You might have felt water pressure while diving in a deep pool; the deeper you dive, the more you feel the water press against your eardrums.

Water has another interesting quality: its particles like to stay together. It is as if there is a thin film around a body of water. Scientists call this surface tension. You can see surface tension at work when looking closely at water droplets on a solid surface; they tend to clump together in round dots or small puddles rather than spreading out completely flat and evenly.

Air pressure and surface tension work together in this activity to prevent small holes from leaking.

INTERESTING FACTS ABOUT OCEANS- CREATE POWERPOINT

Size: The ocean covers about 70% of the Earth's surface.

Biodiversity: The ocean is home to over one million species of plants and animals, and many more are likely undiscovered.

Oxygen: The ocean produces about half of the Earth's oxygen.

Salt: Ocean water is salty because of runoff from land and openings in the seafloor.

Volcanoes: There are an estimated one million volcanoes in the ocean, many of which are active.

Mid-ocean ridge: The mid-ocean ridge is a chain of mountains that runs around the Earth, stretching over 40,000 miles.

Mariana Trench: The Mariana Trench is the deepest known point in the ocean, reaching depths of over 35,000 feet.

Denmark Strait cataract: The Denmark Strait cataract is the tallest waterfall on Earth, dropping 3,500 meters.

Pacific Ocean: Magellan named the Pacific Ocean after entering it and finding the waters calm.

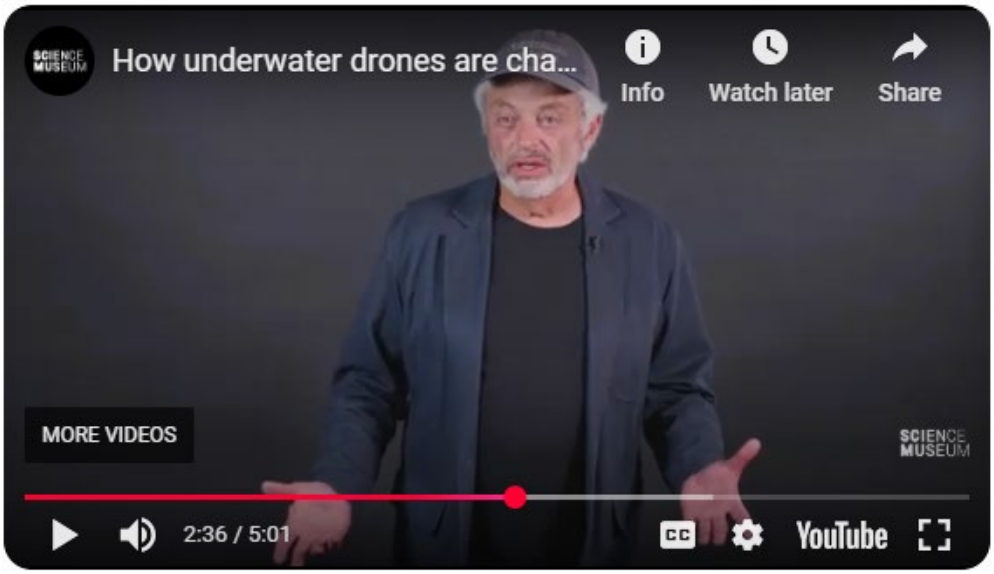
Ocean currents: Ocean currents help balance the Earth's heat, and bring rain to coastal areas.

Sound: Sound travels 4.3 times faster underwater than in air.

Human artifacts: The ocean contains many human artifacts left behind by travelers over time.

DRONE USE IN THE OCEAN- Research oceanographer Jules Jaffe is building underwater drones that are changing our understanding of the oceans. From MAE's, drones and swarms; find out how this technology and the "maker generation" are revolutionising the future of underwater exploration.

See the object and discover more in our exhibition Driverless: Who is in control? giving a unique glimpse into the AI-driven tech that could shape the habits, behaviour and society of tomorrow. Find out more: https://www.sciencemuseum.org.uk/see-...



STUDENTS SHOULD ALSO CONTINUE TO GET A CHANCE TO PRACTICE WITH THE DRONES AND CONTINUE THEIR 3-D PROJECTS

DAY 4- STEAM PROJECT DAY

DURING THIS DAY WE WILL FINISH ANY ACTIVITIES NOT YET COMPLETED AND WORK ON SOME VARIED STEM PROJECTS AND A FEW EXPERIMENTS AND COMPETITIONS

MARBLE RUN PROJECTS

Students will get a chance to work with various Marble Run Projects

LEGO ZIP LINES

Using Legos and fishing lines students will make a Lego ZiP Line and see who can get it the farthest

CREATE YOUR OWN CIRCUITS LIGHT

Students will get a chance to work with Christmas lights and circuits projects.

CODING THE DRONE

Students will learn how to code the drones and drive them.

ART HOUR

Students will be able to make 1 or two art projects

Black Glue Art- Ocean Pictures

Winter Tree Scene- Watercolor and Salt Project-

https://www.youtube.com/watch?v=iWr_HsO_ja4

3-D PRINTING PROJECT DESIGN

Students will continue to work on 3 projects and have a chance to try out making a design in small groups.

EXPERIMENT STATION

TRAVELING WATER

Traveling Water Experiment- https://www.youtube.com/watch?v=9EUfVIon6t8

Incredible color mixing science experiment! Watch as this water walks. Walking water or travelling water as it's known is a really cool science demonstration project. Watch as the colors from each cup travel up and down the paper towels to mix into new colors!

The "walking water" experiment works due to a phenomenon called capillary action where water travels upwards through the tiny spaces between fibers in a paper towel, essentially "walking" from one container to another, against gravity, because of the attractive forces between the water molecules and the paper towel fibers; this is the same process that allows water to move up from a plant's roots to its leaves.

Key points about capillary action in the walking water experiment:

Paper towel structure:

The paper towel is made up of tiny fibers with gaps between them, acting like small capillary tubes.

Adhesion:

Water molecules are attracted to the cellulose fibers in the paper towel, pulling them upwards.

Cohesion:

Water molecules also stick to each other due to surface tension, allowing them to form a continuous column as they move up the paper towel.

How to perform the experiment:

Setup:

Place several glasses in a row, fill some with colored water, and then place paper towels with one end in a filled glass and the other in an empty glass.

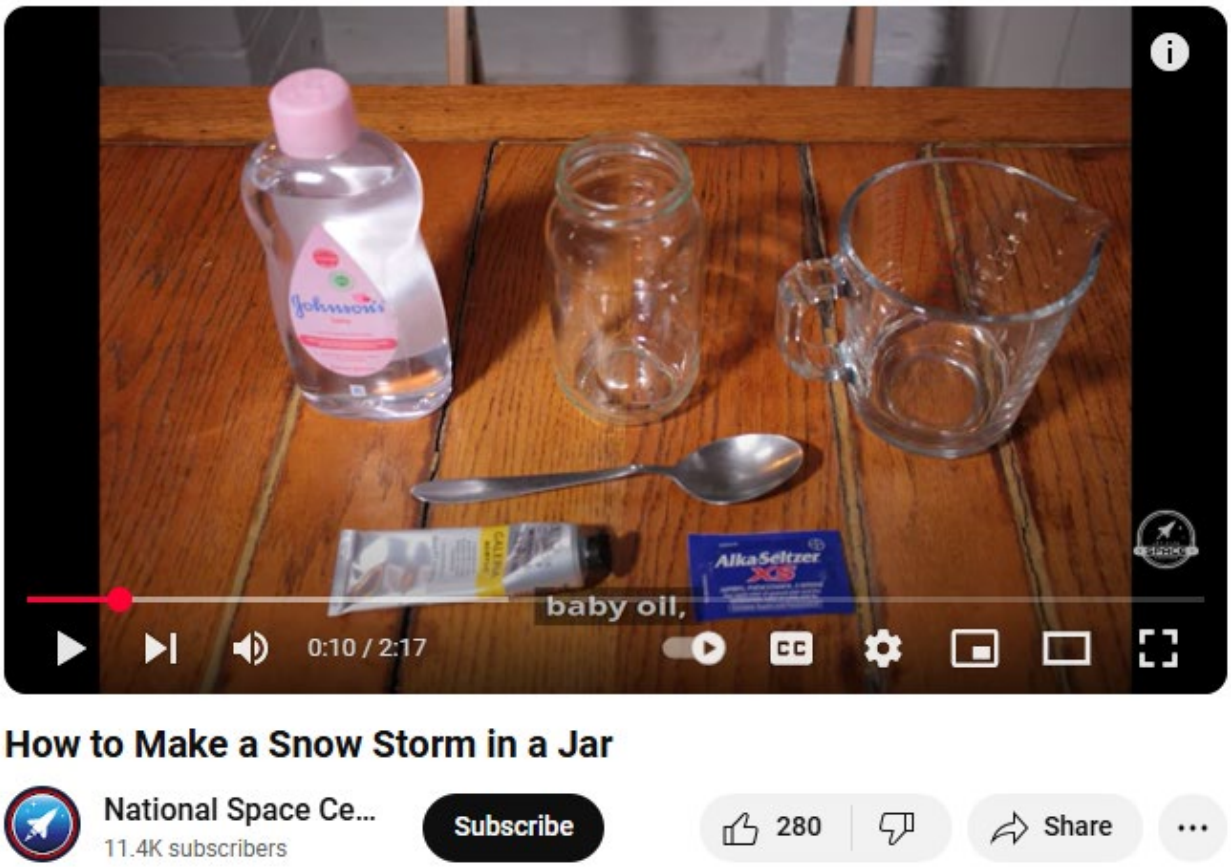
Observation:

Over time, the colored water will travel through the paper towel and into the empty glass, creating a visible "walking" effect.

SNOWSTORM IN A JAR

Making a snowstorm in a jar- https://www.youtube.com/watch?v=5i6SkoJAEYA

You'll need: baby oil, acrylic white paint, water and Alka Seltzer tablets.



How to Make a Snow Storm in a Jar

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In a "snowstorm in a jar" experiment, when you drop an Alka-Seltzer tablet into a jar filled with water and oil (with added glitter or paint), the tablet reacts with the water, creating carbon dioxide bubbles that rise through the oil, carrying small droplets of colored water with them, simulating a snowstorm effect as the bubbles pop and the water sinks back down due to its density difference with the oil; essentially, the oil and water separate, with the fizzing bubbles acting as the "snow" rising up and falling back down.

Key points about the science behind it:

Oil and water don't mix:

Oil is less dense than water, so it floats on top.

Alka-Seltzer reaction:

When the tablet dissolves, it releases carbon dioxide gas, creating bubbles.

Bubble movement:

These bubbles rise through the oil, carrying small droplets of water (and added glitter) with them.

Visual effect:

This creates the appearance of a "snowstorm" as the bubbles reach the top and pop, causing the water droplets to fall back down.