



national science week 2023

DIY Science – Sunny Survival

Use the Sun to distil water and measure the time until sunset and use the stars to navigate.

Safety

When doing science activities outdoors, wear sun protection and comfortable, closed-in shoes. Always treat the natural environment with care and try to leave it as you found it.

What you need

Two clean and clear glass or plastic drink bottles of the same size (no lids), table salt, teaspoon, tape, natural materials (dirt, rocks, leaves), fruit juice

What to do

Part A: Distilled water

Imagine you are stranded in the bush with no fresh water. Using simple materials, you will purify salty water to make it safe to drink. Record your results on the next page.

1. Add water to one of the bottles until it is about $\frac{1}{4}$ full.
2. Add 1 teaspoon of salt to the water and swirl the bottle to dissolve the salt.
3. Turn the other bottle upside-down so the openings of the two bottles are lined up and wrap tape around the join to hold the bottles together. Use enough tape to create an airtight seal. Be careful to make sure none of the salty water goes into the empty bottle.
4. Find a sunny location and use dirt or rocks to create a low mound.
5. Carefully lay the connected bottles on their sides with the empty bottle resting on the mound. Remember, the salty water must not go into the empty bottle.
6. Use leaves to create shade over the empty bottle.
7. Leave the bottles in place for several hours and watch what happens. Can you see water collecting in the empty bottle?
8. To test the distilled water, carefully unwrap the tape while the bottles are still on their sides and take a sip of water from the empty bottle. Does the water taste salty?
9. Wash the bottles and repeat the activity using fruit juice instead of salty water. Does the distilled water taste like fruit juice? What is the colour of the distilled water?
10. Wash the bottles and repeat the activity, but this time DO NOT taste the distilled water. Try mixing dirt with the water in the first bottle to make it brown and murky. What is the colour of the distilled water?



Can you improve the design of the water distiller?

What would happen if you painted the bottle of saltwater/juice/dirty water with black paint?

Part B: Time until sunset

When camping in the bush, it is important to have enough time to set up camp before sunset. To estimate the amount of time until sunset, try a simple trick using an outstretched hand



with bend wrist and fingers held horizontally. Line up the little finger with the horizon, or the point where the sky meets the land, and count the number of finger-widths between the land and the setting Sun. If four fingers are not enough, stack the other hand on top of the first. The approximate time until sunset is 15 minutes multiplied by the number of finger widths. For example, if the Sun is 4 finger widths above the horizon, the Sun will set in approximately $15 \text{ minutes} \times 4 = 1 \text{ hour}$. This is based on an adult hand and works best in locations that are close to the Equator where the Sun moves straight down towards the horizon. For locations closer to the Poles, sunset will take longer because the Sun's path is at an angle to the horizon.

What's happening?

Distillation is a way of purifying water using heat. Light from the Sun warms up the salty water and causes some of the water to evaporate, forming invisible water vapour, which is a type of gas. The water vapour spreads throughout the two bottles. When some of the water vapour in the empty bottle cools down in the shade, it condenses, and turns back into liquid water. The salt does not evaporate, so it stays in the first bottle, and the condensed water in the empty bottle is salt-free and purified. If you were using this method to survive, you might need a few more bottles to purify enough water to drink!

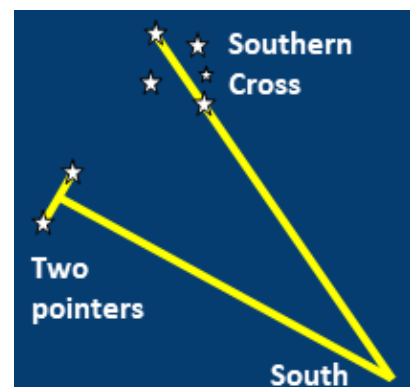
During the day, the Sun appears to move across the sky, but it is really planet Earth that is moving as it spins on its axis, doing one complete revolution every 24 hours. It takes one year for Earth to orbit the Sun. The path of the Sun across the sky depends on the location on Earth but the Sun always travels at the same speed across the sky. This is measured as an angle, with the Sun moving 15° across the sky every hour.

Results

	Question	Answer
Salt water	Does the distilled water taste salty?	
Fruit juice	Does the distilled water taste sweet?	
Fruit juice	What is the colour of the distilled water?	
Dirty water	What is the colour of the distilled water?	

Did you know?

On a clear night, the stars of the Southern Cross and the Two Pointers can be used to find the direction South. Draw an imaginary line joining the two pointers and a second imaginary line from the middle of the two pointers, perpendicular to the first line. Draw a third line through the long axis of the cross. This line meets the second line in the direction South.



Find out more

- Learn about Aboriginal and Torres Strait Islander peoples' techniques for navigating using the stars: <https://bit.ly/3NupiWv>
- Experiment with a different design for a solar-powered water purifier: <https://bit.ly/3VnDgvf>
- Discover how sunscreen protects skin from the Sun's energy: <https://bit.ly/3HyoZpO>