Sunlight Speed Test

Compare a fair test of how sunlight warms three materials.

S6E4.b "Plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land and water at different rates."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the conditions the class kept the same, circle the steps used to measure temperature, and number the evidence that shows which materials warmed at different rates.

A Fair Warming Investigation

1. To test sunlight warming, a class used three identical clear containers. The containers held equal volumes of dry soil, water, or air. Each began at 20°C and stood side by side in direct sunlight. A probe measured each material. The air probe had a white cap that blocked sunlight from the probe, not from the container or its air.

2. Before starting, the class checked all probes in one room. They recorded temperatures every five minutes for fifteen minutes. Only the material changed. Container size, starting temperature, location, sunlight, and measuring times stayed the same. The probe cap was a measurement control. Without it, sunlight could heat the probe itself and make the air reading too high.

TEMPERATURE DATA FROM THE INVESTIGATION

Time	Dry soil temperature (°C)	Water temperature (°C)	Air temperature (°C)
0 minutes	20	20	20
5 minutes	25	22	21
10 minutes	29	24	23
15 minutes	34	26	25

3. After fifteen minutes, soil had warmed the most. Water changed temperature more slowly because water requires more energy to raise its temperature than dry soil. The air also warmed, showing that energy from the sun entered the container and then heated the air. The results show a temperature change, not a final temperature alone, so the class could compare warming rates.

2 ANSWER WITH EVIDENCE

Use the passage

1. Name two conditions the class kept the same. Why did keeping conditions the same make the comparison fair?

2. Calculate the temperature change for dry soil, water, and air after 15 minutes.

3. Which material had the greatest average warming rate during the 15 minutes? Use data from the table as evidence.

4. Why did the air probe have a white cap, and what did the cap not shade?

3 YOUR TURN

Your own words

Plan an investigation that compares warming of air, dry soil, and water in sunlight. In 5 to 7 sentences, name the materials, state at least three controls, tell where and when you will measure temperature, and predict which material will have the greatest temperature change after 15 minutes.

ANSWER KEY

Sunlight Speed Test

GRADE 6 · S6E4.b

PART 1 · READ AND MARK

Underline the conditions the class kept the same, circle the steps used to measure temperature, and number the evidence that shows which materials warmed at different rates. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Name two conditions the class kept the same. Why did keeping conditions the same make the comparison fair?	**Answers may include container size, starting temperature, location, sunlight, measuring times, or probe checking. Keeping these conditions the same meant the material was the only intended difference.**
2	Calculate the temperature change for dry soil, water, and air after 15 minutes.	**Dry soil: 14°C. Water: 6°C. Air: 5°C.**
3	Which material had the greatest average warming rate during the 15 minutes? Use data from the table as evidence.	**Dry soil. It warmed 14°C in 15 minutes, from 20°C to 34°C, which was a greater change than water or air.**
4	Why did the air probe have a white cap, and what did the cap not shade?	**The cap stopped sunlight from heating the probe itself and causing an air reading that was too high. It did not shade the container or its air.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I will use three identical clear containers with equal volumes of dry soil, water, and air. I will begin each at 20°C, place the containers side by side in sunlight, and use the same type of probe. I will measure soil and water at the center and use a capped probe in the center of the air container. I will record each temperature at 0, 5, 10, and 15 minutes and subtract the starting temperature from the final temperature. I predict that dry soil will have the greatest temperature change after 15 minutes.

Accept any two accurately stated controls in Question 1 and equivalent calculations in Questions 2 and 3. For the open response, accept reasonable predictions if the plan includes comparable containers, stated controls, repeated temperature measurements, and a way to compare temperature change.