

Factors That Affect Climate

Teacher Notes

TIME REQUIRED one 45-minute class period

LAB RATINGS

Easy ← 1 2 3 4 → Hard

Teacher-Prep–1
Student Set-Up–2
Concept Level–2
Clean Up–2

SKILLS ACQUIRED

Observing
Measuring
Experimenting
Predicting
Collecting Data
Organizing and Analyzing Data

THE SCIENTIFIC METHOD

In this lab, students will

- Ask Questions
- Test a Hypothesis
- Make Observations
- Analyze the Results
- Draw Conclusions

MATERIALS

The materials listed on this page are enough for groups of two to four students.

TIPS AND TRICKS

Make sure the two containers are the same size and shape and that the lamp is positioned so that it shines evenly on both containers. The thermometers should be positioned the same distance below the surface of the soil and water, and the same volume of soil and water should be used in the containers. Also, make sure that the soil is dry. Have students predict the results of this activity if they used different soil types or sand or gravel.

ANSWER KEY

Factors That Affect Climate

Many factors affect climate. One of the most significant factors that influence climate is the distribution of land and water. Because land and water absorb and release heat energy differently, they affect the atmosphere differently. In turn, the differences between land and water affect climate. In this lab, you will explore how the properties of land and water affect climate.

OBJECTIVES

Determine whether land or water absorbs heat faster.

Explain how the properties of land and water affect climate.

MATERIALS

- container (2)
- heat lamp
- meterstick
- soil
- thermometer, Celsius (2)
- water

SAFETY



ASK A QUESTION

1. How do properties of land and water affect climate?

FORM A HYPOTHESIS

2. Write a hypothesis that is a possible answer to the question above.

TEST THE HYPOTHESIS

3. Fill one container with soil and the other with water. Place both containers on a flat surface next to each other.
4. Place a thermometer in the soil, and record the temperature.
5. Place the second thermometer in the container of water. The bulbs of both thermometers should be placed so that they are covered by no more than 0.5 cm of water or soil.
6. Place the heat lamp 25 cm above both containers. Turn on the heat lamp.

ANSWER KEYFactors That Affect Climate *continued*

7. Create a data table like the one shown below. In the table, record the temperature of each sample at 1, 3, 5, and 10 min intervals.

DATA TABLE

Time (min)	Temperature of soil (°C)	Temperature of water (°C)
1		
3		
5		
10		
5 (after light off)		

8. Disconnect the lamp, and record the temperature of the soil and water after 5 min.
CAUTION: be sure to let the heat lamp cool before storing it.

ANALYZE THE RESULTS

1. **Analyzing Data** Which substances absorbed more heat energy: water or soil?

The soil absorbed more heat than the water did.

2. **Analyzing Results** Which substances lost heat faster when the heat lamp was turned off: water or soil?

The soil lost heat faster than the water did.

DRAW CONCLUSIONS

3. **Evaluating Conclusions** What conclusion can you draw about how land and water on Earth are heated by the sun?

The sun heats the land faster than it does the water. The water, on the other hand, will retain heat from the sun longer than the land does and the water will cool down more slowly.

ANSWER KEYFactors That Affect Climate *continued*

4. **Analyzing Methods** Does this experiment describe how proximity to a body of water affects the temperature of a region? If so, explain your answer. If not, how could you test that variable?

While this experiment provides evidence that proximity to a body of water might have an effect on the temperature of a region, it does not really test the variable specifically. One way to test the variable would be to take measurements of soil temperatures in areas near a large body of water and away from the water at various times on a sunny day and again at different times throughout the following night.

EXTENSION

1. **Applying Ideas** Repeat this experiment, but modify the angle at which the light strikes the surface of the soil and the water. How do your results differ from the results of the original experiment? How does the angle of the light affect temperature change in water and soil?

At angles of less than 90°, the soil and water should not heat up as much or as quickly as they did in the original experiment. The smaller the angle at which the light strikes the soil and water, the smaller the temperature increase should be.

Factors That Affect Climate

Many factors affect climate. One of the most significant factors that influence climate is the distribution of land and water. Because land and water absorb and release heat energy differently, they affect the atmosphere differently. In turn, the differences between land and water affect climate. In this lab, you will explore how the properties of land and water affect climate.

OBJECTIVES

Determine whether land or water absorbs heat faster.

Explain how the properties of land and water affect climate.

MATERIALS

- container (2)
- heat lamp
- meterstick
- soil
- thermometer, Celsius (2)
- water

SAFETY



ASK A QUESTION

1. How do properties of land and water affect climate?

FORM A HYPOTHESIS

2. Write a hypothesis that is a possible answer to the question above.

TEST THE HYPOTHESIS

3. Fill one container with soil and the other with water. Place both containers on a flat surface next to each other.
4. Place a thermometer in the soil, and record the temperature.
5. Place the second thermometer in the container of water. The bulbs of both thermometers should be placed so that they are covered by no more than 0.5 cm of water or soil.
6. Place the heat lamp 25 cm above both containers. Turn on the heat lamp.

Factors That Affect Climate *continued*

7. Create a data table like the one shown below. In the table, record the temperature of each sample at 1, 3, 5, and 10 min intervals.

DATA TABLE

Time (min)	Temperature of soil (°C)	Temperature of water (°C)
1		
3		
5		
10		
5 (after light off)		

8. Disconnect the lamp, and record the temperature of the soil and water after 5 min.
CAUTION: be sure to let the heat lamp cool before storing it.

ANALYZE THE RESULTS

1. **Analyzing Data** Which substances absorbed more heat energy: water or soil?
2. **Analyzing Results** Which substances lost heat faster when the heat lamp was turned off: water or soil?

DRAW CONCLUSIONS

3. **Evaluating Conclusions** What conclusion can you draw about how land and water on Earth are heated by the sun?

Factors That Affect Climate *continued*

- 4. Analyzing Methods** Does this experiment describe how proximity to a body of water affects the temperature of a region? If so, explain your answer. If not, how could you test that variable?

EXTENSION

- 1. Applying Ideas** Repeat this experiment, but modify the angle at which the light strikes the surface of the soil and the water. How do your results differ from the results of the original experiment? How does the angle of the light affect temperature change in water and soil?