



## Heating and Cooling of Land Forms

### Annotation

The purpose of this lab is to observe heating and cooling rates of samples of soil, grass, saltwater, fresh water, and sand. The sun's energy warms different types of materials at different rates. This activity will demonstrate the different rates at which common substances seen in nature are heated by the sun's energy.

### Primary Learning Outcomes

Does land or water heat and cool faster? How does the presence of salt in the ocean's water affect the rate at which it is heated or cooled?

### Assessed Georgia Performance Standards

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SPS7. Students will relate transformations and flow of energy within a system.

### Materials and Equipment

- 5 large test tubes
- 5 single-hole rubber stoppers
- Samples of soil, grass, saltwater, fresh water, and sand
- 5 thermometers
- 100-watt bulb with light stand
- Graph paper and colored pencils
- Stopwatch
- Ruler

### Procedures/Activities

*Step: 1 Duration: 45 minutes*

1. Use glycerin or soapy water on the rubber stopper prior to placing it on the thermometer.
2. In each test tube, place one thermometer and one sample of the previously listed materials.

3. Place all five test tubes in clamps and secure the tubes/clamps under the lamp.
4. Record the beginning temperature of each material.
5. Turn on the lamp.
6. Record the heating temperature at each minute.
7. At minute 15, record the temperatures then turn off the lamp.
8. Record the cooling temperatures every minute until minute 30.
9. Graph recorded results on a graph paper using appropriate scale. (*Suggestion: You might want to use a different colored pencil for each material.*)

*Step 2: Duration 30 minutes*

Students should answer the following questions:

1. Which material heated up the fastest and slowest? Why?
2. Which material cooled off the fastest and slowest? Why?
3. Were there any differences in the heating and cooling of the salt and fresh water? If so, what were the differences and why do you think they exist?
4. At the beach on a sunny day, the sand is much hotter than the water. Why is this?

**Total Duration**

1 hour 15 minutes

**Assessment**

Students can be assessed through participation in laboratory activity, as well as through the grading of the laboratory questions.

## Laboratory Worksheet

| Time  | Soil | Sand | Grass | Saltwater | Fresh Water |                     |
|-------|------|------|-------|-----------|-------------|---------------------|
| 1:00  |      |      |       |           |             | <b>Heating Time</b> |
| 2:00  |      |      |       |           |             |                     |
| 3:00  |      |      |       |           |             |                     |
| 4:00  |      |      |       |           |             |                     |
| 5:00  |      |      |       |           |             |                     |
| 6:00  |      |      |       |           |             |                     |
| 7:00  |      |      |       |           |             |                     |
| 8:00  |      |      |       |           |             |                     |
| 9:00  |      |      |       |           |             |                     |
| 10:00 |      |      |       |           |             |                     |
| 11:00 |      |      |       |           |             |                     |
| 12:00 |      |      |       |           |             |                     |
| 13:00 |      |      |       |           |             |                     |
| 14:00 |      |      |       |           |             |                     |
| 15:00 |      |      |       |           |             |                     |
| 16:00 |      |      |       |           |             | <b>Cooling Time</b> |
| 17:00 |      |      |       |           |             |                     |
| 18:00 |      |      |       |           |             |                     |
| 19:00 |      |      |       |           |             |                     |
| 20:00 |      |      |       |           |             |                     |
| 21:00 |      |      |       |           |             |                     |
| 22:00 |      |      |       |           |             |                     |
| 23:00 |      |      |       |           |             |                     |
| 24:00 |      |      |       |           |             |                     |
| 25:00 |      |      |       |           |             |                     |
| 26:00 |      |      |       |           |             |                     |
| 27:00 |      |      |       |           |             |                     |
| 28:00 |      |      |       |           |             |                     |
| 29:00 |      |      |       |           |             |                     |
| 30:00 |      |      |       |           |             |                     |