

Heating & Cooling Different Materials

The Earth is covered by a variety of different materials—dark, tropical rainforests, wide-open grasslands, high mountains with steep slopes, wide-open bodies of water, and open, sandy deserts. How does the Sun heat and cool these different materials? How does the heating and cooling of these materials affect the weather and climate in these areas? Keep this focusing question in mind as you design your experiment:



? Do different Earth materials heat up and cool down at the same rate **?**

MATERIALS

Water (room temperature)
Sand
Soil
Gravel or rocks
Potted plants
2 identical containers
2 thermometers
Stopwatch or clock
Heat source (clip-on shop lights with 100 watt light bulbs; desk lamps)

PROCEDURE

Note: Explain to the students that they need to set up their experiments in exactly the same manner. For example, the thermometer should be inserted at the same depth in each experiment, and the light should be the same distance away from each container.

1. All teams will use water as one of their materials. Talk to your partner and decide which other material you plan to test.
2. You will need to record the temperature near the surface of both materials for 15 minutes under the influence of the heat source, and 15 minutes after removing the heat source. Decide how you will set up the experiment.
3. Make a prediction about how the temperature of each of your materials will change over the 30-minute period. Graph your idea, or describe it in terms of specific temperature changes over time.
4. With your partner, discuss how many temperature readings you will take in each of the 15 minute-intervals. Set up a data table in your science notebook.

5. Talk to your partner as you set up a data table in your science notebook.
6. Graph the heating and cooling of the two materials you chose.
7. If time allows, repeat the experiment with different materials. Try adding a couple more containers, and examine whether proximity to another material affects the rate of heating and cooling.

ANALYSIS QUESTIONS

1. What variable did you choose to test for this experiment?
2. Your experiment can be seen as a simple model of a region of the Earth heating up and cooling off. Describe what each of the materials in your experiment models.
3. Which of the two materials in your experiment received the most heat energy from the heat source? Explain.
4. Did both Earth materials you tested heat up at the same rate? Explain your answer by using your data.
5. Did both Earth materials you tested cool down at the same rate? Explain your answer by using your data.
6. Compare your data with another team that tested other materials. Describe any patterns you observe.
7. After examining all the class data, explain why cities near oceans stay warmer in the winter than cities in the interior of land masses.

CONCLUSION

Use what you learned in this lesson to write a conclusion to the focusing question.