TAKING THE ROCKY SHORE'S TEMPERATURE

Topic
Land and Water Temperature Changes

Duration
One session

Vocabulary
absorb
density
heat energy
molecule
reflect
release
retain
temperature

STANDARDS

Practices
Analyzing and Interpreting Data

Core Ideas
Weather and Climate

Crosscutting Concepts
Cause and Effect

OCEAN LITERACY PRINCIPLES

OLP 1, OLP 3

Focus Question

Why is the temperature of the land and water different at the rocky shore?

Overview

Students discuss their personal experiences with temperature at the ocean or other waterways. Students investigate how the temperature varies from land to water at the rocky shore. Students make inferences as to how the temperatures might impact life on the rocky shore.

Objectives

Students will be able to:

- Discover the ability of different substances to absorb, retain and release heat at different rates
- Infer how temperatures of different substances might impact life on the rocky shore

Materials Needed

Per group:

- Two aluminum foil pie pans
- Two thermometers
- One flood lamp (high watt bulb)
- One clock or stopwatch
- Sand and water
- Activity sheet per student

Teacher Preparation

1. Prepare all of the materials listed above for each group. Students need enough small rocks and water to fill three-fourths of the pie pan.
2. Make sure the lamps are plugged in and working beforehand.
3. Make sure the clocks or stopwatches are working.
4. Make sure the thermometers are working.
5. Print out the activity sheet (pages 54–55) for each student.

Teacher Tips

- To emulate saltwater in the experiment, add 35 grams of salt to every 965 grams of water.
- If necessary, review with students how to read the temperature of a thermometer.

Extension Suggestions

- If students are taking a field trip to the ocean, have them bring thermometers and record the temperature of the land and water at designated times during their visit. Have them investigate their recordings after the field trip.
- Have students add the recording of the temperature of air to their investigation. Students can prop up a thermometer in a third pie pan so it is not touching any surface and record the increase and decrease of the air temperature.

Background

As heat energy reaches a substance, the substance absorbs the heat and the temperature of the substance increases. The longer a substance is exposed to the heat source, the more heat it absorbs. If the heat source decreases in energy or is removed, the substance releases heat and the temperature of the object decreases. Some substances reflect heat rather than absorb, so the substance's temperature takes longer to increase or decrease when exposed to a heat source.

Different substances absorb, retain and release heat at different rates. Some substances absorb heat well, while other substances do not absorb heat well. For instance, dark-colored substances absorb heat more than light-colored substances. Land can absorb heat better than water because most land surfaces are darker than water. Water can also reflect the heat that reaches its surface back into the air.

The molecules of water, a liquid, are also in greater motion than molecules of land. Because water molecules are in constant motion, it takes longer for a heat source to raise the temperature of water, whereas the molecules of a solid are denser so the heat is absorbed more quickly. Because of the different densities of molecules, water also retains heat better than land and takes longer to release heat.

Procedure

Part One

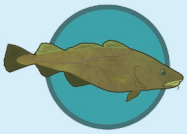
1. Review with students what they learned in the previous lesson about tides.
2. Ask students about their experiences of swimming in the ocean or lake and what they can recall about the temperature of the land and the water.
3. Most students may recall that the water was cooler than the land. Ask students why they think the water was cooler than the land and record their answers.
4. Inform students that they are going to be investigating the temperatures of land and water.
5. Clarify to students that heat and temperature are not the same thing. Heat is energy that causes objects to become warmer. Temperature is the degree of hotness or coldness of an object that can be measured using a thermometer.

Part Two

1. Inform students that they are going to work in groups to investigate the absorption, retaining, and releasing of heat by land and water.
2. Review the definitions of absorb/absorption, retain, and release.

Books

- *Super Simple Things to Do with Temperature: Fun and Easy Science for Kids* by Kelly Doudna



Websites

- Watch a clip from PBS's television show Cyberchase on the PBS LearningMedia website on how to read a thermometer.
- After the investigation, check out the Crash Course Kids YouTube Channel episode "Land and Water" which answers the question, "Which one absorbs more of the sun's energy: land or water?"

Scientist Notebook

- Students can record the definitions of absorb, retain, release and reflect. They can also record or paste their investigation observations into their notebook. Students can record their inferences of how land and water temperature could impact rocky shore organisms.

Procedure (continued)

3. Review the procedure of the investigation (the "Direction Checklist" of the activity sheet, page 54), and the students' responsibilities in their groups. Emphasize the importance of safety and working well together.
4. Review the activity sheets (pages 54–55) that each student is going to fill out in their groups.

Wrap-up

- Ask groups to refer to their activity sheets and report their findings of their investigation.
- Inform students why water takes longer to absorb and release heat than land, and why it can retain heat longer.
- Ask students to make inferences as to what impact the differences in land and water temperature could have on living organisms at the rocky shore.

TAKING THE ROCKY SHORE'S TEMPERATURE INVESTIGATION

Name: _____

Date: _____

Direction Checklist ☑

- ☐ Answer questions one and two on the next page.
- ☐ Put your thermometers under the surface of the sand and water so the thermometer bulb is completely covered.
- ☐ Place the light above the pans, turn the light on, and record the temperature of the sand and water every two minutes for twenty minutes.
- ☐ Turn the light off after twenty minutes and record the temperature of the sand and water every two minutes for twenty minutes.
- ☐ Answer questions three, four and five on the next page.

Time	Temperature	
	Land	Water
2		
4		
6		
8		
10		
12		
14		
16		
18		
20		
22		
24		
26		
28		
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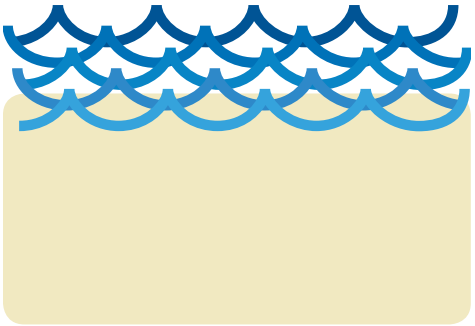


TAKING THE ROCKY SHORE'S TEMPERATURE INVESTIGATION

Name: _____

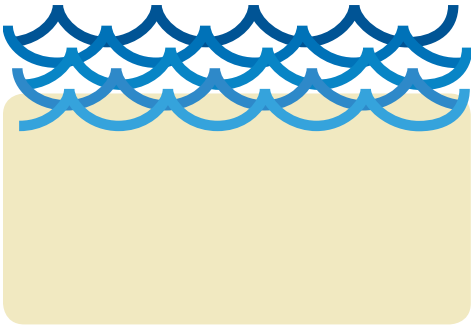
Date: _____

1. Do you think land or water will absorb heat more quickly? Why?

2. Do you think land or water will release heat more quickly? Why?

3. Did the land or water absorb more quickly? Why do you think this happened?

4. Did the land or water release heat more quickly? Why do you think this happened?



5. Did the land or water retain heat longer (did land or heat cool down more slowly)? Why do you think this happened?