MiSP Insolation Worksheet #1 L1

Name _____ Date _____

INSOLATION: ABSORPTION AND RADIATION BY LAND AND WATER

Introduction:

The word *insolation* comes from the three-word phrase *incoming solar radiation*. Insolation is the electromagnetic radiation or sunlight that comes to Earth. As we all know from entering a car on a bright, sunny day, the sun's light energy can be transformed into heat energy.

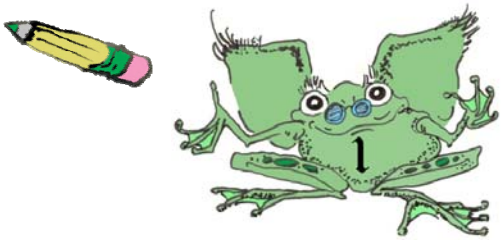
Absorption occurs when matter takes in heat and its temperature increases. Radiation (in this situation) occurs when an object releases its heat to its surroundings.

Problem or Question:

What happens to the temperatures of soil and water when exposed to the same light, and what happens to the temperatures of soil and water when they cool down in the same environment?

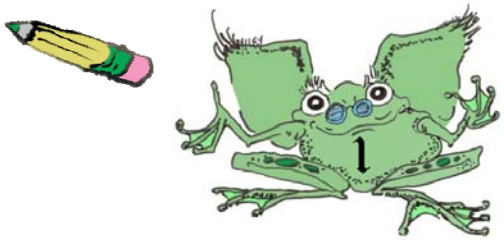
Procedure:

- Your teacher will give specific laboratory instructions. You will be using equal amounts (100 ml) of soil and water in approximately 250 ml containers, and you will shine a heat lamp 10 cm from the samples for ten (10) minutes. During that time you will record the temperatures of each sample at one-minute intervals. After ten minutes, the lamps will be turned off and removed, and you will record the temperatures as the soil and the water cool. Be sure to get an initial temperature (time 0) before you turn on the light.
- Lab notes:
  - ✓ Wear goggles.
  - ✓ Caution: The lamps will be hot.
  - ✓ Calibrate your thermometers by selecting two that have equal readings.
  - ✓ The bulbs of the thermometers should be placed 1 cm below the surface of the soil and the water.



Record your data here:

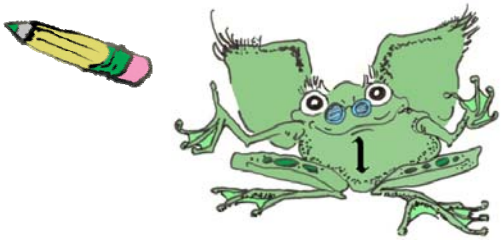
Light on or off	**Time (minutes)**	**Soil** Temperature °C	**Water** Temperature °C
Take initial temperature and then turn On	**0**		
On	**1.0**		
On	**2.0**		
On	**3.0**		
On	**4.0**		
On	**5.0**		
On	**6.0**		
On	**7.0**		
On	**8.0**		
On	**9.0**		
On –Take temperature -Then Off –REMOVE THE LAMP!	**10.0**		
Off	**11.0**		
Off	**12.0**		
Off	**13.0**		
Off	**14.0**		
Off	**15.0**		
Off	**16.0**		
Off	**17.0**		
Off	**18.0**		
Off	**19.0**		
Off	**20.0**		

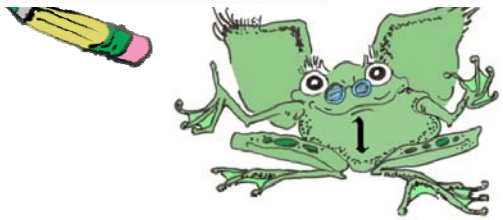


Graph your data:

Graph the data on the next page to show the relationships between time and the temperature changes in the soil and the water. Graph the soil data with one color of pen or pencil, and graph the water data with a different color. Label each line or write a key.

- Label the *x*-axis.
- Label the *y*-axis.
- Connect the data points by drawing straight lines between them.





Discussion Questions:

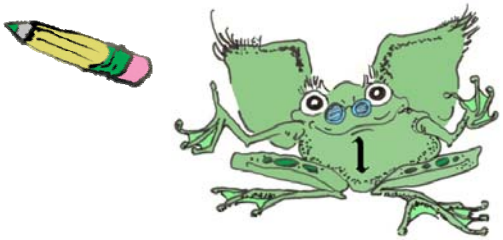
1. Light is a form of energy. Which material (soil or water) received the most energy from the lamp? Be careful; think about the question and the experimental setup. Explain.

2. Which material (soil or water) heated up more rapidly?

3. Which material (soil or water) cooled down more rapidly?

4. How are your answers to 2 and 3 shown on the graph?

5. On a clear, sunny summer afternoon at the beach, will the air be cooler over the sand or over the water? Explain your answer.



6. One summer day, two places received similar amounts of sunlight (insolation) but had very different air temperatures. One place, which was very far from any body of water, had a high temperature in the afternoon of 95°F and a low temperature in the morning before dawn of 55°F. The other place, which was near the ocean, had an afternoon high of 83°F and an overnight low of 71°F. On the basis of this lab, what is a likely reason for the very different high and low temperatures? Explain your answer.

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