Name_____

Heating and Cooling of Earth's Surfaces

Introduction

Have you ever walked barefoot on a sidewalk in the early summer? The concrete probably felt hot against your feet. But if you jumped into the a pool on the same day, you might have felt cold. How could this be?

Part of the explanation has to do with the way the Earth's surface receive and give off heat. All the surfaces on earth absorb some of the sun's energy and give off heat to the air as they cool but they do at different rates. Did you know that the earth's surfaces heat and cool differently? In this lesson, you will investigate the rates at which soil and water heat and cool.

Problem: State the problem we are investigating in this lesson.

1._____

Hypothesis: Predict the rate each type of surface will heat and cool.

2._____

Materials

2 Glass beakers
2 digital thermometers
1 heat lamp
100 mL soil
100 mL water

Procedures

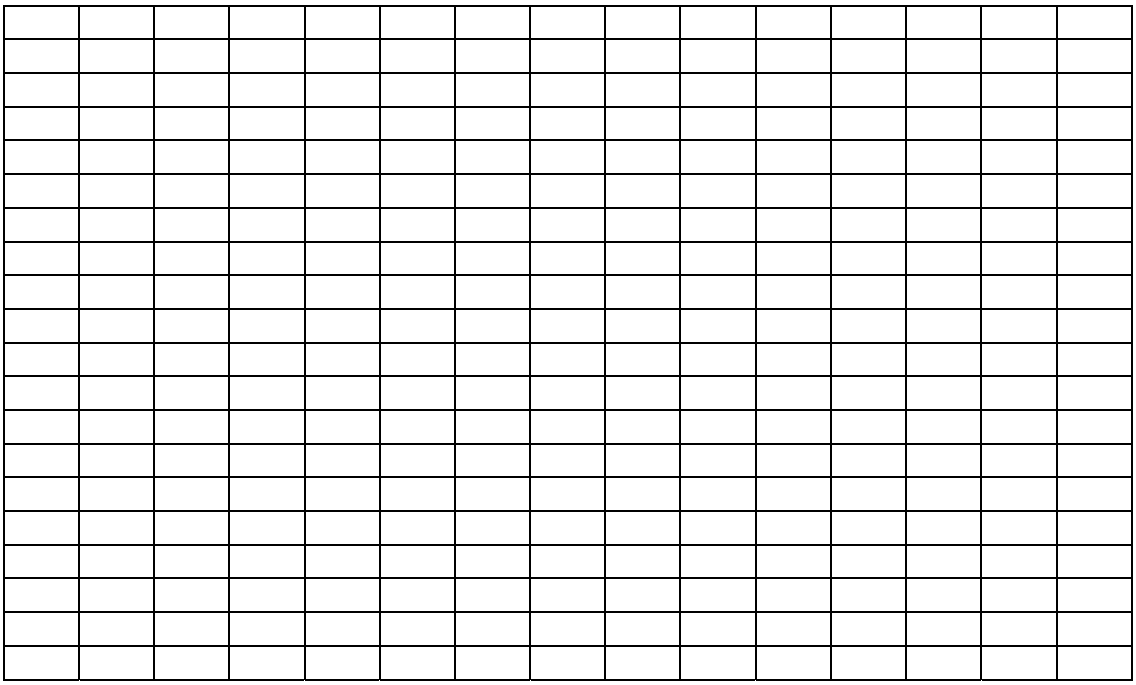
1. Take initial temperature of soil and water using the digital thermometers and record in data table.
2. Turn on the heat lamp
3. Mrs. Reese will start the stop watch. Read the temperature of both surfaces to the nearest 0.1°C every minute for 10 minutes. Record your data in the data table.
4. At the end of 10 minutes, turn off your lamp. Quickly record the 10-minute temperature for soil and water in heating columns. Record the same number across from the 10:00 minutes at the top of the Cooling Columns. Continue reading and recording the Cooling temperature for soil and water every minute for 10 minutes.
5. Turn of Thermometers and clean up.
6. Graph your data as a double line graph. *see example
7. Complete analysis questions and calculate the overall change in temperature of each surface during heating and cooling . For Heating columns, subtract the first temperature (0:00 minutes) from the last temperature (10:00). For the Cooling columns, subtract the last temperature (20:00 minutes) from the first temperature (10:00 minutes). Give your answers to nearest 0.1 degrees.

Name_____

Heating			Cooling		
Time (Minutes)	**Soil Temp (Celsius)**	**Water Temp (Celsius)**	**Time (Minutes)**	**Soil Temp (Celsius)**	**Water Temp (Celsius)**
0:00			**10:00**		
1:00			**11:00**		
2:00			**12:00**		
3:00			**13:00**		
4:00			**14:00**		
5:00			**15:00**		
6:00			**16:00**		
7:00			**17:00**		
8:00			**18:00**		
9:00			**19:00**		
10:00			**20:00**		
Total Temp Change			**Total Temp Change**		

Data

Name_____



Name_____

Analysis

1. How would you describe the heating and cooling rates of soil and water in the investigation?

2. Which surface held the heat longer?

3. What factors may have influenced your results?

4. Reread the introduction to this lesson. Can you explain now why concrete feels hot under your feet in early summer, while water in a pool feels cold?

5. What would each surface's temperature be like during the night? How would you know?

6. On the basis of your investigation, how do you think oceans absorb and hold heat? How do you think the temperature of the of the ocean compares with the temperatures of the land nearby?