Name _____ Date _____

Heating and Cooling of Common Earth Materials

Objective:

The objective of this experiment is to observe how different substances heat up and cool down to later make real-world connections.

Procedure:

1. Obtain a heat lamp, ring stand, stopwatch, 2 thermometers, and 2 containers with an equal amount of soil and water.

2. Set up the experiment as shown in the front of the room. Make sure the heat lamp is 30 centimeters above the height of the desk and placed over the 2 dishes so that each substance receives the same amount of heat. Also be sure that the thermometers are at the same angles in each of the containers.

3. Once everything is set up, read and record the initial temperatures of the substances. Then, turn on the heat lamp and record the temperatures (^{o}C) of each substance every 2 minutes for a total of 16 minutes.

4. Shut the lamp off and return it to the cart. The second part of the experiment simulates what happens after the Sun has set. Continue taking the temperatures (^{o}C) of each substance every 2 minutes for 16 more minutes.

5. Return all materials neatly to the cart, and thoroughly clean up your area.

6. Construct a line graph showing the heating and cooling of the materials. Time will go on the x-axis and temperature on the y-axis. Make sure to create an appropriate scale to use as much of the plotting area possible (Remember the halfway rule …). Use a different colored line to represent each substance, and then create a graph key.

Quantitative Observations (a.k.a. numerical data)

	Time (minutes)	Soil Temperature (°C)	Water Temperature (°C)
HEAT LAMP ON	0		
	2		
	4		
	6		
	8		
	10		
	12		
	14		
	16		
HEAT LAMP OFF	18		
	20		
	22		
	24		
	26		
	28		
	30		
	32		

DISCUSSION QUESTIONS (Answer in Complete Sentences):

1. Why is it important to place each bowl an equal distance from the lamp?

2. After 16 minutes why was it necessary to remove the lamps from the soil and water set up?

3. Which substance absorbed energy more quickly? How does your graph line illustrate this?

4. Which substance released energy more slowly? How does your graph line illustrate this?

5. Calculate the rate at which the soil and water heated up during the first 16 minutes of the experiment.
   Show all work (write rate formula, substitute data, solve with units and round to the nearest tenths place).

rate of heating of soil	rate of heating of water

6. Calculate the rate at which the soil and water cooled down from the 16 minute mark to the 32nd minute.
   Show all work (write rate formula, substitute data, solve with units and round to the nearest tenths place).

rate of cooling of soil	rate of cooling of water