

QUESTION/PURPOSE:

Manipulated Variable (MV) Responding Variable(RV)

1. How does the type of material affect the heating rate?
2. How does the type of material affect the cooling rate?

HYPOTHESIS (IF, THEN, BECAUSE) :

Manipulated Variable (MV) Scientific Reason (WHY)
 Responding Variable (RV)

Heating:

Cooling:

Manipulated Variable Units

Responding Variable Units

Controlled Variable(s) Units

- 1.
- 2.

PROCEDURES:

Manipulated Variable (MV)
 Responding Variable (RV)
 Controlled Variable(s)
 Repeated Trials
 Logical Steps

1. Attach a lamp to the bookends
2. Fill one beaker with 150mL of room temperature _____ (Earth's material)
3. Fill another beaker with 150mL of room temperature water.
4. Place the beakers side by side and about 30cm away from the base of the lamp.
5. Slide each thermometer into a tongue depressor, set them on top of each beaker. The tip of the thermometer should be covered with about 1.5cm of Earth's material and water.
6. Turn on the thermometers. **Wait until the temperatures have stabilized before starting.**
7. Record the temperature of Earth's materials and water in the data table.
8. Turn **on** the lamp and the timer at the same time.
9. Record the temperature of Earth's material and water every minute for 10 minutes.
10. At the 10 minute mark, turn the lamp off. **Do not turn the timer off.** Record this temperature reading at both the heating 10 minute mark and the 10 minute reading for the cooling cycle.
11. Record the cooling temperature every minute for 10 minutes.
12. Turn off the thermometer and timer.
13. Put away supplies into the correct tubs and clean up.

MATERIALS Measuring Device

- 2 thermometers
- 2 tongue depressors
- Timer
- 2 beakers
- 150mL Earth's material
- 150mL water
- Lamp
- 2 Bookends
- Ruler

DATA TABLE:

- Title (Manipulated vs. Responding)
 Units

- Trials
 Averages

TITLE _____

Temperature with Light On (°F)			Temperature with Light Off (°F)		
Heating			Cooling		
Time (minutes)	Earth's Material	Water	Time (minutes)	Earth's Material	Water
0			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		

CONCLUSION:

- Answered Questions Explanatory
 Cite High Data Cite Low Data

Heating

Cooling

Name _____

Period _____

Heating Earth's Surface Questions

1. Make your own line graph showing the time/temperature change in both Earth's material and water. Use a dashed line to show the temperature change in water and a solid line to show the temperature change in Earth's material.

2. Calculate the total change in temperature for each material.

Earth's Material: _____ heated by _____ degrees in 10 minutes; cooled by _____ degrees in 10 minutes.

Water heated by _____ degrees in 10 minutes; cooled by _____ degrees in 10 minutes

3. Based on YOUR data, which material heated up faster? _____

4. Based on YOUR data, which material cooled faster when the light was shut off?

5. How do these results compare to your hypothesis?

6. Based on YOUR results, which do you think will heat up more quickly on a sunny day: the water in a lake or the sand surrounding it? Support your answer with data.

7. After dark, which will cool off more quickly: the water in the lake or the sand surrounding it? Support your answer with data.

8. Air in the troposphere (bottom layer of the atmosphere) is heated from the bottom up by heat given off by the surface and trapped by clouds and other particles in the atmosphere. If the sun shines equally on Seattle (near the water) and Bismarck, North Dakota (near center of continent), which would get hotter during the day? (HINT: Think about the lab.) Explain.

9. Based on the results of YOUR lab, which of the two cities, Seattle or Bismarck, would probably have a bigger difference between day and night temperatures? _____

ONE-CENTIMETER GRAPH PAPER

