

NAME: _____ PERIOD: _____ DATE: _____

LAB PARTNERS: _____ LAB #29

ABSORPTION AND RE-RADIATION OF ENERGY BY LAND AND WATER

PHENOMENON

If you go to the beach at 6am and stay until 10pm, you will notice the direction of the wind will change over the course of the day. At some points, you will have a **sea breeze**, where the wind is blowing from the ocean towards the land, and other times you will have a **land breeze**, where the wind is blowing from the land towards the ocean.

1. Think about the changes that occur from early morning, throughout the day, into the evening. What do you think could cause the changes in wind direction?



OBJECTIVES

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.



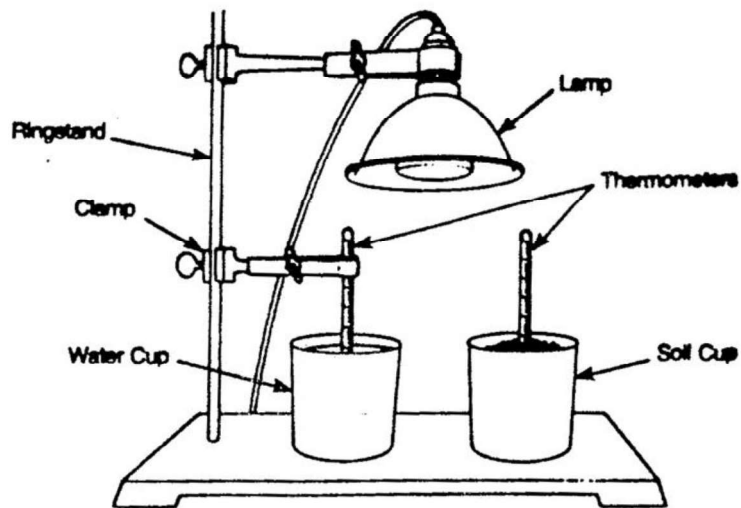
MATERIALS

2 cups	heat lamp	graph paper	
2 thermometers	soil and water	ring stand	2 clamps

PROCEDURE

1. Fill one cup with water at room temperature and the other with soil at room temperature.
2. Place a thermometer in each cup making sure the bulb is just below the surface of the water and soil.
3. Allow the thermometers to reach room temperature and enter that reading under time 0 in the data table.
4. Turn on the lamp and take readings at **one minute intervals for 10 minutes**, recording these readings in the data table.
5. At the end of 10 minutes, **turn off the lamp and move it away**. Continue reading and recording the temperature of both cups each minute for the next 10 minutes.
6. Graph the temperature for the soil and water using two curves on the same set of axes. Be sure to properly label the axis of the graph, provide a title and label each line.
7. Answer the following questions.

HYPOTHESIS: Think about the set-up of this lab. Write a short hypothesis about what you think may happen to the temperature of the soil and water in this lab.



DATA TABLE

LIGHT ON			LIGHT OFF		
TIME (Min)	SOIL TEMP °C	WATER TEMP °C	TIME (Min)	SOIL TEMP °C	WATER TEMP °C
0			11		
1			12		
2			13		
3			14		
4			15		
5			16		
6			17		
7			18		
8			19		
9			20		
10					

LABORATORY QUESTIONS

1. How did the heat energy **RECEIVED** by the cup of soil compare to the heat energy **RECEIVED** by the cup of water? _____
2. Which cup heated more rapidly? _____
3. Which cup cooled more rapidly? _____
4. Which was the better absorber of energy, soil or water? _____

5. Which material has the higher specific heat, soil or water? _____
6. By 3:00 PM on a clear summer day, would air be warmer over the land or over the nearby ocean?

 Why? _____
7. Does this experiment support your hypothesis? Explain. _____

8. In *Figure 1* below, **fill in the blanks** with the temperatures at 10 minutes (found on the data table). Use the temperatures recorded at 10 minutes to fill in the temperatures on the land and water diagram.
9. We know **warm air rises** and **cool air sinks**. Using the diagram, draw an arrow to represent the warmer air rising and draw another arrow to represent the cooler air sinking. Complete the convection current by drawing two more arrows (you should have a total of 4).
10. With what you know about the heating and cooling of land versus water, **draw a convection current** to show the movement of air in *Figure 2* below. Think about which substance (land or water) holds onto heat.
11. Provide the titles of land breeze and sea breeze to *Figure 1* and *Figure 2* on the line provided at the top of the figure. Use the descriptions of a land breeze and sea breeze from the beginning of the lab to help label each figure appropriately.

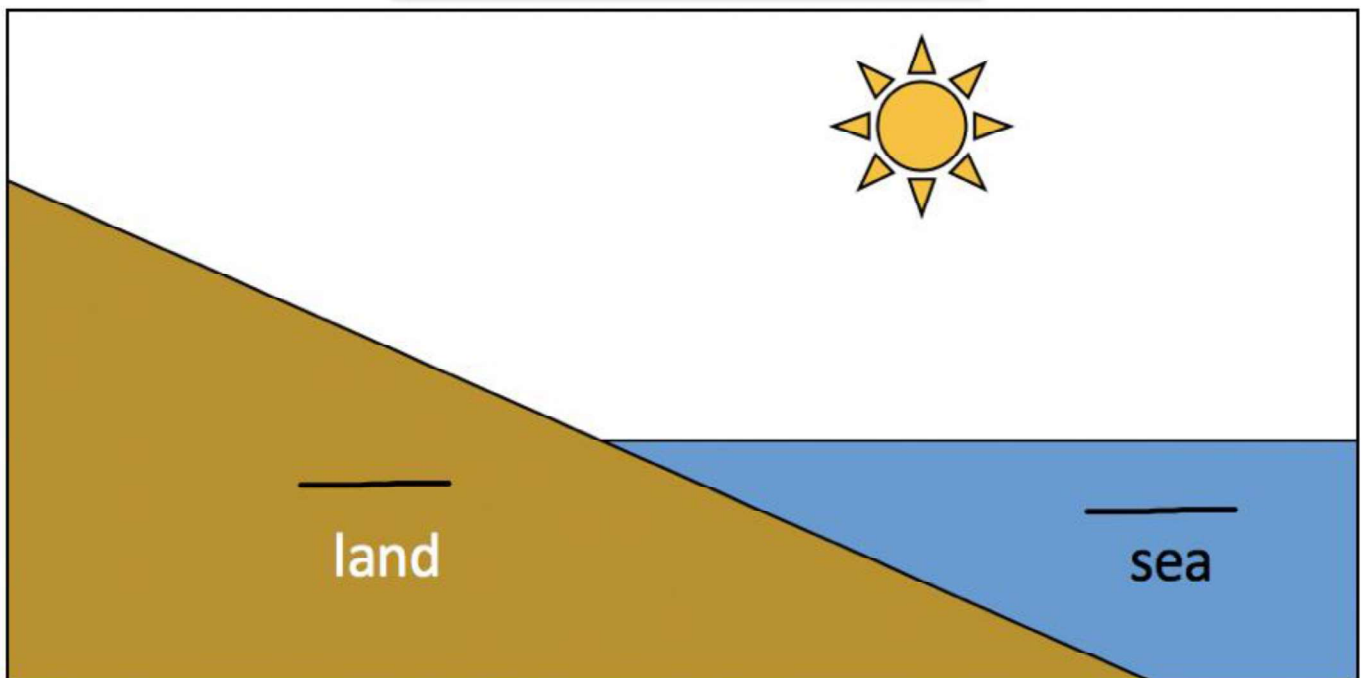


Figure 1

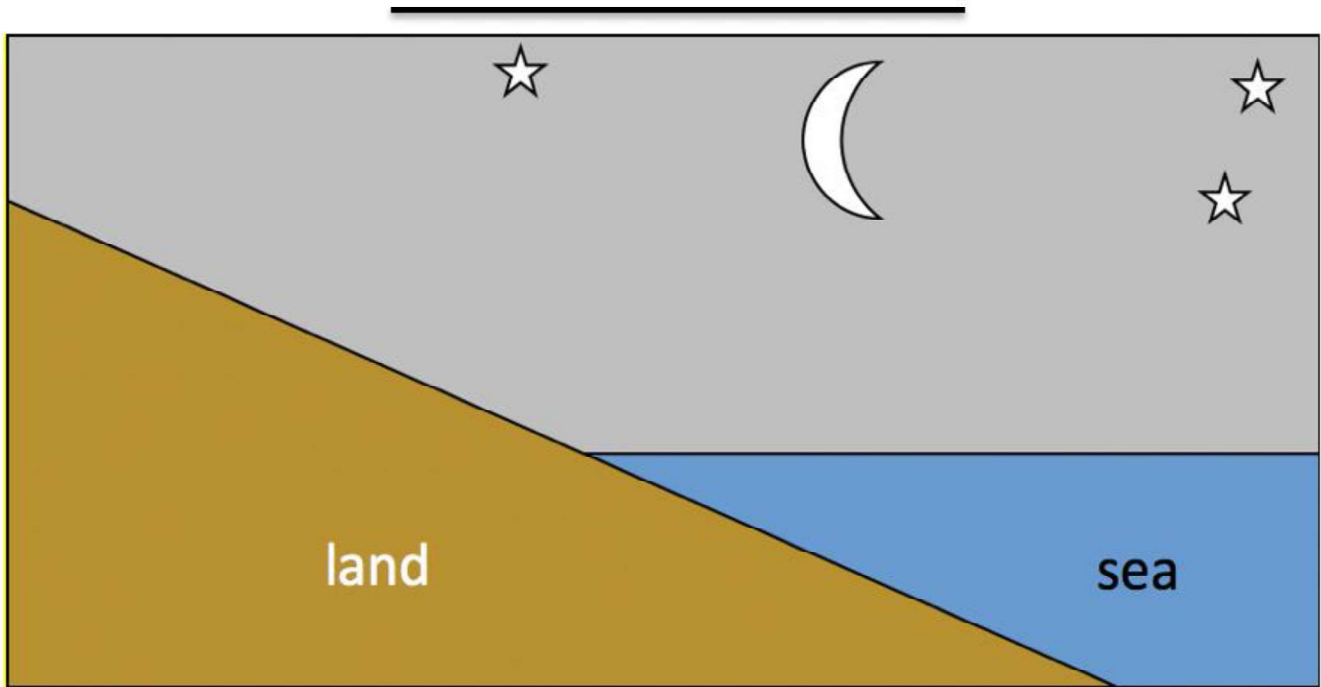


Figure 2

CONCLUSION:

12. Earth is approximately 29% land and 71% water. Using information you've learned in this lab, what do you think would happen to Earth's temperatures **during the day** if 50% of the Earth was land? Explain your reasoning.

13. Earth is approximately 29% land and 71% water. Using information you've learned in this lab, what do you think would happen to Earth's temperatures **at night** if 50% of the Earth was land? Explain your reasoning.