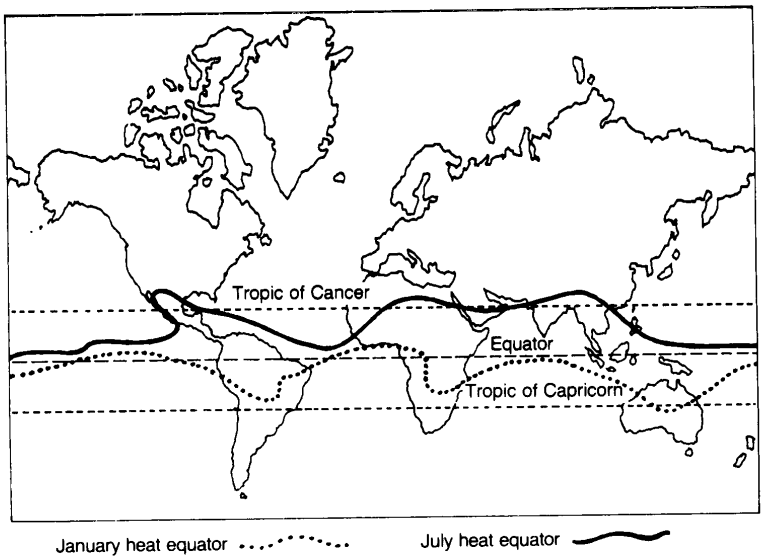
Name _____ **Due Date** _____

Partners _____

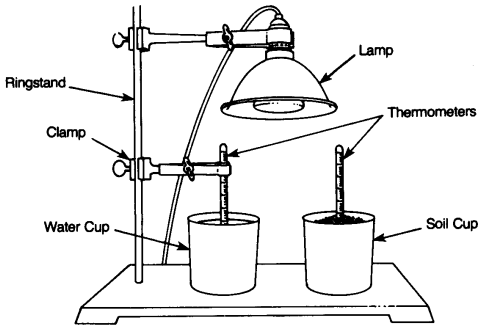
ABSORPTION & RADIATION BY LAND & WATER

Objective: In this lab we will compare the rates at which land and water surfaces heat and cool. Soil has a much lower specific heat than water. Approximately 70% of the Earth is covered by water. Since water and land areas heat and cool unequally, this affects local and global weather patterns. On a clear summer day, air heats up a lot over the land but not so much over the water. The heated air over the land becomes less dense and rises, while the more dense air over the water sinks. This causes a "sea breeze" to blow onto the land. The opposite effect ("land breeze") occurs at night. Also, the *heat equator* (an isotherm along which the highest average global temperatures occur during a given period of time), bends north over northern continents in July, and south over southern continents in January, because the continents get hotter than the water during the summer months.



PROCEDURE:

1. Fill a cup half full with room temperature water.
2. Using a triple beam balance, determine the mass of the cup with the water.
3. Remove the cup and leave the weights of the balance set at the mass of the cup with the water.
4. Place an empty cup on the balance and carefully add soil until the combined mass of the cup and soil is equal to the mass of the cup with the water.
5. Calibrate your thermometers.
6. Place a thermometer in each cup making sure that the bulb is just below the surface of the cup's contents.
7. Allow the thermometers to reach room temperature and enter that temperature under Time 0 on your Report Sheet.
8. Place the two cups under the heat lamp and adjust the lamp so that both cups will receive equal energy.
9. Turn on the heat lamp and take readings at one minute intervals for 10 minutes.
10. Record these temperatures on your Report Sheet.
11. At the end of 10 minutes, turn off the lamp and move it away from the cups.
12. Continue reading and recording the temperature of both cups each minute for the next 10 minutes.
13. Plot a graph showing both sets of data on one set of axes. Use time on the horizontal axis and use a different color for each line.



REPORT SHEET

Time in minutes	0	1	2	3	4	5	6	7	8	9	10
Soil temp °C											
Water temp °C											

Time in minutes	11	12	13	14	15	16	17	18	19	20
Soil temp °C										
Water temp °C										

QUESTIONS:

1. The cup containing _____ heated more rapidly; therefore it _____ more rapidly, too.

2. _____ is a better absorber and radiator than _____.

3. On a clear summer night at 3 am, the air would be cooler and _____ dense over the _____, so the air here would (RISE / SINK). This would set up a (LAND / SEA) breeze.

4. During January, the HEAT EQUATOR bends south over S. America, Africa and Australia because _____
_____
_____
_____

CONCLUSION: How do land and water surfaces differ in their abilities to absorb and radiate heat energy?