DMAE Earth Science Name:

HEATING DIFFERENT EARTH MATERIALS

Introduction

When sunlight strikes the Earth's surface, energy is absorbed and the surface material is heated. But although the same amount of sunlight strikes different materials at a location the different materials heat up at different rates. You know this from your own experience at a beach where the sand is hot and the water is cool.

Why does this happen? What brings the sunlight to Earth in the first place? Can we make models of such energy changes in a "controlled experiment"? How does understanding such a model help us understand more about what happens to create our planet's weather, ocean currents, and other types of "heat transfer"?

Procedure

Heating Different Earth Materials

1. Place thermometers in four similar containers. Put equal amounts of water, light- colored sand, and dark-colored soil in three, leaving the fourth with only air. Arrange the containers so that they are the same distance away from the **heat source** (150-watt bulb inside an aluminum container.)

2. When all is ready, record the "starting temperature" ("Time 0") of each material in your "data table."

3. Turn the bulb on and record the temperature of each material every sixty seconds for ten minutes.

4. After the 10-min. readings, turn off the bulb—DO NOT CHANGE ANYTHING ABOUT THE SET-UP—and continue to make readings every sixty seconds for another ten minutes.

Preparing Your Report

Your lab report should include the following sections, each set off by a sub-title.

Purpose section:

Include as many reasons to do this investigation as you can.

Procedure section:

Include important details about all five parts of the investigation.
Leave out unimportant details.

Results section:

Include both a data table and a line graph showing temperatures of all four materials for the 21 readings. A sample data table is provided below.
If you can, use an Excel spreadsheet to make your table and chart.

Answers to these Questions:

1. Why is it important for the arrangement of the equipment to be the same for all of the materials?

2. What is the **experimental variable** in this investigation? What are the **controlled variables** in this investigation?

3. Describe a way to change this investigation so that you would control this experimental variable and instead test for one of the controlled variables.

4. Explain the general pattern of heating and cooling you observe. That is, what is the order in which the materials warm up and cool down? Compare group and class results.

5. What is meant by the term "**specific heat**"? How does this apply to this investigation?

6. Using the table of "Specific Heats of Common Materials" in your *Earth Science Reference Tables*, predict which of the materials listed would warm up fastest, slowest, and at the same rate as another.

7. What is meant by the terms **"angle of insolation"** and **"duration of insolation"?** Describe an experiment using the same equipment to investigate these ideas?

Discussion section:

Connect this model with what happens in the "Real World" outside the classroom, such as air movements in the atmosphere, ocean currents, etc. Try to include examples of radiation, conduction, and convection involving Earth.

Be sure to explain why the pattern of change is more important than the actual temperature values. Compare your pattern and actual values with other groups' results.

Discuss possible sources of error that might have occurred in this experiment.

References and Acknowledgments:

Use proper bibliography style for your written references, including appropriate recognition of online resources and any images that you use. Use simple thanks for the people who helped you. (This is not an Oscar acceptance speech.)

"HEATING DIFFERENT EARTH MATERIALS" DATA TABLE					
Name(s):					
	Temperature (deg C)				
	Time	Air	Light sand	Dark soil	Water
	0				
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				