



Atmosphere & Weather Name _____

Heating the Earth

Purpose: To illustrate how dark land surfaces, light land surfaces and water all heat at different rates.

Overarching Question: How do different types of earth material absorb heat?

MATERIALS:

Waterproof containers (3)	Thermometers (3)	Heat lamp
Water	Sand	Potting soil
Timer		

PROCEDURE:

1. Fill one container about half full with light sand, one with potting soil, and the third with water to the same level.
2. Place the thermometers upright into the sand and water, submerging the ball of the thermometer into the material.
3. Place the containers under the heat lamp so that they all get equal amounts of light rays from it. Make sure the thermometers are upright and not receiving direct light.
4. Before you turn the light on, take the initial (starting) temperature,
5. Turn the light on and measure the temperature of each material in Celsius every 5 minutes. Record.
6. After 20 minutes, turn off the light and record the falling temperatures for about 20 minutes.

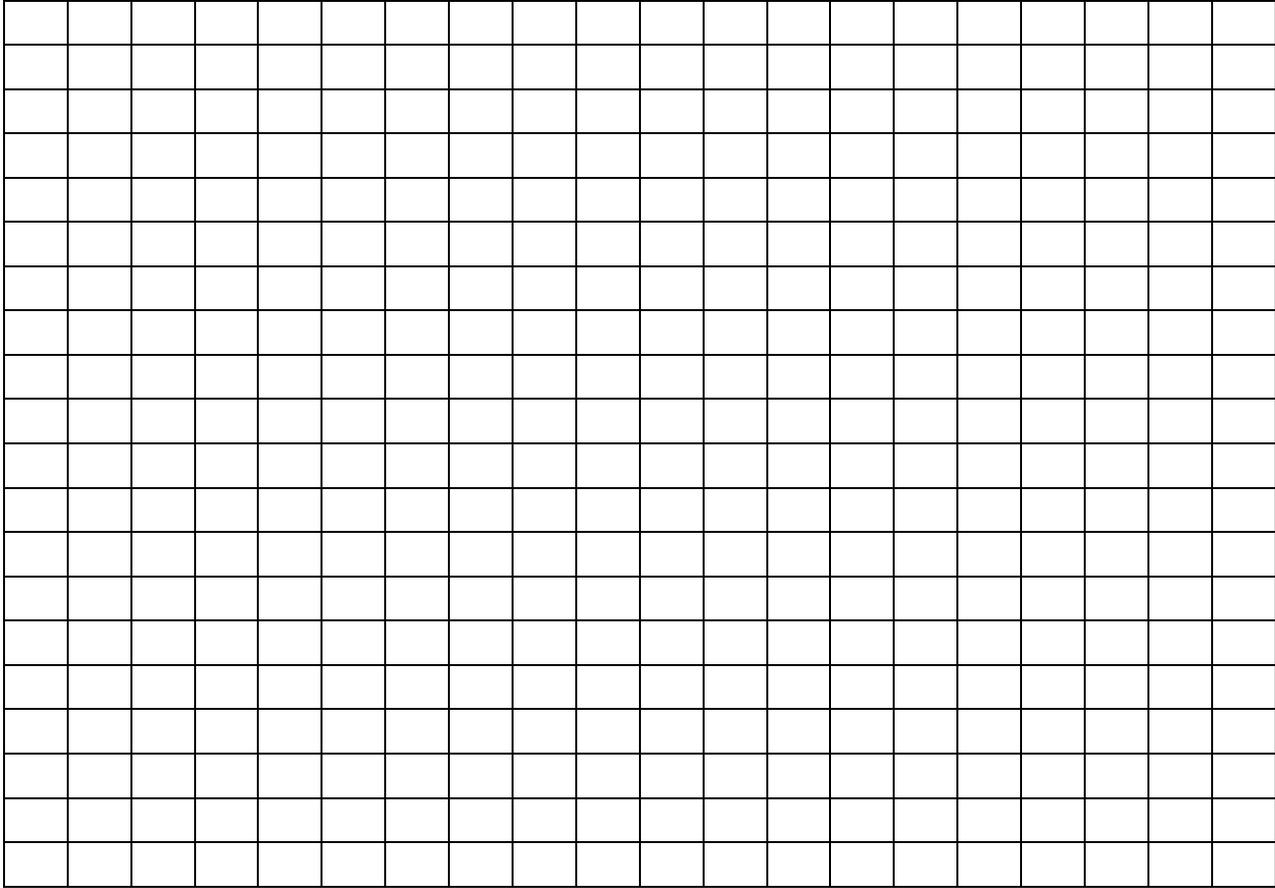
DATA:

	Initial T	Warming Up				Cooling Down			
Time	0	5	10	15	20	25	30	35	40
Water T									
Sand T									
Soil T									

DATA ANALYSIS:

Make a TRIPLE line graph. Why?

Use a different color of pencil for each substance measured. Make a key to show which color represents which substance.



What is the independent variable in this investigation?

What is the dependent variable in this investigation?

What relationship do you see between the variables?

Key

Questions:

1. What can you conclude from these results? (Which material heats and cools the fastest/slowest?)

2. What do these results indicate about the heating of the Earth? (Does the Earth heat the same way all over?)

3. Think about it: What do you think would happen if the Earth were covered with over 70% land instead of water?

Levels of Inquiry

Confirmation – Provide the students with the overarching question and the procedure, as well as the materials. Place several instrument artifacts around the room so that students can check their progress.

Structured - Provide the students with the overarching question and the procedure, as well as the materials. Allow students to discover the finished product on their own.

Guided – Provide the students with the overarching question and materials. Students are to create and write their own procedures and determine which materials to utilize. Allow students to discover the finished product on their own.

Open - Students are given a scenario that describes a situation. From this scenario, students are to generate an overarching question. From that point, students are to create and write their own procedures and determine which materials to utilize. Allow students to discover the finished product on their own.

Possible scenario – Susan wonders why the sand on the beach seems warmer than the ocean water.

Correlated Literature (with Lexiles) (Audio capable)

(All literature can be found on the Galileo website unless otherwise noted.)

Helmuth, L. L. (1999). Rainy night in Georgia, at least in Atlanta. *Science News*, 155(13), 198 (1130) (Audio capable)

Rosenfeld, J. (1999). Brewing the Storm. *Weatherwise*, 52(5), 33. (1090) (Audio capable)\

Technology Integration

Digital Camera – Documenting your student’s work with a digital camera is a great idea. Not only do you have digital media, but students are usually excited about presenting their work to be captured by camera. With the media, there are endless possibilities, from PowerPoints to blogs to Glogs and beyond!!! (Always refer to your school’s policies about posting student’s pictures or work on the Internet.)

Presentation Platforms – Presentation platforms have evolved. PowerPoint is still effective, but here some examples of Internet based platforms. (Many of them allow the embedding of pictures, video, and audio, as well as text.)

<http://www.prezi.com> – zoomable slide presentation tool

<http://edu.glogster.com/> - Internet based poster maker

<http://museumbox.e2bn.org/index.php> - description of an event or person in an interactive box

<http://www.voki.com/> - create an avatar to speak for you

Common Core (Grades 6-8)

L6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

L6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

L6-8WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
- e. Establish and maintain a formal style and objective tone.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Georgia Performance Standards

S6CS2. Students will use standard safety practices for all classroom laboratory and field investigations.

- a. Follow correct procedures for use of scientific apparatus.
- b. Demonstrate appropriate techniques in all laboratory situations.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

S6CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.

- c. Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, and temperature, and choose appropriate units for reporting various quantities.

S6CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.

- a. Observe and explain how parts are related to other parts in systems such as weather systems, solar systems, and ocean systems including how the output from one part of a system (in the form of material, energy, or information) can become the input to other parts. (For example: El Nino's effect on weather)
- b. Identify several different models (such as physical replicas, pictures, and analogies) that could be used to represent the same thing, and evaluate their usefulness, taking into account such things as the model's purpose and complexity.

S6E3. Students will recognize the significant role of water in earth processes.

- b. Relate various atmospheric conditions to stages of the water cycle.

S6E4. Students will understand how the distribution of land and oceans affects climate and weather.

a. Demonstrate that land and water absorb and lose heat at different rates and explain the resulting effects on weather patterns.