



Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Title: Changing Albedo Lab  
Teacher Sheet

**Objective:** Develop and test a hypothesis about how albedo affects temperature.

**Problem:** How will temperature change in materials with different albedos?

**Independent Variable:** (the factor that is intentionally changed in an investigation)

This investigation is designed to see if **(materials with different albedos)**, the independent variable, will have any impact on the heat absorbed from radiation.

**Dependent Variable:** (the factor that changes as a result of the independent variable; it is what is measured to determine if the independent variable has the expected effect)

The dependent variable, **(temperature)**, is measured in degrees Celsius ( $^{\circ}\text{C}$  or  $^{\circ}\text{F}$ ) and may change as a result of the energy absorbed by different colored surfaces.

**Hypothesis:** (should be written in the following format and should answer the question posed by the problem statement.)

If [independent variable], then [dependent variable].

If materials with **(different albedos)** are heated by radiation from a light bulb, then the **(temperature)** of the white material will increase **(less than/more than/the same as)** than that of the **(darker)** material.

**Materials:**

For each group:

1. Thermometers (3 per group)
2. Lamps (3 per group) with heat (incandescent) bulb and stand if necessary
3. Containers to hold materials
4. Stopwatch
5. Dark potting soil
6. Sugar (to simulate snow)
7. Water with blue and/or green food coloring added to make it look like ocean water
8. Ruler





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For Each Student;

1. Graph paper
2. Colored pencils
3. Student data sheets

Preliminary questions about your model:

1. Which Earth surface does the dark soil represent? (**dark surfaces including soil**)
2. Which Earth surface does the dark water represent? (**oceans and bodies of water**)
3. Which Earth surface does the sugar represent? (**snow and ice**)

Procedure

1. Fill each container with approximately 4 cm of the materials (potting soil, sugar, colored water).
2. Place the containers under the lights. Make sure they each are receiving light from the same angle and the same height above the container. Do not turn the lamps on yet.
3. Place a thermometer in each container making sure it is the same depth in each container. (Hint: Insert the ruler to the same depth to help with thermometer placement.)
4. Prepare your Data Collection Table by recording the temperature of the soil, sugar and colored water before you turn on the lamp. This should be at time 0.
5. Turn on the lamps and start the stopwatch at the same time.
6. Record the temperatures in °C or °F every minute for 10 minutes.
7. Graph the results.
  - Use a different colored pencil for each material.
  - Label the axes.
  - Include a title.
  - Include a caption.

Post Investigation Questions

1. What were the differences between the materials?  
(**Accept reasonable responses. It is expected that the temperature will increase faster in the darker materials.**)



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2. Based on your graph, as the temperatures rise and fall with the seasons, what will happen to snow and ice compared with the ocean?  
**(Accept reasonable responses. The snow and ice will not increase in temperature as quickly as the ocean.)**
3. What do you think happens to the ice in the Arctic when the Sun shines on it?  
**(It will reflect more energy than darker surfaces. It will warm slowly and slowly melt.)**
4. As ice and snow begin to melt, what will form?  
**(water)**
5. How will melting ice and snow change the albedo?  
**(The albedo will decrease.)**
6. As the albedo changes from the melting, what affect does this have on the snow and ice?  
**(It will speed up melting.)**



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<b>Data Collection Table</b>			
<b>Time (min)</b>	<b>Dark Soil Temperature</b>	<b>Colored Water Temperature</b>	<b>Sugar Temperature</b>
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			