**Reflectivity (Albedo):**

**Do Light or Dark Surfaces Absorb more Heat?**

**PURPOSE**

The purpose of the lesson is to investigate which surfaces are more effective at absorbing and reflecting solar radiation.

**EXPERIMENTAL DESIGN**

In this experiment, you will measure the temperature of two surfaces (one dark and one light) over time to answer the following question:

**Which will absorb more heat––a dark-colored surface or a light-colored surface?**

**Hypothesis**

After reading through the methods section below, write a hypothesis to answer the question above.

*Hypothesis:*

**Methods**

1. Cut a 3 cm x 10 cm piece of paper out of white and dark paper.
2. Loosely wrap the bulb of one thermometer with white paper and one with dark paper and tape closed.
3. Place the thermometers under a heat lamp equal distance from the lamp.
4. Record the temperature (?C) of each thermometer at 2-minute intervals for 20 minutes. Write your results in the table and include a title for the table.
5. Construct a line graph that summarizes your results. Label the axes and include a title and legend.

**Results**

**Table - Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **Air Temperature (˚C)** | **Initial****Temp** | **2 min** | **4 min** | **6 min** | **8 min** | **10 min** | **12 min** | **14 min** | **16 min** | **18 min** | **20 min** |
| White-Covered Surface |  |  |  |  |  |  |  |  |  |  |  |
| Black-Covered Surface |  |  |  |  |  |  |  |  |  |  |  |

**Graph *-* Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**Findings**

Write a summary of your results.

**CONCLUSIONS: DEVELOPING EXPLANATIONS FROM EVIDENCE**

1. Was your hypothesis supported by the data or evidence?
2. Explain your rationale for the results.
3. What recommendations do you have for improving the experiment and for further study?
4. Look at a globe or map of the world. Think about different types of surfaces on the Earth such as ice, oceans, forests, and large cities. What surfaces are best represented by the white paper?
5. What surfaces are best represented by the black paper?
6. Which surfaces absorb more solar radiation? Which reflect more solar radiation?
7. What do you predict would happen to the total reflectivity (albedo) and temperature of the Arctic region if more sea ice melts?

**THE SCIENTISTS’ EXPLANATION**

Fresh snow has a reflectivity (albedo) of 0.8 – 0.9, and sea ice has an albedo of 0.5 – 0.7. Therefore, glaciers and ice sheets reflect 80% to 90% of the radiation reaching their surfaces. Water reflects a smaller amount of solar radiation than snow or ice. Because ice and snow have a higher reflectivity (albedo), the Arctic Sea ice and snow reflect more sunlight than water. When this ice and snow melts, the darker ocean water absorbs more heat. This causes the Arctic Ocean to heat up even more. This is example of a positive feedback––in other words, the melting of Arctic Sea ice amplifies an already warming trend.