

ScienceSource 7 > Chapter 10 > Polar Bears and Radiation

Background:

Polar bears have many adaptations that help them survive extremely low temperatures in the arctic.

While many polar bear adaptations are meant to retain heat, they also have a very interesting method of absorbing as much heat as possible. Their hair is actually clear, not white, helping to conduct sunlight energy to the skin. The skin of the bear is not white or pink, it is actually black.

What advantage is black skin in a cold environment? In this lab temperature sensors are used to compare the absorption of heat by different colours.

Task:

Is black skin an advantage in a cold environment?

Materials:

- two temperature sensors
- two USB links
- two aluminum soup cans
- black and white paper
- water

Procedure:

Step 1:

Connect the temperature sensor to your computer.

Step 2:

Set up the computer to collect temperature data on a graph for both temperature sensors.

You can use a separate graph for each temperature sensor, or use one graph for both – this will depend on the software you are using.

Step 3:

Cover an aluminum can with black paper. Cover the other aluminum can with white paper. Fill each can with 200 ml of water. Place a temperature sensor in each cup.

Step 4:

Place both cans in the full sun. Tilt them so that they are exposed to as much sun as possible. Begin collecting data by pressing the Start button in your data collection software. Allow the temperature to record for about 10 to 20 minutes.

Analyzing and Interpreting:

- Examine the graph and study the data. Which of the two cans absorbed more heat? Explain why.
- Some cities in very hot areas of the world have civil ordinances that prohibit black or dark roof coverings. By law, roof coverings must be light coloured. Explain why such a law might be necessary.

Forming Conclusions:

- Based on the data you have collected, write a summary statement for the following question:

Is black skin an advantage in a cold environment?

Extending:

- Radiation may be reflected or absorbed. In this activity, the amount of radiant energy that was absorbed was measured via the heat gained by aluminum cans and their contents. Design an experiment that measures the amount of radiant energy reflected by different surfaces, and carry out your experiment.