

**Did you know polar bears have black skin?** Try this experiment about albedo and learn why this helps them survive in such a frigid environment!

**You will need:**

- 1 piece each of black and white construction paper or any material as long as they are made from the same material
- 2 thermometers
- Stopwatch or clock
- Writing paper
- Pen or pencil

**Optional:**

- Ice cubes and glass containers
- Other colored paper/materials



Albedo is the amount of light (solar radiation) reflected by a surface. A surface with a high albedo will reflect more light and absorb very little causing the surface to be cooler. A surface with low albedo will reflect very little light and absorb most light causing the surface to be warmer. Think about which you would prefer to walk on barefooted in the middle of summer, dark pavement or a grassy yard?

**Directions:**

1. Print or copy the worksheet on the 2nd page of this experiment to record your findings.
2. On a sunny day, place 1 piece of black paper/material and 1 piece of white paper/material in a sunny location (if windy, you may have to tape them down or place rocks on them, just make sure to do the same thing to each paper).
3. Place a thermometer onto each paper. Write down your hypothesis (your educated guess) on which you think will be warmer and cooler by end of the experiment.
4. Record the start temperature of each paper and then for the next 10 minutes take a recording each minute for each paper.
5. After the 10 minutes has gone by, quickly move both papers into the shade and repeat the recordings for the next 10 minutes.
6. When the experiment has finished, answer the questions on the worksheet.

**Optional variations for the experiment:**

- Place 2 equal size ice cubes into 2 identical glass containers and then place one on the black paper and one on the white paper in the sunny location and leave for 10 minutes. Repeat in a shady location and record your findings.
  - Repeat the 1st experiment but use different color paper/materials like red, blue or yellow to see which has the higher or lower albedo and record your findings.
7. Share pictures of your science experiments with us on our Facebook page “Adventures in EdZoocation” or tag the North Carolina Zoo at #NCZOO or #NCZOOED.

Hypothesis:

Data for sunny location:

Time (minute)	0	1	2	3	4	5	6	7	8	9	10
Black (°F)											
White (°F)											

Data for shady location:

Time (minute)	0	1	2	3	4	5	6	7	8	9	10
Black (°F)											
White (°F)											

Analyze and Conclude:

1. Calculate the total change in temperature for each paper:

Black: heated by \_\_\_\_ degrees in 10 minutes; cooled by \_\_\_\_ degrees in 10 minutes

White: heated by \_\_\_\_ degrees in 10 minutes; cooled by \_\_\_\_ degrees in 10 minutes

2. How did the results compare to your hypothesis?

3. Which had a higher albedo (reflected more light resulting in a lower temperature change)?

4. Which had a lower albedo (reflected less light resulting in a higher temperature change)?

5. Based on this data, what would be the best color for your roof if you wanted to keep your house warmer?  
Cooler?

6. Why does a polar bear have black skin?

Optional variations:

Ice cubes– Which ice cube melted more in the sun?

Which melted more in the shade?

Data for different colors in a sunny location:

Time (minute)	0	1	2	3	4	5	6	7	8	9	10
Color 1 (°F)											
Color 2 (°F)											

Data for different colors in a shady location:

Time (minute)	0	1	2	3	4	5	6	7	8	9	10
Color 1 (°F)											
Color 2 (°F)											

Which color had a higher albedo?

Which color had a lower albedo?