Energy Transfer Lab

Introduction:

Energy is constantly changing from one form to another. The mechanical energy of moving water can spin turbines to create electrical energy. Light energy from the sun is used by plants to create chemical energy. In this activity, you will be using the principles of energy transformation to decide what color is best for an efficient solar cooker.

Directions:

You will be provided with cans of two different colors: black and silver. In your lab group you will test these cans to see which would make a better mini-solar cooker. A good solar cooker should be able to do two things:

1) Efficiently transform solar energy into heat energy
2) Retain heat energy even after the source of solar energy is removed

Your experiment should be designed to test the cans' ability to meet these criteria.

Materials:

(Using probeware)

Black and silver cans
Temperature probes, LoggerPro, and computer
Ring stand
Stop watch
Ruler

(Without probeware)

Black and silver cans
Thermometers
Ring stand
Stop watch
Ruler

Graph and Analysis Questions

Print out a double line graph of your data produced by your probes.

1. Which can heated up faster? _____
   Why did this happen? (Explain using specific evidence and terminology.)

2. Which can cooled down faster? _____
   Why did this happen? (Explain using specific evidence and terminology.)

3. Draw a labeled sketch to describe in detail how the energy traveled from the electrical outlet to the temperature probe. Include electrical energy, heat energy, electromagnetic radiation, conduction, and convection.

4. Look at the graphed results of two other groups. Are the results the same?
   What could contribute to different results?

5. What colors absorb radiated energy the best? _____
   Why?

   What colors reflect radiated energy the best: _____
   Why?

6. List 4 everyday situations that illustrate the principles learned in this lab.

   a. b.

   c. d.

[redacted]

You will be designing a lab set-up using a black and a silver can, thermometers, and a light bulb to investigate radiant heat transfer. Place a thermometer in both cans and read your starting temperatures. They should be the same or very close. Record your starting temperatures for time 0 on your data table. Before you continue, write a hypothesis about what will happen when your light is turned on for 10 minutes and then turned off for 10 minutes. Be specific and include the words radiation, absorb, reflect, heat, cool, etc.

Hypothesis:

Now place both cans approximately 20 cm from the light and turn it on. Record the temperatures every minute for 10 minutes. Then turn the light off and record the temperatures for 10 more minutes. Graph your results and answer the analysis questions on the back of this sheet.

Time (Minutes)	Black Can Temp. °C	Silver Can Temp. °C
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Turn	Off	Light!
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Problem Statement:

IV:

DV: