

NAME _____

Due Date _____

Partners _____

ABSORPTION & RADIATION OF ENERGY

INTRODUCTION: The Sun gives off electromagnetic energy of many different wavelengths. That which reaches the Earth is called insolation (INcoming SOLar radiATION). Most of the electromagnetic energy which reaches Earth's surface is relatively short-wavelength visible light and short-wavelength ultraviolet light. After reaching the Earth, these shorter wavelengths are transformed by the Earth into longer-wavelength heat, or infrared radiation, which is re-radiated into the atmosphere, warming it. Some surfaces absorb more insolation than others. Color and texture are the most important characteristics that influence energy absorbed and re-radiated.

OBJECTIVE: To determine how the surface characteristics of a material affect the rate of energy absorption and radiation.

VOCABULARY:

absorption:

reflection:

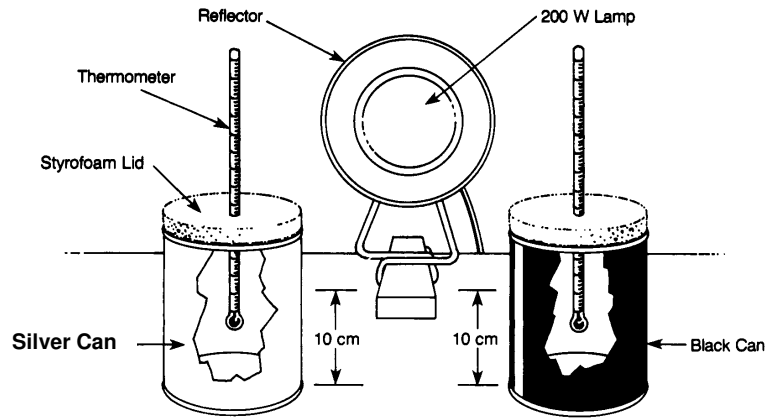
re-radiation:

radiative balance:

PROCEDURE: **NOTE: DO NOT TURN THE LAMPS ON YET!!!**

1. Calibrate your thermometers so that they both read the **same temperature**.
2. Arrange the black and silver cans as shown on the next page. Place the cans **equally distant** from the lamp, about 10cm away. Be sure the thermometers don't touch the can sides or bottom.
3. On the report sheet, record the temperature of each thermometer at time 0.
4. Turn on the lamp and record the temperatures at one minute intervals for ten minutes, **or until one of the thermometers reads 45⁰C or higher (NOTE: at temperatures above 45⁰C the thermometer could explode)**.
5. After ten minutes, and without disturbing the positions of the cans, turn off the lamp and **move it away from the cans. CONTINUE TIMING**.
6. Continue to take temperature readings every minute for another ten minutes.
7. Make line graphs of your data, plotting both curves on the same graph.

DIAGRAM



TIME (minutes)	BLACK CAN TEMP ($^{\circ}\text{C}$)	SILVER CAN TEMP ($^{\circ}\text{C}$)	TIME (minutes)	BLACK CAN TEMP ($^{\circ}\text{C}$)	SILVER CAN TEMP ($^{\circ}\text{C}$)
0			11		
1			12		
2			13		
3			14		
4			15		
5			16		
6			17		
7			18		
8			19		
9			20		
10					

QUESTIONS:

1. The _____ can absorbed energy quickest. It's line has a _____ slope compared to the other can.
2. The _____ can re-radiated energy quickest. It's line has a _____ slope compared to the other can.
3. The _____ can had the greatest rate of change throughout this experiment.
4. Good absorbers are also good _____.
5. As the cans cooled, the difference in temperature (potential) between the cans and the air _____, so the rate of change _____.

CONCLUSION:

- a) What two characteristics of an object's surface affect the rate of heating and cooling?
- b) Compare the wavelengths absorbed to those re-radiated.