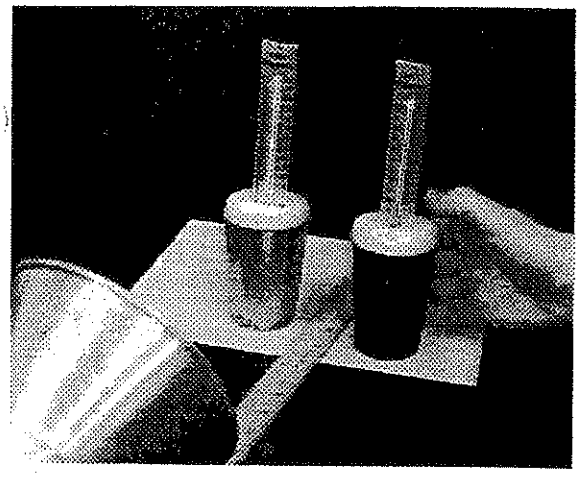


Date _____ Per. ____

In this experiment we will see how the color of an object affects its ability to absorb visible radiation, and then to give off invisible heat radiation.

You will be recording the temperatures of the two cans as they absorb and then loose heat. (You may be surprised by part of the results.)

Materials:

2 cans: 1 Black, 1 Silver	Lamp with reflector
Foam covers for cans	Books to rest cans on
2 metal backed Thermometers	½ Meter Stick

Procedure:

1. Find two thermometers that read the same Celsius temperature. Then set up the apparatus as shown above. The two cans should be only about 2-3 cm apart. *Be sure that the two cans are at the same height as the light bulb, and that each can is exactly 15 cm from the light bulb.* Don't turn it on yet.
2. Record the initial temperatures of both cans in the "0 min." boxes below. (Ask your teacher to check your setup before you turn on the light.)
3. Record the two temperatures each minute for 10 minutes while the lamp is on.
4. Without disturbing the cans, turn the lamp off *and slide it away* after exactly 10 minutes. Continue taking the temperatures for another 10 minutes as the cans cool off.
5. Construct a graph of your data. This graph will have *two best fit* lines on one graph, one line for the silver can and one for the black can. Each line will go up for the first 10 minutes, and then down for the last 10 minutes. You can start your graph while you are recording the cooling data.

Time (min) →

	0	1	2	3	4	5	6	7	8	9	10	Turn the Lamp Off	11	12	13	14	15	16	17	18	19	20
Black																						
Silver																						

A. Which color (black or silver) absorbs electromatnetic energy best? _____

B. According to your graph, which color cools off fastest? (Note which line is steeper.) _____

C. On a cool, sunny day, which color would keep you the warmest? _____

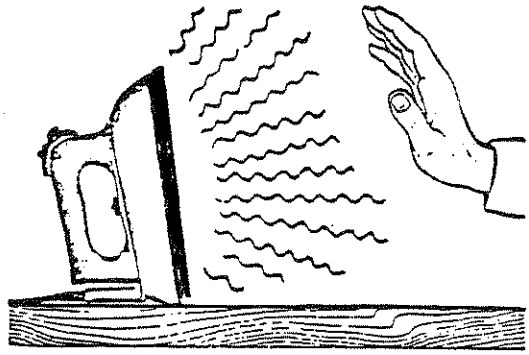
D. Which of these colors is best to wear to keep cool in the summer? _____

E. What color of car is the most practical in keeping a comfortable temperature. This color should keep cool on sunny summer days and warm on cloudy winter days. Please explain your answer.

_____

F. What other factor, besides color, seems to affect the rate of cooling. (Your cooling line for the black can should become less steep as time passes. Why does this happen?)

_____



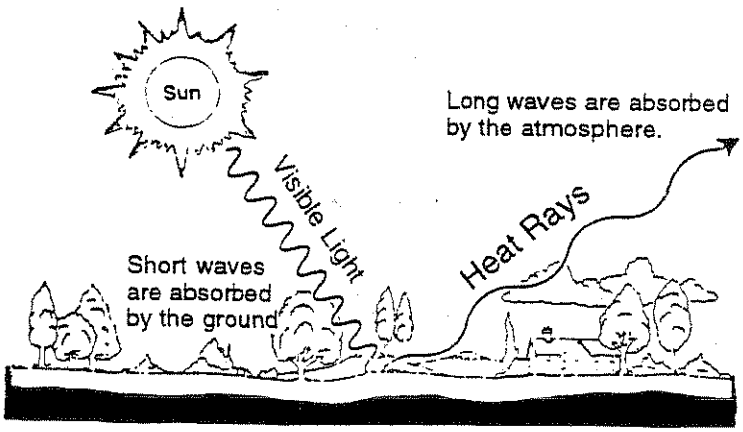
A Hot Iron Radiates Heat Energy

You may know that the Earth receives nearly all of its energy as insolation. But the Earth also radiates energy back into space. If it did not, the Earth would become constantly hotter and hotter. The balance between the insolation absorbed and the heat energy lost to space keeps the climate of our planet moderate.

G. Is heat radiation visible to our eyes? _____

H. How can the person in the top diagram to the left tell that the iron is radiating energy?

_____



The Earth absorbs mostly visible light. The energy radiated into space is mostly long wave heat energy known as infrared radiation.

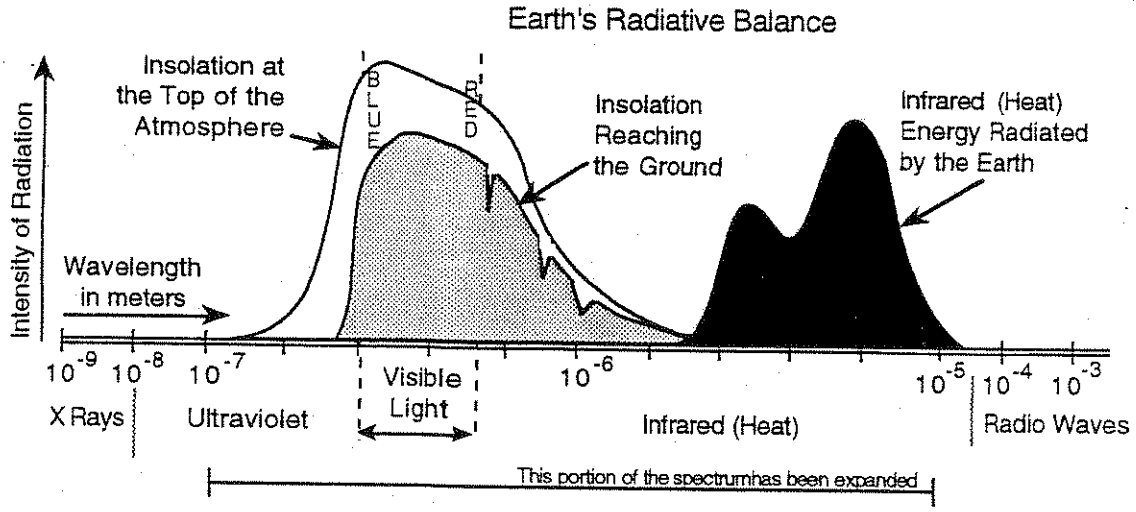
I. According to the second diagram, what happens to the wavelength of energy when it is absorbed by the Earth and then re-radiated?

_____

J. What would happen to the Earth if it did not loose as much energy as it absorbs?

_____

The graph to the right shows the radiation given off by the sun and the radiation that reaches the Earth's surface. It also shows the infrared (heat) radiation that the Earth looses to outer space. Notice that most of the ultraviolet light is absorbed by our atmosphere. Ozone is the principal gas that protects the Earth from this dangerous ultraviolet radiation.



K. According to this graph, in what part of the spectrum is insolation most intense? _____

L. In what part of the spectrum is the radiation that reaches the ground the most intense? _____

M. In what part of the spectrum is the terrestrial radiation lost to space the most intense? _____

N. What color should a home radiator be painted to give off heat the best? _____

O. What color is the best absorber *and* radiator of electromagnetic energy? _____