SCOPE, SEQUENCE, and COORDINATION

A National Curriculum Project for High School Science Education

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Student Materials

Learning Sequence Item:

947

Heat from the Sun

March 1996
Adapted by: Adapted by: Brett Pyle

Contents

This micro-unit was adapted by Brett Pyle (Grady Middle School, Houston)

Science as Inquiry

Invisible Radiation

How do we know invisible radiation exists?
Demonstration

Overview:

This demonstration provides evidence for the existence of radiation.

Procedure:

Your teacher has set up a demonstration. Listen to the description of the experiment and predict what you think will happen. Record the results of the experiment.

Questions:

1. What caused the initial changes in the thermometer?

2. Why did the thermometer do what it did when the petri dish of water was added?

Student Sheet

Science as Inquiry

Here Comes the Sun

How might we measure solar energy?

Overview:

This activity is designed to measure the amount of energy reaching the surface of the Earth.

Procedure:

With the materials provided, measure the amount of water needed to fill one styrofoam cup. Place one cup inside the other (for extra insulation) and fill the combined cup with the measured amount of water. Add equal amounts of blue and green food coloring until the water is dark and record the initial temperature of the water. Cover the cup with the plastic wrap and seal it with a rubber band. Place the cup in the sun and let it sit for 10 minutes, remove the plastic wrap and stir the water with the thermometer. Record this temperature as the final temperature. Calculate the surface area of the top of the cup (area = πr^2) and then calculate the energy in calories that was collected in the cup using the following equation:

Heat energy collected by water = (mass of water)(specific heat of water (1 cal/g°C))(ĐT °C)

The heat energy will be in calories. This number is used to calculate the solar energy flux or the energy collected per square centimeter per minute. Calculate the solar energy flux, or the amount of energy from the sun per square centimeter per minute using the following equation:

$$\text{Solar energy flux } (\text{cal/cm}^2 \cdot \text{min}) = \frac{\text{Heat energy (calories)}}{\text{area of cup opening } (\text{cm}^2) \cdot \text{time (minutes)}}$$

Questions:

1. The solar flux measured in space is two calories per cm^2 per minute. Compare this to your calculations. What could cause the difference?

Student Sheet

Science in Personal and Social Perspectives

Living in a Greenhouse

What variables affect the warming of the Earth?

Overview:

In this activity, you will experiment with how warming affects air, plants and soil.

Procedure:

Create a data table to record various temperatures of the different jars. If you are inside, you will also record how long the light was on and at what time it was turned off. If you are outside, you will record weather conditions.

Set up the four jars as follows:

Jar 1. Empty jar with top open.

Jar 2. Empty jar with plastic covering over opening.

Jar 3. Coleus plant in jar with covering over opening.

Jar 4. Dry soil in jar with covering over opening.

Before sealing the jars, tape a white note card to the back of each thermometer. Place one thermometer inside of each jar, making sure that the note card keeps the thermometer shielded from direct light. Make a good seal on jars 2–4 by placing a small amount of petroleum jelly along the rim of the jar and then placing the cover (glass, plexiglass, etc.) over the opening (Jar 1 should remain open). Place the jars in the sun—or use light sources for each jar—so that the jars receive equal amounts of light. Record the initial temperature in each jar and then take the temperature in each jar every 5 minutes for 45 minutes. Plot the data on a line graph of temperature vs time.

Questions:

1. Why and how did the temperature change in each jar over the course of the experiment?

2. How did this experiment relate to the information in Reading 1?