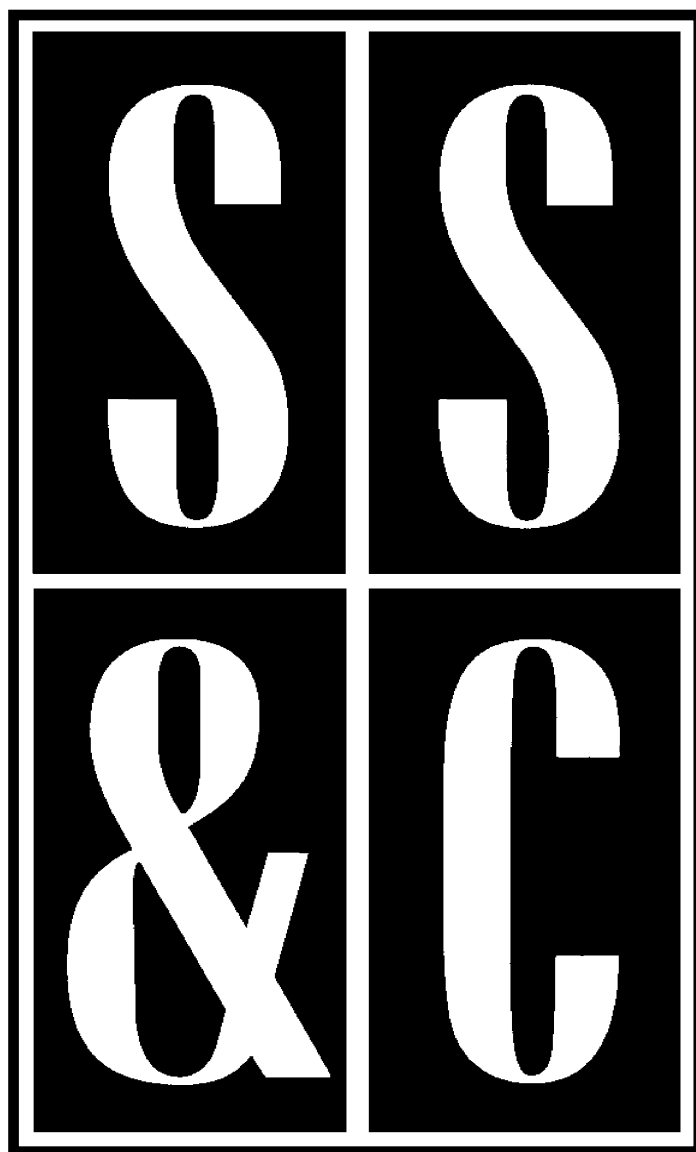


Scope, Sequence & Coordination

A National Curriculum Development and Evaluation Project for High School Science Education



A Project of the National Science Teachers Association



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SS&C Research and Development Center

Bill G. Aldridge, *Principal Investigator
and Project Director**
Dorothy L. Gabel, *Co-Principal Investigator*
Erma M. Anderson, *Associate Project Director*
Nancy Erwin, *SS&C Project Editor*
Rick McGolerick, *Project Coordinator*

Evaluation Center

Frances Lawrenz, *Center Director*
Doug Huffman, *Associate Director*
Wayne Welch, *Consultant*
University of Minnesota, 612.625.2046

Houston SS&C Materials Development and Coordination Center

Linda W. Crow, *Center Director*
Godrej H. Sethna, *School Coordinator*
Martha S. Young, *Senior Production Editor*
Yerga Keflemariam, *Administrative Assistant*
Baylor College of Medicine, 713.798.6880

Houston School Sites and Lead Teachers
Jefferson Davis H.S., Lois Range
Lee H.S., Thomas Goldsbury
Jack Yates H.S., Diane Schranck

California Coordination Center

Tom Hinojosa, *Center Coordinator*
Santa Clara, Calif., 408.244.3080

California School Sites and Lead Teachers
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Iowa Coordination Center

Robert Yager, *Center Director*
Keith Lippincott, *School Coordinator*
University of Iowa, 319.335.1189

Iowa School Sites and Lead Teachers
Pleasant Valley H.S., William Roberts
North Scott H.S., Mike Brown

North Carolina Coordination Center

Charles Coble, *Center Co-Director*
Jesse Jones, *Center Co-Director*
East Carolina University, 919.328.6172

North Carolina School Sites and Lead Teachers

Tarboro H.S., Ernestine Smith
Northside H.S., Glenda Burrus

Puerto Rico Coordination Center**

Manuel Gomez, *Center Co-Director*
Acenet Bernacet, *Center Co-Director*
University of Puerto Rico, 809.765.5170

Puerto Rico School Site
UPR Lab H.S.

Pilot Sites

Site Coordinator and Lead Teacher
Fox Lane H.S., New York, Arthur Eisenkraft
Georgetown Day School, Washington, D.C.,
William George
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* Western NSTA Office, 394 Discovery Court, Henderson, Nevada 89014, 702.436.6685

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Student Materials

Learning Sequence Item:

951

Starlight

March 1996

Adapted by: Glendena Heiman

Contents

Lab Activities

1. What is Light?
2. Light Near and Far
3. Light from Candles Near and Far
4. What Do Light Meters Do?

Readings

Science as Inquiry

What is Light?**Procedure:**

Several sources of light have been put at the lab stations in this room. You will need to work as a group to observe the light sources at one station, make your observations, and move to the next station. Develop a data table to record your data. Think about the light being produced—but disregard heat, gases, smoke, etc., that might be produced. Develop your own definition of light from your observations. Locate a reference which explains the theory of light and record it on your table.

Questions:

1. What is your definition of light?
2. Explain how the current theory might have begun when someone like you asked, “What is light?”

Science as Inquiry

Light Near and Far**Procedure:**

Your teacher will demonstrate properties of light. Create a data table comparing information you obtained regarding area and distance (covered in the demonstration). From your observations, answer the questions below.

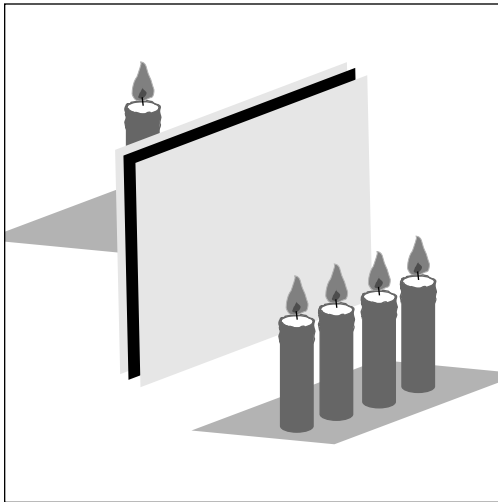
Questions:

1. What happens to the area covered by the light source at different distances?
2. The data shows the light covering a small area at one distance and at another area at another distance. What does this illustrate about the intensity of apparent brightness of the light?
3. The law represented by this activity is called “The Inverse Square Law for Light Intensity.” It states if the distance is doubled, the light is spread out four times the area. Look at your data. Did your data show this relationship?

$$\left(\frac{\text{intensity at distance 1}}{\text{intensity at distance 2}} = \frac{\text{distance 2}}{\text{distance 1}} \right)^2$$

4. Your friend has a flashlight with an intensity of 24 watts/m² when he is 5 meters away from you at the campground. At what distance will the flashlight appear to have an intensity of 6 watts/m²? Is your friend moving toward you or away from you?

Science as Inquiry

Light from Candles Near and Far**Procedure:**

You will create a paraffin light meter. Assemble the meter as follows: Cut one paraffin block into half to form two 2.5 inch squares. Cut one 2.5 inch piece of aluminum foil. Fold the foil, shiny side out, in half to fit the paraffin squares and “make a sandwich” by placing one paraffin square on the table, add the foil and top with the second paraffin square. Finish your light meter by placing a rubberband around the “sandwich.” Put your new light meter on the table—with its wider side facing you.

Now, place four candles in a row on one side of your light meter, and one candle on the other side. Put scratch paper under all to catch wax drips. Light the candles. Experiment with the light by moving the candles closer and/or further away until the light meter glows the same on both sides. This will

indicate the same brightness of the one candle compared to the group of four candles. Measure the distance from the light meter to the one candle. Measure the distance from the group of four candles to the meter. Experiment with two more trials.

Develop a table showing a comparison of brightness and distance between the candle setups.

Questions:

1. What happened to the paraffin on both sides of the sandwich when the candles were moved different distances from it?
2. What does your data table show about the apparent intensity of light and the distance it is from the source?
3. The Inverse Square Law for light intensity shows that if the distance is doubled the light is spread out four times the area. Did this experiment illustrate this law? Explain your answer.

Science and Technology

What Do Light Meters Do?**Procedure:**

You will be provided with a light meter for this activity. Work as a group and learn to read the specific values on your light meter. Select two places to measure the amount of light used in your classroom. Think about two different activities you usually do in this class.

Record the distance from the source of light and the intensity of the light reading from the light meter. Measure exactly half the distance from the source of light. Read the intensity of light reading from the light meter at this distance. Record the data.

Questions:

1. What could be done to increase the light intensity if you must work at this same place in this classroom?
2. Was there a relationship between light intensity and distance?
3. Do you think the places where you measured the intensity of light have the right amount of light to avoid eye strain? Explain your reasoning.