

# What is the effect of light on ice?



## Lesson 3 of 3

*\*Can be used in conjunction with the following lesson plans:*

*Lesson 1: Steps to creating a science research project*

*Lesson 2: Scientific Method: How do scientists solve problems?*

## Purpose

This lesson focuses on applying the scientific method.

## Georgia Performance Standards

### Characteristics of Science:

#### Habits of Mind:

**SCSh1.** Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science

- Exhibit the above traits in their own scientific activities
- Recognize that different explanations often can be given for the same evidence
- Explain that further understanding of scientific problems relies on the design and execution of new experiments which may reinforce or weaken opposing explanations.

**SCSh3.** Students will identify and investigate problems scientifically

- Suggest reasonable hypotheses for identified problems
- Develop procedures for solving scientific problems
- Collect, organize, and record appropriate data
- Graphically compare and analyze data points and/or summary statistics
- Develop reasonable conclusions based on data collected
- Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information

**SCSh6.** Students will communicate scientific investigations and information clearly

- Write clear, coherent laboratory reports related to scientific investigations
- Use data as evidence to support scientific arguments and claims in written or oral presentations

#### Nature of Science:

**SCSh7.** Students will analyze how scientific knowledge is developed. Students recognize that:

- Hypotheses often cause scientists to develop new experiments that produce additional data

**SCSh9.** Students will enhance reading in all curriculum areas by:

- Building vocabulary knowledge
- Establishing context

### Content:

**SC1.** Students will analyze the nature of matter and its classifications

- Identify substances based on chemical and physical properties

**SC2.** Students will relate how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions

b. Experimentally determine indicators of a chemical reaction specifically precipitation, gas evolution, water production, and changes in energy to the system

**SC6.** Students will understand the effects motion of atoms and molecules in chemical and physical processes

a. Compare and contrast atomic/molecular motion in solids, liquids, gases, and plasmas

### **Materials**

Search engine, support literature, paper and pen, 2 100 ml beakers with ice, table lamp, thermometer

### **Procedure**

- Introduce the concept of a testable question by making observations of ice beakers and brainstorming for a possible testable question.
- Form a hypothesis
- Identify and define control and independent variable
- Students conduct Exercise 1 – Reviewing the Scientific Method
- Students conduct Exercise 2 – Applying the Scientific Method

### **Key Questions**

- What is the effect of light on ice?
- How can we apply the scientific method to answer any kind of testable question?

### **Explanations**

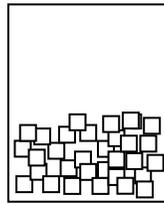
Light increases the kinetic energy of water molecules causing increased disorder and an increase in the rate that hydrogen bonds form and break. The phase of water changes, and we observe ice melting.

Name \_\_\_\_\_

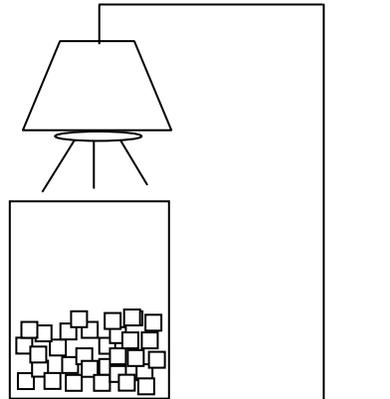
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### What is a testable question?

I – Reviewing the scientific method.



Beaker 1  
(with ice)



Beaker 2  
(with ice)

1. State your observation.
2. Write down all possible questions that arise from your observation of this demonstration.
3. Identify those questions that may lead to further investigations.
4. State your hypothesis.
5. Identify the control and the variable for this experiment.
6. Design your experiment. Since this experiment has been designed already, list all materials and set up. Explain why this is a good or poor set up for this investigation and suggest what is needed to make it better, if necessary.
7. Using the data collected for melting ice, design a way that shows your data efficiently - for example, a graph or a table.
8. Evaluate your hypothesis and state your conclusion.

## II – Applying the Scientific Method

### Procedure

1. Choose one of the problems or questions listed below. (You may also raise your own problem or question.) Follow the steps outlined in the scientific method to devise an experimental design that could provide an answer to your question.
  - Which brand of acetylsalicylic acid (aspirin) is the most acidic?
  - Which substances in my daily diet contain the most fats?
  - Which minerals are present in our sweat?
  - (We can add more questions as necessary)
2. Complete the following:
  - a. Observe, question, collect background information
  - b. Form a hypothesis
  - c. Describe your experimental design
  - d. Collect data
  - e. Draw conclusions
3. Observations and analyses
  - a. What procedures would you follow to confirm your results?
  - b. Describe the materials you would need to conduct the experiment.
  - c. What steps would you take to insure that the data collected were accurate?