

# Melting Ice Cube

## GENERAL INFORMATION

Pure water will freeze at 32° Fahrenheit or 0° Celsius. The water crystallizes because the motion of the water molecules becomes so slow that they freeze and become ice. Impurities will lower the temperature at which water will freeze. Sea water, because of its salt content, freezes at 28.5° F. Sugar and alcohol are other substances that lower the freezing point of water in which they are dissolved.

When water freezes it increases its volume by 1/11. If 11 cubic inches of water are placed in a freezer, the ice that is formed will take up 12 cubic inches of space. The density of ice is less than the density of the water from which it was formed. This is why ice will float when placed in water. The expansion of ice explains why water pipes split open in subfreezing temperatures and why freezing water in an automobile radiator damages a car's engine. Ice starts to melt when the temperature goes above 32° F.

More than 21,000,000 tons of commercially manufactured ice is sold in the United States each year. In Canada and in the northern part of the U.S. some natural ice is cut from rivers and lakes and used in refrigeration processes. The first artificial ice plant was set up about three years after the end of the Civil War in New Orleans in 1868. The same year, the first refrigerated railroad car was built. This enabled businessmen to expand their operations. For example, ranchers in Texas could slaughter their cattle and ship the meat in refrigerated cars to all parts of the United States. Fruit and vegetable farms in the southern states could ship their products to other markets around the U.S.

When ice is placed in water, just a small portion of it is above the surface. About 9/10 of the total mass of the chunk of ice is below the water level. Huge icebergs, some as high as 400 feet, are mostly underwater.

## MATERIALS

When preparing the ice cube, use an ice cube tray, a small plastic container, or an empty butter or margarine tub. Vary the size of the container to the time period that you will have the students observing the experiment.

## PROCEDURE

Have students estimate the number of minutes that it will take for the ice cube to melt when placed in the saucer. Record the starting time and place the saucer and cube in a place where it can be observed. (It works well to appoint an "ice cube monitor" to check the cube periodically during the day.) The monitor should be instructed to keep the teacher informed of the progress. During the last few minutes the class should be involved in close up observation.

It is suggested that this be presented as a math/science integrated lesson. Students could calculate what time it will be if their estimate turns out to be the exact time required for melting. They could be assigned an addition/division problem to determine the average time estimate. The estimates could be graphed which would require them to determine the range and set up time intervals on the graph.

## POSSIBLE ANSWERS

1. The actual melting time will depend on several things, including the size of the piece of ice, placement in the room, and the room temperature.
2. Answers will vary. It could be placed near a window, near a heater, or on a high shelf because warm air rises and the room temperature would be warmer in a higher position.
3. Suggestions will vary but they will probably include placing it in the sun, rubbing it, blowing on it, etc.
4. A larger piece of ice would require more melting time and a small piece, less time.
5. Discuss with students the variables that can be taken into consideration when determining the required melting time. These variables would be brought out while answering questions 2, 3, and 4.

## EXTENSION ACTIVITIES

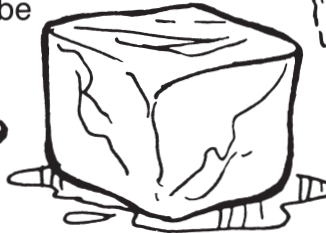
1. Have students suggest ways that ice is used in our everyday life. Some suggestions might include the following: (A) it is used to keep food from spoiling; (B) some sports depend on ice, including skiing, ice skating, and ice sailing; (C) it is used to chill beverages and make ice cream; and (D) ice is used to treat some types of injuries; therefore, it adds to our health and comfort.
2. Prepare several chunks of ice that are different shapes and sizes. Float them in water to observe what amount is below the surface.
3. Using a clear plastic container, partially fill it with water, mark the water level, and then place it in a freezer. After the water freezes, remove it from the freezer and note the increased volume taken up by the ice. Is it approximately 1/11 more than the volume taken up by the water? Let the ice melt to find out if the water takes up less volume.

# Melting Ice Cube

## You Will Need

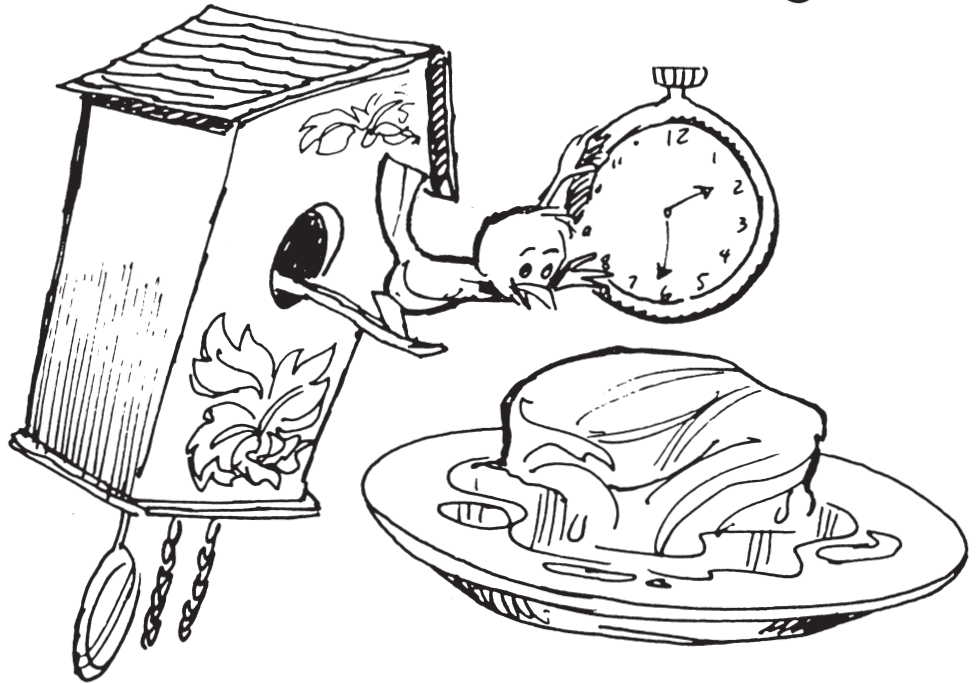
saucer

ice cube



## Procedure

1. Estimate the number of minutes it will take the ice cube to melt completely.
2. If your estimate is correct, what time will it be when all of the ice is melted?



## Questions

1. How long did it take for the ice to melt?
2. Where could you have placed the saucer so the ice would have melted faster? Why?
3. List some of the things that could be done to make the ice cube melt faster.
4. Indicate what the results might have been if a larger piece of ice had been used. A smaller piece of ice.
5. What does the experiment demonstrate?

# To The Teacher

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The activities included in *Earth Science* have been selected especially for use with elementary and middle grade students. The activities provide teachers and students with interesting, easy-to-do science investigations. The necessary materials are commonly found around the house and in school supply closets or resource centers. Because the materials are readily available, the activities can be conducted at home. A caution statement, suggesting adult supervision, is included on all activity sheets that require lighting a match, working near a hot plate, using dry cell batteries, etc. Health and Safety lessons, which discuss proper use of the materials, can be integrated when presenting these science demonstrations in the classroom. A form letter is provided which may be reproduced and sent home to inform parents of the science activities and encourage their participation when activities are assigned for homework.

When these activities are presented to lower elementary students at the preconceptual or awareness level, the emphasis is on the sensory-motor, observation, and communication skills. In the upper elementary and lower intermediate grades (after the students have developed readiness for a particular concept through awareness level activities), a formal classroom lesson that involves using comparison and organization skills may be presented. Upper intermediate and middle school students can be involved in the activities at the mastery and reinforcement level. This level requires them to relate the concept to new or untested experiences, hypothesize, test variables, and use other high level thinking skills.

## **Suggestions for Using Materials**

- The activity book can be placed in the school library and made available for students to use at home.
- The materials can be placed in the Media Center and used by teachers as a resource prior to presenting activities in the classroom.
- Assign to a cooperative learning group for sharing with the rest of the class.
- Students can use some of the suggested extension activities for Science Fair projects.
- The letter to parents may be attached to selected activities and sent home. Encourage students to involve parents in setting up and conducting the experiments.

Although many of the concepts can be keyed to grade level objectives, the *Hands-On Experiments* series has been developed to be used as a supplement to the basic grade level program. It is designed to give students opportunities to perform meaningful science investigations that focus on concepts that are applicable to everyday life situations.

# Special Suggestions To Teachers

## AWARDS

The reproducible *Super Scientist Award* and the *Recycling Award* at the end of this book are designed for elementary teachers to use as motivational awards when appropriate.

## INTRODUCING THE LESSON

The *General Information* at the top of each teacher page may be read to the class before each experiment to introduce the activity. With older students, the *General Information* portion of the teacher page could be reproduced and given to the students. Italicized words found on the teacher pages are also found in the glossary. Glossary words can be incorporated into spelling or vocabulary lessons.

## THOUGHT QUESTIONS

Some activities include “Thought Questions” under the heading *Extension Activities* on the teacher page. The questions are designed for oral presentation to the students during the lesson. Some questions may be used to introduce the activity, while others work better at the close of the lesson. Encourage oral participation and creative thinking when posing “Thought Questions” to the students.

## HOME PARTICIPATION

Students should be encouraged to share selected investigations with family members at home. A reproducible *Letter To Parents* is included in the book which may be used to introduce these activities to the adults at home.



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Dear Parents,

A series of reports released by the National Science Foundation, The Association for the Advancement of Science, and other organizations reveal that U.S. students are lagging behind students of other nations in science and math skills. In order to narrow the gap and advance our students' performance in these areas, they suggest abandoning much of the traditional memorization-based instruction in these subject areas. They recommend that students be involved in hands-on activities that require analytical thinking and encourage them to be inquisitive and critical thinkers.

Because the teaching-learning process is a shared responsibility between the school and the home, I would like to invite and encourage you to work with your child in conducting these experiments and discussing the results. Although knowing the right answers is important in many curricular activities, the emphasis in these investigations should be on observing, analyzing, discovering, communicating the results of the experiments, and relating them to everyday life experiences.

As part of our basic science program, your child will periodically be given homework assignments from the *Hands-On Experiments* series. The *Earth Science* activities are designed to involve students and parents in science investigations that promote analytical thinking skills using materials commonly found in the home.

Although most of the experiments can be conducted with children manipulating the materials, some of the activity sheets include a "caution" statement. These investigations require using a flame, a dry cell battery, pouring hot water, etc. If any of these activities are selected, please work with your child to demonstrate the safest way to use the materials.

If you need more information, in addition to that given on the teacher's page, please feel free to contact me at school. Working together, we can provide your child with the best science education possible.

Sincerely,

# Glossary

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*atmospheric pressure* – The pressure in the atmosphere caused by the weight of the air as it presses down on the layers of air below. It is measured in pounds per square inch (PSI).

*boiling point of water* – The point at which water boils. At standard atmospheric pressure (14.7 lbs. per square inch—PSI) pure water will boil at 100° Celsius or 212° Fahrenheit.

*buoyancy* – The upward force that water exerts on a floating body. It is equal to the weight of the body and varies according to the density of the fluid.

*candle power* – The amount of light given off by a candle.

*candela* – The standard for measuring the intensity or strength of light sources.

*freezing point of water* – The point at which water freezes. At standard atmospheric pressure (14.7 lbs. per square inch—PSI) pure water will freeze at 0° Celsius or 32° Fahrenheit.

*lumens* – The standard for measuring the amount of light that flows away from a light source.

*oils* – Greasy substances that are liquid or capable of becoming liquid upon warming. They are combustible, viscous, soluble in ether, and insoluble in water. They are usually classified as fixed or volatile oils.

*vacuum* – A space containing no matter.



# SUPER SCIENTIST AWARD

\_\_\_\_\_ is recognized for  
outstanding participation in the  
School Science Program.

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Date*

# Recyclins Award



\_\_\_\_\_ is recognized as a  
concerned environmentalist for using  
recycled materials in presenting a  
science experiment.

Signature \_\_\_\_\_

Date \_\_\_\_\_