

# The Science of Snow and Ice

A field guide of experiments to learn about snow, ice, science, and careers.



Scientist's Name: \_\_\_\_\_

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# Title: Snowflake Science

Are all snowflakes different?



## Materials:

- Black Construction Paper
- Magnifying Glass
- Falling Snow



## EXPLORE

### Experiment:

1. When it is snowing, collect snowflakes on black construction paper.
2. Use a magnifying glass to look at the snowflakes.
3. Identify the different types of snowflakes using the guide on page 2 or go to <http://www.its.caltech.edu/~atomic/snowcrystals/class/class.htm>

## All books are by Kenneth Libbrecht

Read books about snowflakes:

- The Little Book of Snowflakes (Picture book)
- The Art of the Snowflake (Large book)
- The Secret Life of a Snowflake (ages 6-12)
- Snowflakes (a chunky book)
- The Magic of Snowflakes (Postcard book)
- Ken Libbrecht's Field Guide to Snowflakes



Other books about snowflakes:

- Snowflakes: A Pop-up Book by Jennifer Preston
- Snowflake Bentley by Jacqueline Briggs Martin
- Snowflakes: Creative Paper Cutouts by Cindy Higham
- Snowflakes for all Seasons: by Cindy Higham
- The Snowflake: A Water Cycle Story by Neil Waldman
- The Story of Snow: The Science of Winter's Wonder by Mark Cassino
- Winter's First Snowflake by Cheri Hallwood



Identify the different crystals you find using this code sheet. Color in the crystals you discover with your own snow science experiments.

 Simple Prisms	 Solid Columns	 Sheaths	 Scrolls on Plates	 Triangular Forms
 Hexagonal Plates	 Hollow Columns	 Cups	 Columns on Plates	 12-branched Stars
 Stellar Plates	 Bullet Rosettes	 Capped Columns	 Split Plates & Stars	 Radiating Plates
 Sectoried Plates	 Isolated Bullets	 Multiply Capped Columns	 Skeletal Forms	 Radiating Dendrites
 Simple Stars	 Simple Needles	 Capped Bullets	 Twin Columns	 Irregulars
 Stellar Dendrites	 Needle Clusters	 Double Plates	 Arrowhead Twins	 Rimmed
 Fenlike Stellar Dendrites	 Crossed Needles	 Hollow Plates	 Crossed Plates	 Graupel

Types of Snowflakes ... SnowCrystals.com

Source: SnowCrystals.com



# Title: Frost Freeze!

## Making Frost

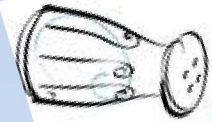
### Materials:

- Empty Can
- Crushed ice
- 1/2- 1 cup of salt
- Paper
- Teaspoon



### Experiment 2:

1. Fill an empty can 2/3 full with crushed ice.
2. Spread a teaspoon full of water on a piece of paper. Place underneath the can.
3. Fill the rest of the can with salt.
4. Mix the salt with ice using a spoon.
5. Watch frost appear on the can.



### 3 types of frost:

Rime frost: forms when a damp icy wind blows over plants, trees, and other surfaces

Hoar frost: water vapor touches a very cold surface and instantly freezes. It looks like spiky fingers. It is found on cars, soil, and metal.

Fern frost: tiny water droplets form on the cold glass. A layer of ice forms and then more moisture freezes on top. Fern frost looks like the pattern of a fern.

### Frost Facts:

Frost is white because the crystals contain air.

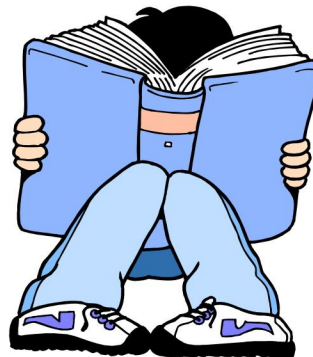
Ice is similar to frost.

Frost will more likely form when the sky is clear.

Frost occurs more inland than on the coast because the sea retains heat.

Source:

<http://www.rcn27.dial.pipex.com/cloudsrus/frost.html>



### Books about frost:

The Story of Jack Frost (Rise of the Guardians) by:

Farrah McDoogie & Larry Navarro

Wolves of the Beyond: Frost Wolf by: Kathryn Lasky  
(8 & up)

Odd and the Frost Giants by Neil Gaiman

The Tale of Jack Frost by Marcia T. Jones

Frosty the Snowman by Diane Muldrow

A Fairy Frost (Disney Fairies) by Tennant Redbank

Here Comes Jack Frost by Kazuno Kahara

Water as a Solid by Hellen Frost

Frost Bites (Edgar & Ellen Nodyssey) by Charles Ogden

# Title: Ice Grows?

Does water grow when it freezes?

Materials:

- 1 Empty Can
- Water
- Permanent Marker
- Tray or aluminum foil

## Experiment 3

Materials:

- 1 empty plastic bottle
- Water
- Freezer or outside when it is freezing
- Measuring tape
- Permanent Marker

Experiment 2: The Exploding Bottle

1. Fill a plastic soda bottle or water bottle with water stopping about 1/4 inch from the top.
2. Replace the lid.
3. Use the measuring tape to measure 3 different places around the bottle, bottom, middle, and top.
4. Mark where you measure with a marker. Record the measurements below.
5. Sit the bottle in the freezer or outside for several hours sitting straight up.
6. Measure the same places again. Write your findings below.

	Liquid	Solid
Top	_____	_____
Middle	_____	_____
Bottom	_____	_____

Experiment:

1. Fill an empty can with water stopping about 1 inch from the top
2. Use a permanent marker to mark the water line on the outside of the can
3. Put the can on a tray or foil and put it outside if it is freezing or in the freezer overnight.
4. Is the ice higher than the water line?

When water turns to ice it expands or grows.

Source: <http://cocopreme.hubpages.com/hub/Easy-Snow-and-Ice-Experiments>



Read more about ice with these books:

*Ice (Stories without words)* by Arthur Geisert  
*Ice Barons: A Picture Book about Polar Bears for New Readers Who Love Animals (Kindle only)* by E. T. Aardentee  
*In the Ice Caves of Krog (Secrets of Droon, 20)* by Tony Abbott  
*Callie Cat, Ice Skater* by Eileen Spinelli  
*The Ice Castle: An adventure in Music (Ages 9 & Up)* by: Pendred Noyce  
*The Ice Bear* by Jackie Morris (ages 4 & up)  
*Magic Tree House #32 Winter of the Ice Wizard* by Mary Pope Osborne  
*The Snow Queen* by Hans Christian Anderson

# Title: Melting Mania

## Melting Ice in Color

### Materials:

- Ice Cubes
- Food Coloring
- Warm Water
- A bowl

### What happens?

#### Experiment:

1. First make 2 color ice cubes. Mix food coloring in water and pour in ice tray 1/2 full for each square.
2. Freeze
3. Then mix water and clear ice together to make really cold water and pour on top of the frozen colored ice cubes.
4. Freeze solid
5. Place warm water in a bowl
6. Place one of the colored/clear ice cubes in the bowl.
7. Observe

Source: TheTeachersCorner.net

<http://lesson-plans.theteacherscorner.net/science/experiments/turnice.php>



What happens to the ice cube as it melts?

Does it turn over?

Why do you think it turns over?

What happens to the colored water as the ice cube melts?

Does it float or sink?



The warm water melts the bottom of the ice cube first, then the top becomes too heavy and the ice cube flips over.

The colored water will sink because the very cold water of the newly melted ice is more dense than the warm water.

When water gets very very cold, it suddenly expands, rises, and freezes into ice, which makes ice float!