Crystals

Recommended for Grades K-3

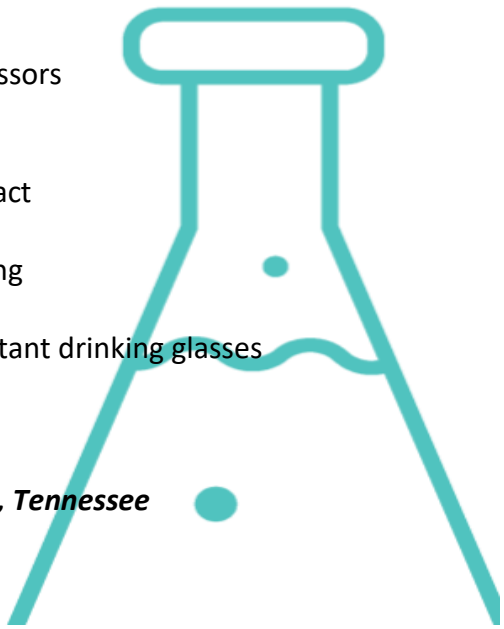
Crystals are solids that are made up of molecules that have smooth sides and fit together in a neat, ordered package. All crystals of the same material have the same shape, no matter what their size. Crystals are formed when certain liquids and gases cool and lose water. Most minerals, such as salt, are crystals. Some crystals can be polished into gems (like diamonds or rubies).

HERE ARE THE ACTIVITIES WE'LL DO AS WE INVESTIGATE CRYSTALS:

- Crystals in Everyday Life
- Beautiful Surprise: Secret Crystals
- Crystals for Lunch?
- Crystal Recycling: Making New Crystals from Old Ones
- Homemade Ice Cream

YOU WILL NEED:

1) Two geodes
2) A magnifying glass
3) Two popsicle sticks
4) Three pieces of string, 12" long
5) Epsom salt
6) Table salt
7) Rock salt in a plastic bag
8) Black construction paper
9) A metal pie tin
10) Two different bags of sugar
11) A hammer
12) A pair of scissors
13) A ruler
14) ½ cup milk
15) Vanilla extract
16) Ziploc bag
17) Food coloring
18) Spoon
19) 2 Heat resistant drinking glasses



Thank you to the WIN Chapter at Oak Ridge National Lab, Tennessee for lesson plan development.

Everyday Crystals

YOU WILL NEED:

- Pinch of rock salt
- Pinch of table salt
- Pinch of Epsom salt
- Pinch of sugar
- Frosty freezer
- Magnifying glass

WHAT TO DO:

1) Look at each of the five ingredients (rock salt, table salt, Epsom salt, and sugar) with the magnifying glass. Notice the different size and shapes of the crystals.
2) Draw what you see in the spaces below.

Rock Salt	Table Salt	Epsom Salt
Sugar	Freezer Frost	

A Beautiful Surprise

YOU WILL NEED:

- Geode
- Ziploc Bag
- Hammer

WHAT TO DO:

1) Place the geode inside a plastic bag and seal.
2) With an adult's help, use the hammer to tap the geode until it cracks open.
3) Look at the crystals using the magnifying glass and compare the crystals that you see within the geode to those from the everyday crystals you drew on the page before this one.

WHAT IS A GEODE:

Crystals can form when a molten rock (a rock so hot that it melts!) cools off. This is what happens with a ***geode***, a hollow rock lined on the inside with crystals. Geodes form when the minerals inside a molten rock cool and crystallize. Take the geode and look at the outside. Right now, it just looks like a rock, right? That's because the crystals are INSIDE the geode! The crystals remain hidden until someone or something breaks the rock.

Crystals for Lunch?

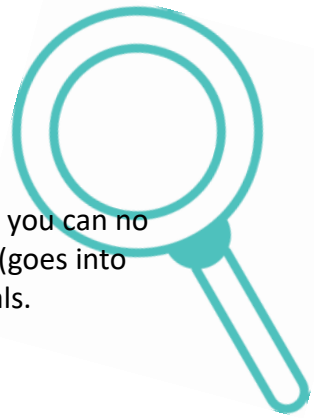
Do you know why some crystals are bigger than others? In this experiment, we will discover how time and temperature affect how crystals grow!

YOU WILL NEED:

- Hot water
- 2 pieces of string, cut about 12 inches long
- 2 popsicle sticks
- 1 cup sugar
- 2 heat-resistant drinking glasses
- Magnifying glass
- Spoon
- Food coloring
- 12-inch ruler
- An adult

WHAT TO DO:

1) Fill each glass with very hot water about 2/3 of the way.
2) Slowly mix ½ cup sugar into each glass and stir with your spoon until dissolved. Add two drops of your favorite color food coloring to each glass.
3) Tie a piece of string around the center of each popsicle stick.
4) Place one popsicle stick across the top of each glass so that the string hangs in the sugar water.
5) From outside the glass, use your ruler to measure the distance from the top of the glass to the top of the water. Copy down your answers on the chart on the next page.
6) With an adult's help, place one of the glasses in a warm spot, like in the sun or on top of a heating vent, and place the second glass in a cooler spot, like your pantry. Your glasses will need to sit for about seven days.
7) Check the glasses every day to measure how high the water is in your glass and record your results.
8) After seven days, pull the strings out of the glass, and see your new crystals! Use your magnifying to examine their shapes.



WHAT HAPPENED:

When sugar dissolves in hot water, it breaks up into smaller and smaller pieces until you can no longer see it. As the sugar water (called a ***solution***) cools and the water ***evaporates*** (goes into the air), the sugar becomes ***concentrated*** and begins settling out and forming crystals.

The crystals that grew in the cold place may be larger than the crystals you grew in the hot place. Cooler places have a slower evaporation rate. The slower the water evaporates, the larger the crystals grow. Crystals that grow slowly through evaporation or cooling (such as the geode) have more time to form, and thus are larger. Is this concept reflected in your results?

RESULTS TABLE				
	Warm Glass		Cold Glass	
	Measure liquid level	**Change from day before**	**Measure liquid level**	**Change form day before**
Day 1		0		0
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				
Total:				

Helpful Hint: To find the change in liquid level, subtract the new liquid level from the day before. For example: if the liquid level on Day 1 is 12 inches, and 10 inches on Day 2, then subtract 10 from 12, and you will find the change from the day before is 2!

Crystal Recycling

YOU WILL NEED:

- Black construction paper
- Pencil
- Scissors
- Metal pie tin
- ¼ cup warm water
- Epsom salt
- Drinking cup
- Spoon
- Magnifying glass

WHAT TO DO:

1) Use your pencil to trace the bottom of the pie tin on the black construction paper. Use your scissors to cut out the traced circle and fit it into the bottom of the pie tin.
2) Add 1 tablespoon of Epsom salt to ¼ cup of warm water. Stir with your spoon until the salt is dissolved.
3) Pour the salty water onto the black paper sitting in the pie tin.
4) Put the pie pan out into the sun. When the water evaporates, you'll see lots of crystal spikes on the black paper!
5) Look at the crystals under a magnifying glass.

WHAT HAPPENED:

When you add Epsom salt to water, the salt dissolves. When you leave the pan in the sun, the water evaporates, and the salt forms crystals shaped like long needles.

Homemade Ice-cream

Crystals are used every day to make and flavor our food. In this experiment, we will use salt crystals and water crystals to make ice cream!

YOU WILL NEED:

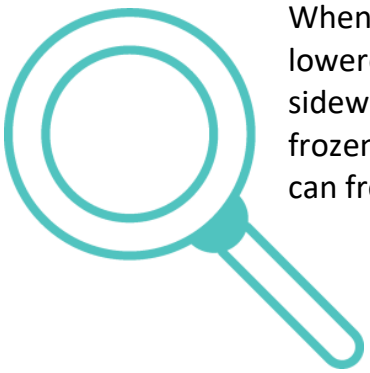
- 1-gallon Ziploc bag
- 1-sandwich Ziploc bag
- ½ cup milk
- ½ teaspoon vanilla
- 1 tablespoon sugar
- 4 cups crushed ice
- 3 tablespoons rock salt
- An adult
- Gloves or hand towels to keep your fingers from getting cold

WHAT TO DO:

1) Add the milk and vanilla to the sandwich-sized Ziploc bag with 1 tablespoon of sugar. With an adult's help seal the bag as tightly as possible. If there is too much air left inside the bag it may explode during shaking.
2) Combine the crushed ice and rock salt into the 1-gallon Ziploc bag.
3) Place the sandwich bag, containing the milk, vanilla and sugar inside the 1-gallon bag, containing the ice and rock salt. Try to let as much air out of the larger bag as possible and seal the bag tightly.
4) Wrap the bag in the towel or put your gloves on, and shake and roll the bag, making sure the ice is surrounding the milk mixture. Shake for five to eight minutes, or until the mixture freezes.
5) When your ice cream is done, open the bags and enjoy!

Did You Know? *Legend has it that the Roman emperor, Nero, discovered ice cream. Runners brought snow from the mountains to make the first ice cream. In 1846, Nancy Johnson invented the hand-cranked ice cream churn and ice cream surged in popularity. Then, in 1904, ice cream cones were invented at the St. Louis World Exposition. An ice cream vendor ran out of dishes and improvised by rolling up some waffles to make cones.*

WHAT HAPPENED:



When salt comes into contact with ice, the freezing point of the ice is lowered, and the ice will melt. This is why we use salt on icy roads and sidewalks in the winter. By lowering the temperature at which ice is frozen, we are able to create an environment in which the milk mixture can freeze into ice cream at a temperature below 32 degrees Fahrenheit.