Crystals

What's a crystal?

Crystals are solids that are made up of tiny building blocks called molecules that have smooth sides and fit together in neat packages. All crystals of the same material have the same shape, no matter what their size is. 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:

1. Crystals in everyday life.
2. Geodes- crystals hidden inside rocks.
3. Sugar Crystals- Growing crystals that you can eat!
4. Epsom salt- dissolving one crystal to grow a different one.
5. Crystals in food- making ice cream!

The experiment kit contains:

1. Two geodes
2. A magnifying glass
3. Two popsicle sticks
4. Three pieces of thread
5. Epsom salt
6. Black construction paper
7. A metal pie tin
8. Rock salt in a plastic bag
9. Two different bags of sugar

****You will also need a hammer, a pair of scissors, ½ cup milk, and vanilla- these are not in your kit. Also, to grow the sugar crystals, you will need more SUGAR! (about 3 cups -we've given you 1 cup to get started)****

Crystals in everyday life-let's investigate where you see crystals…

What you need:

1. a pinch of rock salt
2. a pinch of table salt
3. a pinch of Epsom salt
4. a pinch of sugar
5. wall of freezer (if has frost on it)
6. magnifying glass

What to do:

1. Look at each of the five items with the magnifying glass. Notice the different sizes and shapes of the crystals.
2. Use the spaces on the next page to **draw what you see** in the magnifying glass:

Don't throw the Epsom salt, sugar, or rock salt out as you'll need these for other experiments!

everyday crystals

Rock Salt	Table Salt	Epsom Salt
Sugar	Frost from the freezer	

Geodes

What you need:

1. **Geode**,
2. a plastic bag,
3. a hammer,
4. and an adult to use the hammer

What to do:

1. **Get an adult's permission to do this first!!**
2. Place the **geode** inside the plastic bag and seal.
3. Use the hammer to tap the rock until it cracks open.
4. Look at the pieces of the **geode**.
5. Compare the crystals that you see on the **geode** to those you saw when you looked at the salt, sugar, and freezer wall in the last experiment.
6. If one **geode** doesn't have crystals in, place the second **geode** in the bag and carefully tap it with the hammer until it cracks open.

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 (like limestone) 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.

Epsom Salt Crystals

Sometimes you can dissolve one crystal and make another one that looks totally different!

What you need:

1. Black construction paper
2. Scissors
3. Metal pie pan
4. ¼ cup of warm water
5. Epsom salt
6. a cup

What to do:

NOTE: This works best on a sunny day

1. Use your scissors to cut the black paper so it will fit in the bottom of your pie pan.

2. Add 1 tablespoon of Epsom salt to 1/4 cup of warm water. Stir until the salt is dissolved.
3. Pour the salty water onto the black paper in the pie pan.

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.

Why does Epsom salt make crystal spikes?

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.

Growing Sugar Crystals … That You Can Eat (yum)!

Why are some crystals bigger than other crystals? Our next experiment will look at how time and temperature help to decide how large the crystals grow.

What you need:

1. VERY Hot water- and a grown-up to help you with it
2. 2 pieces of string (about 12 inches long each)
3. 2 popsicle sticks
4. 1 cup sugar from your kit plus several more cups of sugar (~3)
5. 2 big heat-resistant glasses, like old jelly jars
6. Magnifying glass
7. A spoon
8. Food coloring (optional)
9. A ruler

What to do to start your crystals:

1. Fill (not all the way!) each glass with very hot water.
2. Slowly mix half the sugar into one glass, and the rest of the sugar into the other glass. The sugar will dissolve. You should add sugar until you cannot dissolve anymore in the water and the extra starts to collect on the bottom. (If you want, add a few drops of food coloring to the syrup)
3. Tie a piece of string around the center of each popsicle stick and place one popsicle stick across the top of each glass, so that the string hangs in the sugar water.
4. Use your ruler to measure the distance from the top of the glass to the top of the water (do this on the outside of the glass). Write your answer on the results table on the next page.
5. Have a grown-up help you place one of the glasses in a warm spot (near a sunny window, or a heat vent) and place the second glass in a cool spot (the basement, a closet).

What to do to watch your crystals grow:

6. Every day, check the glasses and measure where the top of the sugar water is. Record the results in the results table on the next page.
7. If after 4-7 days you do not see crystals forming, try tying a small crystal (or piece of hard candy) to the end of the string. This will help get things started.

8. After a few days, crystals will begin growing around the string. They may be growing on the bottom of your glass.
9. In about 7 days, pull the strings (and your new crystals) out of the glass. Use your magnifying glass to examine the crystals' shapes.
10. ASK PERMISSION BEFORE YOU EAT YOUR CYSTALS!

GROWING CRYSTALS YOU CAN EAT RESULTS TABLE

	Glass in Warm Spot		Glass in Cold Spot	
	Measure liquid level	Change from day before	Measure liquid level	Change from day before
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

When your crystals are done, use your results table to ask yourself…
Do you see any difference in the crystal sizes?

Did the water in one glass go down (evaporate) faster than the other?

Why do crystals form?
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 that grow.

Using Crystals- Let's Make Ice Cream!

Crystals are used everyday to make and flavor our food. In this experiment, you will use salt crystals and water crystals (ice) to make ice cream!!

What you need:

1. 1/2 cup milk
2. 1/2 teaspoon vanilla
3. The plastic bag with 1 tablespoon sugar from your kit
4. 4 cups crushed ice
5. The plastic bag with 3 tablespoons rock salt from your kit
6. 1 or 2 hand towels to keep fingers from freezing as well!

NOTE: Parents, this will get a little messy as water condenses on the outside of the bag. The towels are important!

What to do:

1. Add the milk and vanilla to the plastic bag with 1 tablespoon of sugar from your kit. Get a grownup to help you seal the bag tightly, allowing as little air to remain in the bag as possible. Too much air left inside may force the bag open during shaking.
2. Add crushed iced to the bag with the rock salt in it.
3. Put the smaller bag with the milk, vanilla, and sugar inside the large bag. Get a grown-up to help you seal the bag (try to get as much of the extra air out as you can).
4. Wrap the bag in the towel or put your gloves on, and shake and roll the bag, making sure the ice surrounds the milk mixture. Five to eight minutes is adequate time for the mixture to freeze into ice cream.
5. When your ice cream is done, open the bags and enjoy!!

Who invented ice cream?

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.

So what does the salt do?
Salt mixed with ice causes the ice to melt. This is why we use salt on icy roads and sidewalks in the winter. When salt comes into contact with ice, the freezing point of the ice is lowered. Water will normally freeze at 32 degrees F. A 10% salt solution freezes at 20 degrees F, and a 20% solution freezes at 2 degrees F. By lowering the temperature at which ice is frozen, we are able to create an environment in which the milk mixture can freeze at a temperature below 32 degrees F into ice cream.

Here's another experiment to demonstrate:

Rising Ice

What you need:

1. large glass of water
2. the short piece of string from your kit
3. ice cubes
4. salt

What to do:

Do you think you can get an ice cube out of a glass of water using a piece of string?

1. Drop an ice cube into a glass of water.
2. Put a pinch of salt on the ice cube.
3. Drag the string over the ice cube.
4. Now put a little more salt on top of the string.
5. Wait a little while. In about three minutes try lifting the ice out of the water with the string. The string becomes attached to the ice.

What is happening?

This works because the salt melts the ice and makes a small puddle of water on top of the ice cube. The puddle then re-freezes a little bit around the string and you have "rising ice."

Interested in Learning More About Crystals??

Credit where credit is due….

The experiments, discussions, and pictures in this handout were taken or adapted from the following websites and books:

1. PBS Kids http://pbskids.org/zoom
2. Teachnet science lesson plans http://www.teachnet.com/lesson/science/
3. Exploratorium, The museum of science, art and human perception http://www.exploratorium.edu
4. Snowflakes http://www.its.caltech.edu/~atomic/snowcrystals/photos/photos.htm
5. http://www.shermanisd.net/Curriculum/matter/ice_cream.htm
6. http://sln.fi.edu/tfi/activity/physics/mat-2.html
7. Magic School Bus **http://www.microsoft.com/education/MSBEarth.mspx#EALAC**

PARENT FEEDBACK- Please help us improve! Just fill this out, and have your child take it to the library.

1. Were the materials provided appropriate? Yes _____ No _____
Please explain._____

2. Did you have enough materials for each experiment? Yes_____ No_____

Please explain._____

3. Did the experiments work? Yes_____ No_____

If not, please explain_____

4. Please provide any suggestions for improvements or additional

experiments/explanations._____

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