

SALTY CRYSTALS

Background Information for Activity Leaders

Overview

Children will learn about minerals and the formation of crystals by observing the mineral growth process.

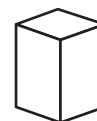
Key Concepts

- On Earth, matter can be observed as a **solid**, a **liquid** or a **gas**. In some solids, the arrangement of molecules is random. **Crystals**, however, are solids that form a regular repeated pattern of connected molecules.
- **Geodes** are spherical-shaped rocks with a hollow cavity that becomes lined with crystals over millions of years.
- **Crystals** can form interesting geometric shapes that can be observed under a microscope or using a magnifier. Sodium Chloride (table salt) has a cubic structure.
- **Crystals** form naturally all over the earth: inside **concretions** (holes inside of rocks), inside caves, and inside gas bubbles trapped in cooled lava.
- In the natural environment, minerals dissolve in water as it flows through the ground, down mountains, through rivers and in the ocean. When water runs through naturally occurring holes in the ground, and begins to slowly evaporate, tiny mineral crystals begin to form and line the inside of the hole. This process can take thousands of years.
- To grow crystals in a container you need to dissolve chemicals that form crystals in water until they are **supersaturated** and then allow the water to evaporate. **Solutes** are what are dissolved in the **solvent**; in this case the solvent is water. Solutes and solvents together form a solution. In a salt water solution, salt is the solute and water is the solvent.
- There are two ways to dissolve a substance into water: stirring and heating. But even if you do both of these, there is still a limit to the amount of solute you can add to water. Eventually you'll reach a stage where no more solute will dissolve no matter what you do. When no more solute can be added to the solvent the solution is called supersaturated.

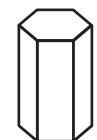
Common crystal shapes



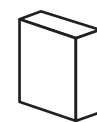
Cubic



Tetragonal



Hexagonal



Orthorhombic



Monoclinic



Triclinic



Trigonal

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- For your own investigation, you can grow other types of crystals using various other chemicals. Other chemicals such as aluminum potassium sulfate (alum) can be purchased at a drug store; while, copper sulfate (Bluestone algacide) can be purchased at a pool supply or hardware store. Children should **not** be allowed to work with these two chemicals. They are harmful if swallowed. The pots used to prepare supersaturated solutions of these two chemicals should be washed very well or reserved for experiments once they have been used for this purpose.
- Children should not place chemicals in their mouths to taste, or eat them. Goggles should be worn while working with chemicals no matter how small a quantity is being used. Remember that even though salt may seem harmless, if it falls into a child's eyes, it will irritate and sting.

What to Expect

- Children are often more familiar with rapid changes in nature, such as the eruption of a volcano, and are often unfamiliar with gradual changes, such as the formation of crystals. Most children are accustomed to fast results; it is important to emphasize that sometimes natural phenomena take time to occur.
- To speed up the evaporation of the crystals that will be observed using the microscope, a drop of alcohol can be added to the slide.
- There are many chemicals that form crystals. Some chemicals that form crystals are very easy to obtain such as sodium chloride (salt) and magnesium sulfate (Epsom salt). These two chemicals can be used with children, but as with all chemicals they need to be monitored.

Common Misconceptions

- *Children may think: "Large crystals can form in a few moments."*

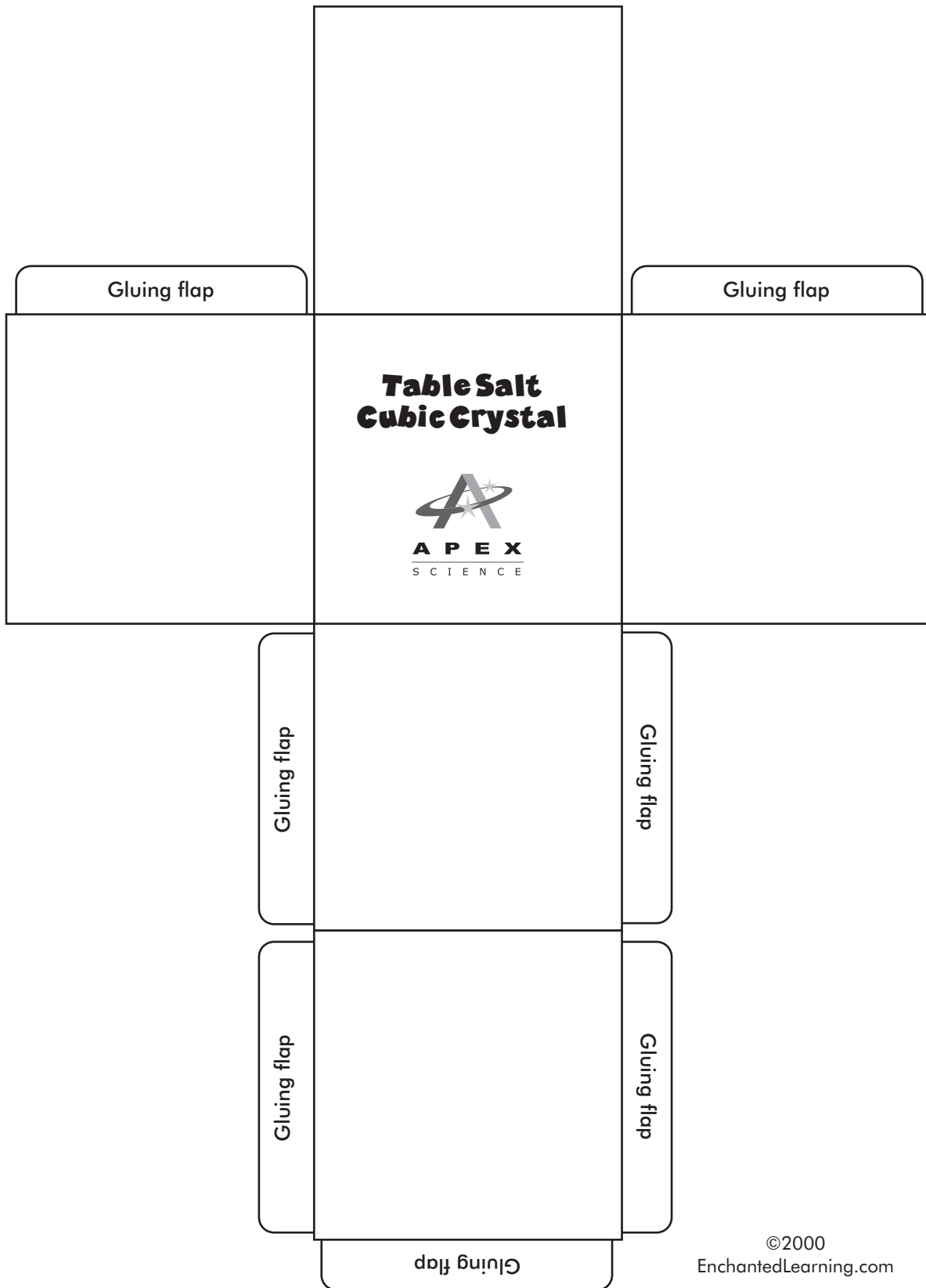
Even though a crystal large enough to be seen using a magnifier or a microscope takes minutes to form, in nature a larger crystal may take millions of years to form.

- *Children may think: "Every rock is a geode with crystals inside."*

Geodes form in the hollows left behind by bubbles in volcanic rock or as animal burrows, tree roots or mud balls in sedimentary rock. Not every rock has a hollow, and not all hollows in rocks are exposed to the conditions necessary to form mineral deposits that form crystals.

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Expand Activity Template



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Data Collection Sheet

Name: _____

Date: _____

WONDER What do mineral crystals look like?

RECORD Notice what happens to the two mineral solution you placed on each slide. Describe what you see:

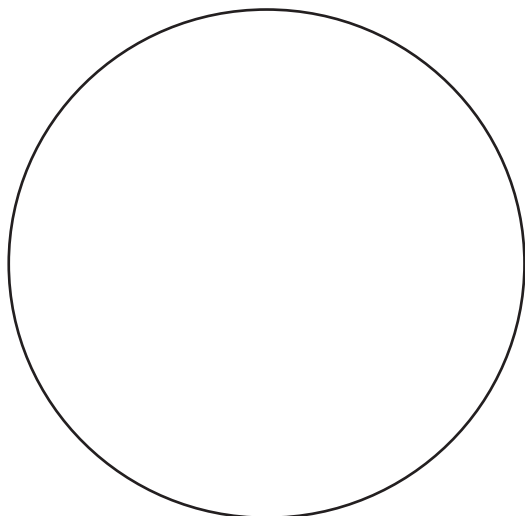
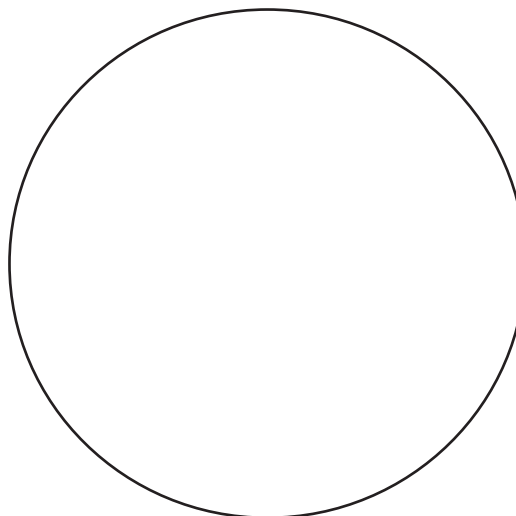


table salt



Epsom salt

CONCLUDE Consider what you noticed. What happened as the mineral solution evaporated?

What shape do the crystals have?

Set Up the Expedition

Materials:

For the activity leader:

- **Salty Crystals** Learning Cards
- (1-3) microscopes
- two different food colors
- (5 tbsp per group) table salt
- (5 tbsp per group) Epsom salt
- (12 tbsp per group) hot distilled water
- (2-4) empty, clean one-liter soda bottles

For each group:

- (2) scissors
- (1) roll of masking tape
- (2) small plastic cups

For each child:

- (1) **Salty Crystals** Data Collection Sheet
- (1) magnifier
- (1) pair of goggles

Prepare the demonstration:

1. Place a geode that has been cut and polished where all the children can see.
2. If a geode is not available, provide a picture book about rocks and minerals that includes a geode.

Prepare the exploration:

1. Using a waterproof marker, label one cup "Table Salt" and one cup "Epsom salt."
2. Pour 6 tbsp hot distilled water into each cup.
3. Immediately, mix 5 tbsp table salt and 6 tbsp Epsom salt into the appropriate plastic cup using a clean spoon for each.
4. Add a drop of food coloring to each cup.
5. Stir until most of the table salt or Epsom salt dissolves.
6. Prepare two cups for each group. One cup will hold the table salt solution and the other will hold the Epsom salt solution. With a waterproof marker, label the contents of each cup.
7. Scoop out one tsp of the liquid from each cup and place it in the appropriately labeled cup for each group.

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Activity Leader's Guide

Group Size: 4-6 children

Time: 45 minutes

Engage

- 1 Gather the children together.

Say:

"Minerals can form crystals with regular geometric patterns." Show children the inside of the geode and pass the geode around so that they can examine it.

Say:

"Inside this rock, minerals that were dissolved in water millions of years ago formed crystal shapes. Crystals can form very interesting shapes."

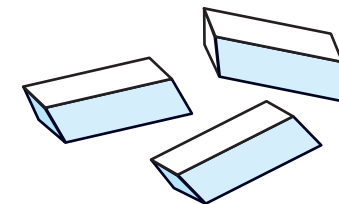
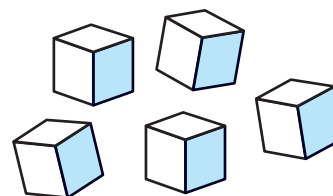
Ask:

"What shapes do you notice?"

- 2

Say:

"In nature, many different kinds of minerals dissolve in water as it flows through rivers and through underground caverns. Different kinds of minerals form different shaped crystals."



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Activity Leader's Guide

Explore

- 3 If working with more than 4-6 children, divide the children into groups. Distribute the Data Collection Sheets and the Learning Cards.

Say:

“Now you will use two different mineral solutions to observe how a crystal forms. I added food coloring to make them easier to see. Follow the instructions on your Learning Card. Don't forget to wear your goggles!”

- 4 Allow children enough time to complete the WONDER, EXPLORE, RECORD and CONCLUDE sections of their Learning Card.

Conclude

- 5 Gather the children together to complete the Learning Card. Ask the following questions:

“Describe what you saw under the magnifier or microscope.” Table Salt will form crystals that look like cubes. Epsom salt forms crystals that are rectangular and may form long needle-like clusters.

“What did you notice about the shapes formed by the crystals?” As the solutions evaporate, children will notice that the level of the liquid will go down and small crystals will begin to form along the edge.

“What did you notice as the solutions evaporated?” As the solutions evaporate, children may notice that some solutions require different amounts of time to evaporate, the colors of the crystals may differ, and the crystal formations will vary in shape and size.

Expand

- 6 If time permits, ask children to complete the EXPAND section of their Learning Card.

Say:

“Follow the instructions on your Learning Card to make a model of your salt crystals.” Distribute a copy of the salt crystal template to each child. Children can decorate their salt crystal before they glue it together.


- 7 **Say:**
“Congratulations! You have earned your ‘Ask Me About Rocks and Minerals’ stamp. You are ready to tell people about rocks and minerals.”

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Expedition Learning Card

? What do mineral crystals look like?

 solution crystal cubic

 Explore how minerals found in the Earth's layers can form crystals.

1 WONDER What do mineral crystals look like?

 Record your ideas on your Data Collection Sheet.

2 EXPLORE Wear your goggles! Do not taste any of the materials!

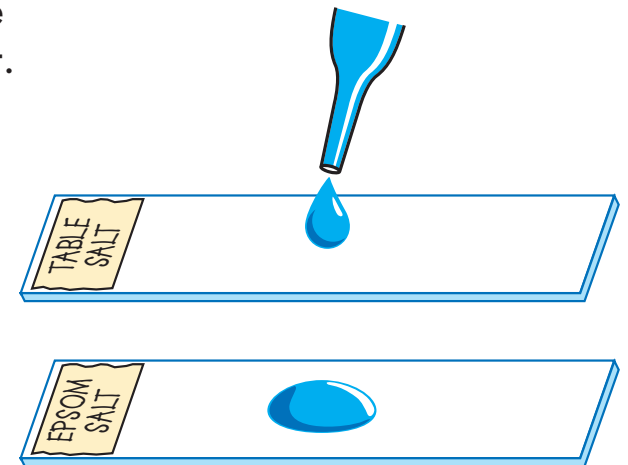
1. Using a strip of masking tape, label one slide table salt and the other Epsom salt.

2. Drop 1 drop of the table salt solution on the slide labeled table salt.

3. Place the slide under the microscope. Notice what happens to the solutions as they evaporate.

4. If the crystals do not begin to form, add a drop of alcohol onto the slide.


5. Repeat steps 2 thru 4 using the Epsom salt solution.



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Expedition Learning Card

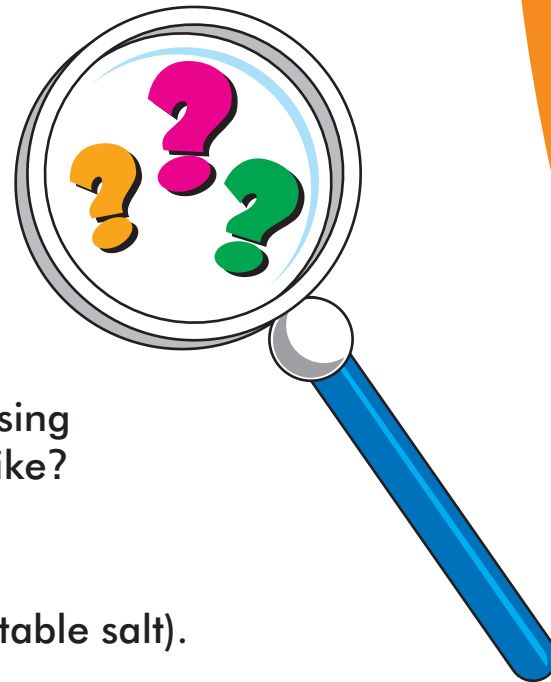
3 RECORD What happens to the mineral solutions you placed on each slide?

 Draw or write on your Data Collection Sheet what you notice on each of the slides.

4 CONCLUDE Consider what you noticed using the microscope. What did the table salt look like? What did the Epsom salt look like?

5 EXPAND Make a model of a cubic crystal (table salt).

- Cut along the edges of the crystal template.
- Decorate the crystal model.
- Fold along the inside lines and form a cube shape.
- Glue the flaps into place.



Discovery

Why did we do that?

- Minerals can be dissolved in water.
- Crystals form when mineral solutions evaporate.
- Crystals have geometric shapes.

Congratulations!

You have earned your "Ask Me About Rocks and Minerals" stamp! Now you are ready to tell people about rocks and minerals!

