



# GROWING *Crystals*



Use Borax, water & pipe cleaners!

## Grow Crystal Decorations

Well, it is officially winter! Do you know how the beautiful crystal structures are formed in the snow? Let's create some of our own crystal snowflakes! You can make crystal ornaments or other decorations with a simple solution of Borax, water and pipe cleaners.

## WHAT ARE CRYSTALS?

A crystal is a natural solid made up of a repeated pattern of molecules connected together. Crystals can form through the slow cooling of molten material (gemstones), or when a warm gas such as oxygen cools down (snowflakes), or when a liquid that contains dissolved minerals cools very slowly (salt). *Sciencefriday.com*

Every crystal has a repeating pattern based on its unique shape. They may be big or little, but they all have the same "shape." Salt, sugar, and Epsom salts are all examples of crystals. Salt crystals are always cube-shaped while snow crystals form a six-sided structure. *from Children's Museum of Sonoma*

## WHY DO BORAX CRYSTALS GROW?

Crystals can form when a supersaturated liquid that contains a dissolved mineral cools. In this activity, a supersaturated solution is made using hot water and borax (a soft crystal). The hot water causes the water molecules to move further away from each other so that more of the borax could dissolve into the solution. Once the solution reaches a point where it cannot dissolve any more borax, it becomes supersaturated. As the solution cools, the water molecules come closer together again causing the forming borax crystals to cling to the pipe cleaner (a nucleation site). *Sciencefriday.com*

This also applies to snowflakes - as air and water cool, the molecules move closer together. Since all water molecules are shaped the same (H<sub>2</sub>O) they align in a six sided crystal.



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# Borax Crystals

## MATERIALS

- Beaker or a wide-mouth jar
- String
- Colorful pipe cleaners
- Pencil
- Boiling water
- Borax (20 Mule Team Borax Laundry Booster)

## METHOD

1. Cut and bend pipe cleaners into desired shape. It should easily fit into the jar you have with a least 1/2 inch of space all around. Pipe cleaners form a base for the crystals to grow on.
2. Now, attach string to the top of one of the pipe cleaners and tie the other end to a pencil (this is to hang it from). Remember that the crystals will also form on the string, so place it somewhere that it will still look nice.
3. Fill a wide-mouth jar with boiling water. (Measure how much you put in!)
4. Mix borax into the water one tablespoon at a time. Use three tablespoons of borax per cup of water.
5. Stir until dissolved, (don't worry if there is powder settling on the bottom of the jar).
6. Insert your pipe cleaner shape into the jar so that the pencil is resting on the lip of the jar and the ornament is freely suspended in the borax solution. It should be completely submerged and not touch sides or bottom.
7. Wait overnight and by morning the shape will be covered with shiny crystals!
8. Remove from jar, let air dry, and hang in a window as a sun-catcher or use as a decoration.

Tell us how your experiment goes by sharing photos and tagging The Works on social media: **#attheworks** and **#STEMActivity**

## TRY ANOTHER EXPERIMENT!

**Make two jars from the directions above. Let one sit at room temperature overnight, but put the other one in an ice bath until most of the ice has melted then it can go into the refrigerator overnight. Is there a difference in the crystals that are formed?**

### *Why is there a difference?*

**When the molecules of the crystal come together, other products that are often considered impurities, or the unwanted products of the chemical reaction, do not fit well into the structure. If the crystals form slowly enough, the impurities will be rejected because they do not fit correctly, and instead will remain in the water. This is why the crystals in the room-temperature jar should have been larger and more cube-like. But if a solution is cooled too quickly, there isn't time to expel impurities and instead they become trapped within the crystal structure and the pattern is disturbed. The crystals in the bowl of ice water should have formed more quickly and in greater numbers, but were smaller and less cube-like because they had more impurities.** *Science Buddies*