

# GROW A CRYSTAL

## Tap into chemistry to discover how crystals are formed

### What you'll need:

- Pipe cleaners
- Scissors
- String
- A pencil or pen
- A wide-mouth glass jar
- Tape
- A heat-safe measuring cup
- A spoon or something to stir with
- ¼ cup salt
- 1 cup of very hot water (from the tap or freshly boiled)
- Food colouring (optional)

### Activity setup:

1. Cut a piece of pipe cleaner so that the length is smaller than the width of your glass jar. The pipe cleaner will need to fit inside the jar with some room to spare.
2. Twist the pipe-cleaner into a shape, if you like.
3. Cut a piece of string to about the same height as your glass jar. A mason jar is a great option for this activity. Tie one end of the string to the centre of the pipe cleaner and the other end to a pencil.
4. Place the pencil across the top of the jar, letting the pipe cleaner dangle on the string inside the jar. Turn the pencil to wind the string around it until the pipe cleaner is hanging without touching the bottom or sides of the jar. Then tape the string in place.
5. Pour one cup of very hot water into your measuring cup. Ask a grown-up for help with this step!
6. Add half of the salt to the hot water and stir it until it is completely dissolved.
7. Slowly add the remaining salt, stirring as you go. When the salt won't dissolve anymore and a few crystals have settled at the bottom of your cup, stop adding salt.
8. If you want your crystals to be a certain colour, add food colouring to your salt solution.
9. Pour the salt water into your jar. Make sure the pipe cleaner is submerged in the salt water but not touching the bottom or sides of the jar.
10. Store the jar in a safe location. Keep it in a spot where you can watch the crystals develop, but where the jar won't accidentally be knocked over or disturbed.
11. Now, it's time to wait. It will take up to four days for the crystals to fully form. Look at the jar each day to observe any changes, but don't move it.
12. After four days, carefully remove your crystal from the salt water. Hang it somewhere safe to dry.



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## How does it work?

When you mixed the salt with the water, the molecules combined completely, creating a solution. The hot temperature of the water made the salt dissolve even more easily than usual. By adding salt until it couldn't dissolve any more, you made a **saturated** solution.

When the hot water cooled, it contained more salt than water usually does at this temperature. As a result, the salt slowly began to **precipitate**, or turn back into solid crystals. Over a few days, the tiny salt crystals grew on top of each other on your pipe cleaner to form a large set of visible crystals.

## How do crystals form?

The salt crystals you see on your pipe cleaner are a collection of hundreds of smaller crystals.

Here you made crystals in a saturated solution, but crystals can grow from vapour as well. For example, snowflakes are composed of many tiny water crystals arranged in a pattern.

When the warm water vapour in a cloud comes into contact with cool air, it changes form, transforming from a gas into a liquid. When the temperature is cold enough, these liquid water droplets that encounter a speck of dust transform from liquid to solid to make a water crystal. As this crystal falls through the cool air, more droplets attach to it and form new crystals.

There are other examples of crystals out there. Crystals found in igneous rocks like granite, for instance, form when liquid rock, or magma, cools very slowly. Quartz, used in watches, forms from silicon dioxide. Graphite, used in pencils, is made from carbon crystals—and so are diamonds!

Some of the largest natural crystals we know about were found in a cave in Naica, Mexico, which—similar to your crystal—was flooded with a saturated solution. In this case, though, the solution was calcium-sulfate-rich water, heated by magma. Over millions of years, gypsum crystals formed, and they grew to 12 metres long!

How many types of crystals can you find around your home?

## Experiment with different materials

Try using a different ingredient instead of table salt to create your crystal. You can follow the same procedure using one cup of Epsom salt or two cups of sugar. How do the crystals differ from the ones you made using table salt? Compare how long it takes the crystals to form, and be sure to observe the shape and size of your crystals when you use different materials.

For speedier results, follow the same procedure as above, using three tablespoons of Borax. You should notice lots of crystals after just one day!

**Safety first!** Borax can irritate your skin, eyes and lungs, and it can be harmful if you swallow it. Ask a grown-up for help handling borax, and don't touch your crystal once it's done.