



Crystals of Sugar

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This activity will introduce you to the concept of crystallization, which is the process through which crystals are made. Before becoming the solid we can observe and touch, crystals grow out of very tiny crystal nuclei. In this activity, you will grow your own crystals in the form of rock candy and observe the changes that occur.

What you will need

Ingredients:

500ml water

1500g sugar (separate in 2 parts)

Gel food colouring (optional)

Flavouring (optional)

Utensils:

Wooden sticks/ skewers

Spatula

Plate (2)

Saucepan

Tall, cylindrical glasses/ jars

Clothing pegs

Stove

You can download and print the activity worksheet or follow along on a device. You will need internet access to watch the video of crystallization. This activity will be carried out over multiple days.

Learning Outcomes

In this activity, you will:

- Learn keywords about solution.
- Learn what a supersaturated solution is.
- Learn about crystallization.

Recommended Age

This activity is suitable for ages 8+ years with adult supervision and guidance.

Health & Safety

These activities are carried out at your own risk. Please read these health and safety guidelines to reduce risks.

- Any access to the internet for minors should be done under adult supervision.

- Heating is required for this activity and should be done with an adult to reduce the risk of burns.
- If you print and cut out the handouts, please be aware of potential cuts from scissors or papers, and irritation from contact of glue with eyes, skin, hair or ingestion.

Steps

Step 1: Add two tablespoons (or more as needed) of sugar on a plate. Pour some water in a second plate, ensuring that there is enough water to coat a skewer to the halfway point. Take the wooden sticks or skewers and roll them back and forth in the water up to the halfway point on the sticks, then roll the damp end in the sugar, ensuring they are fully coated. Set the skewers rolled in sugar aside leaving them to dry for 24 hours. Repeat this process for however many rock candies sticks you would like to have. Make sure that your sugar sticks are fully dry before moving onto step three.

- *Why is it important for the sugar sticks to be fully dry before continuing?*

Step 2: Put the other 500ml of water in a saucepan and heat it enough to get the water warm but not boiling. Pour in half of your sugar, and wait for it to dissolve, stirring continuously. Add the remaining sugar a little bit at a time, waiting for it to dissolve, then repeating this process until you have used up all your sugar. The mixture should be slightly cloudy, and you will be unable to dissolve any more sugar. Wait for the mixture to cool slightly before proceeding. If your mixture crystallizes before you pour it then you will have to make the sugar solution again.

- *Why is the sugar no longer dissolving?*

Step 3: Take the cylindrical jars/glasses and add food colouring and flavours (optional, you can prepare your glasses ahead). Fill your glasses with the sugar solution. Then take the sugar-coated sticks and place them down into the glass until the end of the stick touches the bottom of the glass, then lift it up slightly so that the tip of the stick is 1/4 above the bottom of the glass. Make sure that the stick is in the centre of the glass before securing it in place with a clothing peg.

Step 4: And now, we wait and watch them for around 7+ days. Crack open the surface of the sugar solution by slightly tapping on the surface with a butter knife until the stick can move freely. Take the stick out and discard the sugar solution. You will see the beautiful Sugar Crystals shiny and delicious.

Explanation

This activity is showing an example of crystallisation. At the beginning of the experiment, we dissolved sugar in water and made a solution. A solution is a liquid that contains different substances. The most abundant component is called the solvent, which means that in the solution there is much more of this component than of the others. The other component, present in smaller amount, is called solute and it is dissolved in the solvent. In our experiment water is the solvent and sugar is the solute. As we dissolved the sugar in water, at some point the sugar no longer dissolved in the water. This is due to something called supersaturation. Supersaturation occurs when the concentration of your solute is higher than the concentration required to balance the solution.

When the solution becomes colder, the sugar molecules are less happy to stay in solution – this is caused by a property called solubility-, they would rather stay with other sugar molecules and are ready to form crystals again. In these conditions, when they meet other sugar molecules in the solution, they start creating a solid, the crystal.

In this experiment we covered the sticks with sugar crystals before immersing it in the solution. Why, you ask? We wanted to help molecules to start crystallising. It is easier for them to grow on an existing crystal rather than creating a new one. This is because crystallisation takes place in two parts: nucleation, which is the formation of a tiny crystal, and growth, which is when more molecules attach to the existing crystal nucleus. Creating a nucleus can sometimes be very difficult and introducing ready crystals is a good way to help them!