SCIENCE EBOOK

7 Winter Science Projects

For Christmas Break or Any Winter Day

HOME SCIENCE TOOLS®

Contents

SCIENCE PROJECT

Paper Snowflake Crystal Ornament

Use common household items—and common chemistry principles—to grow a Borax crystal snowflake ornament.

What You Need:

- ☐ Filter paper (or coffee filters)
- ☐ Borax (sodium tetraborate)
- ☐ Water
- ☐ Glass measuring cup or 600 ml beaker
- ☐ Stirring rod or skewer
- ☐ Scissors
- ☐ Fishing line or ribbon
- ☐ Petri dish or deep plate

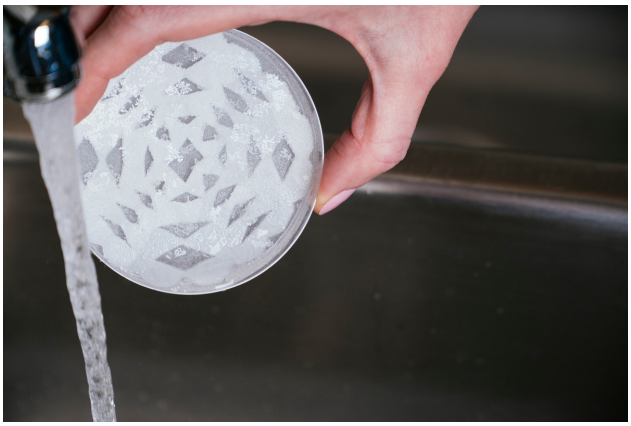
What To Do:

1. Make a supersaturated solution of Borax and water by having an adult help you. Use the microwave to heat about 200 ml of water until boiling. Use caution when removing the glass from the microwave, because it will be hot! Mix in teaspoons of Borax until no more will dissolve. Allow the solution to cool.

2. If you're using a petri dish, use it as a template to cut your filter paper (or coffee filter) down to size so it will fit inside. Then fold the paper in half 2-3 times and snip the edges thinking about where the cuts will appear when you unfold it. You may want to practice on scratch paper first and figure out where to cut to come up with the best snowflake design.

3. Unfold your snowflake and place it in the petri dish (or on the plate) and carefully pour the saturated solution over the snowflake, making sure it's completely immersed.

4. Let the snowflake sit in the solution for an hour or longer until it is covered in crystals. Pour off the solution and use a butter knife to carefully remove the snowflake.



5. Place your crystal snowflakes on paper towels to dry. You may need to use a toothpick to knock crystals out of the snowflake's holes.

6. Once it is dry, feed fishing line or string through the snowflake and hang your ornament on your tree. Or if it's a gift, wrap it up for Christmas!

Note: Borax can be irritating to skin, so make sure you wash your hands after doing this project.

SCIENCE EXPERIMENT

Hot Chocolate Solvent

A yummy experiment to help you understand how hot cocoa powder becomes hot chocolate.

What You Need:

- ☐ 3 identical pieces of chocolate candy (soft chocolate, like milk chocolate sections, works best)
- ☐ Stopwatch or a watch with a second hand
- ☐ Volunteer (or you can be the volunteer)

What To Do:

1. Place the first piece of chocolate in the volunteer's mouth. Tell the volunteer to not move his or her teeth, tongue, or actively suck on the chocolate. Let it dissolve in the saliva in the volunteer's mouth.

Time how long it takes the chocolate to dissolve from the time it is placed in the mouth until it is completely gone.

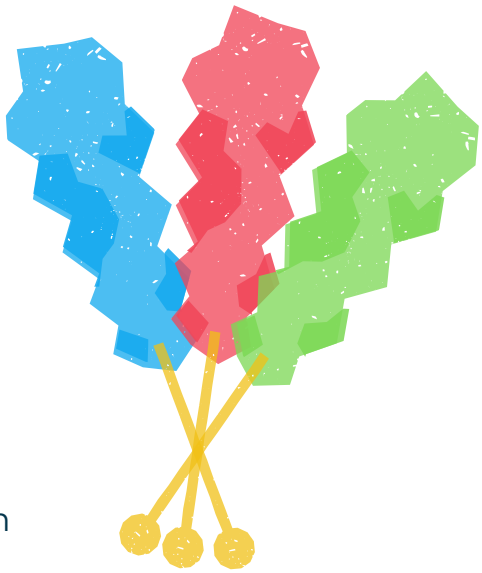
2. Place the second piece of candy in the volunteer's mouth. This time, tell your volunteer to use the tongue to move around the chocolate, but do not chew on it. Again, time how long it takes for the chocolate to disappear.

3. Place the third piece in the volunteer's mouth, this time letting him or her chew on the piece. Again, time how long it takes for the chocolate to disappear.

Pro-Tip: Consider having extra chocolate on hand! It may take a few tries for excited little volunteers to let the candy dissolve on its own!

SCIENCE PROJECT

Rock Candy Sticks



Get ready to watch some cool crystals grow! And when you're done, you can eat them or give them away as Christmas gifts!

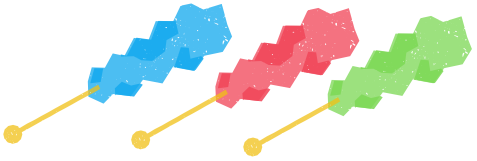
What You Need:

- ☐ 1 1/2 cups white sugar
- ☐ 1 cup water
- ☐ 1 small plate
- ☐ Several small clean jars
- ☐ Wax paper
- ☐ 1 saucepan
- ☐ Stove
- ☐ 1 spoon
- ☐ 1 glass
- ☐ Food coloring (optional)
- ☐ An adult to help you
- ☐ Cake pop sticks or wooden skewers

What To Do:

1. Fill a glass with water, pour some sugar on a small plate, and lay out a sheet of waxed paper. Dip one end of each stick (cut pointed ends off if you use skewers) into the water and then roll it in the sugar, tapping it gently to remove excess. Set each stick to dry on the waxed paper.

2. Pour the cup of water into the saucepan and add 1/2 cup sugar. Stir it well until no more sugar will dissolve. Add more sugar (1/2 cup at a time) until you can't get any more to dissolve even after stirring for several minutes. You should end up with about 1 1/2 cups sugar dissolved in the saucepan. It's OK if there is some undissolved sugar at the bottom of the pan. (You now have a saturated sugar solution.)



3. Ask an adult to help you heat the sugar mixture on the stove until it boils, stirring the whole time. Turn the heat to medium-low and keep stirring until all the sugar dissolves. (Now you have made a supersaturated solution!)

4. Keep cooking the liquid and stirring it until it becomes clear, but not for more than 5 minutes, or it will get too hot and turn into hard candy! Turn off the stove as soon as it starts to look clear.

5. Move the pan off the heat and allow it to cool down until the pan is no longer hot (the sugar solution will still be slightly warm).

6. Have an adult slowly pour the thick sugar solution into the jars. Fill each about 2/3 full, or enough so that sugar solution will cover several inches of your sugar-coated sticks.

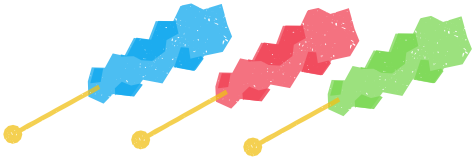
7. Add 5-6 drops of food coloring to each jar and stir. (Optional: Only do this step if you want to make different colors of rock candy!)

8. Once the solution is cool and the sugar-coated sticks are completely dry, place several sticks into each jar.

9. Carefully move the jars to a place where they won't be disturbed. Check them every other day and gently stir the sticks around in the sugar solution to break up any large crystals forming on the surface.

10. Within a few days, you should start to see crystals growing on the sticks. After about one week, you will probably have a lot of crystals. When your "rock candy" crystals are as big as you want them to be, take them out of the jars and set each color of candy in a clean glass to dry.

11. Once they are dry, you can wrap in cellophane food wrap and tie with ribbon for a sweet Christmas gift!



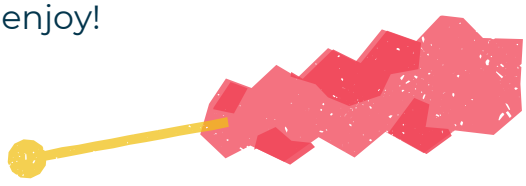
What Happened:

In step two you made a saturated solution—there was so much sugar in the water that it couldn't dissolve any more sugar and some was left in the bottom of the pan. Once the saturated solution started to heat up, the water was able to dissolve even more sugar and a supersaturated solution was formed in step three. Then, as the solution cooled, the sugar molecules in it started to join with the sugar molecules on the sticks. The sugar on the sticks are called "seed" molecules and the sugar molecules in the solution attached themselves to the seed molecules.

Meanwhile, the water in the solution started to evaporate or dry up into the air, leaving only sugar molecules behind. More sugar molecules gradually joined with the ones already on the stick, forming larger crystals. Because all of the solute molecules are the same (they are all sugar), they all form the same shape of crystals and they all stick together, making a big chunk of sugar crystals that are pretty to look at and tasty to eat!

Note that this is a special science project that is safe to eat because you only used food products, not chemicals. Plus, you used clean dishes from your kitchen. Never eat any experiment unless it is made entirely out of food and you only used clean dishes to prepare it!

Note: You can make Rock Candy without sticks. Use a piece of clean cotton string or thread. Follow steps 2-7 then dip the string into the solution so that half of the string is coated. Take the string out and let it dry. Once the string has dried, tie the clean end around a pencil and put the dipped end back into the glass of sugar water solution, balancing the pencil across the rim of the glass. Make sure the string does not touch the bottom or the sides of the glass, or your crystals will not form right! When your piece of "rock candy" is as big as you want it to be (about one week), take it out of the glass, let it dry, and enjoy!



SCIENCE PROJECT

Poinsettia pH Paper

Once Christmas is over, use the red leaves from a poinsettia plant to do an easy chemistry science project! In this experiment, you'll make pH test strips from poinsettia leaves and use them to discover acids and bases.

What You Need:

- ☐ 4-5 red poinsettia leaves
- ☐ 400 ml beaker
- ☐ 250 ml beaker
- ☐ Funnel
- ☐ Baking rack
- ☐ Cookie sheet
- ☐ Heat source, such as a hot plate, lab burner, or alcohol lamp
- ☐ Glass petri dish or small, shallow dish
- ☐ Water
- ☐ Filter paper (or coffee filters)
- ☐ Scissors

What To Do:

1. Remove 4-5 red leaves from the poinsettia and use the scissors to cut them into pieces.

2. Place the cut up leaves into the bottom of the 400 ml beaker. Add just enough water to cover the leaves.

3. Use your hot plate, lab burner with stand, or alcohol lamp with stand to heat the water to boiling. Be sure to follow lab fire safety protocol! (You may also use a microwave for this step.)

4. Continue simmering a few minutes until the leaves lose their color and the water takes on a deep red tinge. Turn off the heat source.

   If you're handling the beaker (removing from the microwave), use caution as the beaker will be hot! Allow the solution to cool.

5. Meanwhile, line the funnel with filter paper. To make a cone, take a piece of filter paper and fold in half, then in half again. Pull one layer open to reveal a cone shape that will fit inside the funnel.

6. Once the beaker is cool enough to touch, carefully pour the liquid through the filter paper-lined funnel into the other beaker. Remove the funnel and discard the remaining plant material and used filter paper.

7. Place another piece of filter paper (or coffee filter) into the petri dish (or other shallow dish).

8. Carefully pour the filtered liquid over the paper.

9. Remove the now-saturated filter paper from the shallow dish and allow to dry. Consider laying the saturated paper across a baking rack with paper towels or a cookie sheet underneath.

10. Once your poinsettia pH paper is dry, cut it into strips. Now it's ready to use!

What Happened

Like red cabbage (which can also be boiled to make pH test strips), poinsettia leaves contain a chemical pigment called anythocyanin. It's responsible for giving poinsettia leaves their deep red color.

It's also behind the color of red cabbage, blueberries, and the fall colors of some leaves. Anthocyanin is also pH sensitive, which is why you can use it to make poinsettia pH paper.

Remember that the pH scale allows us to measure how acidic or basic a solution is. Many varieties of pH test strips are commercially available, but some plants contain chemicals that can be used to make your own pH test strips!

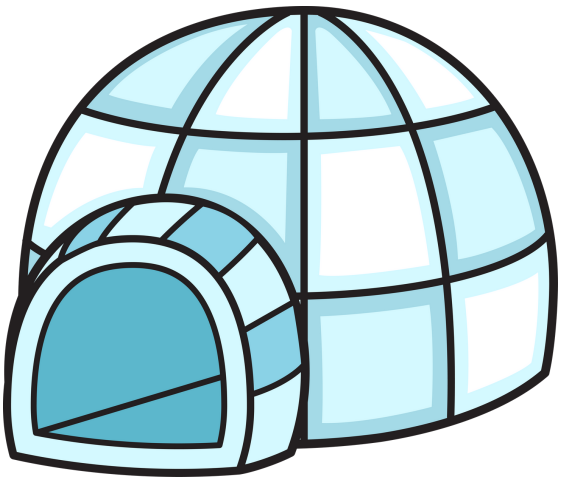
With these poinsettia pH strips, acids will turn the pigments in the indicator to an orange or reddish color.

Bases will turn the pigments in the poinsettia pH strips yellow-green, blue or purple. Neutral substances will show no change on the poinsettia pH paper test strip.

Follow the steps in this red cabbage pH project to use your poinsettia strips to compare solutions for acidity and alkalinity (basicity). And for even more information, check out this article about acids and bases.

SCIENCE PROJECT

Build an Ice Cube Igloo



What You Need:

- ☐ Slushy mix (made with a few ice cubes and tablespoons of water in the blender)
- ☐ 2-3 ice cube trays
- ☐ Salt
- ☐ Water
- ☐ Teaspoon
- ☐ Baking sheet
- ☐ Freezer space

What To Do:

1. Before you begin, make ice cubes for your igloo. You'll need around 50 ice cubes in various sizes. Make half the ice cubes full sized. The other half should be an assorted sizes made from filling the ice cube trays half and three-quarters full.

2. Once the ice cubes are frozen solid, sprinkle salt on the cookie sheet. Make a circle with 12 ice cubes and place in the freezer until completely frozen.

3. For the second row, dip one side of each ice cube in the salt. Center each cube, salty side down, on the seam between two cubes from the bottom row (like brick walls). Use the slushy mix to carefully fill the gaps. Refreeze.

4. Repeat step 2, making each successive layer with smaller and smaller cubes. Each new row should be smaller than the one before, creating a dome. Refreeze as necessary. Continue until only a small hole in the top center remains.

5. Make a door with two parallel rows of ice cubes and smaller ice cubes placed on top. Use slushy mix to fill the gaps.

6. Carefully pat a thin layer of slushy mix over the entire igloo and then refreeze for 2-3 hours.

What Happened

The salt works as an adhesive by melting the ice cube where you dipped it. The melted part then "sticks" to the frozen cubes below. The salt works by lowering the freezing point of the ice cube.

Freshwater freezes at 32° F, but saltwater freezes at 28.8° F. In order for the salty ice cube to stay frozen, the side with the salt on it would need to be below 28.8° F. Since room temperature is often around 70° F, the ice melts.

SCIENCE PROJECT

DIY Hand Warmers

Perhaps you've toted a pack of hand warmers along to a football game or crammed them into the toe of your ski boots. While there are various types of commercial hand warmers, this version uses rusty iron filings to create a toasty, pocket-portable heat source.

What You Need:

- ☐ Iron filings
- ☐ Sodium chloride (table salt)
- ☐ 3×5 thick zip-top bag, or other small size on hand
- ☐ 4×6 thick zip-top bag, or other larger size on hand
- ☐ Water gel powder (sodium polyacrylate), or other absorbent material, like sawdust or sand

What To Do:

1. Put 30 grams (approximately 1 1/2 tablespoons) iron filings in a 3×5 zip-top bag.
2. Add 1 1/2 tablespoons salt. Add 1 1/2 tablespoons water gel powder or sodium polyacrylate.
3. Finish with 1 1/2 tablespoons of warm – NOT hot – water.

4. Carefully remove air and close zip bag.

5. Place 3×5 bag inside 4×6 bag. Carefully remove air and close zip bag.

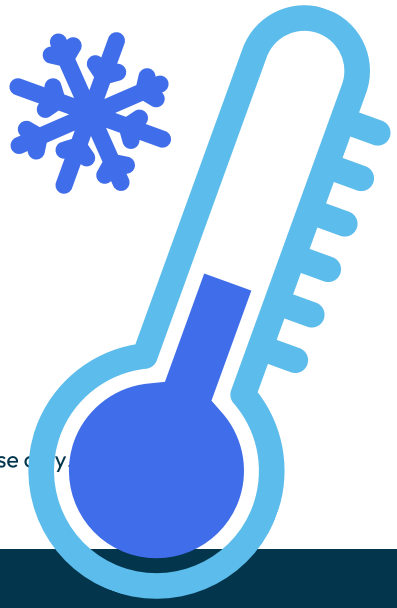
6. Shake, squeeze, and knead the mixture for 30 seconds or so until a slush forms inside the smaller bag and the water is completely mixed in. Be cautious to set the bag down if it gets too hot.

What Happened

When you introduced the iron filings to salt, air, and water, it produced iron oxide, or rust. The chemical reaction that occurred is considered an exothermic reaction. Exo means out and thermal means heat, so an exothermic reaction is literally one in which heat (or light) is released. In this case, while the oxidation is occurring, heat is produced. The sodium polyacrylate, or water gel powder, helps lock in moisture so the chemical reaction can take place. But once the air-activated process is complete, no more heat will be emitted—this can take from one to several hours! To avoid tetanus exposure, throw hand warmers away when you're finished experimenting.

Further exploration: How does the reaction change if you add more iron filings? How does it change if you add less? What about the other ingredients? How does adjusting the ratio of salt or water gel powder affect the reaction?

Repeat the experiment using varying amounts of materials. Use a thermometer to record the temperature of each and and note how long the bag stays heated.



SCIENCE PROJECT

Make Frosted Window Panes

Use epsom salt to create crystals and frost your windows - even if it's hot outside!

What You Need:

- ☐ 1/3 cup (75 grams) Epsom salt, (magnesium sulfate)
- ☐ 1-2 drops liquid dishwashing soap
- ☐ 1/2 cup water
- ☐ Lens cleaning cloth (or similar high-density cloth)
- ☐ 600 ml beaker (or other glass container)
- ☐ Stirring rod (or spoon)

What To Do:

1. Make a saturated solution by stirring the Epsom salt (solute) into warm tap water (solvent) inside the beaker. If the salt doesn't dissolve completely, have an adult help you microwave it for about 30 seconds. Carefully remove it, and stir it again.
2. Add the dishwashing soap and stir again.
3. Use the lens cloth to "wash" the solution onto a glass window or mirror. Dab away the excess to avoid drips. Let it dry and enjoy your homemade "frost!"