

Crystal Gardens

Concept: *properties of crystals*

Materials: bluing, ammonia, water, cups, salt, rock salt, Epsom salts, straws, magnifying glass, sugar, measuring cup, black construction paper, paper plate, string, paper towels, green ammonia, tape, cotton swabs, Styrofoam tray, food coloring, facial tissues

Optional: craft sticks, aquarium salt, ammoniated window cleaner, microscope, flat trays, other common household crystals

Simple Crystals

Salt is a common crystal with a cubic shape.

Use the magnifying glass to examine a few crystals of salt. Feel them with your fingers.

1. Use the measuring cup to pour three ounces (90 mL) of water into a small cup.
2. Use the measuring cup to pour 30 cc of salt into the water. Use a craft stick or straw to stir the salty water until all or nearly all of the salt has been dissolved.
3. Lay a piece of black construction paper on a paper or plastic plate.
4. Pour the salty liquid slowly onto the paper in the plate. Do not pour out undissolved salt.
5. Leave the plate in a warm place for several days for evaporation to occur.

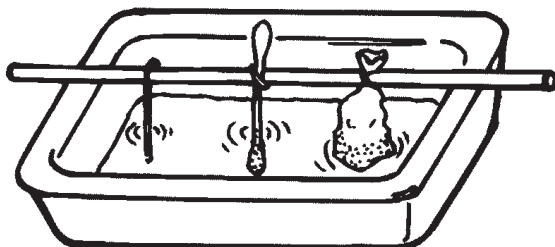


6. Examine the paper as the liquid starts to evaporate and later when it is totally dry. What does it look like? Can you see any stacks of salt crystals?
 - Compare these crystals with the salt crystals you started with. Use the magnifying glass to study some crystals of rock salt. How are they alike? How are they different?
 - Use the magnifying glass to compare the salt and rock salt crystals with Epsom salts. How would you describe the shape of Epsom salts?
 - Compare some crystals of granulated sugar with the various salt crystals. Can you identify any of these crystals by feel? Which ones can you identify?
 - Pour three ounces (90 mL) of water into a small cup and stir 30 cc of Epsom salts into the water until all or nearly all of the Epsom salts has been dissolved. Lay a piece of black construction paper on a paper plate and pour the salty liquid slowly onto the paper in the plate. Do not pour out undissolved Epsom salts. Leave the plate in a warm place for evaporation to occur. What shape is formed by the dried Epsom salts?

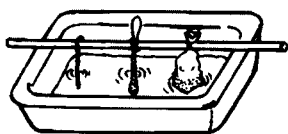
Crystal Gardens (cont.)

Crystals on a String

1. Use a measuring cup to pour three ounces (90 mL) of warm or hot water into a clear plastic cup or in a flat Styrofoam tray.
2. Stir in a few drops of food coloring.
3. Use the measuring cup to pour in 30 cc of sugar crystals. Stir the solution until all the sugar is dissolved in the colored water.
4. Tape a straw across the top of the plastic tray.
5. Tie string on the straw and dangle it into the water. It should touch the bottom of the cup.
6. Tear a small piece of white paper towel and twist it into a "string" of toweling as shown in the illustration.
7. Tie the toweling to the straw and dangle it into the solution so that it touches the bottom of the cup.
8. Tape a cotton swab to the straw and put the other end in the solution.
9. Place the cup in a warm area so that evaporation can occur.



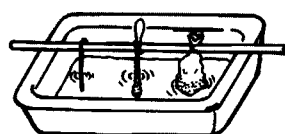
- Examine the string and paper towel as the solution starts to evaporate. Did any crystals form on either material? How many days did it take for the crystals to be visible? What do the crystals look like?
- Try the same experiment with other crystals such as those used for fruit drinks, salt, rock salt, Epsom salts, and other crystals you can find. Remember to use three ounces (90 mL) of hot water and 30 cc of the crystal you are using. Make each solution in a separate tray or cup.
- Which of the other materials yielded some kind of crystal formation?



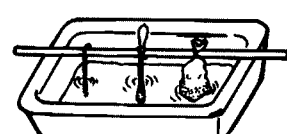
Salt



Rock Salt



Epsom Salts

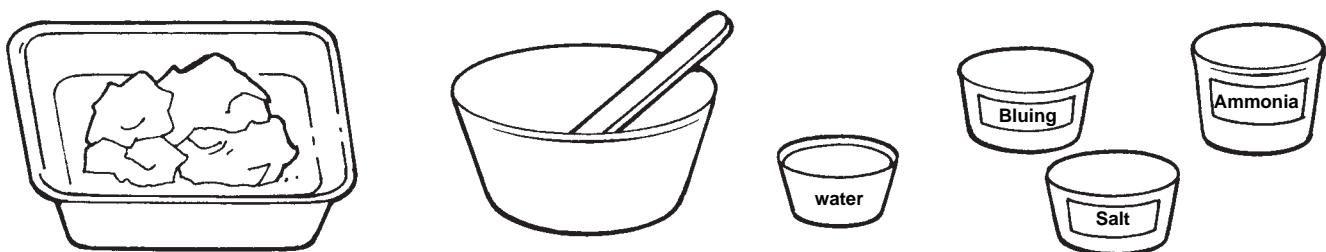
Fruit Drink
Crystals

Crystal Gardens (cont.)

Simple Gardens

1. Place several balled-up facial tissues in a flat Styrofoam tray or bowl and set aside.
2. Use a measuring cup to pour one ounce (30 mL) of water into a clear plastic cup.
 - Add one ounce (30 mL) of laundry bluing into the cup of water.
 - Add $\frac{1}{2}$ ounce (15 mL) of ammonia into the cup.
 - Add 30 cc of salt into the solution.

Stir the solution until the salt is completely dissolved. Pour the solution into the tray with the tissues and leave it outside in hot, direct sunlight for several hours.



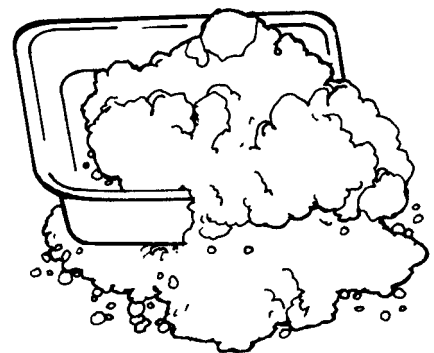
Examine the tray when the fluid is dry. Puffy white crystals should be evident.

- Did any crystals grow on the outside of the tray? Break a few of the crystals off and examine them with your magnifying glass (or microscope if you have one).
- How do they feel? Can you see a shape? Do you think more crystals will grow?
- A few days after your crystal garden seems to have stopped growing, you may sometimes stimulate more growth by spraying a thin film of water on it or by adding a little ammonia.

Rock Gardens

Try making this crystal garden with rock salt.

1. Place several balled up facial tissues in another flat Styrofoam tray.
2. Pour one ounce (30 mL) of water into a clear plastic cup.
3. Pour one ounce (30 mL) of laundry bluing into the cup of water.
4. Pour $\frac{1}{2}$ ounce (15 mL) of ammonia into the cup.
5. Pour 30 cc of rock salt into the solution (instead of regular salt).
6. Stir the solution until the rock salt is completely dissolved.
7. Pour the solution into the tray with the tissues and leave it outside in hot, direct sunlight for several hours.
 - What is different about the look and feel of these crystals?
 - Do you have as many crystals?



Crystal Gardens *(cont.)*

Garden Varieties

Try making other crystal gardens with the ingredients which follow below. (Always stir the solution until all salt is completely dissolved and always pour the solution into the tray with the tissues and leave it outside in hot, direct sunlight for several hours.)

Dashes of Color

1. Pour one ounce (30 mL) of water into a clear plastic cup.
2. Pour one ounce (30 mL) of laundry bluing into the cup of water.
3. Pour $\frac{1}{2}$ ounce (15 mL) of ammonia into the cup.
4. Stir 30 cc of salt into the solution.
5. Add several drops of food coloring—either one or several colors—to the solution or pour it separately onto the tissues.
6. Pour one ounce (30 mL) of water into a clear plastic cup.
7. Pour one ounce (30 mL) of laundry bluing into the cup of water. Pour $\frac{1}{2}$ ounce (15 mL) of green ammonia (usually pine-scented) into the cup. Stir 30 cc of salt into the solution.

You might also make a garden using ammoniated glass cleaner to see if it works.

Try the regular formula, using Epsom salts instead of regular salt.

- Which garden has the most color?
- Which garden has the best crystals?
- Which garden has the most unusual crystals?

Designing Your Own Formula

Design your own formula for a crystal garden. Change the amounts, the types of material used, and even the material in the tray. Be sure to keep a record of exactly how much you use of each ingredient.

- Try growing the gardens on pieces of charcoal, pieces of brick, or other types of paper.
- Try using twice as much ammonia in the formula or half as much.
- Try using aquarium salt or ocean salt instead of the regular salt.
- Try using more water or less.
- Vary the amount of bluing used.
- Try using other crystals along with the salts.
- Share your results with the class.