Classroom Activity

10 Big Question: How do we unravel the causes of disease?

Grow your own crystals

A crystal is made up of matter formed in a regular arrangement of atoms, molecules, or ions. As there are repeated arrangements, crystals have recognisable structures. Crystals can be made from everyday materials that you encounter including table salt, sugar, Epsom salts, alum and washing powder.

Quick crystals

Growing crystals can take several days, but this super-easy recipe gives you a cup full of needle-like crystals in just a few hours!

For this activity you will need:

- Epsom salt
- Food colouring (optional)
- Beaker, cup or small bowl

1. In the beaker, stir 1/2 cup of Epsom salts with 1/2 cup of very hot tap water for at least one minute. This creates a saturated solution (some undissolved crystals may be visible at the bottom of the container). Add a couple drops of food colouring at this step if you want your crystals to be coloured.
2. Put the beaker in the refrigerator and leave it for a few hours.
3. When the time is up, remove your container from the refrigerator, and pour off the remaining solution to examine your crystals.

Epsom salts are also called magnesium sulphate. The temperature of the water determines how much magnesium sulphate it can hold, so you'll find that it will dissolve more when it is hotter. When you can no longer dissolve any more of the base material into the water, your solution is now saturated solution.

Cooling the solution quickly encourages rapid crystal growth, since there is less room for the dissolved salt in the cooler, denser solution. As your solution cools, the magnesium sulphate atoms run into each other and join together to form a crystal structure. Crystals grown this way will be small, thin, and numerous. This will be the case for any material/chemical that you use.

Crystals from seed

If you want to grow single, large crystals reminiscent of a gemstone, then you need to start with a seed crystal.

For this activity you'll need:

- Alum (or any material/chemical you want to crystallise). Alum can be found in the spice section of the supermarket
- Clean beaker or jar
- Saucer or shallow dish (a Petri dish works, too)
- Pencil (a pop stick or pen could also be used)
- Fishing line (also known as nylon line)

1. In one beaker, slowly add alum to 1/4 cup of very hot tap water, stirring to dissolve. Keep adding the alum until no more will dissolve: this is your saturated solution. Pour a little bit of this solution into a shallow dish or saucer and let it sit undisturbed overnight. Make sure you only pour the clear solution, not any of the undissolved material. You can pour it through a fine filter if necessary.
2. The next day you should see small crystals growing in the dish. When they look to be a good size, carefully pour off the solution.
3. Make another saturated alum solution with about 1/2 cup of hot water. Pour the solution into a clean beaker or jar being careful to avoid pouring any undissolved material. Let the solution cool slowly, to room temperature, before you add your seed crystal to it.
4. Remove the biggest and best-looking of the small crystals from the saucer to use as your seed crystal.
5. Get someone to help you tie the fishing line to the seed crystal. This can be tricky; a pair of tweezers will help if you find your fingers too big. You can score a small groove in the crystal to hold the line in place, if you are having trouble securing it.
6. Tie the other end of the fishing line to the pencil, and then put the pencil across the top of the jar so the seed crystal is suspended in the alum solution without touching the sides or bottom of the jar. You may need to adjust the length of the fishing line: just wrap it around the pencil until it is the right length. Note: If you find that your seed crystal starts to dissolve when you put it in the solution that means your solution isn't saturated enough. Remove the seed quickly and add more alum to the solution, filtering off any undissolved particles.
7. Cover the jar with a paper towel to keep out the dust and let your crystal grow until you are happy with its size. When you take it out of the solution, quickly dry it off carefully with tissues to stop it dissolving. Note: if you see other crystals growing in the jar, transfer the solution and seed crystal to another clean jar.

The small crystals that formed in the saucer grew because of nucleation; alum molecules found each other in the solution and joined together in a crystal pattern. Other alum molecules continued to join them until enough molecules gathered to become a visible crystalline solid.

If you left these crystals in the solution for a longer period of time they would continue to grow, but they wouldn't get very big because they would all be competing for the remaining alum molecules in the solution. Instead, by taking out and using one crystal as the primary nucleation site in the solution, it was the only site for the alum molecules to join together, and so the crystal could grow quite large!