Warning.

Not suitable for children under 8 years. For use under adult supervision. Contains some chemicals which present a hazard to health. Read the instructions before use, follow them and keep them for reference. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes. Keep small children and animals away from experiments. Keep the experimental set out of reach of children under 8 years old. Eye protection for supervising adults is not included.

WARNING — This set contains chemicals and/or parts that may be harmful if misused. Read cautions on individual containers and in manual carefully. Not to be used by children except under adult supervision.
KIT CONTENTS

1  Chenille wire, pink (50 cm)  8  Safety goggles
2  Chenille wire, blue (50 cm)  9  Wooden stirring stick (2)
3  Dome pendant box (2)  10  Measuring beaker, 100 ml
4  Pendant cord (100 cm)  11  Food color dye tablets (5)
5  Clear plastic hemispheres (2)  12  Hexagonal box (2)
6  Round black cardboard  13  Packet of magic water
   Potassium aluminium sulfate powder (alum), 50 g (3)

YOU WILL ALSO NEED: Two glass jars, water, ruler, scissors, pencil or skewer, cooking pot, old spoon, stove, pot holders, labels, safety pin, double-sided tape, small screw driver, paper clip, string

Hey Crystal Jewelers!

Ready to grow some beautiful, colorful crystals and make some pretty jewelry and crafts? You can grow crystals for a pendant, a brooch, a crystal ball, and fun crystal wireframe shapes. Quartz the Geeker will be your guide!
Let’s imagine an Egyptian pyramid to illustrate how crystals grow. The Great Pyramid of Giza, for example, is made of over two million rectangular blocks that are layered on top of one another to form a pyramid shape.

This is much like how a crystal is built up, except that its building blocks are extremely tiny. They are not much bigger than atoms. Those crystal building blocks are called **unit cells**. Some units cells are **molecules** — groups of atoms put together in specific patterns. An example of this would be the sugar crystals in rock candy. Other unit cells may simply be **identical atoms** (for example, diamond crystals are made of carbon atoms). And then there are unit cells made out of **ions** — electrically charged atoms or groups of atoms.

There are positively and negatively charged ions, which attract each other and stick together like the north and south poles of magnets. Materials made out of ions are called **salts**. Examples include table salt and the alum and monopotassium phosphate salts in this kit.

Each unit cell has a shape unique to the material that composes it. The shape is determined by the unit cell’s component parts, their arrangement relative to one another, and the strength of the forces of attraction holding them together. Some are cube-shaped, others rectangular or rhomboid. All the components always strive to pack together as tightly as possible and to use as much of the available space as they can — a result of the strong forces of attraction between them.

Just like the pyramid with its millions of blocks, crystals grow through the accumulation of these unit cells. Of course, if a unit cell has the shape of a cube, it does not necessarily mean that the resulting crystal will also be cube-shaped. After all, a pyramid is made out of rectangular blocks, not pyramid-shaped blocks.
In the same way, cube-shaped or rectangular unit cells can accumulate to form the shape of a pyramid, or an octahedron “double pyramid.” Alum forms an octahedron crystal made from an accumulation of cube-shaped unit cells.

A crystal in a solution is a very busy building site. Instead of human workers like the ones who built the pyramids, the work is performed by forces of attraction between the atoms, ions, and molecules, along with the ceaseless natural movement of these particles.

These tiny particles are constantly attaching themselves to the developing crystal, pausing for a moment, and whizzing off again. That happens mostly at the corners and edges, somewhat less on the flat surfaces. Usually, the arriving particle does not fit properly at its landing spot, so it immediately leaves. Sometimes, though, just the right type of particle arrives at just the right part of a unit cell as it is forming, and it stays put. Even that kind of particle might scoot off too, but on average more particles that arrive at the right spot will stay there than leave — and so the crystal grows, layer by layer.

Because particles come and go more often at the edges than the flat faces, the smaller crystals in a solution will get even smaller as time passes, while bigger crystals grow larger. With the smaller ones, edges take up a higher proportion of their surface area.

It takes time for the particles to find the right resting spots. If there is not enough time, because too many particles in a supersaturated solution want to settle down all at once, some of the unit cells form layers on top of one another, or just stick to whatever they happen to land on — the side of the jar, for example. That is why a crystal that grows very slowly from a solution that is only slightly supersaturated is more orderly than one that grows quickly. And if the solution gets warmer and is no longer saturated? Then the number of particles that fly off outnumber the particles that settle down: the crystal dissolves.