



Grade 6<sup>th</sup> to Grade 10<sup>th</sup>

**Title: Mineralogy  
"Patterns"**

**Stating the Problem - The Big Question**

How do atoms and molecules arrange themselves in minerals?

**Materials**

- \* Large, shallow Baking Pan
- \* Tap Water
- \* Spoon
- \* 1 teaspoon (5 ml) dishwashing liquid
- \* Drinking Straw

**Planning the Procedure**

1. Fill the pan half full with water, then add the dishwashing liquid.
2. Gently stir with the spoon to thoroughly mix the liquids without producing any bubbles.
3. Place one end of the straw beneath the surface of the water.
4. Slowly and gently blow through the straw to make a cluster of 5 to 15 bubbles. *CAUTION: Only exhale through the straw. Do not inhale.*
5. Move the straw to a different location and blow a single bubble.
6. With the straw, move the bubble so that it touches the bubble cluster.
7. Move the straw to a different location and blow through the straw as before to make a cluster of 5 to 15 bubbles.
8. With the straw, move one bubble cluster so that it touches the other bubble cluster.

This project is from Janice VanCleave's book, *Guide to the Best Science Fair Projects*, New York, Jossey-Bass Publisher, A Wiley Imprint, 1997. The Guide is available on line at: [SchooDoodle.com](http://SchooDoodle.com)



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**"Patterns" (continued)**

**Results**

The single bubble attaches to the bubble cluster. The two clusters of bubbles join, making one cluster.

**Why?**

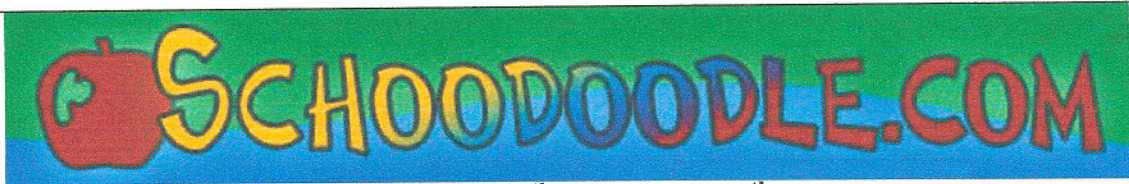
The bubbles represent the chemical particles of a mineral. **Chemical particles** are the **atoms** (the building units of matter) or molecules that make up minerals and all matter. A **mineral** is a solid formed in the earth by nature from substances that were never a plant or animal. Such substances are said to be inorganic. The addition of each bubble to the bubble cluster and the joining of the clusters represent the growth of a mineral crystal (a solid made up of atoms arranged in an orderly, regular pattern). Chemical particles, like the bubbles, can move around in a liquid. Just as a single bubble or bubble cluster moves to a place where it fits in the bubble cluster, chemical particles dissolved in a liquid move to just the right spot in order to fit with other particles.

One of the four basic characteristics of minerals is their definite chemical composition with atoms arranged in an orderly, regular pattern. Once a chemical particle, like the bubble, moves into the right place, it is held there by the attraction it has to the other chemical particles. This attraction between like chemical particles is called **cohesion**. The shape and size of the chemical particles determine how they arrange themselves and the pattern they form.

**LET'S EXPLORE**

Show how the size of the bubbles affects the results. Repeat the experiment twice, first using a narrower straw, then replacing the straw with a cardboard tube from a paper towel roll. **Science Fair Hint:** As part of a project display, use photographs to represent the arrangement and patterns formed by the different bubble sizes.

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**SHOW TIME!**

1a. Sugar crystals are organic (formed from living matter). They are not minerals, but they can be used to represent the ways that crystals in minerals form. Ask an adult to prepare a sugar-gelatin solution by using the following steps:

- Pour  $\frac{1}{2}$  cup (125 ml) of distilled water into a small saucepan.
- Sprinkle  $\frac{1}{4}$  ounce (7g) of unflavored gelatin on the surface of the water and let it stand undisturbed for 2 minutes.
- Stir the liquid continuously over medium heat until the gelatin is completely dissolved.
- Slowly add 1-1/4 cups (313 ml) of table sugar while stirring.
- Continue to stir until all the sugar is dissolved.
- When the liquid starts to boil, remove the saucepan from the heat.
- Allow the solution to cool for 15 minutes.
- Pour the cooled solution into a 1-pint (500-ml) glass jar.

Place the jar where it can remain undisturbed for at least 2 weeks. Make daily observations and draw diagrams of the jar's contents. Display the diagrams.

1b. The gelatin provided a surface for the sugar molecules to cling to. Would the molecules cling to other surfaces? Have an adult repeat the previous procedure, omitting the unflavored gelatin. Cut a piece of cotton string slightly longer than the height of the jar. Tie a paper clip to one end of the cotton string. Lower the paper clip into the jar of solution so that the paper clip rests on the bottom of the jar. Tie the free end of the string to the middle of a pencil laid across the opening of the jar. Make daily observations and diagrams of the jar's contents for at least 2 weeks.

**CHECK IT OUT!**

Find out more about the formation of minerals. What is a geode? How are geodes formed? What mineral is most often found in geodes?

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