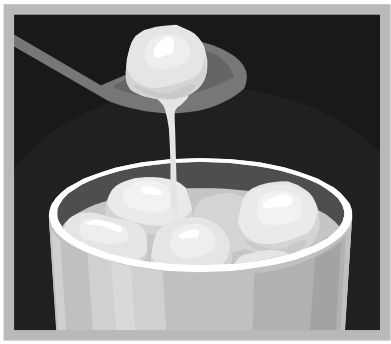
ROCK CANDY



NAME: _____ DATE _____

OBJECTIVE: Understand the principals saturation

Introduction

Have you ever looked at rock candy and wondered how it's made? Rock candy is actually a collection of large sugar crystals that are "grown" from a sugar-water solution. Sugar, like many other materials, can come in many different physical states. As a solid it can either be **amorphous,** without shape, like when it forms cotton candy, or **crystalline,** with a highly ordered structure and shape, like when it forms rock candy crystals.

Crystals form when the smallest particles of a substance, the **molecules,** arrange themselves in an orderly and repetitive pattern. Molecules are too small for us to see moving around and arranging themselves, but you can get a rough idea of what this would look like by taking a small shallow tray and filling it with marbles, ball bearings, or other spheres. As you add more spheres, the bottom of the tray becomes covered, then the spheres must form layers on top of one another, and a structure or pattern emerges.

So how do the molecules of a substance get together to form a crystal? First there have to be enough molecules in one area that they have a high chance of bumping into one another. This happens when a **solution,** which is made up of a liquid and the **compound** that will be crystallized, is saturated. In the rock candy, the liquid is water and the compound is sugar. A solution is **saturated** when the liquid holds as much of the compound dissolved in it as possible. For example, when making rock candy, you dissolve as much sugar as possible in water to make a saturated solution. If you add more compound than can dissolve in the liquid, the undissolved bits remain as solids in the liquid. In a saturated solution, the molecules bump into one another frequently because there are so many of them. Occasionally when they bump into each other, the molecules end up sticking together; this is the beginning of the crystallization process and is called **nucleation.** Once several molecules are already stuck together, they actively attract other molecules to join them. This slow process is how the crystal "grows."

METHODS

Materials

- Sugar
- Stirring rod
- String
- Weight
- Distilled water
- Thermometer
- Pencil
- 250 ml beaker
- Spatula
- waxed paper

Procedures

1. Heat water in a 250 mL beaker over blue flame until it comes to a boil.
2. Add sugar 1 tablespoon at a time. Stir thoroughly after each added spoonful, making sure that the sugar is completely dissolved before adding another spoonful. Note: do not confuse the tiny little bubbles in the solution for undissolved sugar. You can tell them apart by stopping your stirring for a moment; the sugar will settle to the bottom of the pan, the bubbles will remain suspended throughout the solution.

3. Keep adding sugar until no more will dissolve in the solution. If you think you've added too much sugar to your solution, don't worry. Keep stirring and if even after a full 2 minutes of stirring, you have undissolved sugar at the bottom of your beaker, return the beaker to the burner. Heat the solution until it just begins to boil, and then remove it from the beaker. This should help you to get that last bit of sugar into the solution.

What does saturation mean?

4. After the last bit of sugar has been dissolved, allow the solution to cool for 5 minutes.
5. Tie the weight to one end of the string, and then tie the other end to the middle of a pencil. The string should be about 2/3 as long as the beaker is deep.
6. Dip the string into the sugar solution, remove it, lay it on a piece of wax paper, straighten it out, and let it dry for a few minutes.
7. Gently suspend the prepared string in the solution and let sit at room temperature, undisturbed, for several days.

What Makes a crystal grow?

2. At the end of the week, the crystals on your string should be clearly defined, In the field of crystallography, these are called *monoclinic* crystals. Their shape is determined by the way the individual sugar molecules fit together, which is similar to the way the shape of a pile of oranges is determined by the shape of the individual oranges and the way they stack together