

WHAT IS THE EFFECT OF DIFFERENT TYPES OF WATER ON THE TIME IT TAKES
A SPONGE CAPSULE TOY TO FORM?

Meg A. Awesome

Ms. Sieruta, 7th grade

Lake Asbury Junior High School

Sponge capsules are toys made of a gelatin capsule with a foam sponge inside. Each capsule measures approximately 2 cm long by 0.8 cm in diameter. The sponges inside the sponge capsules are made in many colors with the most common colors being red, yellow, blue, and green. The foam sponges are made into different shapes such as zoo animals, fish, and dinosaurs. They come in a package of 12 and can be found at most stores in the toy department. They are also called "Magic Grow and Grow Capsules." (Lau)

The capsule of the toy is made of gelatin. Gelatin is an odorless, tasteless and colorless material made of collagen. Collagen is an animal protein that is made from the skin, connective tissue, and bones of animals, usually cows. It is solid at room temperature and has a melting point of approximately 98 degrees Celsius. Gelatin is also used in cosmetics, food, and photography and skin care products. ("Gelatin Food Science")

The foam sponge inside the capsule is made of foam rubber or from cellulose, a wood product. According to eHow.com sponges are able to pick up liquids because sponges are made with loose fibers that are full of empty space. Two thirds of a sponge is empty space and only one third of the sponges' size comes from the actual material it is made of. The holes between the fibers soak up liquid and the fiber material swells. When the fibers swell, this prevents the liquid from leaving the sponge.

According to the sponge capsule package, the sponge capsules are normally put into warm or hot water that is between 40°C - 70°C. The water dissolves or breaks up the gelatin capsule. Water molecules move in between the gelatin molecules and separate the gelatin molecules. Each of the gelatin molecules is spread though out the water and seem to disappear. (Werwa, 72) As the gelatin capsule dissolves the foam sponge inside absorbs water. The sponge inside then expands, transforming into a shape that measures approximately 3-4 centimeters long. The whole process takes 3-5 minutes depending on the temperature of the water. The warmer the water temperature the faster the gelatin will dissolve and the quicker the sponge will absorb the water and form a shape.

When one substance is dissolved in another substance a solution is made. The substance being dissolved is the gelatin and is called the solute. The water which is dissolving or breaking up the gelatin is called the solvent. A solute will dissolve faster when it is stirred or shaken, when the temperature of the solution is increased, or increasing the surface area of the solute by breaking it up into smaller pieces. A solution that contains all the solute it can hold is called a saturated solution. In

the water gelatin solution, once the water has dissolved all the gelatin it can hold, the gelatin will no longer dissolve. Hot water can hold more gelatin than cold water. (Werwa, 74)

In this experiment sponge capsules will be put into three different types of water; distilled water, tap water, and carbonated water. The chemical formula for water is H₂O. This means that every water molecule contains two atoms of hydrogen and one atom of oxygen. Water has a boiling point of 100° Celsius and a freezing point of 0° Celsius. It is odorless and colorless. "Because water can dissolve so many different solutes, chemists often call it the universal solvent." (Werwa, 70) Distilled water is water that has all minerals and chemicals removed so it is considered to be 100 % pure water. Distilled water is used in fish tanks or car cooling systems where minerals or chemicals could cause damage.

Tap water is water used directly from the faucet in the classroom. Tap water contains minerals and chemicals added during the water treatment process to clean the water and add nutrients for a person's health. Two of the most common things added are chlorine and fluoride. ("Water On Tap: What You Need To Know") Tap water has a higher boiling point than distilled water due to the presence of minerals and it also has a lower freezing point as well. ("Boiling Point Elevation - What Boiling Point Elevation Is and How It Works.")

The last type of water used in this experiment is carbonated water. Carbonated water is water that has carbon dioxide gas dissolved in the water. The carbon dioxide gas gives the water bubbles. In this solution the water is still the solvent and the carbon dioxide gas is the solute. Carbonated water is one of the main ingredients in sodas. It also has a boiling point that is greater than 100°C and a freezing point that is lower than 0°C.

This experiment will show that if sponge capsules are put in tap, distilled and carbonated water then the sponge capsule will dissolve in the least amount of time in distilled water. Distilled water will dissolve the sponge capsule in the least amount of time because distilled water contains no other minerals or chemicals to interfere with the dissolving of the sponge capsule.

Companies that make sponge capsule toys will benefit from the results of this experiment because they can use the information to improve how their product works. Companies that use gelatin capsules or gelatin in their products can use the result of this experiment to improve how their products work as well.

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