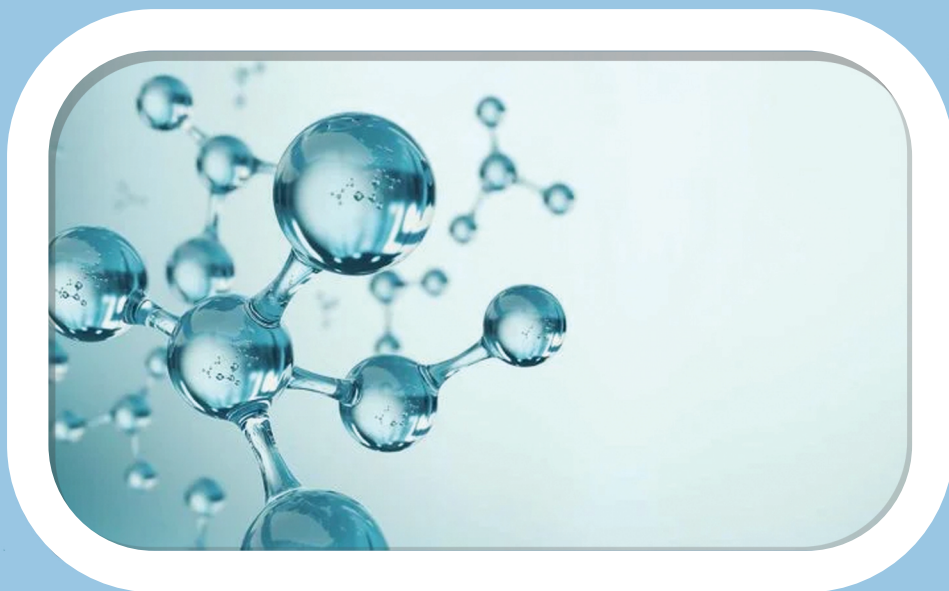


STEM *Sims*TM

Making Molecules



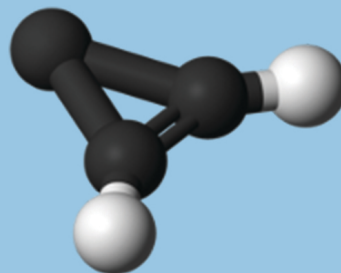
Making Molecules

Do you need an idea for a scientific study?

Try out one of our ideas or make one of your own.

Molecules come in many shapes and sizes. Take the following brief quiz to see how much you already know about molecules. See the bottom of page 4 to check your answers.

1. About how many known different molecules are there?
 - a. 1 million
 - b. 100 million
 - c. 200 million
 - d. 1 billion
2. Which known natural molecule is the longest?
 - a. DNA
 - b. ammonia
 - c. hemoglobin
 - d. chlorophyll
3. PG5 is the largest stable synthetic molecule ever made. About many atoms make up one PG5 molecule?
 - a. 170
 - b. 17,000
 - c. 170,000
 - d. 17 million
4. Titin is the largest known protein. About how many amino acids are chained together to make up one titin molecule.
 - a. 350
 - b. 3,500
 - c. 35,000
 - d. 35 million
5. Where was the unusual molecule cyclopropenylidene first discovered?
 - a. in a volcano on Earth
 - b. in outer space
 - c. in a lab in California
 - d. under the ground in Antarctica



Follow the Bouncy Ball

Have you ever wondered what makes a bouncy ball so bouncy? Today, we're going on a fun adventure to find out by making our very own bouncy balls! You'll be using some simple ingredients you can find right in your kitchen, like cornstarch and white glue, to create a special substance called a polymer.

Imagine tiny, single beads. Now, picture a long, long string of beads all linked together to make a necklace. A polymer is just like that necklace! In science, a polymer is a very large molecule made up of many small, repeating units, just like the beads on the string. When you mix the ingredients for your bouncy ball, you're causing those small units to connect and form a super long, chain-like structure. This long chain is what gives your bouncy ball its unique, bouncy texture. Get ready to mix, mold, and have a ball with science and the polymer you create!

Materials Required

1-tablespoon white glue	1-tablespoon cornstarch	½-teaspoon borax
food coloring	2-cups warm water	stir stick

Procedure

1. Make sure to get permission to complete this investigation.
2. Place 2 tablespoons of warm water and ½ teaspoon of borax into a cup. Stir until the borax is completely dissolved.
3. In a separate cup, mix 1 tablespoon of white glue, 1 tablespoon of cornstarch, and a few drops of food coloring.
4. Pour the glue mixture into the borax solution. Let the mixture sit for about 15 seconds.
5. Stir until the mixture becomes difficult to mix, then use your hands to roll the mixture into a ball.
6. Let the ball harden and then have a ball with your new bouncy ball!

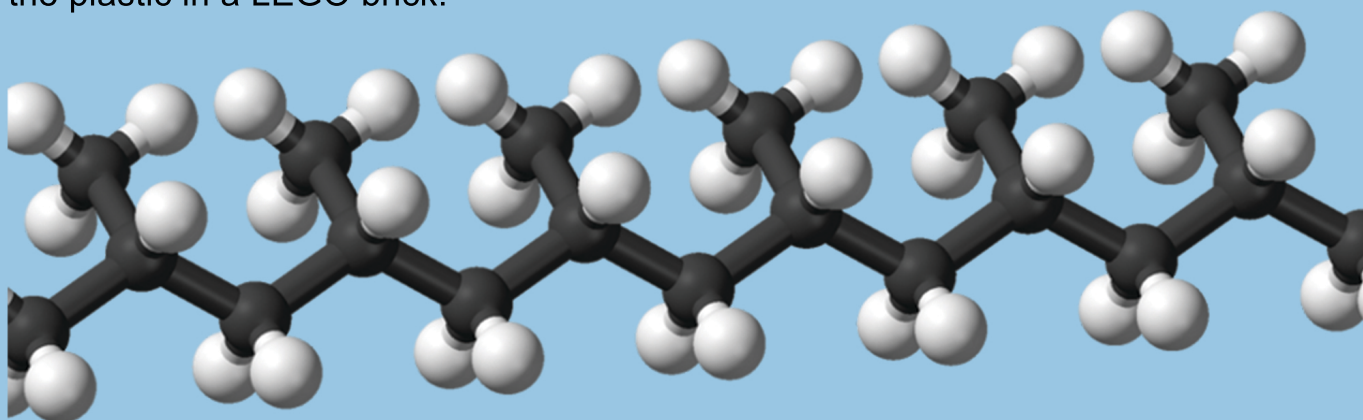
Questions

1. How does a mixture difference from a substance like water?
2. What was the purpose of adding the food color to the mixture?

Making Molecules

Polymers

A really fascinating and common polymer is one you probably interact with every single day: plastic! Think about all the things you use that are made of plastic—water bottles, food containers, toys, and even parts of your phone. Plastic is an amazing polymer because its small repeating units can be linked together in different ways to create materials with all sorts of properties. For example, some plastics are soft and stretchy, like the kind used to make rubber bands, while others are hard and rigid, like the plastic in a LEGO brick.



What's really neat about plastic is how its polymer chains are structured. In some plastics, the chains are arranged in a very organized, crystalline pattern. This makes the material strong and tough. In other plastics, the chains are tangled up in a more random way, which makes them flexible. By changing the building blocks and how they are put together, scientists can create a huge variety of plastics, each with a specific purpose. Your bouncy ball will also be a type of polymer, and it will have a structure that gives it the perfect combination of firmness and elasticity to bounce! Understanding polymers helps us see how big molecules built from small parts can create materials with incredible and useful properties.

Please visit our site for more helpful information:
STEMsims.com

Answers: Page 2 Answers: 1) c, 2) a, 3) d, 4) c, 5) b. Page 3 Answers: Follow the Bouncy Ball 1) A mixture is combination of two or more substances that are physically but not chemically combined. 2) The food coloring was added to give the bouncy ball color.

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