

Gummiworms Museum Show Procedure

The goal of this demonstration is to explore the properties of a cross-linked polymer. When a polymer is cross-linked, it can take on new properties, such as going from a liquid to a solid.

Materials Needed:

- 3 liter storage bottle of Alginic Acid solution
- 3 liter storage bottle of clear Calcium Chloride solution
- Food coloring for the Alginic Acid (green is a favorite with younger kids)
- Paper towels
- Large clear bowl
- 2 Squeeze bottles (one for the Alginic Acid solution and one for the Calcium Chloride Solution)
- Large plastic bag with a sealable top
- White Velcro strips with snaps on the ends
- Black Velcro discs (rough, “hook” side)

Gummiworms Museum Show

Set-Up: Macroscale

- Have the plastic bag, white Velcro strips and black Velcro disks available. The white Velcro strips should be un-snapped to allow the visitors to make the polymer chains. The black Velcro disks should be separated.

Set-Up Microscale

- Have the large plastic bowl and squeeze bottles of Alginic Acid and Calcium Chloride ready. Also, make sure there are paper towels available for clean-up.

The Demonstration

1. Begin the museum show by finding out the museum guests’ background of polymers. If there are visitors present that know what a polymer is, ask them to volunteer. Also, tell them they are going to make Gummiworms and ask how many of them like Gummiworms.
2. Hold up the Velcro strips and explain that polymers are made of smaller molecules called “monomers.” Ask the guests to make polymer chains about 4 or 5 monomers long and then place them in the plastic bag.
3. Show the visitors the Alginic Acid and tell them that Alginic Acid is a polymer. What do they notice about the Alginic Acid? (It is a liquid)
4. In order to make Gummiworms, you have to crosslink or “glue” the polymer chains together to make one very large polymer chain. The Calcium Chloride is the “glue” that will hold together all of the strands of polymer chains.
5. Now, ask for volunteers to put the black Velcro disks into the bag with the white polymer chains.
6. Close or seal the plastic bag and ask another guest to shake the bag. Before you open the bag, ask the guests what they think will happen if they try to pull out one

- polymer chain. (They will not be able to pull out one chain; they will all be stuck together).
7. The next part of the demonstration is cross-linking on the Microscale.
 8. First, put the Calcium Chloride in the bowl or ask for a volunteer to put the Calcium Chloride in the bowl.
 9. Next, put the Alginic Acid in the bowl or ask for a volunteer to put the Alginic Acid in the bowl.
 10. Ask the guest to predict what would happen if you put your hand in the bowl, and then ask for a volunteer to put their hand into the bowl.
 11. They will pull out Gummiworms! At this point, you should allow other visitors to handle the Gummiworms. Also, you may want to point out that Gummiworms are solid and were made from two liquids.