

# Links in a Chain

Activity 5 • Reproducible Master

Polymers are everywhere! They can be seen in nature, in things like tree rubber and even DNA, and can be manufactured to make hundreds of products, from silly putty to plastic packaging. They give strength and elasticity to muscle fibers and hair, spider webs, nylon, and glue. But what is a polymer? Follow your presenter's instructions to find out by working on one of these two projects.

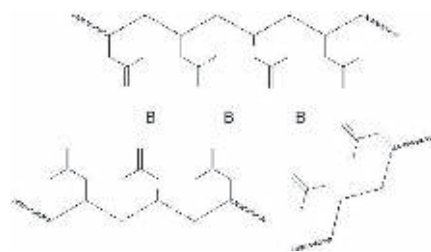
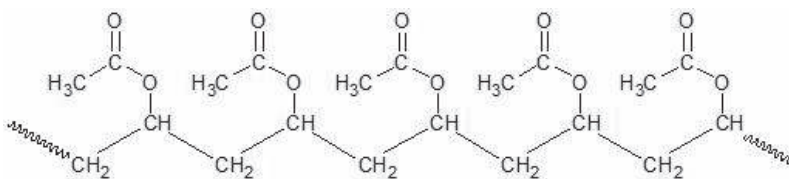
## PROJECT 1: LET'S GET SLIMED!

Using the materials provided to you:

1. First dissolve 1 teaspoon of Borax in 1 cup of water in a small bowl.
2. In a separate bowl, mix  $\frac{1}{4}$  cup of glue with  $\frac{1}{4}$  cup of water. If you want colored slime, add food coloring to the glue and water mixture. Lift some of the solution out of the container with a stir stick and note what happens.
3. Add the Borax solution to the glue and water mixture and stir slowly. The slime will begin to form immediately. Lift some of the solution with the stir stick and observe how the consistency has changed from **Step 1**.
4. Stir as much as you can, then dig in and knead it with your hands until it gets less sticky. This is a messy experience but is necessary to allow the two compounds to bond completely. Pour out any extra water.
5. Give the slime 5 minutes to set.
6. Experiment! What properties do you notice about the slime? Does it stretch? Can it hold the weight of objects placed on top, like a pencil or eraser? Is it sticky? Wet? Transparent? Write your observations on the back of this sheet.

### What's Happening Here?

A polymer is virtually any substance that is made from a series of monomers, or small molecules, that link together in a repetitive chain. On the right is the molecular structure for polyvinyl acetate, the polymer found in glue. Can you find the repeating monomer?



In the slime you made, the Borax atoms have formed crosslinks, or bridges, between the polyvinyl acetate polymer chains. This changes the properties of the glue from viscous and sticky to solid and malleable.

## PROJECT 2: SCIENCE CAN BE ART!

Linseed, or flax, oil was one of the first binders to be used in paint and ink. It is known as a drying oil, because it hardens when exposed to air — a form of oxidation (just like rust!) that leads to the formation of a polymer chain. Create your own printed media to see how it works!

Using the materials you are provided:

1. Choose a pigment and pour approximately 1 tablespoon onto your palette.
2. Mix in linseed oil, drop by drop, until you get a smooth paste.
3. Place one of the stencils onto your paper or canvas.
4. Dip the sponge or roller into the ink and gently run it across the stencil.
5. Repeat these steps to create your own unique image or message.



### POLYMERS IN ACTION

The first synthesized polymer was Bakelite, a plastic that was used for everything from telephones to kids' toys. In the 1950s, the automobile industry began using synthetic polymers to add gloss and texture to car paints.

As you can imagine, polymers are really useful in providing form and structure to all kinds of industrial chemicals, from epoxies to plastic can linings to pipes. What polymer-based products do you think you use every day? Make a list on the back of this sheet. It won't be a stretch to come up with dozens!



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