



Chemistry in the Library: Jiggle Jelly

<http://mdchem.org/citl/citlmain.html>

e-mail: chemists4fun@yahoo.com

Safety Rules

- ❑ **Wear safety goggles.** This means from when you're told to put them on until you're told they can come off.
- ❑ **Detect odors safely.** Use you hand to wave fumes to your nose. Never stick your nose directly into anything.
- ❑ **Wash spills immediately.**
- ❑ **No running, pushing, or shoving.**
- ❑ **Clean up your mess!**
- ❑ **Get help.** If you have any questions, please ask before proceeding.
- ❑ **No eating or drinking.**
- ❑ **No unauthorized experiments.** Only do the things the leader tells you to.

Materials

4 plastic cups	1 bottle borax powder
1 bag with 4 Popsicle sticks & 1 plastic spoon	1 bottle Elmer's glue solution
1 plastic beaker with warm water	1 bottle polyvinyl solution
	2 bottles Guar Gum solution

Demonstration #1 - Water Grabber:

What happened to the water in the demonstration? What are some of the uses of water grabber?

Demonstration #2 - Styrofoam vs. Starch packing peanuts:

What do you think will happen to the packing peanuts in water?

Polymer Science: The Study of Plastic

Polymers are many, many, many small molecules linked together. Polymers are EVERYWHERE around us.

Let's think about and list a couple of polymers that we use or see almost every day:

Natural Polymers

1. _____
2. _____
3. _____
4. _____
5. _____

Synthetic (Man-Made) Polymers

1. _____
2. _____
3. _____
4. _____
5. _____

We can pretend that we are polymers to get a better idea of what it means to have a long molecule instead of a bunch of short molecules. If we consider all the students here participating small molecules, we have a lot of small molecules! Now, if I start linking your hands together (like the borax powder in the experiment that we are going to do) and form a chain, we have just formed one big molecule - a Polymer!

Many of you have already done an imaginary small molecules changing into a polymer demonstration. In art class, you have glued small strips of construction paper together into a link and put a bunch of small links together to form one big chain. This too is like making a polymer! Or if you've ever linked a bunch of paper clips together... or looked at a string of lights at Christmas time compared to one light bulb... or saw a vining plant grow from one leaf to a long vine full of leaves! Polymer demonstrations are EVERYWHERE!!

Now it's time change some polymers into different polymers by a chemical reaction using a linking agent (borax).

Experiment #1:

Use your senses of touch, smell, and hearing to identify properties of the different start up chemicals. Record your observations in the table below.

Chemical	Properties of Starting Materials
Borax	
Elmer's Glue	
Polyvinyl Alcohol	
Guar Gum	
Water	

Now perform your chemical reactions following your leader's directions.

We have already prepared the Borax and poly(vinyl alcohol) solutions for you. It is easier to do this ahead of time since they sometimes take a long time to dissolve into a solution. If we hadn't done this for you ahead of time, you would have had to add an extra step onto each of the following reactions where you would dissolve the powder into the warm water.

Experiment #1:

1. Pour the Elmer's Glue solution into a cup.
2. Stir the solution with a Popsicle stick.
3. Add 1 spoon (or a little less) of the borax solution to the cup.
4. Stir the solution with the Popsicle stick.
5. Observe the properties of the new polymer and record on the student activity sheet.

Tips: How does it sound when you drop it on a table or when you squeeze it? How does it feel on the back of your hand? Does it bounce? What happens when you suspend it in the air? What happens when you pull it apart slowly? How about when you pull it apart fast? What happens when you hold two pieces of jiggle jelly together for a few seconds? What happens when you put it in a cup? How far does it stretch in 15 seconds?

Chemical	Properties After Reaction
Borax + warm water (this is your Borax solution)	
Elmer's Glue + Borax solution (Your 1 st new Polymer!!)	
Poly(vinyl alcohol) (PVA) solution	
Elmer's Glue + PVA solution (Your 2 nd new Polymer!!)	

Experiment #2:

1. Pour the Elmer's Glue solution into a cup.
2. Stir the solution with a Popsicle stick.
3. Add 1 spoon (or a little less) of the PVA solution to the cup.
4. Stir the solution with the Popsicle stick.
5. Observe the properties of your 2nd new polymer and record on the student activity sheet.

Experiment #3:

1. Pour the Guar Gum solution into a cup.
2. Stir the solution with a Popsicle stick.
3. Add 1 spoon (or a little less) of the borax solution to the cup.
4. Stir the solution with the Popsicle stick.
5. Observe the properties of the new polymer and record on the student activity sheet.

Chemical	Properties After Reaction
Borax + warm water (this is your Borax solution)	
Guar Gum + Borax solution (Your 1 st new Polymer!!)	
Poly(vinyl alcohol) (PVA) solution	
Guar Gum + PVA solution (Your 2 nd new Polymer!!)	

Experiment #4:

1. Pour the Guar Gum solution into a cup.
2. Stir the solution with a Popsicle stick.
3. Add 1 spoon (or a little less) of the PVA solution to the cup.
4. Stir the solution with the Popsicle stick.
5. Observe the properties of your 2nd new polymer and record on the student activity sheet.

Do not throw polymers away in the sink! Dispose of in the trash.

Experiments To Do at Home with a friend and a parent:

- When working at Home: ALWAYS remember the safety rules!!
- When working at Home: ALWAYS ask a parent before you start any experiment!!
- When working at Home: ALWAYS remember to work on a surface that is easily cleaned - never work directly on a table. Working on a wax paper or plastic surface will minimize any problems with cleaning up afterwards!

Experiment #1 (To Do at Home!)

Make your own Flubber/Slime:

Materials:

2 cups school glue
1 ½ cups warm water

3 tbsp borax
1 cup boiling water

Directions:

1. Mix school glue with warm water
2. In a separate bowl, mix boiling water and borax
3. Add 1/3 of borax mixture at a time to glue mixture - Mix Well!
4. Store in a Ziploc bag (or the mixture will dry out)

Experiment #2 (To Do at Home!)

Make your own Silly Putty:

Materials:

2 c White all-purpose glue	1 c Liquid starch
----------------------------	-------------------

Directions:

1. Mix together well.
2. Set on trays for play, or use waxed paper.
3. Can be used as the commercial Silly Putty is. Store in an airtight container.

Experiment #3 (To Do at Home!)

Make your own Playdough:

Materials:

$\frac{1}{4}$ cup salt	$\frac{1}{4}$ cup water
1 cup flour	Food Coloring (if different colors desired)

Directions:

1. Mix flour and salt
2. Add water
3. Add food coloring (optional)
4. Store in ziploc bag to keep moist