

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Class: \_\_\_\_\_

# GAK LAB

(and other non-Newtonian Fluids)

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**Directions:** You will be able to make 3 different types of non-Newtonian fluids today. Non-Newtonian fluids have properties of both a solid and a liquid, and it reacts to stress with increased viscosity.

To be safe, use gloves so that the food coloring will not stain your hands. Also, do not get any of these materials on your clothes as they might stain them.

Keep the area CLEAN at all times.

Do not eat any of the materials you create today as they might make you sick.

You may take these items home at the end of the day. If you choose to do so, then label a sandwich bag with your name and the type of item it is.

Please, as with all experiments,

- Read all the directions First!
- Keep the lab area clean.
- No food or drink during the lab.
- Keep hair tied back.
- Wear safety glasses.

## Part 1: Oobleck

Many of the materials we use every day, like starch, are made up of molecules called POLYMERS. POLY means "many" and MER means "unit". Because the units of chains are so long, the movement of polymers is restricted. Viscosity is a physical property of liquids that describes their rate of flow. Honey and corn syrup are described as having high viscosity because they flow more slowly than water.

Materials	Substitutions
1 500 mL beaker	1 bowl
1 cup cornstarch (1/2 box)	
a spatula	a spoon
1 aluminum pie pan	
scissors	
water	

### Procedure

1. Pour 1 cup of cornstarch into a bowl or beaker.
2. Continue to add a small amount of water until the solution begins to thicken. Stir carefully! Do not fight the viscosity of the polymer.
3. Pour some of the polymer into the pie pan. Try to cut it with the scissors as you pour. Tap the polymer in the pie pan with your hands. Pour some of the polymer into your hands and roll it into a ball. Does the ball retain its shape? Form a long rope (snake) with the polymer and pull it apart quickly. What happens? With your spoon, attempt to draw in the polymer. Can you write your name?

**Disposal :** The Oobleck can be spread onto a cookie sheet, dehydrated, and reused!!

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## Part 2: GAK

Materials	Substitutions
2 400 mL beakers	2 jars or 2 styrofoam cups
Elmer's Glue All	
spatula	a spoon
25 mL graduated cylinder	measuring spoons
borax	
water	
food coloring	

## Procedure

1. Mix 30 mL (2 Tbsp) of glue with 20 mL water (4 tsp) in a beaker.
2. Add 2 or 3 drops of your choice of food coloring.
3. To the second beaker, add 200 mL (3/4 cup) of water. Add 2.6 grams (1/2 tsp.) of powdered borax and stir until the borax dissolves.
4. Add 15 mL (1 Tbsp) of the borax solution into the beaker containing glue and water.
5. Stir gently and allow it to sit momentarily.
6. Take the GAK out of the beaker and stretch it. Will it bounce? Does its consistency change? Can you break it?

## Disposal

If you have Ziploc™ bags, you could allow the students to take their GAK home with them. Solutions of borax may be poured into the sinks. Unused mixtures of the borax and glue should be placed into a solid waste container.

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## Part 3: SLIME

Many of the materials we use every day, like starch, are made up of molecules called POLYMERS. POLY means "many" and MER means "unit". Because the units of chains are so long, the movement of polymers is restricted. Viscosity is a physical property of liquids that describes their rate of flow.

### Materials

2.46g sodium borate  
0.63 g guar gum (1/4 tsp.)  
200 mL water  
100 mL graduated cylinder  
2 - 250 mL beakers  
2 stirring rods  
balance  
paper towels  
food coloring  
4-5 zip-lock bags (1 per person)

### Substitutions

1 tsp. Borax  
  
5/6 cup of water  
measuring cup  
2 - 9oz plastic cups  
2 spoons

## Procedure

1. Pour 100 mL of water into a beaker.
2. Add the sodium borate to the water and stir for approximately one minute or until the solid is completely dissolved.
3. Label the solution.

4. Pour 80 mL of water into the other beaker
5. Add guar gum to the water while stirring. Continue stirring until the solid is completely dissolved (approximately one minute).
6. Label the solution.
7. Add food coloring of your choice to guar gum solution and stir for one minute.
8. Add 5 mL of the sodium borate solution to the guar gum solution. Stir for 1 minute, and then let it sit for 2 minutes.

### **Disposal**

This slime can be stored in a Ziploc™ bag so students can take it with them. Its unusual properties will diminish over time as it dries out.