

# Changes in Matter: Gak

Gently pour together two liquids and create a strange substance called Gak.

**Supplies to find:** white glue, plastic portion cups, borax, baggies, food coloring, wax paper, paper towels



**Supplies to create:** Recipe for the class-liquid #1: pour the 16 ounce bottle of white glue into an empty pop bottle, add 10 ounces of water and 20 drops of yellow food coloring, cap and shake to mix thoroughly; liquid #2: fill a one liter pop bottle half full of very hot water, add 1/2 cup borax and 20 drops of blue food coloring, cap and shake to mix, uncap fill to the brim with hot water and allow to cool. For each child—a 6"x6" square of wax paper.

## Prepare

Pour one quarter of a portion cup of each liquid for each student.

## Procedure

Ask students to place a paper towel on their desk and put a square of wax paper over it.



Pass out cup #1 (yellow diluted glue). Observe the contents and list descriptive words as a class. Set the cup aside so that you get a second cup! Pass out cup #2 (blue borax water). Observe the contents and list descriptive words as a class.

Students gently pour cup #1 into cup #2. Then pour cup #2 into cup #1 to mix completely. Pull the gak out of the cup, squeeze out the water.



Give students time to experience their new material. How is it like and not like the liquids that were used to create it? What happens if you hold it up and wait? What happens if you hold it in your hands from each end and pull it quickly apart? What happens if you hold it up with that it starts to ooze and then you cut it with scissors? What happens if you place it in a container? What happens if you place it near the edge of your desk and let it drip off the edge?

How is this new material like a liquid? How is this new material like a solid?

Store the gak in the baggie. Caution the students not to eat it. Although it won't hurt them, scientists do not eat their experiments. Caution them to keep it away from contamination, such as dirt or food, and away from wooden furniture or cloth since it will leave marks. Keep it out of direct sunlight, that will dry it out and make it hard. Keep it away from younger siblings or pets. Keep it away from cloth or wood furniture, it will stain both.

#### Teacher Background

The two liquids combine to form a more viscous liquid, which means it does not flow quickly. Liquids like pancake syrup, corn syrup, and motor oil are viscous compared to water. The borax causes the pieces in the diluted glue to join and makes long chains of pieces into even longer chains.

Long chain molecules exist in your food, such as in ice cream. Xanthan gum, carrageenan and guar gum are all related to sugar and are all made by nature in plants, algae, bacteria, and fungi. They thicken and increase the viscosity of food. Cornstarch and flour have long been used to thicken gravies and soups. Long chain molecules are the main component of rice, flour, and potatoes. Other food polymers include: cellulose, pectin, locust bean, alginic acid, and agar.

**Inquiry:** Devise tests for the gak. Does it bounce? Does it stretch? What happens if you pull it quickly? What happens if you roll it into a snake? Does it cut with scissors? Is it a solid or a liquid? How could you prove your answer?

# Slime

Gently drip one liquid into a second liquid to create a strange substance called slime.

**Supplies to find:** plastic cups, yellow food coloring, borax, and eyedroppers.

Each child will need: a small portion cup, baggie, wax paper sheet, polyvinyl alcohol solution.



## Prepare

**Polyvinyl alcohol solution:** Pour a bottle of gel glue into an empty pop bottle. Add two glue bottles of water. Shake gently. Label the bottle “diluted gel glue” and allow to stand overnight to integrate the glue into the water.

**Sodium borate solution:** Heat one half liter of water to boiling. Remove it from the heat, add three tablespoons of borax and stir briefly. Set aside to cool, pour into an empty pop bottle to store, and label “borax solution”. Add enough food coloring to make the solution yellow. Pour into three tall, plastic cups. Put an eyedropper into each cup.

## Make slime

Give each child a cup of polyvinyl alcohol, a sheet of wax paper, and a baggie.



Assign 3 students to move around and put a quick squirt of sodium borate into each cup using eyedroppers and cups.



Each student stirs the solution and removes any slime that has formed in the cup.



Place the slime on the wax paper.



**Option:** The empty glue bottle makes dropping the sodium borate into each student's cup very easy. As you use up the glue, save the bottles!



The slime is placed on the wax paper so that it does not “overslime” and become like old gelatin in the cup.

Continue adding sodium borate to each cup until all the polyvinyl alcohol is gone.

Take time to test the new material. What happens if you hold it up and wait? What happens if you pull it apart quickly? What happens if

you pull it apart slowly?



Clean up by explaining that slime must be stored in a baggie. It dries and becomes more solid if left out of the baggie. Slime needs to be kept out of the sun and away from warm places. It will not deteriorate on its own unless it is contaminated. Make sure your hands are clean before you play with it and that it stays clean. Keep the slime away from clothes since it will stain. It can also remove the finish from some kinds of wood furniture, so keep it away from wood.

Place the cups, paper towel, and wax paper in the garbage.

**Inquiry:** Devise tests for the slime: How high does it bounce? What happens if you cut it with scissors? Will it drip if you roll it off the edge of your hand? What happens if you lay it on the desk and slap it hard or soft with your hand? Compare and contrast slime to Gak