

# LESSON 6:

# SLIME

Students will explore how slime is made through a chemical reaction, experimenting with how the reactants can alter the consistency.

## OBJECTIVES

- How is slime made?
- What chemical reaction occurs?
- How does shaving foam affect the consistency of the slime?
- What is the evidence that a chemical reaction has occurred?

## SUPPLIES

- 1 cup of school glue (about 4 bottles of 4 fluid ounces each)
- 1 travel-size bottle of saline solution (approx. 4 fluid ounces; must contain boric acid and sodium borate)
- 1 can of shaving foam (non-scented is best)
- 1/4 cup of baking soda
- Measuring spoons
- 12 plastic cups
- 12 spoons
- Food coloring (optional)

## HOOK

 5-10 min

Ask students what they know about slime.

- Has anyone made slime before?
- Is it a solid or a liquid?
- Is all slime the same consistency?

Slime is a non-Newtonian substance. This means it is neither a liquid nor a solid. When slime, and other non-Newtonian substances, are squeezed, agitated, or stirred, they are more like a solid. You have seen this if you have ever tried to rip slime apart. However, when left to sit, it is like a liquid and flows if you, for example, put your finger in it.

## HYPOTHESIS

 3-5 min

Discuss with students:

- What chemical reaction occurs when making slime?
- How does the consistency of the glue change when mixed with the other materials?

Tell students that they will be making slime, one set with shaving foam and one set without. Have them predict:

- How will shaving foam affect the consistency of the slime?
- What will the consistency of the slime without shaving foam be like?



## KEYWORDS

- Reactant
- Consistency
- Ion
- Borate
- Liquid
- Solid
- Non-Newtonian
- Viscosity

## TIP

A splash of saline solution on your hands will stop the slime from sticking to you as you begin to knead it. Be careful just to add a splash and not too much or the slime will become very rigid!



## EXPERIMENT

🕒 15-25 min

Students will each make their own slime, split the class into two so one half of the class makes slime recipe #1 and the second half of the class makes slime recipe #2.

### Slime Recipe #1

1. TEACHER ONLY: fill 6 cups with 1 tablespoon of school glue each, distribute cups to each student
2. Distribute spoons to each student.
3. Mix in 1 tablespoon of water.
4. TEACHER ONLY: add ONE drop of food coloring.
5. Students can stir in 1/4 teaspoon of baking soda.
6. Start with 1 or 2 DROPS of saline solution and begin to stir quickly and vigorously until the mixture begins to pull away from the cup and the slime is formed. If the slime is too sticky, add a drop or two more of saline solution.
7. Finally, begin to knead the slime. It may appear stringy at first but will soon begin to take form as you knead it.

### Slime Recipe #2

1. TEACHER ONLY: fill 6 cups with 1 tablespoon of school glue each, distribute cups to each student
2. Distribute spoons to each student.
3. Mix in 1/2 tablespoon of water.
4. Mix in 1 tablespoon of shaving cream.
5. TEACHER ONLY: add ONE drop of food coloring.
6. Students can stir in 1/4 teaspoon of baking soda.
7. Start with a couple DROPS of saline solution and begin to stir quickly and vigorously until the mixture begins to pull away from the cup and the slime is formed. If the slime is too sticky, add a drop or two more of saline solution.
8. Finally, begin to knead the slime. It may appear stringy at first but will soon begin to take form as you knead it.

## CHEMICAL REACTION

A chemical reaction is where different substances (reactants) are changed into a new substance (product)

### SIGNS

- change of color
- change of temperature
- change of smell
- production of gas
- production of a solid
- emission of light



## OBSERVATION

 5-10 min

Ask students to discuss:

- Are the two slime mixtures the same?
- Did they react the same or differently?

Students should notice that the slime with the shaving foam is fluffy while the slime without the shaving foam is denser. Therefore, the shaving foam slime is bigger in volume. When forming the slime, both types reacted the same way, expect for their consistency.

## CONCLUSION

 3-5 min

Ask students to share their findings.

- What happens to the consistency of slime when shaving foam is added?
- How does the consistency of the glue change when mixed with other materials?
- What chemical reaction occurs to make slime?

Students should note that when the shaving foam is added, the slime increases in volume and appears softer and fluffier. As they play with it repeatedly, it begins to lose this volume and 'fluffy' feeling. The glue starts with less viscosity (it moves more freely and pours more easily). However, when it is mixed with the other materials and slime is formed, the viscosity changes and becomes higher. It does not pour easily and move as freely. Children may note that we know a chemical reaction has occurred because we have an entirely new substance (slime).



## EXTENSION

 5-10 min

If students have time to expand on this experiment, try exploring the viscosity of the slime.

- Let the slime rest for 2-3 minutes. Then try to get it out of the cup. What do you notice about it? (It has lower viscosity.)
- Try and rip the slime in half. What happens? It should tear completely in half like a solid would.
- Move the slime between your hands, pressing on it. How does it feel now compared to when it was resting in the cup? (It should have a higher viscosity.)
- Move the shaving foam slime between your hands repeatedly for 3-5 minutes. What do you notice about its consistency? It should lose some of the air that was in it from the shaving foam, giving it less volume and 'fluff'.

## EXPLANATION

 5-10 min

In this reaction, slime is created when the saline solution and the glue mix. The saline solution has two key reactants - sodium borate and boric acid. These mix with the baking soda to form borate ions. Glue is made up of long, repeated strands (or molecules). The molecules flow past each other to keep it as a low viscosity liquid.

When the borate ions from the baking soda and saline solution are added to the glue, it makes the molecule strands from the PVA connect and tangle, until it becomes thick and rubbery, turning into slime. Both slime and glue are polymers. Polymers are large molecules, made from small, repeated molecules. In the case of glue, they are not connected and flow freely, giving it low viscosity. In slime, they are tangled and connected so do not flow as freely, giving it a higher viscosity. When slime is stretched, the molecule chains begin to untangle and straighten out until they break apart (causing the slime to break apart).

The shaving foam makes the slime bigger in volume and fluffier. When shaving foam comes out of a can, it expands because air is added to it. When we add the shaving foam to our slime mixture, it adds air to the slime, making it bigger in volume and fluffier. As you play with the slime or store it for a longer period, the air from the shaving foam will slowly decreasing, affecting the volume and 'fluffiness' of the slime.

This is a chemical reaction because the boric acid and baking soda make borate ions. These ions then mix with the glue to create a new polymer with a higher viscosity. This new substance, slime, was created through a chemical reaction.

## CLEAN UP & DISMISSAL

 3-5 min

Students must then clean their workspace. Let each student take home one piece of slime. Tell them to store it in an airtight container at home for best results. Make sure to leave the classroom the way you found it.

