



CLASSROOM ACTIVITY

Solid, Liquid, Gas

GRADE RANGE

3–5

OBJECTIVES

Students will be able to:

- **Summarize** what they already know about the states of matter.
- **Create** slime using the instructions provided.
- **Develop** and justify an argument for slime's state of matter.

OVERVIEW

In this activity, students will be introduced to the fun fact that petroleum can occur in the form of a solid, liquid, *or* gas. After examining pictures of all three forms, the class will work together to create an anchor chart that illustrates their knowledge about these three states of matter. They will then follow instructions to create a unique state of matter: slime! Once the slime is complete, they will develop an argument for whether slime is a solid, liquid, gas... or none of the three. They will ultimately be introduced to the concept of a Non-Newtonian Liquid and learn that other substances, like heavy crude oil, also fall into this category!

MATERIALS

- **States of Matter** handout, one for the educator to project
- Slime Ingredients, enough of the following for groups of four students:
 - 6-ounce bottle of Elmer's Glue (or $\frac{3}{4}$ cup)
 - $\frac{1}{2}$ tablespoon of baking soda
 - 1 $\frac{1}{2}$ tablespoons of contact lens solution
 - A bowl
 - A spoon
- **SLIME!** handout, one per student

NATIONAL STANDARDS

Next Generation Science Standards

- **5-PS1-3: Matter and its Interactions:** Make observations and measurements to identify materials based on their properties.

English Language Arts Common Core Standards

- **CCSS.ELA-LITERACY.CCRA.SL.1:** Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- **CCSS.ELA-LITERACY.CCRA.W.4:** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

PROCEDURE

Engage

- Display or project the **States of Matter** handout and ask students to share how these images are alike and different.
- Then tell students that the three images are all examples of petroleum!
- If needed, explain that:
 - Petroleum is a fossil fuel.
 - It is called a fossil fuel because it forms deep underground from the remains of ancient marine organisms like algae and plants.
 - Humans can get petroleum by using drilling machines that go deep into Earth.
 - Once petroleum is removed from the ground, it is sent to a refinery or industrial plant, where it is cleaned and separated into different useable parts.
- Go on to explain that petroleum can be found on Earth in all three states of matter. The images show:
 - **Solid:** Bitumen is a solid form of petroleum. When it is heated, it changes form, gets sticky, and can be used for waterproofing or to bind things together.
 - **Liquid:** When petroleum is in the form of light crude oil, it is a liquid that can be turned into transportation fuel.
 - **Gas:** When petroleum is in the form of natural gas, it is a gas that can be used for cooking, heating, and electricity.
- Then create a three-column anchor chart* on the board titled "Solid," "Liquid," and "Gas." Ask students to share what they know about each state of matter and encourage them to use the three pictures of petroleum as their guide. Be sure students understand that:
 - **Solids:** Keep their shape! Its particles are packed tightly and can vibrate but not move.
 - **Liquids:** Take the shape of their container! Its particles can move and slide around each other.
 - **Gas:** Fills up its container! Its particles are free floating and can move and collide.

**Note:* Keep this anchor chart on the board throughout the remainder of the activity.

Explore

- Now tell the class that they are going to create slime using glue (which has petroleum in it), contact lens solution, and baking soda. Once their slime is complete, they will have to decide whether the slime is a solid, liquid, gas—or none of the three!
- Divide the class into groups of four students. Distribute one set of slime ingredients to each group and one **SLIME!** handout to each student.
- Then decide how you would like the groups to make their slime. You may walk the class through the instructions so groups complete the steps together, *or* each group may make the slime on their own.

Apply

- Once groups have completed their slime, bring students' attention to the bottom "What is slime?" section of their **SLIME!** handout. Read the question aloud and encourage students to use the details recorded on the Solid-Liquid-Gas Anchor Chart as well as the slime in front of them to develop their argument.
- Once about 10 minutes have passed, take a class-wide vote on whether slime is a: 1) Solid, 2) Liquid, 3) Gas, or 4) None of the three.
- After a drumroll, announce that slime falls under the "none of the three" category! Explain:
 - Slime falls between the categories of liquid and solid.
 - This "non" category has a special name: Non-Newtonian Fluid.
 - It is called this because a scientist named Isaac Newton discovered that liquids don't change—they always flow the same way.
 - Slime, on the other hand, can change consistency. Sometimes it's runnier (or more liquid), but it can also become more solid when it is stirred or squeezed.
- Begin to wrap up the activity by asking students to brainstorm other materials they use in their everyday lives that may be a Non-Newtonian Fluid. Accept examples like toothpaste, peanut butter, honey, glue, yogurt, and more.
- Conclude by explaining that one type of petroleum, called heavy crude oil, also fits in this category. Whereas light crude oil is a liquid that can be poured easily, heavy crude oil does not flow the same way. Heavy crude oil is used to make asphalt and plastic!

Solid



Liquid



Gas



How to Make Slime

Materials:

- 6-ounce bottle of Elmer's Glue (or $\frac{3}{4}$ cup)
- $\frac{1}{2}$ tablespoon of baking soda
- 1 $\frac{1}{2}$ tablespoons of contact lens solution
- A bowl
- A spoon

Directions:

1. Pour all of your glue into the bowl.
2. Add the baking soda.
3. Use the spoon to mix it thoroughly.
4. Slowly add your contact solution little by little. (Add a little, and then mix. Then, add a little more, and mix again. Go slowly... You may not need to add all of it.)
5. When a slime begins to form, use your hands to knead it. In other words: pull, press, and fold the slime with your fingers. Continue until you have slime!

What *is* Slime?

Now that you've created slime, it's time to decide: Is slime a solid, liquid, or gas... or none of the three? Write your response in the space below and be sure to explain why!
