SICK! science®
insanely cool experiences

SHAKER SLIME

EXPERIMENT GUIDE

SHAKER SLIME

Creating the perfect batch of ooey, gooey slime is an art form to some and a science to others. Once your class has made the perfect batch of slime, they will be able to tell you all about this exciting chemical reaction and explain the concepts of molecules and polymers!

WHAT YOU NEED

- 1 1-LITER BOTTLE OF CLEAR SUPER SLIME GOO
- 1 BOTTLE OF ACTIVATOR (CROSS-LINKER) SOLUTION
- COLOR FIZZER TABLETS
- SMALL PORTION CUPS AND LIDS
- ZIPPER-LOCK BAGS

1 Fill each portion cup with two ounces of clear Super Slime Goo.

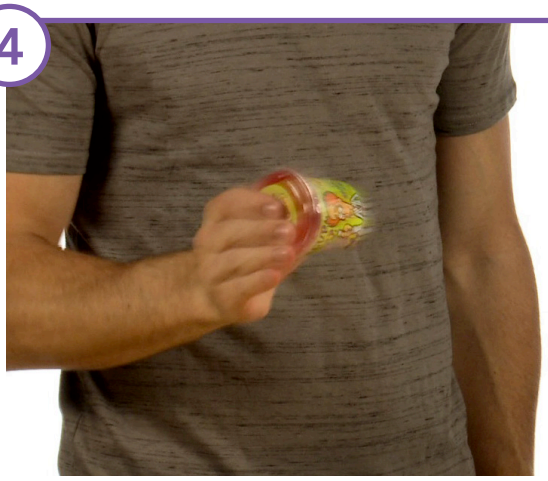
2

Drop a Color Fizzer tablet into each portion cup. Allow the Color Fizzer tablet to fully dissolve.

3

Add one teaspoon of Activator solution to each portion cup. Notice what changes when the two liquids mix.

4



Seal each portion cup with a lid and shake the cup to mix the slime.

Remove the slime. Place it in a zipper-lock bag for storage.

HOW DOES IT WORK

First, let's talk about the slime. Most liquids, such as water, are made up of small, unconnected molecules bouncing around and tumbling over and into one another. These single, unconnected molecules are called monomers. Monomer liquids flow easily and not usually gooey or sticky to the touch.

In other substances, monomers are linked together in really long chains of identical molecules known as polymers. These long chains don't flow as easily. Like a bowl of cooked spaghetti, they sort of roll over and around one another. Liquid polymers tend to be a lot gooier and flow more slowly than liquid monomers. The Slime Goo is a liquid polymer called polyvinyl alcohol (PVA).

The Slime Activator solution is called sodium tetraborate, or more commonly called Borax. You may recognize this as a brand of soap used to whiten clothes and to clean your hands. Sodium tetraborate molecules act to cross-link the long strands of PVA molecules. This solution is also known as a cross linker.

To help your students understand the chemical reaction that happens when the Slime Activator and the Slime Goo interact, as them to imagine a box of tiny, steel chains that slip and slide easily across and around one another. Each chain is made up of hundreds of individual links, but one chain is not connected to another chain; that's the PVA. Now, toss in some tiny magnets and the chains become linked and grab onto each other; that's the Borax. Billions of Borax molecules randomly link trillions of water molecules found anywhere on the chains of PVA. Now when you pull out one PVA chain, all the rest comes with it in a cross-linked blob of Slime!

TAKE IT FURTHER

In the Classroom: Creepy, Crawly Slime

When you're a kid, plastic bugs are just about the coolest things ever. What is more fun than sneaking one of those creepy, crawlers into your brother's cereal, well, slipping one into your slime of course! This special recipe is guaranteed to have people running for a can of bug spray. The mixture is simple... have your students put a plastic bug (spider, cockroach, worm… any will do just fine!) into the portion cup before adding the slime ingredients. Then create the slime as normal. Stir it up! Enjoy!

Home Connection

When students are finished with their slime at home, invite them to leave the slime in a dish for several days and observe what happens. Encourage students to share their observations over the next few days with the class.

ADDITIONAL INFORMATION

Even though this is a really cool activity, someone in your class is likely to ask, "Just what does this have to do with the real world anyway?" Below we have included some real world connections related to Slime.

1. What is PVA used for anyway? PVA is used in the plastics industry to form surface coating and to make surface films resistant to gasoline. It is also used to make artificial sponges, hoses, and printing inks. If you look at the ingredients of contact lens wetting solutions, you may find this chemical as a lubricant and a cleanser.

2. The Activator solution is used in the wood industry to protect against fungus and to make new wood look old. It's also used to solder metals, to glaze enamel pottery, to whiten your laundry, and serves as an excellent soap in the medical industry.

3. Talk to your students about plastics and polymers in everyday life. From the hair on their heads to the cars they ride home in, polymers are everywhere. Your young scientists can make a bulletin board collection of pictures showing polymers and plastics in daily life. Older students could research the merits of plastics in their lives and how plastics have changes everything from toothbrushes and band-aids to space stations and music.

SCIENCE FAIR CONNECTION

While making slime is really cool, it is not a science fair project. You can create a science fair project by identifying a variable, or something that you can change, in this experiment. Let's take a look at some of the variable options that might work:

- All slime batches are not created equal. Some slime is...well...slimier than others and stretches easily. Other batches "break" easily. Try making three new batches of slime. For the first batch, follow the basic recipe; for the second batch use ½ of a teaspoon of Activator solution with the same amount of Slime Goo; and for the third batch use 1 ½ teaspoons of Activator solution with the same amount of Slime Goo. Create a table to record your observations of the three batches of slime and see if you can draw conclusions as to why the consistency of the batches of slime vary.

This is just one idea, but you aren't limited to just that! Come up with different ideas of variables to test and give them a try. Remember, you can only change one variable at a time for each test. For example, if you are testing the effect of the Activator solution on the consistency of the slime, make sure that all other factors in the test remain the same!

TEACHER NOTES:

SCIENCE CONCEPTS OVERVIEW ▸ Polymers, Chemical Reaction, States of Matter

The learning experiences contained in the following Experiment Guide are designed to engage students and deepen understanding, not only of the underlying scientific concepts upon which these experiments/demonstrations are built, but also of critical thinking and problem solving skills. Teachers should allow students to actively participate in each activity as an investigation, where questions are being asked, hypotheses are developed and redeveloped, and where students own the discoveries. Vocabulary was included, assessments were created and critical thinking questions were designed with this underlying goal in mind.

The following are some suggested teaching points that could accompany this experiment/demonstration:

SICK Science Teaching Points: The SICK Science video can be utilized in a variety of ways. It can be used to introduce a scientific concept or in place of doing the demonstration/experiment if materials are unavailable. The video can also be used as a review or to help students complete the various learning experiences included in this guide. The video can also be used as a review or to help students complete the various learning experiences included in this guide.

Visit the landing page below to locate the appropriate video for this activity
stevespangler.com/sick-science-resources

Vocabulary: Students will enhance their science-content related vocabulary. You may choose to introduce the vocabulary words and explicitly teach the meaning of each. You may also use the vocabulary words as an investigation, where students may research the meanings of the words. Finally, students may develop their own meaning for each word through their experience with the experiments and critical thinking work.

Scientific Method: Students can complete a full lab report for the demonstration, including asking questions, identifying variables, forming a hypothesis, designing the experiment, collecting data, and drawing conclusions. Differentiation using the lab report is easy. For lower levels, complete the lab report as a class. As students are more independent, encourage students to work in partnerships or groups to complete the lab report. Eventually, students should be able to complete the lab report independently or design a new experiment using the lab report form based on the demonstration completed in class.

Writing Connections:

How To Writing: One focus of writing standards in the primary grades is "How To" writing. Making slime naturally lends itself to this type of writing. Ask young students to write and illustrate step-by-step instructions for how to make slime. This could be done as a class or independently. (K-3). Have volunteers share their slime batches and "How To" writing with the class.

It's All About Slime: For older students, challenge them to create a short story that includes a "slime" character that gets in and out of trouble. Have students share their writing with the class or visit a younger classroom as a guest reader. Be sure to have them take a bag of slime!

Word Work Activities:

Letter Beads: Make a batch of slime. Add letter beads for the sight words or vocabulary words your students are learning to the slime that day. Ask the young students to spell the sight words so they can search for the letters in the slime or on index cards write the definition of vocabulary words on index cards so the students can search for the vocabulary words. This is a great small group or centers activity. (K-3).

Cookie Cutter Slime: There are a variety of activities you young students can do with slime and alphabet cookie cutters. Give each student a batch of slime and an assortment of alphabet cookie cutters to share. Whether you are practicing rhymes or beginning and ending sounds, students can provide their response in the slime. For example, call out a word and have the students spell out a rhyming word with the slime or call out a word and have the students cut out the letter that makes the beginning or ending sound they heard in that word. (K-2).

Slime Words: Have older students use the slime to create "oozy word" videos or photographs. Have them mold a daily vocabulary word out of slime and drape it over the edge of a desk or table. Have them predict what will happen, and then video or photograph the activity to share with classmates.

Sensory Math Activities:

Slimy Numbers: As a great sensory math activity, ask young students to form numbers or equations from the batches of slime. Have students partner up and take turns identifying numbers or solving equations. (K-1).

Multiplication Madness: Have older students create a multiplication problem on their desks with slime but not to include the answers. Then, when you say Go!, have students choose another desk and use slime to solve the problem by creating a slime answer. Once the problem is solved, the student sits down. The first student to sit down wins the round. Play as many rounds as time allows, and then declare winners for the day.

Expert Vocabulary

NAME _____

WORDS AND DEFINITIONS —
Match the word on the left with the correct definition on the right by filling in the blank with the correct letter.

VOCABULARY WORDS	DEFINITIONS
1 ____ **Polymer**	A — The action between atoms or molecules to form one or more new substances.
2 ____ **Chemical Reaction**	B — A state of matter in which a substance keeps its size and shape. Not a liquid or a gas.
3 ____ **Molecule**	C — A chemical compound formed from a long chain of the same molecule group.
4 ____ **Solid**	D — A state of matter in which molecules are capable of flowing freely like water. Not a solid or gas.
5 ____ **Liquid**	E — A group of two or more atoms that stick together.

Critical Thinking

NAME

VOCABULARY COMPREHENSION —
Students will be able to understand and define content related vocabulary words.

Read the following definitions.

Chemical Reaction: The action between atoms or molecules to form one or more new substances.

Physical Reaction: A process that leads to a change in the form of matter.

Which of the above best describes what happens when you mix the Slime Goo with the Activator solution to make the slime? Explain your thinking with evidence.

Critical Thinking

NAME

VOCABULARY IN CONTEXT —
Students will determine the meaning of vocabulary words by using clues from the context around the word.

Polymers are really long chains of identical molecules. Liquid polymers are long chains that don't flow as easily as water and tend to be a lot gooier and flow slowly. The Slime Goo is a liquid polymer.

The Slime Activator solution is called sodium tetraborate. Sodium tetraborate molecules cross-link the long chains of liquid polymers to create slime. This solution is also known as a cross-linker.

Use the information above to explain why the Slime Activator solution is called a cross-linker. What do you think the word cross-linker means and how does it relate to the mixing of these two solutions to create slime.

Critical Thinking

NAME

VOCABULARY APPLICATION —
Students will write and speak while incorporating newly learned vocabulary.

Using the definitions below, explain how creating slime demonstrates properties of both states of matter. You may use pictures or diagrams to help with your explanation.

Solid: A state of matter in which a substance keeps its size and shape. Not a liquid or a gas.

Liquid: A state of matter in which molecules are capable of flowing freely like water. Not a solid or a gas.

Assessment

NAME _____

ASSESSMENT QUESTIONS —
Read each question, then circle the letter next to the correct answer or write your response on the back of this page or in the box.

1. Slime is a type of
   a. sponge.
   b. catalyst.
   c. goo.
   d. polymer.

2. What kind of reaction takes place when you combine the Slime Goo and Activator solution?
   a. Physical reaction
   b. Interaction
   c. Chemical reaction
   d. No reaction

3. Which states of matter do you observe when making slime? Circe all that apply.
   a. Solid
   b. Liquid
   c. Gas
   d. All of the above

4. What happens to the slime if you do not use enough activator solution? Why?

   _____

   _____

   _____

5. Draw a diagram of what Slime Goo might look like under a very powerful microscope. Label the molecules and polymers.

Expert Vocabulary - Answer Key

WORDS AND DEFINITIONS —
Match the word on the left with the correct definition on the right by filling in the blank with the correct letter.

	VOCABULARY WORDS		DEFINITIONS
1	C Polymer	A	The action between atoms or molecules to form one or more new substances.
2	A Chemical Reaction	B	A state of matter in which a substance keeps its size and shape. Not a liquid or a gas.
3	E Molecule	C	A chemical compound formed from a long chain of the same molecule group.
4	B Solid	D	A state of matter in which molecules are capable of flowing freely like water. Not a solid or gas.
5	D Liquid	E	A group of two or more atoms that stick together.

Critical Thinking- Answer Key

VOCABULARY COMPREHENSION —
Students will be able to understand and define content related vocabulary words.

Read the following definitions.

Chemical Reaction: The action between atoms or molecules to form one or more new substances.

Physical Reaction: A process that leads to a change in the form of matter.

Which of the above best describes what happens when you mix the Slime Goo with the Activator solution to make the slime? Explain your thinking with evidence.

Possible Answer:
I think that making slime is a chemical reaction. The Slime Goo and the Activator solution are both liquids before they are mixed. Then, when they are combined, they create a new substance, the slime. This new substance is actually a solid. Two liquids combine to become a solid. That is a chemical reaction.

Critical Thinking- Answer Key

VOCABULARY IN CONTEXT —
Students will determine the meaning of vocabulary words by using clues from the context around the word.

Polymers are really long chains of identical molecules. Liquid polymers are long chains that don't flow as easily as water and tend to be a lot gooier and flow slowly. The Slime Goo is a liquid polymer.

The Slime Activator solution is called sodium tetraborate. Sodium tetraborate molecules cross-link the long chains of liquid polymers to create slime. This solution is also known as a cross-linker.

Use the information above to explain why the Slime Activator solution is called a cross-linker. What do you think the word cross-linker means and how does it relate to the mixing of these two solutions to create slime.

Possible Answer:
Liquid polymers are long chains of molecules. I think they look like a long linked chain. All of these chains are connected to each other in a long strand, but still only make one chain. Then, when the liquid polymer is combined with the Slime Activator solution, that solution acts like a bunch of magnets. These magnets cause all of the chains to connect together to each other in a big ball, not just in one, long chain anymore. This is when the slime is made. The Slime Activator solution links together all of the polymer chains of the Slime Goo. I think the words cross-linker means that the polymer chains are linked together, or stuck together, in lots of different ways and are all connected.

Critical Thinking- Answer Key

VOCABULARY APPLICATION —
Students will write and speak while incorporating newly learned vocabulary.

Using the definitions below, explain how creating slime demonstrates properties of both states of matter. You may use pictures or diagrams to help with your explanation.

Solid: A state of matter in which a substance keeps its size and shape. Not a liquid or a gas.

Liquid: A state of matter in which molecules are capable of flowing freely like water. Not a solid or a gas.

Possible Answer:
When making slime I can take two liquids and combine them to become a solid. The Slime Goo is a thick, gooey substance. It is a liquid. The Slime Activator solution is also a liquid. Then when I combine them, the polymer from the Goo is linked together with the Activator solution and created a new substance, the slime. The slime is a solid.

Assessment - Answer Key

ASSESSMENT QUESTIONS —
Read each question, then circle the letter next to the correct answer or write your response in the boxes.

1. Slime is a type of
   a. sponge.
   b. catalyst.
   c. goo.
   d. polymer.

2. What kind of reaction takes place when you combine the Slime Goo and Activator solution?
   a. Physical reaction
   b. Interaction
   c. Chemical reaction
   d. No reaction

3. Which states of matter do you observe when making slime? Circe all that apply.
   a. Solid
   b. Liquid
   c. Gas
   d. All of the above

4. What happens to the slime if you do not use enough Activator? Why?

   Possible Answer:
   Without enough Activator solution, the solution would stay more like a liquid than a solid. This is because the Activator solution's job is to make all of the polymers in the Slime Goo stick together. Without enough Activator, the polymers would not all be able to stick together and the Slime Goo will feel more like a liquid than a solid.

5. Draw a diagram of what Slime Goo might look like under a very powerful microscope. Label the molecules and polymers.

   Possible Answer:
   Students might draw a picture of many tiny molecules linked together into a longer chain called a polymer.

Common Core State Standards

Student Outcomes	Standards
Students will be able to ask and answer questions about key details about their observations and discussion to demonstrate their understanding of the scientific concepts presented through the experiment.	RI.K.1, RI.1.1, RI.2.1, RI.3.1, RI.4.1
Students will be able to ask and answer questions to help determine the meaning of vocabulary presented as part of an experiment.	RI.K.4, RI.1.4, RI.2.4, RI.3.4, RI.4.4, RI.5.4
Students will be able to explain the connection between scientific ideas presented in the experiment.	RI.1.3, RI.2.3, RI.3.3, RI.4.3, RI.5.3
Students will be able to retell key details presented in the experiment in order to understand/determine the main idea.	RI.K.2, RI.1.2, RI.2.2, RI.3.2, RI.4.2, RI.5.2
Students will be able to recall information from experiences to answer a question.	W.K.8, W.1.8, W.2.8
Explain the procedure and ideas presented in a scientific experiment including what happened and why, including cause and effect, based on the information presented.	RI.3.3, RI.4.3
Students will be able to draw inferences from a specific scientific learning experience.	RI.4.1, RI.5.1
Students will be able to refer back to their observations and discussion to demonstrate their understanding of the scientific concepts presented through the experiment.	RI.3.1
Students will be able to use information gained from observations of the experiment to demonstrate understanding of the concepts presented.	RI.4.5