

Is All Slime Engineered Equally?



Investigate making slime using simple ingredients. Then test its properties using design criteria and create a new materials test to evaluate slime.

Engineering Design Process Outline

Step 1: Introduction

Step 2: Your Challenge: Test SlimeY

Step 3: Specifications and Constraints

Step 4: Design Criteria

Step 5: Develop Knowledge

Step 6: Check Understanding

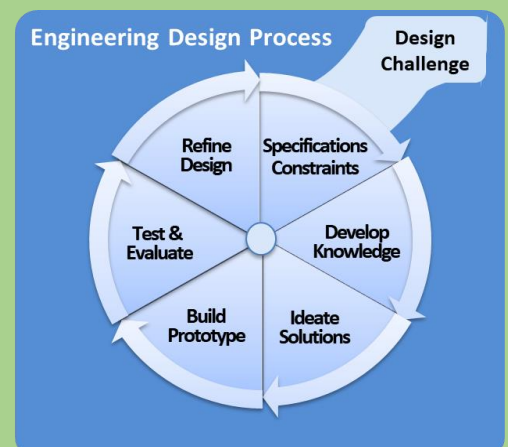
Step 7a: Develop Knowledge

Step 7b: Develop Knowledge

Step 8: Evaluate Your SlimeY

Step 9: Develop Your Own Test

Step 10: Design Solution



Step 1: Is All Slime Engineered Equally?

You're hired!

In the past few months, Slime Inc. has become overwhelmed with an increase in orders for our flagship product — SlimeY, a playful polymer!

To meet the demand, we have hired you as a [chemical engineer](#)* to test SlimeY.

In this project, you will

- Make SlimeY using our secret recipe 😊
- Test SlimeY for bounciness, stretchiness, and stickiness



*To view a career video on chemical engineering hold Ctrl and click to follow this link or copy and paste this link into your browser:
<https://www.youtube.com/watch?v=sxU4oMykyJE>

Step 2: Your Challenge: Test SlimeY



Your **challenge** is to test SlimeY for the following characteristics:

- **Stretchiness**
- **Bounciness**
- **Stickiness**

You will have **limited time and materials** to create and test SlimeY. Your materials include:

- 4 oz. Elmer's white glue
- 1 teaspoon Borax
- Water
- 1 measuring cup
- 1 Mixing bowl
- 2 Ziploc Bags
- 3 plastic teaspoons for stirring
- Food coloring
- Ruler
- Stopwatch
- String
- Tape

Step 3: Specifications and Constraints

To design a solution to our challenge, we must first identify the specifications and constraints.

Specifications are what your solution must do. They are the requirements. For example, specifications for a chemical engineer might be that they must design a polymer similar to slime that sticks to the wall for at least 25 seconds.

Constraints are things that limit your solution. A constraint may be how much you can spend or how much time you have to complete the challenge. For example, a constraint for a chemical engineer is that they must design a polymer for \$0.20 per ounce.

What are the specifications and constraints for this challenge?

	SPECIFICATION	CONSTRAINT
Limited time	<input type="checkbox"/>	<input type="checkbox"/>
Materials limited to what is available in the room	<input type="checkbox"/>	<input type="checkbox"/>
Test SlimeY for stretch, bounce and stickiness	<input type="checkbox"/>	<input type="checkbox"/>

Step 4: Design Criteria

Now that you know what you are supposed to do, here are the criteria that you will use to test for bounciness, stickiness, and stretchiness.

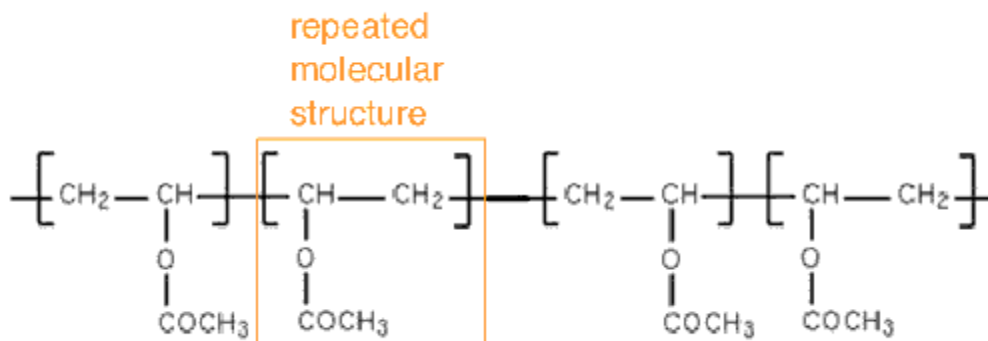
Below is what you will use to rate your SlimeY.

Test Rating	1	2	3
Bounciness	Does not bounce	Bounces one time	Bounces more than once.
Stickiness	Fall from upside down, smooth surface after one minute	Fall from upside down, smooth surface after five minutes	Falls from upside down, smooth surface after ten minutes.
Stretchiness	Stretches 18 inches	Stretches 24 inches	Stretches 36 inches or more

Step 5: Develop Knowledge

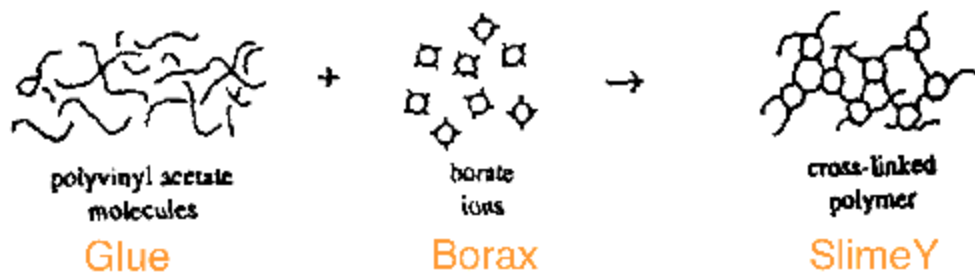
What makes SlimeY a playful polymer?

A **polymer** is a substance that has a molecular building block that is repeated. (**Poly** comes from Greek word meaning "many".)



The glue has an ingredient which is a liquid **polymer**.

The borax **links** the polymer in the glue, creating **one large, flexible polymer**.



Because of its flexibility, **SlimeY** is a "playful" polymer.

Step 6: Check Your Understanding

What makes SlimeY a playful polymer? Mark the following statements as True or False

	TRUE	FALSE
It is created by combining two different substances.	<input type="checkbox"/>	<input type="checkbox"/>
It has a molecular structure that is repeated.	<input type="checkbox"/>	<input type="checkbox"/>
The linked molecular structures make it flexible.	<input type="checkbox"/>	<input type="checkbox"/>

Step 7a: Develop Knowledge

What are the characteristics of SlimeY?



Get to know our product: SlimeY, a playful polymer!

Put on your safety goggles before you start. Wash your hands before and after handling SlimeY.

We promised to share our secret recipe:

1. In one bowl mix, 1/2 cup (4 oz) glue and 1/2 cup water. Add a few drops of food coloring.
2. In the other bowl, mix 1 teaspoon borax with 1 cup water until the borax is completely dissolved.
3. Slowly add the borax solution to the slime mixture while stirring slowly (you do not have to add all of the borax solution).
4. Now, let's get our hands dirty and create SlimeY! Stir as much as you can, then dig in and knead it with your hands until it gets less sticky. (No one makes slime without getting a little messy!) If there is any leftover water in the bowl pour it out.

Based on your experience answer these questions as best you can.

1. What does SlimeY look like?

SlimeY looks like

2. What does SlimeY feel like?

SlimeY feels like

Step 7b: Develop Knowledge

How do you test SimeY?

Now, let's practice testing SlimeY!

Stretchiness Test:

Materials needed: ruler or yardstick.

Procedure: Take 1/2 of your SlimeY and roll into a 4-inch log shape. Hold the top of the log shaped SlimeY and measure how far the SlimeY stretches before breaking.

Bounciness Test:

Procedure: Take 1/4 of your SlimeY and roll into a ball. Hold the ball about 12 inches from the table or floor and drop. How many times does it bounce?

Stickiness Test:

Procedure: Place 1/4 of your SlimeY on a smooth surface. Slowly turn the smooth surface over so that SlimeY is on the bottom. Time how long it takes before the SlimeY falls off.

Step 8: Evaluate Your SlimeY

Evaluate your SlimeY using the rubric below.

Test Rating	1	2	3
Bounciness	Does not bounce	Bounces one time	Bounces more than once.
Stickiness	Fall from upside down, smooth surface after one minute	Fall from upside down, smooth surface after five minutes	Falls from upside down, smooth surface after ten minutes.
Stretchiness	Stretches 18 inches	Stretches 24 inches	Stretches 36 inches or more

1. How did you rate your SlimeY for bounciness?

We give it a (1, 2, 3):

2. How did you rate your SlimeY for stretchiness?

We give it a (1, 2, 3):

3. How did you rate your SlimeY for stickiness?

We give it a (1, 2 or 3):

Step 9: Develop Your Own Test

Now that you have done as your employer has asked, you know about the characteristics of SlimeY; design a test for bounciness, stretchiness, or stickiness.

1. What are you testing for? (bounciness, stretchiness, or stickiness)

2. List the steps involved in your test?

The steps involved in our test are the following:

- 1)
- 2)
- 3)
- 4)

Step 10: Design Solution

Congratulations! You have just done what chemical engineers do every day - test products, like SlimeY, to ensure that every customer experiences high-quality products. Look at others' slime and ask about the test that they designed.

If you have not looked at the video link on the first page of the activity click here to explore a **career** in [Chemical Engineering](#)*.

*To view a career video on chemical engineering hold Ctrl and click to follow this link or copy and paste this link into your browser:
<https://www.youtube.com/watch?v=sxU4oMykyJE>

