

Jiggle Gels

EXPLORE PROPERTIES OF POLYMERS



STUDENT LAB GUIDE

Name _____

Jiggle Gels

EXPLORE PROPERTIES OF POLYMERS

You know how to make things. You can glue things together, paint, string beads together, shape clay, and build with blocks. You know how to take something ordinary and turn it into something better. This is what chemists do. But instead of using beads or clay, they use the very tiny parts that all things are made of—atoms and molecules. They study how things are made, down to these very tiny parts, and change them to make materials that are useful.

With the help of your visiting scientist, you are going to explore a few materials invented by chemists. These materials all seem different and have very different uses, but they have one important thing in common—they are all *polymers*.

Polymer is a name chemists use to describe a material whose molecules are made up of many small repeating parts hooked together like a long and skinny chain. You can't see these chain-like molecules, so you will have to trust us on this one. But as you will see in the coming activities, this unusual shape makes polymers amazing!

Today you will explore some polymers invented by chemists to find out what makes them special and useful. Today, you will do chemistry!



Your visiting scientist performed a trick for you. What was surprising about the trick?



What is the secret to this trick?



The Secret Science of Diapers

The polymer your visiting scientist secretly placed in one cup is also used in many baby diapers. As you saw, this polymer is special because it can absorb a lot of water.

Scientists call a special quality of something a *property*. So, the ability to absorb a great deal of water is a property of this polymer. As you can imagine, being very absorbent is a very desirable property for a diaper!

How absorbent is the baby diaper polymer? Let's find out.

GET READY FOR THE ACTIVITY

Take the following items out of your bag.

- Sodium polyacrylate
- Packet of salt
- Small scoop
- Beaker
- 2 droppers
- 2 paper towels



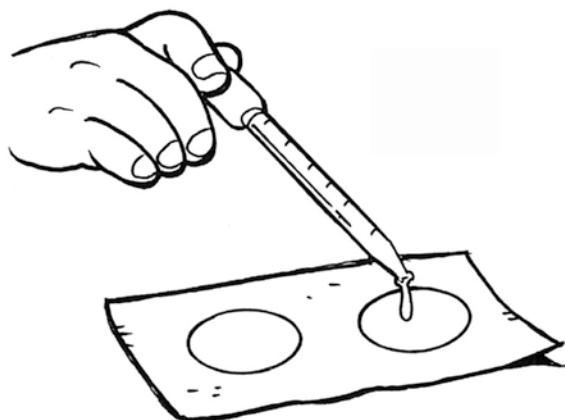
Leave all the other items in the bag, seal it, and place it out of your way.

Put on your goggles now and anytime you see this picture. You must wear your goggles during this activity. Do not remove your goggles until you have finished cleaning up from the activity and your teacher or the scientist says it is okay.



HOW ABSORBENT IS A BROWN PAPER TOWEL?

1. Use a cup and a pencil to draw two circles on a piece of brown paper towel.
2. Use a dropper to add drops of water to the center of one of the circles. Count the drops and continue to add them until the water reaches any part of the edge of the circle.



How many drops of water did you add?

HOW MUCH MORE ABSORBENT IS THE PAPER TOWEL WITH BABY DIAPER POLYMER?

3. Place one scoop of sodium polyacrylate in the center of the other circle.
4. Add the same number of drops you placed in the center of the first circle to the pile of sodium polyacrylate.



Did the water spread to the edge of the circle?

5. Add more drops until you have added a total of 100 drops of water to the pile of sodium polyacrylate.

CAN ANYTHING STOP THIS POLYMER?

6. Sprinkle some salt on the pile of sodium polyacrylate and watch it closely.



What happened?



CLEAN-UP

Put the following items back in your materials bag.



- Sodium polyacrylate
- Small scoop
- 2 droppers

The Thirsty Dinosaur

The little dinosaur toy in your materials bag is made of a super-absorbent polymer similar to the baby diaper polymer. What do you think will happen to the Gro Dinosaur® when it is placed in water? Let's find out. You do not need your goggles for this activity.

Take the following items out of your bag and then seal the bag.

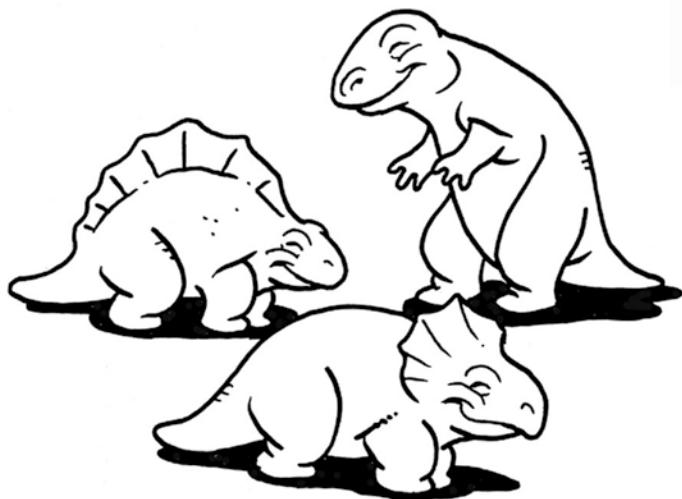
- 2 Gro Dinosaurs
- Beaker
- 2 zip-closing plastic bags

You will also need a metric ruler and a label.

Place the label with your dinosaur's name on the plastic bag.



What is your dinosaur's name?

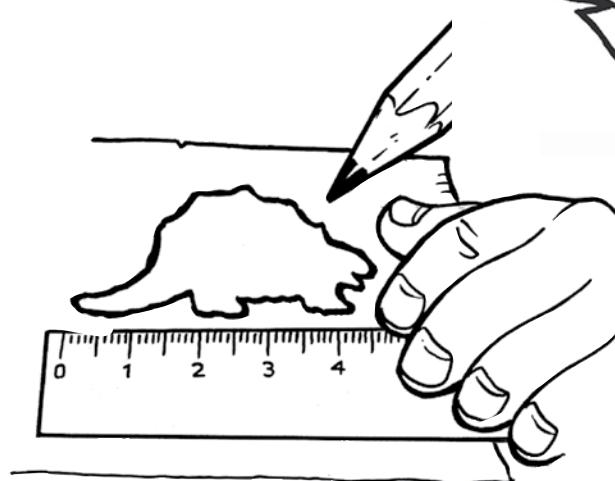


BEFORE

1. Place your group's dinosaur in the space below and hold it down as you trace it.



2. Place your dinosaur next to the ruler so that its tail is at the line marked zero and its nose is on the mm lines. Measure to the closest millimeter and write this next to your drawing.



3. Use your beaker to measure 90 milliliters of water. Pour the water into your zip-closing plastic bag.
4. Drop your dinosaur in the water and carefully seal the bag.
5. Place the bag with the dinosaur aside. You will check on your dinosaur again in a day or two.



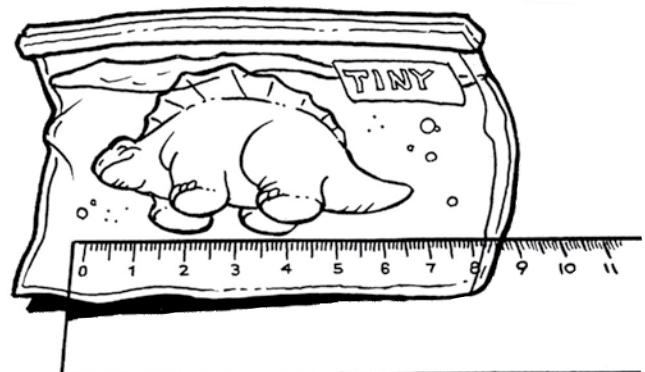
AFTER

1. Compare your dinosaur to your drawing on page 6.



How did your dinosaur change?

2. Leave the dinosaur sealed inside the bag as you place it next to your ruler. Measure the distance between the dinosaur's nose and tail to the nearest millimeter.



How long is your dinosaur?



There is less water loose in the bag than there was when you first added the dinosaur. Where did the water go?



Do you think your dinosaur would stay the same size, get bigger, or get smaller if you took it out of the water and left it out for a week?

Super Slime

You will start this activity with a clear colorless liquid called PVA solution. This polymer is used in white and gel school glues. Then you will add borax solution, which is an ingredient in laundry detergent. Gooey slime will develop right before your eyes.

Take the following items out of your bag:

- Borax solution
- 2 droppers
- 2 Popsicle sticks
- 4 small zip-closing plastic bags

The scientist or your teacher will give your group 2 cups of PVA solution.

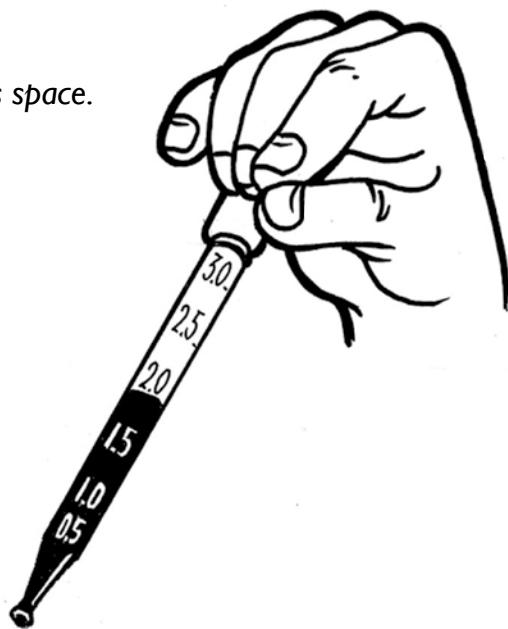


GET READY

Notice the marks on the side of the dropper. You will need to add a total of 5 mL. The dropper only goes up to 3 mL.



How will you do this? Write your plan in this space.

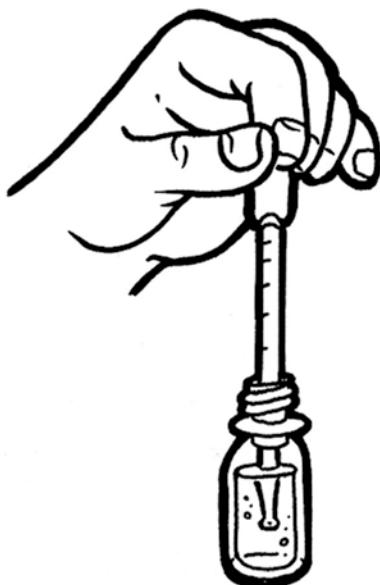


GET SET

You will need to work with a lab partner to make your slime. There are two jobs, a stirrer and a dropper. Decide who will do which job.

GO!

1. Stir continuously while your partner slowly squirts borax solution into the cup. Be sure to add a total of 5 mL of borax solution.



2. Pull the Popsicle stick up out of the cup and touch the slime. If some liquid remains in the bottom of the cup, or the slime feels very sticky, add 5–10 drops of the borax solution. Stir to mix the drops into the slime.



3. Pull the slime off the stick and divide it in half so that you and your lab partner each have a piece.

4. Play with your slime to explore its properties. When you are finished, place your slime in a zip-closing plastic bag and seal it.



CLEAN-UP

Place your slime in a zip-closing plastic bag and seal it. Your slime will keep for weeks if you store it in this bag. Take care to keep the slime away from fabrics, carpet, small children, and pets.



Check to see that your materials bag contains the following items:

- Borax solution
- Beaker
- Sodium polyacrylate
- Small scoop

The droppers may be placed in the trash or washed and reused.



What change did you observe when you added the borax solution to the PVA solution?



What property of slime did you find most fun or surprising?

WHAT'S GOING ON HERE?

If you could look at the polymer molecules in the PVA solution, you would see that the long polymer chains slide past each other very easily through the water. This is why the PVA solution acts like a normal liquid.

But when borax solution is added, things change! This is because the borax molecules connect parts of one long skinny polymer molecule to parts of other long skinny molecules. With the borax holding on, the polymer chains can't move past each other as easily anymore. This is why the liquid clumps up.

As you may notice when you play with slime, it can flow like a liquid does, but much more slowly. The polymer chains do still slide around a bit, even with the borax holding on. If you are patient, you will see that slime flows, pours, and takes the shape of its container just like a liquid does.

THE AMAZING PROPERTIES OF POLYMERS

What do baby diaper powder, growing dinosaur toys, slime, and plastic bags all have in common?

The materials you worked with today were all invented by chemists. They have something else in common, too. They are all polymers. Because of their special properties, these materials also have a wide variety of uses.

Polymers are everywhere. Some are invented by chemists and others are found in nature. Plastics, glue, clothing, balls, rubber, feathers, fur, turtle shells, and even your skin and hair are made of polymers. The list can go on and on because polymers make up so many different things. No matter where you find them or how you use them, polymers have amazing properties!

**Congratulations!
YOU DID CHEMISTRY!**



Visit www.acs.org/kids for more science activities you can do at home.



WHAT DID YOU LEARN?

What does the dinosaur in the picture have to do with the activities you did with your visiting scientist?



What is the secret that makes disposable baby diapers so absorbent?

What changes do you observe when you add borax solution to PVA solution?

List 2 things that are made of polymers.

Name one amazing property of a polymer that you explored with your visiting scientist.