

## Cl**o**verbud Investigator: STEM for Every Season



# Leak Proof Bag



### Background:

Take a gander around, odds are that there is a variety of the things you can see are made of plastics. There are hard plastics and soft plastics, clear ones and colorful ones, and plastics that look like other types of substances such as wood, metal, or leather.

The word plastic comes from the Greek word *plastikos* means "to mold." All plastics were soft and moldable during their fabrication - that's why they're called plastics. You can form practically any object out of plastics from bristles on toothbrushes to bulletproof vests.

Now that we know how plastics got its name, let's talk about what they are made from. Plastics are made with synthetic or man-made materials derived from organic (carbon-containing) compounds. The materials commonly come from oil (petroleum) or natural gas, but they can also come from other organic materials such as wood fibers, corn, or even banana peels!

Each of those small molecules is known as a monomer. Monomer means "one". Monomers are capable of joining with other monomers to form very long molecule chains. These long chains are called polymers. Polymers, means many. This long chain of polymers occurs during a chemical reaction called polymerization. Polymers continue to prove an indispensable part of life.

How do we use plastic in our everyday lives? We use plastic baggies almost daily to store foods, snacks, office supplies, and much more. It even holds in liquids. Ever wonder what that small thin plastic bag is made of and how it is so strong?

In the Leak-Proof Bag experiment, you will show the investigators how you can stick a bunch of pencils right through a baggie of water without gushing water all of the floor. There little faces will just light up when they will get to try it for themselves. The secret isn't magic; it's just the chemistry of polymers.

In spite of what it looks like, the baggie isn't covered in a magic sealant that blocks water from leaking out. When your investigators puncture these baggies with a sharpened pencil, they are basically separating polymer chains without breaking them. The long chains of molecules than squeeze in snug around the surface of the pencil stopping any sort of leak.



**September's Mystery:** Will our plastic baggie be leak proof with pencils stuck through it?

***Supplies:***

- 5 Sharpened pencils with round edges
- Zipper-lock sandwich plastic bag
- Zipper-lock quart plastic bag
- Zipper-lock gallon plastic bag
- Water
- Pitcher
- A few paper towels



**Science Behind Leak Proof Bag:**

The plastic bag is made out of long chains of molecules called polymers. This gives the bag its flexible properties. The sharpened pencils slide between the molecule strands without slitting the entire baggie. Believe it or not, the long chains of molecules seal back around the pencil to prevent leaks. Now that's the "Spear-It" of science!

**What to Do:**

**Step 1: Start by sharpening the pencils (if they aren't sharp already).**

**Step 2: Fill the bag ½ to ¾ full with water and then seal the bag closed.**

**Step 3: Hold the pencil in one hand and the top of the bag in the other hand.**

**Step 4: Push the pencil slowly, but firmly through one side of the bag and half way out the other side.**

**Step 5: Jab the remaining pencils through the bag.**

**Step 6: Hold the bag over the sink and remove the pencils. Throw away the bag and dry off the pencils.**



**Go Over Findings:**

What is a polymer?

Why didn't the bag leak when the pencils are stuck in it?

Would we have the same results if we used a sharpened barbecue skewer? Why or why not?

**Sources:**

The Leak-Proof Bag – Science Trick, Steve Spangler Science:

<http://www.stevespanglerscience.com/lab/experiments/leak-proof-bag/>

Plastics and Polymers, Plastics have changed the world,

<http://www.nobelprize.org/educational/chemistry/plastics/readmore.html>

Polymer Science Learning Center, The University of Southern Mississippi, Department of Polymer Science, <http://pslc.ws/macrog/kidsmac/basics.htm>

**Additional Links:**

Leak-Proof Bag - Cool Science Experiment, by Spangler Science TV:

<https://www.youtube.com/watch?v=LXRMVbPaZXw>

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