Spear-It

Materials

- Sharpened round pencils
- Plastic zipper lock bag
- Water
- Sink or plastic tub to catch water

Directions

Fill the bag 1/2 full of water and seal it closed.
Pose this question to your kids, “What would happen if I tried to push one of these pencils through the bag of water? Will the water leak out and make a giant mess?” Yes... unless you know the scientific secret.

Here comes the scary part. Hold the pencil in one hand and the top of the bag in the other hand. Quickly push the pencil right through one side of the bag and half way out the other side. If you do it fast enough you won’t spill a drop. The bag magically seals itself around the pencil. Sounds impossible?

Continue to rekindle your “spear-it” for science by jabbing the remaining pencils through the bag. Encourage youth to try it!

When you are finished, remove the pencils. Throw away the bag and dry the pencils.

Helpful hints

Make sure the tips of the pencils are sharpened to a point. Be careful not to push the pencils all the way through the bag or your “spear-it” experiment will turn into a big “clean- up-the-water” activity.

How does it work?

The plastic bag is made out of long chains of molecules called polymers. This gives the bag its stretchy properties. The sharpened pencil slips between the molecule strands without tearing the entire bag. 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!

Balloons and Skewers

Some things in this world just don't mix - dogs and cats, oil and water, needles and balloons. Everyone knows that a balloon's worst fear is a sharp object...even a sharpened, wooden cooking skewer. With a little scientific knowledge about balloons under your belt, you'll be able to perform a seemingly impossible task... pierce a balloon with a wooden skewer without popping it. Piercing takes on a whole new meaning!

Materials

- Several latex balloons (9 inch size works well),
- Bamboo cooking skewers (approximately 10 inches long),
- Cooking oil,
- Sharpie pen
- Nerves of steel

Directions

Inflate the balloon until it's nearly full size and then let about a third of the air out. Tie a knot in the end of the balloon.

If you carefully examine the balloon you'll notice a thick area of rubber at both ends of the balloon (where you tied the knot and the opposite end). This is where you will pierce the balloon with the skewer … but not yet. Keep reading.

Dip the tip of the wooden skewer into the cooking oil, which works as a lubricant. Place the sharpened tip of the skewer on the thick end of the balloon and push the skewer into the balloon. Be careful not to jab yourself or the balloon with the skewer. Just use gentle pressure (and maybe a little twisting motion) to puncture the balloon.

Push the skewer all the way through the balloon until the tip of the skewer touches the opposite end of the balloon where you'll find the other thick portion of the balloon. Keep pushing until the skewer penetrates the rubber. Breathe a huge sigh of relief and take a bow! Ta-Dah!

Gently remove the skewer from the balloon. Of course, the air will leak out of the balloon, but the balloon didn't pop.

A Balloon's Hidden Stress

Let's do it again, but this time you'll see the hidden "stress" in a balloon.

Before blowing up the balloon, use the Sharpie pen to draw about 10-15 dots on the balloon. The dots should be about the size of the head of a match. Be sure to draw them at both ends and the middle of the balloon.

Inflate the balloon half way and tie the end. Observe the various sizes of the dots all over the balloon.

Judging from the size of the dots, where on the balloon are the latex molecules stretched out the most? Where are they stretched out the least?

Carefully examine the wooden cooking skewer. Dip the tip in the vegetable oil and use your fingers to coat the skewer with oil.

Use the observations that you made previously with the dots on the balloon to decide the best spot to puncture the balloon with the skewer. Of course, the object is not to pop the balloon!

How does it work?

The secret is to uncover the portion of the balloon where the latex molecules are under the least amount of stress or strain. After drawing on the balloon with the Sharpie marker, you probably noticed that the dots on either end of the balloon were relatively small. You've just uncovered the area of least stress... the ends of the balloon. When the point of the skewer is positioned at the ends of the balloon, the solid object passes through the inflated balloon without popping it.

If you could see the rubber that makes up a balloon on a microscopic level, you would see many long strands or chains of molecules. These long strands of molecules are called a polymer, and the elasticity of these polymer chains causes rubber to be stretchy. Blowing up the balloon stretches these strands of polymer chains. Even before drawing the dots on the balloon, you probably noticed that the middle of the balloon stretches more than either end. You wisely chose to pierce the balloon at a point where the polymer molecules were stretched out the least. The long strands of molecules stretched around the skewer and kept the air inside the balloon from rushing out. It's easy to accidentally tear the rubber if you use a dull skewer or forget to coat the end of the skewer with vegetable oil. When you remove the skewer, you feel the air leaking out through the holes where the polymer strands were pushed apart. Eventually the balloon deflates… but it never popped. Thanks to chemistry, you're amazing!

Oh, just to prove your point, try pushing the skewer through the middle part of an inflated balloon. At least you went out with a bang.

Helpful Hints

Dip the tip of the skewer in oil each time you use the skewer.
A slow twisting motion works best to insert the tip.