Skewer Through a Balloon Lesson Plan

Amount of time Demo takes: 2-5 mins.
Try this at home!

Materials

- Large balloons (2/demo)
- Wood skewers
- Petroleum jelly (1 jar/day)
- A sharp pin (5)
- Scotch tape (1 roll/day)
- Paper towels (1 sheet/demo)

Set-up Instructions

1. Blow up several balloons, but not too full.
2. Dip the sharp end of the skewers in Vaseline.

SAFETY!

- Some people - especially younger students - are very startled/made nervous by popping balloons. Give them a heads-up that this does happen sometimes.
- With very young participants, skewer ends can be cut off or ask parent if it OK if they can carry a sharp skewer around.

Instructional Procedure

1. Have students blow up a balloon – not too full – and tie it shut.
2. Dip the sharp end of a skewer in Vaseline.
3. Insert the skewer with a slight twisting motion into the end of the balloon opposite the knot. Start at the dark spot on the top of the balloon. Continue pushing the skewer until the tip emerges from the other end, very near the knot.

Optional

4. Put a small piece of scotch tape on the side of the balloon and press it down well.
5. Take the pin and press it through the tape and into the balloon.

Lesson’s Big Ideas
Molecular Links: The rubber in the balloon consists of many long molecules that are linked together. It's similar to the way all of the noodles in a plate of spaghetti stick together.

Polymers: These long molecules are called polymers; when molecules of a polymer are chemically attached to each other called cross-linking. These links hold the polymer molecules together and allow them to stretch...up to a point. When the force or tension pulling on the cross-links is too great, they will break, and the polymer will pull apart. Look at the rubber near the ends of the balloon where you first inserted the skewer. Does it look lighter or darker than the rubber in the rest of the balloon?

Figure 1: Cross-linked polymer

Force: The rubber at the ends of the balloon is less stretched than in the middle of the balloon. That’s why it’s darker - there’s ‘more balloon’ there and less force pulling on it. This allows the tip of the skewer to break some polymer cross-links, push aside the molecules of rubber, and puncture the balloon (similar to working a knitting needle through a ball of yarn). However, enough cross-links remain so that the balloon holds together.

Cross Links: In the side of the balloon, there are fewer polymer molecules. When you push the tip of the skewer through the rubber in the side of the balloon and the skewer breaks a few of the cross-links, the tension on the remaining cross-links is too great and the balloon pops.

Clean Up

Throw away used/popped balloons. Clean up the mess generated from students getting Vaseline on the table, skewers, etc.
References
  ● http://scifun.chem.wisc.edu/homeexpts/needle.htm

Next Generation Science Standards
  ● K-5
    ○ K-PS2
    ○ 2-PS1-1
    ○ 3-PS2-1
    ○ 5-PS1-1