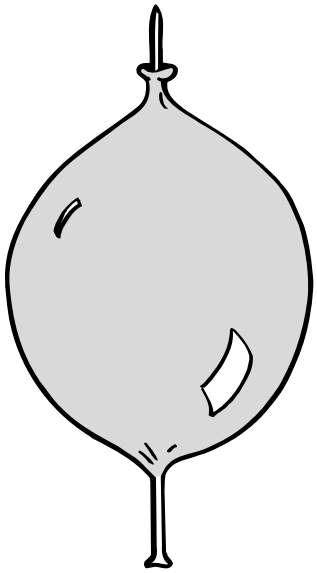
Balloon Needle Kit

Introduction

The needle through the balloon demonstration is a fun and interesting way to demonstrate the polymeric properties of latex balloons to your students.

Concepts

- Polymer properties



Materials

Balloon needle kit
- 22″ needle
- Crocus cloth
- Emery cloth
- Cork

Balloons, good-quality latex, 9-in or larger

Mineral oil

Paper towel or cloth

Safety Precautions

Keep a cork on the tip of the needle when not in use to prevent accidental stabbing. If a balloon explodes, be careful of flying particles. Wear chemical splash goggles and always follow laboratory safety rules when performing demonstrations. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Preparation

1. For best results, use a clean needle. If the needle shows signs of heavy oxidation, first clean the needle with emery cloth, then follow with crocus cloth. If the needle shows signs of only light oxidation, the crocus cloth should be sufficient to remove the oxidation.
2. For best results, use a sharp needle. If the needle becomes dull, sharpen it by folding a piece of emery cloth around the tip of the needle and rotating the needle back and forth until the tip is sharp. If necessary, polish the tip to smooth it with crocus cloth.

Procedure

1. Blow up the balloon to its full size. Release some of the air reducing the balloon volume to about 2/3 its full size. Tie the end of the balloon in a knot.
2. Use a cloth or paper towel to coat the needle with a small amount of mineral oil.
3. Slowly insert the needle through the end of the balloon where the latex is thickest. Use a twisting motion on the needle and apply only slight pressure. If the needle does not slide easily, more lubrication is needed. Continue inserting the needle through the balloon using a twisting motion until it reaches the other side. Penetrate the balloon again so that the needle comes out of the balloon near the knot.
4. Withdraw the needle from the balloon. The needle will leave two small holes in the balloon since the latex does not make a perfect seal in those spots.
5. Throw the balloon into the air and pop it with the needle so that your students are not aware of the holes left in the balloon.

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Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. Dispose of latex balloons in the trash. Save all other materials for next year.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Content Standards: Grades 5–8
Content Standard B: Physical Science, properties and changes of properties in matter
Content Standards: Grades 9–12
Content Standard B: Physical Science, structure and properties of matter

Tips

- The procedure outlined above is the procedure used by professional magicians. Although not essential, clear tape can be used to keep the balloon from breaking and will provide the inexperienced demonstrator an extra margin of confidence. To do this, simply put a piece of clear tape on each end of the balloon where the needle will penetrate the balloon's sur face.
- For safety reasons, metal needles can be replaced with wooden skewers when performing the demonstration with younger students. Lubricating the skewer with oil may not be necessary since wooden skewers generally contain sufficient oil to slide easily through the balloon. If the skewer does not slide easily, however, simply lubricate it as described for the metal needle. Make sure the wood skewer is smooth.
- When lubricating the needle, simply act as if you are cleaning the needle if you wish to perform the demonstration as more of a magic trick.
- Wipe the needle with a cloth or paper towel containing a small amount of mineral oil before storage. Store the needle with a cork on its tip to prevent accidental stabbing.

Discussion

Latex ballons are composed of rubber. Natural rubber is a polymer of isoprene (2-methyl-1,3-butadiene). The isoprene units are joined in a network structure and have a high degree of flexibility. Upon application of a stress to the balloon material, such as inflating it, the polymer chains, which are randomly oriented, undergo bond rotations allowing the chains to be extended or elongated. The fact that the chains are joined in a network allows for elastomeric recoverability since the cross-linked chains cannot irreversibly slide over one another. If the needle is sufficiently sharp and smooth, it will not tear the rubber, but will slide between the polymer chains, allowing them to stretch around the needle. The needle will leave two small holes where it penetrated the balloon's surface because the rubber does not make a perfect seal in those spots.

Acknowledgment

We would like to extend a special thanks to David A. Katz, Associate Professor of Chemistry, Community College of Philadelphia, for providing us with the instructions for this activity.

The *Balloon Needle Kit* is available from Flinn Scientific, Inc.

Catalog No.	Description
AP1969	Balloon Needle Kit
AP1900	Balloons, Latex, pkg/20
M0064	Mineral Oil, 500 mL

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.