

Smelly Balloons

Diffusion Through a Membrane

Introduction

It may be true that seeing is believing, but molecules are hard to see. Sometimes, however, we can smell them!

Concepts

- Diffusion
- Semipermeable membrane
- Motion of molecules

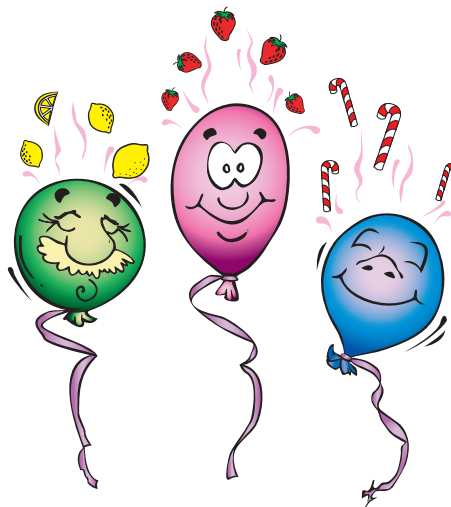
Materials

Balloons, large, latex, various colors

Flavor extracts, various—peppermint, vanilla, strawberry, orange, lemon, etc.

Pipets, Beral-type, one for each extract

String



Safety Precautions

Although latex is considered nonhazardous, not all health aspects of this substance have been thoroughly investigated. Latex may be an allergen. If a balloon explodes, be careful of flying particles. Wear safety glasses. All food items that are brought into the lab are considered laboratory chemicals and should not be consumed. Do not taste or ingest any materials in the lab. Do not remove any food items from the lab after they have been used in the lab.

Preparation

1. Select balloons of a variety of colors. Use a different color balloon for each extract.
2. Stretch each balloon several times with your hands before inflating. Inflate each balloon completely and then let the air out. This will also help to stretch out each balloon.
3. Add about 2 mL of a flavor extract to each balloon with a Beral-type pipet. Insert the pipet tip well inside the balloon before squeezing the pipet to add the extract.
4. Record which extract is placed in each balloon.
5. Blow up the balloons and tie them shut.
6. Fill one balloon with air to serve as a control.

Procedure

1. Pass the balloons around the class.
2. Have students record the “odor” of each balloon and compare their observations.

3. Discuss the following questions or concepts as appropriate:
- How do “smells” get out of the balloon?
 - What is the biological basis of smell perception?
 - Molecular motion
 - Diffusion
 - Semipermeable membranes

Discussion

The balloon is a semipermeable membrane that allows the selective passage of molecules through its apparent boundary. Molecules small enough to fit through the “holes” in the balloon membrane will diffuse through the membrane, both into and out of the balloon. The flavor extracts are mixtures of small organic molecules that, in general, are small enough to “fit” and thus diffuse through the balloon membrane. Eventually, the diffusing molecules reach the smell-sensing areas of the human nose and the molecules are detected as a smell outside of the balloon. Stored patterns of previous smells in our brains are used to interpret the recent and usually recognizable odors.

Disposal

Balloons can be deflated and tossed in the solid waste trash can.

Tips

- Flavor extracts may be purchased at grocery stores.
- Time each extract to see if one balloon allows all of its extract to escape faster than another.
- Compare the rate at which air escapes and the balloons deflate to the rate at which the smells escape.
- Does stretching the balloon before inflating it change the size of the “holes” and thus the rate at which the molecules escape? *Hint:* Try one balloon that has been inflated several times versus a new, uninflated balloon.
- Compare the rate of diffusion of an extract through a latex balloon versus a Mylar® balloon.

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 A: Science as Inquiry

Content Standard B: Physical Science, properties and changes of properties in matter

Content Standard C: Life Science, structure and function in living systems

Content Standards: Grades 9–12

Content Standard A: Science as Inquiry

Content Standard B: Physical Science, structure and properties of matter

Content Standard C: Life Science, matter, energy and organization in living systems

Materials for *Smelly Balloons* are available from Flinn Scientific, Inc.

| Catalog No. | Description |
|-------------|----------------------------------|
| AP1900 | Balloons, Latex, Assorted Colors |

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