



Drexel-SDP GK-12 ACTIVITY

Activity: Polymers All Around You

Subject Area(s) Chemistry
Associated Unit Polymers
Associated Lesson none
Activity Title Polymers All Around You
Grade Level 6 (3-8)
Activity Dependency None
Time Required 30 minutes
Group Size 2
Expendable Cost per Group approx. \$2

Summary

Students will learn that polymers are in all different common household items and that they all have very different properties by evaluating a variety of everyday items hands on. Students will be evaluate what the different material properties are and analyze the benefits of these different properties.

This module will introduce the students to the world of polymers. Students will learn what a polymer is, how they are made, and how they are used. Students will learn how important polymers are in their everyday lives. Students will also investigate polymers' connection to renewable and nonrenewable resources, landfills, and recycling through various inquiry based lessons and activities.

Engineering Connection

Chemical engineering is the application of science, mathematics and economics to the process of converting raw materials or chemicals into more useful or valuable forms. Chemical engineers work to produce the household items we use and appreciate every day, such as Teflon-coated cookware, plastic cups and brightly-colored candies. Plastics ranging from milk jugs to ladies' handbags to thermal underwear are also designed by chemical engineers – these plastics are often referred to as polymers. In this activity, students will investigate the absorption property of a polymer and will try to guess its identity.

Keywords

Polymer, chemical engineer,

Educational Standards

- Science:4.2.7 Renewable and non-renewable resources, A. Know that raw materials come from natural resources, B. Examine the renewability of resources, 3.1.7 Unifying themes, C. Identify patterns as repeated or recurring elements in science and technology., 3.2.7 Inquiry and Design, B. Apply process knowledge to make and interpret observations., 3.4.7 Physical Science, Chemistry, and Physics, A. Describe concepts about the structure and properties of matter
- Math: 2.5-Mathematical Problem Solving and Communication, E. Develop problem solving strategies (drawing a picture or a diagram), 2.6- Statistics and Data Analysis, A. Organize and display data using pictures, tallies, tables, charts, scatter plots, bar and circle graphs, 2.8- Algebra and Functions, B. Discover and describe patterns including linear, nonlinear relationships, D. Represent relationships using pictures, words and tables

Pre-Requisite Knowledge

Be familiar with the practice conducting an experiment in a controlled, measured way.

Learning Objectives

After this lesson, students should be able to:

- Explain what the properties and definition of a polymer.
- Give some examples of polymers around their house

Materials List

Rubber bands
Bouncy balls (rubber)
Stryofoam cups
Plastic cups
Plastic shampoo bottles (or something similar)
Nalgene® bottles
Neoprene® shirt
Gortex® gloves
Eggs
Any other common household polymers available
Plastic toy beads (to demonstrate polymer formation)

Introduction / Motivation

Students will be able to explain what a polymer is, build a model of a polymer, and examine their importance in everyday life.

Vocabulary / Definitions

| Word | Definition |
|-------------|--|
| Monomer | A simple molecule that can combine with other to form a polymer. |
| Initiator | An agent used to start the polymerization of a monomer. |
| Copolymer | Polymers made of two or more different types of monomers. |
| Homopolymer | Polymer made of all the same monomer |

Procedure

Background

Nearly all materials that make up living organisms involve polymers. Stages of civilization are characterized by the building materials used. The Stone Age was first, followed by the Bronze, Iron, and Steel Ages. We are now living in the age of polymers. The word polymer might be unfamiliar, but without them life as we know it would not exist.

Before the Activity

Review vocabulary on polymers.

With the Students

Methods:

1. Review polymer basics:
 - a. A Polymer is POLY (Many) MER (parts)
 - b. MONOMER = one repeat unit
 - c. COPOLYMER has different monomers
 - d. HOMOPOLYMER all the same monomer
2. Material properties
 - a. Flexible/Elastic
 - b. Toughness / Strength
 - c. "Strechiness"
 - d. Absorb water/repel water?
3. Hand out an assortment of materials to each group
4. Hand out worksheet (see Investigating Questions section of this activity)
5. Review as a group at the end of the session results for different materials
6. Why did they think they had these different properties
7. Have students evaluate the properties of the materials /
 - a. Similar/ different
 - b. Does it bounce?
 - c. Can you stretch it?
 - d. Etc
8. Which did they think were crosslinked?

Safety Issues

- None

Troubleshooting Tips

Students may have trouble understanding the repeating chains and how to translate that into a model. Give some demonstrations in front of the class using boys and girls as elemental blocks.

Investigating Questions

(Print into a worksheet for each student group)

Title: POLYMER MATERIALS

1. What do these materials have in common?
2. Do they stretch? Bend?
3. Can you tear them? Break them?
4. What happens if you drop it?
5. Which one would you carry your groceries in? Why? Why not a different one?
6. How do you think you could compare these materials experimentally?

Assessment

Pre-Activity Assessment

None

Activity Embedded Assessment

Each student completes worksheet of questions during class.

Post-Activity Assessment

Assign a writing activity based upon this lesson.

Activity Extensions

Suggested Reading:

Polymers All Around You!- Linda Woodyard

Owner

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