



Drexel-SDP GK-12 ACTIVITY

Activity: Silly Polymers

Subject Area(s)	Chemistry
Associated Unit	Polymers, module 1
Associated Lesson	none
Activity Title	Silly Polymers
Grade Level	6 (3-8)
Activity Dependency	None
Time Required	30 minutes
Group Size	2
Expendable Cost per Group	approx. \$2

Summary

Students will observe different material properties and be able to assess their benefits. Students will understand that polymers can be more complex than a simple string of monomers by making their own “silly polymer” (silly putty).

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 a polymer is
- Give some examples of polymers around their house

Materials List

Elmer's Glue®
Borax/powdered laundry detergent
Water
Plastic cups
Wooden popsicle sticks (to mix)
Food coloring
Measuring cups
Measuring spoons
Paper towels!
Baby wipes to clean "goop" spills

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
Cross linked polymer	Cross-links are bonds that link one polymer chain to another.
Branched polymer	Polymer having smaller chains attached to the polymer backbone.
Elasticity	The tendency of a material to return to its original shape after it has been stretched or compressed
Rubber	An elastic material obtained from the latex sap of trees.

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:

- Give students materials to make Goop (glue + borax + water + food coloring)
- Allow them to mix in their own ratios.
- What does it feel like? Look like? Students will record observations in their laboratory notebooks.
- What properties does it have? Does it stretch, does it bend? Does it hold its shape?
- How is this polymer different from the others? (Pass out store bought silly putty to compare to as well)
- How is it similar?
- Make a table on the board of different groups ratios of ingredients
- What happened? The polymer **CROSSLINKED**.
- Explain cross linked polymers, branched polymers, and material properties of these types of polymers.

Safety Issues

DO NOT EAT ANYTHING

Keep out of EYES

NO THROWING of anything

Keep water/glue/laundry detergent in the cup or bag... not on floors or tables

READ THE DIRECTIONS

Investigating Questions

- Did it work? Did it form a solid polymer? (silly putty)
- Compare to your neighbors.
- Do you know why it didn't work?
- What do you think happened

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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