

# Polymers - Teach

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Polymers - Teacher's Pages

Subject - Chemistry

Grade Level - Middle School

Objectives -

- To define and make a model of a polymer
- To compare and contrast similar types of polymers
- To make and describe the properties of slime
- To make and compare different balls observing how the type of material used affects the properties of the ball
- To define, make and compare 2 cross-linked polymers

Activities:

- Hook: Polymers are long chains of molecules. To demonstrate polymer structure - make a paper chain - as long as time and student interest allows.

- Packing Peanut comparison: Compare cellulose packing peanuts to poly packing peanuts. (Cellulose usually look more like peanuts and can be squished. Poly peanuts are like Styrofoam, and break when you try to squish them.)

- Perform several tests on the peanuts and record observations on the Packing Peanuts data sheet. Allow students to perform some of their own tests and record the results.

- Following testing discuss with students similarities and differences between the two types of peanuts also why the cellulose would be preferred by environmentalists.

- NOTE: Please be careful when using acetone - it will melt any plastic containers, you must use a glass container.

- NOTE: Depending on the age of the students you may want to do the burn test as a demonstration.

- EXTENSION ACTIVITY: Students can create artwork with packing peanuts.

- Slime: Using the Slime Worksheet prepare and play with slime. Record your observations on the chart.

NOTE: Slime will be hot after it is made and will need to cool before you can experiment with it.

- Making and Testing Balls:

- Gather and compare several types of rubber balls. Use different sizes as well as different types. Discuss how the material the ball is made of affects the way the ball bounces, also compare how the balls react when squeezed.

- Using Lab Activity Level 2 students make 3 or 4 types of polymer balls following the instructions given. Compare the performance of the balls.

- End with a discussion of the balls that were made and how the materials used affected the performance of the balls.

- NOTE: It may be difficult to find the sodium silicate solution for ball #4. Carolina Biological carries the chemical, but I do not know if they will sell to an individual. Many science supply companies send chemicals only to institutions. Vodka is a 40%-50% ethanol solution.

- Cross-linked Polymers: Using the Cross-linked Polymers worksheet make and experiment with Silly Putty and Funny Putty. (download WORD Format) or (download PDF Format)

- Note: you must be logged in with a current subscription for download link to function

- Assessment:

- Oral - Assess students understanding as they make comparisons and describe the properties of the various polymers made.

- Written - Have students create a Venn Diagram to show similarities and differences between some of the polymers studied

- OR - Have students write a comparison paper that shows their understanding of the properties and similarities and differences of various polymers

Additional on-line resources:

Kids Macrogalleria

<http://www.pslc.ws/macrog/kidsmac/index.htm>

This site provides a world of information and activities on polymers. It is designed for kids to explore and learn. Also has a section for parent and teachers. Best information I've found on polymers.

Polymer Science Learning Center

<http://pslc.ws/>

Parent site to Kids Macrogalleria - The "Educational Resources" section provides additional information and experiments. "Protector Man" use a comic book format to teach about physical characteristic of common polymer coatings. Experiments, teacher information and lab print outs available. Other great ideas as well.

## Slime

<http://www.frionaisd.com/webquests/osborn170.htm>

This is a very good web quest for learning about polymers. Some of the links no longer work, and they have the wrong link to the Macrogalleria - try the one above. Kids have lots of fun with the creative aspect of this web quest

{mospagebreak title=Materials}

### Materials Needed -

- Construction paper
- Scissors
- Stapler or glue
- Packing peanuts - poly and cellulose
- Acetone - contained in many nail polish removers. (You can purchase pure acetone in drug stores, or paint stores.)
- Protective clothing - goggles, apron
- Matches
- Water
- Gar gum powder - available at a health food store
- Borax - found with laundry detergents
- Measuring cups and spoons
- Saucepan
- Hot plate or other heat source
- Quart Ziploc storage bags
- Elmer's white glue and Blue Glue Gel

- Liquid latex rubber - hobby or craft store - where stage make-up supplies are sold
- 5% acetic acid solution - household vinegar
- Sodium silicate solution - chemical supply company
- 50% ethanol solution - Vodka
- 5-8 oz plastic cups
- Small craft sticks for stirring
- Liquid starch - found in isle with laundry products

{mospagebreak title=Nebraska Standards}

Nebraska Science Standards:

8.1.2 By the end of eighth grade, students will develop an understanding of evidence, models, and explanation.

8.1.4 By the end of eighth grade, students will develop an understanding of form and function.

8.3.1 By the end of eighth grade, students will develop an understanding of properties and changes of properties in matter.

8.8.2 By the end of eighth grade, students will develop an understanding of the nature of science.