

## Lesson #13: Humans and Polymers

<b>Stage 1 – Desired Results</b>	
<b>Established Goals: SLO D1:</b> Use the concepts of similarity and diversity for organizing our experiences with the world	
<b>SLO A5:</b> Describe disciplinary processes used to enable us to investigate and understand natural phenomena and develop technological solutions	
Understandings: Students will understand that... 1. Polymers are made by linking monomers 2. Polymers are useful. 3. Polymers introduce many STSE issues 4. Real-life examples of polymers 5. Many hydrocarbon-based products are made by polymerization	Essential Questions: What is the basic chemistry of hydrocarbons and how do we TAKE them from earth and MAKE products out of them? <b>SLO D1:</b> How can we use the concepts of similarity and diversity for organizing our experiences with the world?
Students will know... 1. C11-5-22 Describe the process of polymerization and identify important natural and synthetic polymers. Examples: polyethylene, polypropylene, polystyrene, polytetrafluoroethylene (Teflon) C11-5-23	Students will be able to... 1. Experience the making of polymers 2. Demonstrate work habits that ensure personal safety and the safety of others, as well as consideration of the environment. Include: knowledge and use of relevant safety precautions, WHMIS, equipment (C11-0-S1)
<b>Stage 2- Assessment Evidence</b>	
Knowledge: 1. Assess using questions directly from lab kit. 2. Assess understandings (#1-4) above	Skills: Assess laboratory skills
<b>Materials Required</b>	
Educator Reading: Teacher notes from <b>Manitoba Education, Citizenship &amp; Youth. (2006). Grade 11 Chemistry: A Foundation for Implementation. (Topic 5, page 68-77): Manitoba.</b> Materials for Lab Kit: Discovering Polymers Demonstration Kit (Source: Carolina) (list of materials is included in the kit) Alternate: Making Polvinyl Alcohol Slime ( <a href="http://www.chymist.com/PVA%20Slime.pdf">http://www.chymist.com/PVA%20Slime.pdf</a> ) Retrieved May 28, 2006 Access to web: On-line demonstration of the synthesis of nylon at Making Nylon. Retrieved May 28, 2007 from <a href="http://www.youtube.com/watch?v=y479OXBzCBQ&amp;mode=related&amp;search=">http://www.youtube.com/watch?v=y479OXBzCBQ&amp;mode=related&amp;search=</a>	
<b>Stage 3 – Learning Plan</b>	
<p><b>1. Slide 32:</b> Now we have taken from the earth, we will focus on the implications of MAKing the products (most of them require what Janine Benyus calls a “Heat-Beat-Treat” mental model (Benyus, 1997)</p> <p><b>2. Slide 33&amp;34:</b> We have several processes for “MAKing”. DISCUSS what the processes mean in general terms.</p> <p>3. Direct instruction as time permits using teacher notes from <b>Manitoba Education, Citizenship &amp; Youth. (2006). Grade 11 Chemistry: A Foundation for Implementation. (Topic 5, page 68-73): Manitoba.</b></p> <p>4. <b>Slide 35 &amp; 36-</b> Refer back to handouts on Rubbers/Plastics and Natural/Synthetic Fibers and discuss differing mental models (use diapers as an example of a product that does not have a cyclic plan for its TAKE-MAKE-WASTE)</p> <p>5. <b>Slide 37:</b> LAB KIT: Discovering Polymers Demonstration Kit. These can be used as demos, you can assign each one to groups of students to demo or present as magic tricks.            a) Diapers &amp; Sodium Polyacrylate (called the Super Sponge in the kit)(Also detailed in the Educator Reading). Be sure to discuss the sustainability of doing such demonstrations (ie does it violate any of the 4 guiding ideas?)</p>	

b) Rubber

c) Slime (If students have never done this, use the alternate Making PVA Slime)

d) The Invisible Crystal

(There is a demonstration of the synthesis of nylon at Making Nylon

<http://www.youtube.com/watch?v=y479OXBzCBQ&mode=related&search=>

Retrieved May 28, 2007)

7. **Slide 38** - DIRECT students to complete the MAKE Report at this time. These experiences will give them more “leads” for where to start researching how their particular product is made.

### **Extension Learning Activities**

Integrate The Invisible Crystal with index of refraction. See your nearest physics teacher to discuss these connections!

It would be GRAND to organize a POLYMER magic show for others! (include refraction and get a whole bunch of physics students to help!)

## **Teacher Notes**

**Source: Manitoba Education, Citizenship & Youth. (2006). Grade 11 Chemistry: A Foundation for Implementation. (Topic 5, page 68-77): Manitoba**