# #9666

# SELECTED DERIVATIVES OF HYDROCARBONS 2

LANDMARK MEDIA, 2001
Grade Levels: 10-13+
17 minutes

## DESCRIPTION

This organic chemistry tutorial is divided into two parts. Part 1, "selected derivatives, hydrocarbons," focuses on the properties of glycerol and phenol; part 2, "synthetic substances," demonstrates properties of polyethylene and the depolymerization of polyethylene.

## ACADEMIC STANDARDS

**Subject Area: Science – Physical Sciences**

★ Standard: Understands the structure and properties of matter

- Benchmark: Knows the variety of structures that may be formed from the bonding of carbon atoms (e.g., synthetic polymers, oils, the large molecules essential to life) and their roles in various chemical reactions, including those required for life processes (See Instructional Goals #1, 2, and 3.)
- Benchmark: Understands that chemical reactions either release or consume energy (i.e., some changes of atomic or molecular configuration require an input of energy; others release energy) (See Instructional Goals #1, 2, and 3.)

## INSTRUCTIONAL GOALS

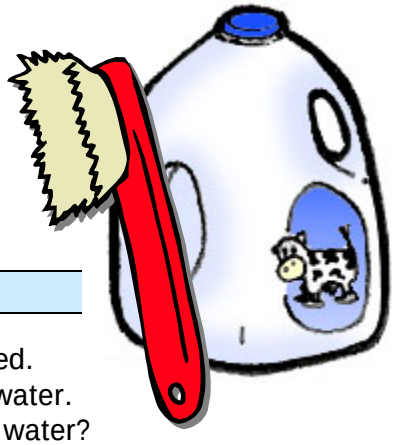
1. To demonstrate properties of glycerol.
2. To point out some properties of phenol.
3. To show some properties of polyethylene.

## VOCABULARY

1. bromine
2. coagulate
3. density
4. depolymerization
5. ethane
6. ethanol
7. exothermic
8. glycerol
9. litmus
10. monomer
11. mucous membrane
12. multifunctional
13. opaque
14. phenol
15. polyethene
16. polyethylene
17. polymer
18. potassium permanganate
19. primer
20. protein
21. thermoplastic
22. titration flasks


**Captioned Media Program**
**VOICE** (800) 237-6213 **TTY** (800) 237-6819 **FAX** (800) 538-5636 **EMAIL** info@cfv.org **WEB** www.cfv.org
Funding for the Captioned Media Program is provided by the U.S. Department of Education

## BEFORE SHOWING



1. Show the chemical formulas for the substances that will be discussed in the video: glycerol, phenol, polyethylene, and ethane. Note what the formulas have in common.
2. Display several examples of plastics (milk jug, toothbrush, plastic tubing, and credit card). List what each item would be made of if plastic was not invented yet and discuss the disadvantages of those materials.

## DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the section showing the glycerol being added to the water. What can be said about the density of glycerol compared with water?
3. Pause at the section after the test tube containing water and glycerol was shaken. What can be said about the solubility of glycerol in water?
4. Pause at the section showing the reagent bottle containing phenol. What does the hand symbol on the label indicate? What does the –OH symbol mean?
5. Pause at the section showing the litmus being added to the phenol. What does the color change indicate?
6. Pause at the section showing the bromine water being added to the phenol. What happened to the yellow color of the bromine water?
7. Pause at the section showing the protein being added to the phenol. What change took place?
8. Pause at the section showing polyethylene added to water and to ethanol. Determine the density of polyethylene according to the results of this demonstration.

## AFTER SHOWING

### ► Discussion Items and Questions

1. Glycerol is a multifunctional alcohol. What does this mean?
2. Why was it necessary to add dye to the water in this demonstration?
3. What chemical is used as the “volcano” in the demonstration?
4. What happens when glycerol is added to the potassium permanganate? What kind of reaction is this?
5. What happens to the chemical phenol when it is exposed to air? Why must one wear protective gloves when working with phenol? What are three properties of phenol demonstrated in the video?
6. What is polyethylene? What are some physical properties of polyethylene?
7. What is a thermoplastic?
8. Explain how two strips of polyethylene can be welded together.
9. What happens to melted polyethylene when it is cooled?
10. What is a polymer?
11. What does depolymerization mean?
12. After heating the polyethylene in the test tube for a length of time, what state of matter does it change to?
13. What is the monomer of polyethylene? How is the presence of that monomer proven?


**Captioned Media Program**
**VOICE** (800) 237-6213 **TTY** (800) 237-6819 **FAX** (800) 538-5636 **EMAIL** info@cfv.org **WEB** www.cfv.org
Funding for the Captioned Media Program is provided by the U.S. Department of Education

## ► Applications and Activities

1. Research and report on the practical uses of glycerol in the pharmaceutical industry, the food industry, and the chemical industry.
2. The reaction between glycerol and potassium permanganate is also called spontaneous combustion. Report on how spontaneous combustion occurs and list other examples.
3. Make a chart with information about phenol including its physical properties, chemical properties, production, and uses.
4. Report on the invention of plastics. Draw a timeline to show when specific plastics were invented.
5. Write an essay on "A World without Plastics".
6. Report on environmental issues regarding plastics.
7. Report on how plastics are recycled.
8. Research and report on other well-known polymers such as nylon and polyvinyl chloride.

## RELATED RESOURCES

- Hydrocarbons #9657
- Selected Hydrocarbons and Their Derivatives 1 #9667

### World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **ABOUT PLASTICS**

Contains information about plastics such as what they are, how they are made, the history of plastics, and the production of plastics.

http://www.mindfully.org/Plastic/About-Plastics.htm

- **IAN REED'S SCIENCE WIZARDS** http://sci_wiz.tripod.com/

Contains a collection of demonstrations and simple experiments that clearly point out scientific principles. Click on "complete list" and then "spontaneous combustion" to get instructions for the experiment with glycerol and potassium permanganate.

- **HOW ARE PLASTICS MADE** http://www.teachingtools.com/Slinky/imagine.html

Explains what plastics are and gives some history of their invention. Lists the steps in the petroleum-to-plastics process. Includes an activity about imagining life without plastics.


**Captioned Media Program**
**VOICE** (800) 237-6213 **TTY** (800) 237-6819 **FAX** (800) 538-5636 **EMAIL** info@cfv.org **WEB** www.cfv.org
Funding for the Captioned Media Program is provided by the U.S. Department of Education