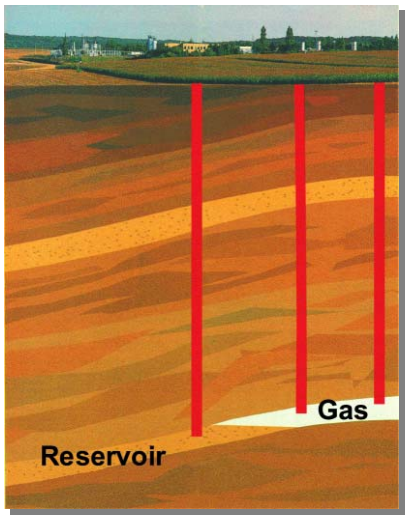

#9657

HYDROCARBONS

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

DESCRIPTION

Lab experiments demonstrate a variety of ways to detect carbon and hydrogen in organic substances. Burns hexane, benzene, cyclohexane, and naphthalene; shows properties of a propane-butane mixture.

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, 3, 4, and 5.)
- 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 Goal #2.)

INSTRUCTIONAL GOALS

1. To define hydrocarbons.
2. To demonstrate how the presence of carbon in organic substances can be detected.
3. To point out some properties of hexane, cyclohexane, benzene, and naphthalene.
4. To show that proteins contain carbon and hydrogen.
5. To demonstrate properties of a mixture of propane and butane.

VOCABULARY

1. hydrocarbon
2. organic compounds
3. hexane
4. cyclohexane
5. benzene
6. naphthalene
7. ethanol
8. proteins
9. copper (II) oxide
10. anhydrous copper (II) sulfate
11. apparatus
12. pressure tank
13. propane-butane mixture
14. ignited

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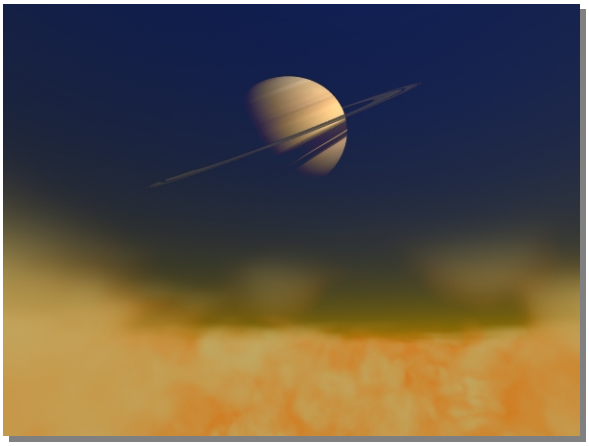
BEFORE SHOWING

1. Display several examples of hydrocarbons such as sugar, oil, alcohol, formaldehyde, and beeswax. Write their formulas on the board. Determine what all these substances have in common.
2. Discuss the difference between inorganic and organic chemistry.

DURING SHOWING



1. View the video more than once, with one showing uninterrupted.
2. Pause at the section showing the four hydrocarbons burning in the watch glasses. How can the presence of carbon be detected?
3. Pause at the section showing the experiment with ethanol. Point out the water vapor condensing on the walls of the glass cylinder. Explain that this proves the presence of hydrogen in ethanol.
4. Pause at the section showing the experiment with the peas. Display bottles of anhydrous copper sulfate and aqueous copper sulfate. Note the difference in color.
5. Pause at the section showing the pressure tank containing the propane-butane mixture. Note the foreign language printed on the label. Explain that the video was produced in another country.
6. Pause at the section when the thermometer is used to measure the boiling point of the mixture. What is the boiling point?
7. Pause at the section showing the liquid propane-butane mixture being changed into a gas. Point out the large gas bubble at the bottom of the tube, which indicates the volume of the mixture, has become much larger.
8. Pause at the section showing the gaseous mixture of propane and butane being poured into the trough.
9. What does this indicate about the density of the mixture?

AFTER SHOWING

► Discussion Items and Questions

1. What are hydrocarbons? What are organic compounds?
2. What happens if a cube of sugar is heated to a high temperature?
3. What are some general properties of the liquid hydrocarbons hexane, cyclohexane, and benzene?
4. What solid hydrocarbon is mentioned in the video?
5. How is the presence of hydrogen detected in hydrocarbons? What is the test for carbon dioxide?
6. What hydrocarbons are contained in peas? What is the reason for mixing the crushed peas with copper (II) oxide?
7. Why is anhydrous copper (II) sulfate used in the experiment?
8. What reaction takes place in the test tube containing limewater?

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9. What state of matter is a mixture of propane and butane in a pressure tank? Why does water vapor from the air condense on a test tube containing the propane-butane mixture?
10. How is the liquid propane-butane mixture changed to gas in the experiment?
11. What state of matter is a mixture of propane and butane under normal temperature and normal pressure?
12. Is the propane-butane mixture soluble in water?

► Applications and Activities

1. Research and compare the number of inorganic compounds with the number of organic compounds.
2. Hexane, cyclohexane, butane, and naphthalene have characteristic odors. Research or obtain samples of each and describe the odors.
3. Research the production and use of ethanol.
4. Research the chemical composition of peas.
5. Report on the effect of hydrocarbons on pollution.
6. Experimenting with hydrocarbons can be dangerous. List safety measures that should be taken when:
   a. extinguishing the flames caused by burning hydrocarbons.
   b. testing for the odor of hydrocarbons.
   c. pouring a gaseous propane-butane mixture into a flask.
7. Research and list common substances that are made from hydrocarbons. Create a slide show using digital pictures of the substances.

RELATED RESOURCES

- Selected Derivatives of Hydrocarbons 2 #9666

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.

- **SUMMARY OF THE PROPERTIES AND USES OF HYDROCARBONS**

http://www.ausetute.com.au/usehydrc.html

Contains a table that lists the formula, melting point, boiling point, state of matter, and uses of some hydrocarbons.

- **ORGANIC CHEMISTRY**

http://www.pinkmonkey.com/studyguides/subjects/chem/chap13/c1313101.asp

Contains information such as the differences between inorganic and organic compounds, functional groups, and formulas for organic compounds.

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