



#9667

SELECTED HYDROCARBONS AND THEIR DERIVATIVES 1

LANDMARK MEDIA, 2001

Grade Levels: 10-13+

18 minutes

DESCRIPTION

Focuses on organic chemistry experiments that demonstrate the preparation and properties of ethanol. Additional experiments review ethyne (acetylene), and naphthalene.

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 #2, 3, 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 Goals #1, and 4.)

INSTRUCTIONAL GOALS

1. To show how to produce the hydrocarbon ethyne.
2. To point out properties of ethyne.
3. To demonstrate properties of naphthalene.
4. To show how to produce the hydrocarbon ethanol.
5. To point out some properties of ethanol.

VOCABULARY

- | | |
|----------------------|---------------------|
| 1. acetic acid | 11. ethanol |
| 2. acetone | 12. ethyl alcohol |
| 3. acetylene | 13. ethyne |
| 4. apparatus | 14. exothermic |
| 5. bromine | 15. fermentation |
| 6. calcium carbide | 16. limewater |
| 7. conical flask | 17. naphthalene |
| 8. copper (II) oxide | 18. sodium ethoxide |
| 9. ethanal | 19. sublimation |
| 10. ethanoic acid | |

BEFORE SHOWING

1. Display the formulas for substances that will be seen in the video: ethyne, naphthalene, ethanol, ethanoic acid, acetic acid. Note what the formulas have in common.
2. Perform an experiment that produces ethanol.
 - a. Dissolve a tablespoon of sugar in a beaker of warm water and add $\frac{1}{4}$ of a yeast cake or package of dried yeast.
 - b. Allow the beaker to stand for several days in a warm place.
 - c. Smell the yeast culture and note the odor of ethanol. Compare it with rubbing alcohol.
 - d. Note the bubbles and discuss ways to test to identify the gas that is produced.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the section showing the reaction of calcium carbide with water. Explain why there is white fog in the flask.
3. Pause at the section showing the decolorization of bromine water. Discuss why the bromine solution lost its color. Write the equation to show the reaction.
4. Pause at the section showing the ignition of ethyne. Discuss its use as a torch.
5. Pause at the section showing the caption "like dissolves like". Explain the meaning of the phrase and predict which liquid the naphthalene is soluble in.
6. Pause at the section showing the unfamiliar fruit juice carton. Explain that the video was produced in another country.
7. Pause at the section showing the fermentation process. Clarify the use of water in the thin tube.

AFTER SHOWING

► Discussion Items and Questions

1. What two substances react to form ethyne gas? What is another name for ethyne?
2. Since calcium carbide reacts violently with water, what precautions should be taken when storing the chemical?
3. When heat is released during a reaction, what is the reaction called?
4. Ethyne causes the characteristic brown color of bromine to disappear. Predict what will happen to its odor.
5. What is sublimation?
6. How is the naphthalene separated from the charcoal?
7. What is another name for ethanol? In what drinks is ethanol found?
8. In the fermentation process, what is the sugar in the fruit juice changed to? What gas is released? What alcoholic beverage is formed? How can the presence of alcohol in wine be detected?
9. If wine is left in an open container, what acid is eventually formed? How may the presence of this acid be detected?
10. What reaction occurs when sodium metal reacts with ethanol?
11. What reaction occurs when copper (II) oxide reacts with ethanol?



► Applications and Activities

1. Sketch the apparatuses used in the following experiments in the video and write a description of the reaction that occurs in each:
 - a. the reaction of calcium carbide and ethyne
 - b. the separation of naphthalene from a mixture
 - c. the reaction of yeast with fruit juice
 - d. the reaction of sodium with ethanol
 - e. the formation of copper (II) oxide
 - f. the reaction of copper (II) oxide with ethanol
2. Invite a local welder to come and demonstrate the operation of an oxyacetylene torch. Inquire about the uses of the torch, the temperature of the flame, and the safety precautions taken.
3. Research and report on the reaction of ethyne with halogen gases other than bromine.
4. Research information on the solid hydrocarbon naphthalene. Include its color, odor, melting point, solubility, use, abundance, and molecular structure.
5. Acetone is a very common organic solvent. Check various household products and list those which contain acetone. (varnish remover, fingernail polish remover, paint remover) Note its characteristic odor.
6. Report on the properties, preparation, industrial, and medical uses of ethanol.
7. Report on eras of history where moonshining was widespread.



RELATED RESOURCES



- [Hydrocarbons #9657](#)
- [Organic Acids #9663](#)
- [Selected Derivatives of Hydrocarbons 2 #9666](#)



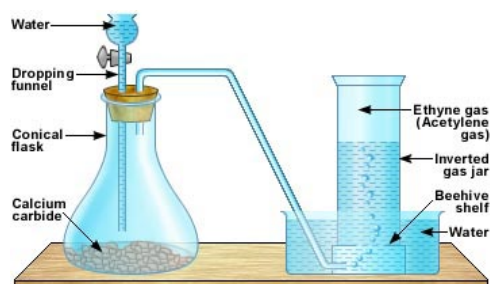
World Wide Web

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.

• ORGANIC CHEMISTRY

Contains information about ethyne with an illustration of how to prepare it in the lab. Lists physical properties, chemical properties, and uses of ethyne.

http://home.att.net/~cat6a/org_chem-VI.htm



A labelled diagram of the apparatus for the laboratory preparation of ethyne or acetylene.

Chemical of the Week

- **CHEMICAL OF THE WEEK: ETHANOL**

<http://scifun.chem.wisc.edu/chemweek/ethanol/ethanol.html>

Contains information about ethanol including its properties, methods of preparation, and its affect on the central nervous system. Also includes a table of blood alcohol levels.

- **ETHANOL SCIENCE AND TECHNOLOGY**

<http://www.nwicc.cc.ia.us/Module2.htm>

Includes information about ethanol such as its properties, structural formula, lab preparation, and commercial preparation. Also explains about ethanol fuel.

Module 2



Ethanol Science & Technology
