



#9663

ORGANIC ACIDS

LANDMARK MEDIA, 2001

Grade Levels: 10-12

12 minutes

DESCRIPTION

Organic acids, found in common foods, appear as citric acid (lemons), acetic acid (vinegar), and malic acid (apples). Also shows esterification and the formation of an ester.

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 Goal #1.)
 - 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 #2 and 3.)

INSTRUCTIONAL GOALS

1. To point out properties of citric acid, acetic acid, and malic acid.
2. To demonstrate a neutralization reaction using sodium hydroxide and acetic acid.
3. To show the reaction of an organic acid and a metal.
4. To demonstrate esterification.

VOCABULARY

- | | |
|---------------------|----------------------|
| 1. acetic acid | 12. lactic acid |
| 2. alkali | 13. litmus |
| 3. aroma | 14. malic acid |
| 4. citric acid | 15. neutralization |
| 5. condenser | 16. organic acids |
| 6. ester | 17. oxalic acid |
| 7. esterification | 18. sodium chloride |
| 8. ethanol | 19. sodium hydroxide |
| 9. formic acid | 20. sulfuric acid |
| 10. indicator | 21. zinc |
| 11. inorganic acids | 22. zinc acetate |

BEFORE SHOWING

1. Review the difference between inorganic chemistry and organic chemistry.
2. Introduce the -COOH functional group.
3. Compare inorganic and organic acids.
 - a. Display bottles of inorganic acids such as hydrochloric acid, sulfuric acid, and nitric acid. Write the formulas for each.
 - b. Display bottles of organic acids such as acetic acid, malic acid, and citric acid and write the formulas for each.
 - c. Note the similarities and differences in the formulas.
 - d. Show two different ways that the formula for acetic acid can be written.
4. Review neutralization. Write the equation for the reaction of sodium hydroxide with hydrochloric acid. Predict what will happen if an organic acid is used instead.
5. Review reactions that occur between an acid and metal. Write the equation for the reaction of hydrochloric acid and zinc. Predict what will happen if an organic acid is used instead.
6. Display the following: an apple, a lemon, a carton of milk, a bottle of aspirin, and a bottle of vinegar. Discuss what these substances have in common.



DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the section where an indicator is added to the sodium hydroxide on the watch glass. Which indicator is used?
3. Pause at the section showing the white solid remaining on the watch glass. What is the name of this salt?
4. Pause at the section showing the reaction between acetic acid and zinc. Where is the zinc acetate?

AFTER SHOWING

► Discussion Items and Questions

1. Where are organic acids found in nature? How can the presence of organic acids be detected?
2. What organic acid is found in lemons? In vinegar? In apples? What are three other organic acids mentioned in the video?
3. What happens when sodium hydroxide reacts with the organic substance acetic acid? How can the salt and water be separated?
4. How can the reaction of acetic acid with the metal zinc be speeded up? What gas is given off? What is the name of the salt produced?
5. What is esterification? What is an ester?
6. Why is sulfuric acid added to the reaction mixture of acetic acid and ethanol? Where does the ester collect in the experiment? How can the ester be separated from the water?
7. What are esters used for?

► Applications and Activities

1. Make a table of organic acids. Include the name, chemical formula, structural formula, its relative strength, where it is found, and its practical use.

2. Research and report on other indicators that can be used to detect the presence of acids and the color changes that are characteristic of acids.
3. Report on different kinds of esters and their characteristic smells. Include the chemicals that are needed to produce these esters.
4. Research and report on how "scratch 'n sniff" stickers are made.

RELATED RESOURCES

- [Electrolysis & Corrosion #9655](#)
- [Metals 2 #9660](#)
- [Salts #9665](#)
- [Selected Derivatives of Hydrocarbons 2 #9666](#)



World Wide Web

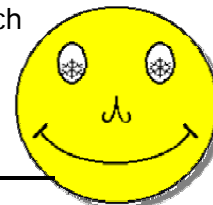
The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. 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.

- **ESTERS, THE SECRET OF NATURAL AND SYNTHETIC FRAGRANCES**

<http://www.iit.edu/~smile/ch9205.html>



Includes an activity that explains which foods and plants have esters, which fragrances are given off, and how esters are synthesized.



- **ORGANIC ACIDS**

http://www.schoolresult.com/chemistry/organic_chemistry9.htm

Includes information on organic acids such as preparation, physical properties, chemical properties, and uses.