



#9661

NATURAL SUBSTANCES

LANDMARK MEDIA, 2001

Grade Levels: 9-12

19 minutes

DESCRIPTION

Experiments illustrate the presence and properties of: (1) saccharides (glucose and starch) in fruits and vegetables; (2) lipids (fats) in nuts and vegetable oils; and (3) proteins in eggs, meat, and milk. Emphasizes that chemistry is all around us.

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, 4, and 7.)
 - 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 #8.)

INSTRUCTIONAL GOALS

1. To show examples of food containing carbohydrates.
2. To demonstrate how to detect the presence of glucose.
3. To demonstrate how to detect the presence of starch.
4. To point out some foods that contain fats.
5. To show how to detect the presence of lipids in crushed nuts.
6. To demonstrate some properties of lipids.
7. To show examples of foods that contain proteins.
8. To show how proteins behave when heated and how they react with some substances.
9. To demonstrate how to detect the presence of nitrogen in a vegetable protein.

VOCABULARY

- | | |
|------------------------|-----------------------------|
| 1. alkaline | 9. extraction |
| 2. bromine | 10. Fehling's reagent |
| 3. calcium oxide | 11. glucose |
| 4. carbohydrates | 12. heterogeneous substance |
| 5. carbonyl group | 13. iodine |
| 6. coagulate | 14. lipids |
| 7. copper (II) sulfate | 15. monosaccharide |
| 8. ethanol | 16. nitrogen |

17. phenolphthalein
18. polysaccharide
19. protein

20. saccharides
21. unsaturated double bond

BEFORE SHOWING

1. Display several examples or pictures of foods. Categorize them in different ways:
 - a. healthy or unhealthy
 - b. placement on the food pyramid
 - c. same color
 - d. similar taste
2. Obtain three small empty boxes. In the first box place food found in a vending machine, in the second box put food served in the school cafeteria, and in the third box put food brought from home.
 - a. Discuss which groups are probably higher in sugar, in starch, in protein, and in fats.
 - b. Explain that one way to find out how much sugar, starch, protein, and fat are in foods is to perform chemical tests on them.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the sections showing various unfamiliar food items. Explain that this video was made in a different country.
3. Pause at the section showing the bottle of iodine. What does the symbol on the bottle indicate?
4. Pause at the section showing the effect of temperature on the iodine test. Explain why this happens.
5. Pause at the section showing the reaction of oleic acid with bromine water. Explain why the color of the bromine water disappeared.
6. Pause at the section showing the calcium oxide being added to the crushed peas. What is the purpose of using calcium oxide in this experiment?



AFTER SHOWING

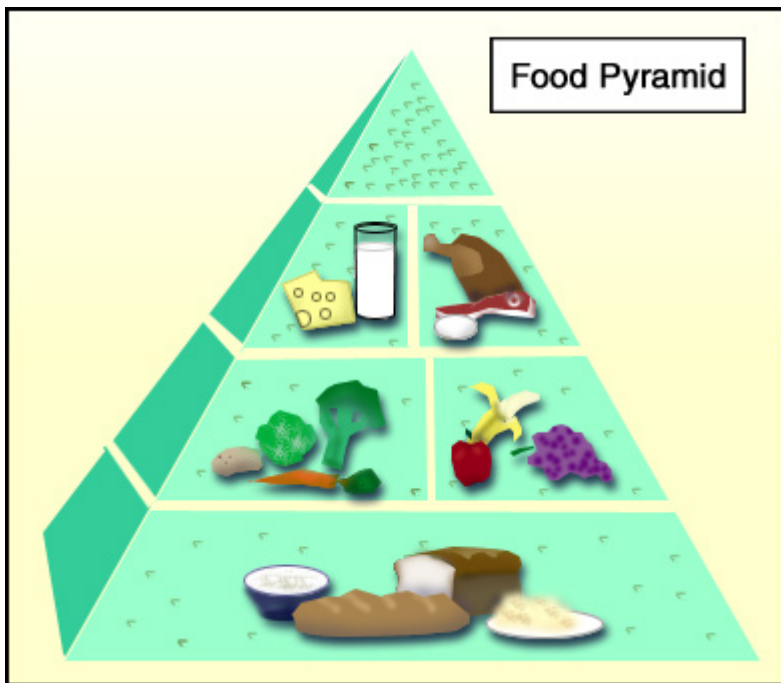
► Discussion Items and Questions

1. What are carbohydrates? What is the chemical name for carbohydrates? What are some foods that contain carbohydrates?
2. What is a monosaccharide? What is the monosaccharide found in apple juice?
3. What experiment is performed to detect the presence of glucose in a substance? What functional group is responsible for the color changes in the glucose test?
4. What carbohydrate is found in potatoes? What other foods contain starch? What is the chemical name for starch?
5. How is the test for starch performed? In the starch test, what happens when the contents of the test tube are heated? When they are cooled in a beaker of ice?
6. What is the chemical name for fats? In what foods are fats found?
7. What is the purpose of adding ethanol when testing for fats? What happens to the filter paper that contains fats?

8. What is oleic acid?
9. What are proteins? What happens when protein is heated?
10. What happens when protein reacts with the following substances: concentrated nitric acid, sodium hydroxide, copper (II) sulfate, and ethanol? How are the results of this experiment relevant to health issues?
11. How can the presence of nitrogen in protein be detected?

► **Applications and Activities**

1. Draw the food pyramid on poster board and list foods that are in each group. Write a paragraph explaining the importance of each food group.
2. Test various foods for sugar, starch, and fats. Create a table and show the results.
3. Display samples of unknown substances. Perform the tests for sugar, starch, and fats. Given a list, identify the substances.
4. Research and report on tests to detect proteins.
5. Research and report on different kinds of oils such as olive, canola, safflower, coconut, and linseed. Rank the oils in order of health value.
6. Report on triglycerides which are made up of fatty acids such as oleic acid.
7. Report on the following:
 - a. saccharides
 - b. monosaccharides
 - c. polysaccharides
 - d. carbonyl group
8. Draw the structural formulas for each of the organic compounds mentioned in the video.



RELATED RESOURCES

- [Organic Acids #9663](#)
- [What is Chemistry? #3534](#)



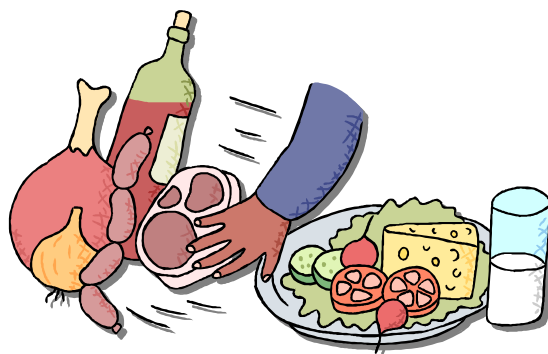
World Wide Web

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.

- **THE BIOCHEMICAL GUESSING GAME!**

<http://myworksheets.com/science/chem/lab1/>

Contains an activity to perform chemical tests and find out which foods have carbohydrates, lipids, and/or proteins. Includes a prediction table.



- **LIPID CHARACTERIZATION**

http://academics.vmi.edu/chem_aa/CH150/experiments/lipids.htm



Includes an activity observing different kinds of lipids and noting their physical properties, chemical properties, and molecular structure.

- **ORGANIC CHEMISTRY GUIDE PICKS**

<http://chemistry.about.com/cs/organic/>

Contains links to sites with information on organic chemistry. Includes a section on food chemistry.

