

Polymers and Crystals

Summary

Observations and experiments dealing with crystals and polymers and their roles in food science.

Main Core Tie

Food Science

[Strand 6 Standard 3](#)

Background for Teachers

The term carbohydrate refers to a group of compounds which have a similar structure. They are the most abundant organic molecules on earth and are produced by living organisms (plants not animals).

All carbohydrates are composed of carbon (C), hydrogen (H), and oxygen (O), and contain the same ratio of hydrogen to oxygen as occurs in water. Carbohydrates are identified by the number of saccharide units in their structure.

Sugars and starches are carbohydrates. Sugar is the quick energy source for cells in both plants and animals, excluding humans. When sugars are digested in the cells, they are oxidized.

Oxidation occurs when oxygen molecules interact with other molecules and strip away some of their electrons. (the Epicurean Laboratory, p.5). Starch is formed by many sugar molecules bonding together. Sugar molecules also bond to starch to form crystals. Oxygen molecules have an affinity for electrons and will pull them away from any other molecule that has electrons in weak or loose bonds. Oxidation of a molecule changes the original appearance and properties of the molecule. It also releases energy held in a molecule's bonds. For example, when wood burns, the oxygen in the air reacts with wood, the becomes ashes, energy is released. DNA in cells masterminds oxidation.

Intended Learning Outcomes

All sugars and starches are crystalline in nature and some are composed of molecules that are polymers.

Instructional Procedures

See attachments below:

As a PREASSESSMENT, the students will respond to a series of questions about sugars. This quiz may be given orally or on paper. This preassessment should not be graded. It is very possible that only a few students will be able to respond correctly. the teacher can use a poor response to point out that the purpose of the unit of study is to explore the concepts of the questions in the quiz. It is OK for students to guess at answers on a preassessment.

The students will participate in scientific activities which involve polymers and POLYMERIZATION.

The activities will:

1. Describe several natural and man-made polymers.
2. Identify the chemical elements in man-made polymers.
3. Diagram atomic structure and use it to understand bonding.
4. Describe, observe, and model polymerization.
5. Apply understanding of polymerization to explain the behavior and nature of gelatin.

NOTE TO TEACHER: If you do not feel comfortable with this option, ask a science teacher for assistance in presenting the concepts to the students and overseeing the activities with you. The teacher will have the students use the computer, choose a symbol, graphically construct sugar molecules, and then show them bonded together to form starch molecules.

The students will collect labels from adult and childrens' cereal (or other food) packages. They will list separately the amount of sugar each label discloses. Remember that 1/4 tsp. sugar on a piece of waxed paper. On a second sheet of waxed paper, they will place the amount of sugar indicated on the product label.

Observe, compare, and discuss results of the displays.

Knowing that sugars and starches are both carbohydrates and that one gram of carbohydrate provides 4 calories, the students will peruse food labels to figure the calories from the carbohydrates found in any food product. The students will complete the worksheet CALORIES IN CARBOHYDRATES.

Authors

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