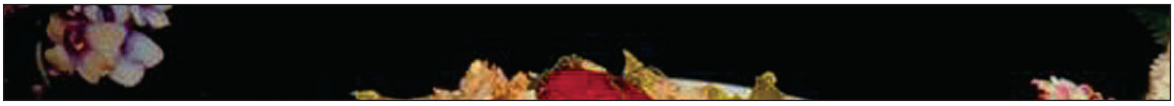
Food Nutrient Analysis



TEACHER'S MANUAL AND STUDENT GUIDE

Carolina BioKits®

CAROLINA®
www.carolina.com

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TEACHER'S MANUAL

STUDENT GUIDE

Photocopy the Student Guide as needed for use in your classroom.

Food Nutrient Analysis

Investigative Phenomenon

If you hold a cracker in your mouth for several minutes without chewing, a sweet taste will develop. Amylase, a digestive enzyme, is present in human saliva. As students hold crackers in their mouth, amylase breaks the bonds of starch molecules, removing glucose subunits from the larger macromolecules. The concentration of sugar molecules increases as this process continues. The longer the students keep the cracker in their mouth, the higher the concentration will become. Eventually the concentration will reach a level that the sweet receptors in a student's mouth detect the sugar, and the individual will notice a shift from a starchy taste to a sweet taste.

This phenomenon provides students with a direct experience of different nutrient components in food and the way in which those nutrients are structurally connected to one another. This phenomenon further presents students with the opportunity to make an initial claim in response to the Driving Question, "What evidence can I use to support an argument for which types of nutrients, primarily large, carbon-based macromolecules, are present in the different foods that I eat?" Throughout this series of laboratory investigations, students collect and evaluate evidence to add more layers of depth and understanding to their claim.

Related Performance Expectations

The activities in this kit build toward the following Performance Expectations of the Next Generation Science Standards*:

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.

Three-Dimensional Learning

The activities in this kit address the following dimensions of the Next Generation Science Standards.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge, and student-generated evidence.	**LS1.C: Organization for Matter and Energy Flow in Organisms** • The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.	**Patterns** • Empirical evidence is needed to identify patterns.

*"Next Generation Science Standards" is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards was involved in the production of, and does not endorse, this product.
Source: NGSS Lead States, 2013. *Next Generation Science Standards: For States, By States.* Retrieved from **www.nextgenscience.org** or **ngss.nsta.org**.

Accessing Carolina's Digital Resources

This kit includes free 1-year access to digital resources designed to engage your students and support the lab.

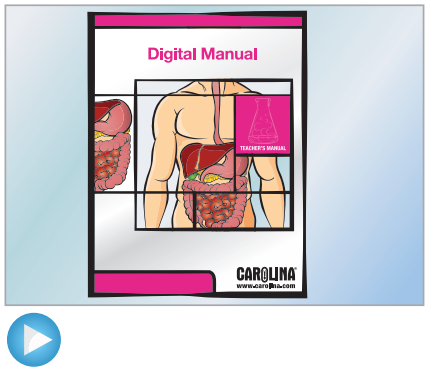
We sent the purchaser of the kit an e-mail with the access code to unlock the free resources for this product. If you did not receive the e-mail, contact the purchaser, call 800.334.5551, or e-mail us at **cso_support@carolina.com** to get the access code. When contacting us, please provide your order number, school/district name, and the purchaser's name if possible.

To redeem your access code, visit **carolinascienceonline.com** and follow these steps:

1. If you do not have an account, click on Teacher Login to create one.
2. If you already have an account, log in.
3. Click "redeem access code" and enter your code.

After you redeem your code, you can access the complete playlist of digital resources bundled with this kit. An example playlist is shown below. See the next page for a list of resources specific to this kit, which may include videos and interactive lessons, as well as a Digital Teacher's Manual.

Digital Teacher's Manual



Digital Teacher's Manual:

- Digital version of the printed manual
- Viewable on any device
- Links to downloadable resources

Video

Videos may include:

- Safety
- Animations
- Procedures
- Phenomena

Interactive Digital Lesson

Interactive Digital Lessons may include:

- Prelabs
- Postlabs
- How-to Lessons
- Safety Lessons
- Assessments
- Simulations

You can assign these resources to your students' CSO accounts! Find these tutorials, before log-in, at **carolinascienceonline.com**. Look for this icon:

Your Digital Resources

Your digital resources will be available to you for 1 year after you redeem your access code.

Record the date of first access: _____/_____/_____

Digital Teacher's Manual

The Digital Teacher's Manual is an HTML version of the printed manual. It can be viewed on any device. In addition to the contents of the entire printed manual, the Digital Teacher's Manual includes hyperlinks to the **downloadable** and **printable** resources listed in the table below. If you are currently viewing the Digital Teacher's Manual, you can click on any resource in the table and view, download, or print it.

Resource (click to access)	How to Use
Student Guide PDF	This digital version of the Student Guide can be printed and distributed to students or groups. As a paper-saving alternative, however, you also can assign it for viewing on students' electronic devices.
Fill-in Answer Sheets	This is a PDF of the manual's questions and data tables, without lab procedures and illustrations. You can send these to your students electronically or print them. Students can provide their answers digitally, save the document, and send it back to you (or print it out).
Editable Assessment Questions	This Microsoft® Word document contains all the assessment questions found in the Student Guide. You can edit these questions or add your own, and then print them or assign them to students electronically.
Whiteboard Resources	This PDF is a compilation of the important photos and illustrations in the Teacher's Manual and Student Guide. Use them on a whiteboard as instructional tools and incorporate them into laboratory investigations, class discussions, presentations, and assessments.
Polysaccharide Graphic	This is a legal-sized, downloadable document that teachers should print and cut into strips for the Prelab.

Interactive Digital Lessons:

Nutrients Tutorial – This digital resource uses a combination of interactive modules, video, and text to introduce to the basic groups of macromolecule nutrients including their function, sources, importance, and relationships.

Student Artifacts

Throughout the lab, students produce artifacts as evidence of three-dimensional learning, including but not limited to the following.

Lab Component	Student Action or Behavior	Artifact Generated
Prelab	• An initial claim explaining the taste change in crackers held in the mouth. • An analysis of the available information on a nutrition label, and its efficacy to a scientist in building evidence-based arguments.	Answers to Prelab Questions
Investigation 1	Color-coded guide to using the included indicator solutions.	Nutrient Analysis Toolbox table
Investigation 2	• An evidence-based argument of the identities of two unknown samples. • An analysis of the potential limitations of the Nutrient Analysis Toolbox presented in Investigation 1.	Answers to Analysis questions
Investigation 3	An evidence-based conclusion for the taste change described in the investigative phenomenon.	Answer to Analysis question
Assessment	An argument as to the potential efficacy of these analytical tools for the analysis of the nutritional variation between whole and skim milks.	Answers to the Assessment Questions

Objectives

Students' performance objectives are to

- use evidence collected in the lab to argue the identity of two unknown solutions.
- use evidence collected in the lab to make a claim as to the effect of saliva on starch molecules in a cracker.
- use evidence collected in the lab to make claims regarding the efficacy of a set of indicator solutions used for determining the nutrient content of foods.

Prerequisite Knowledge and Skills

- the role of an indicator molecule to determine a positive or negative lab result
- introductory knowledge of biological macromolecules (i.e., carbohydrates, lipids, proteins)
- basic knowledge of elements, compounds, chemical formulas, and chemical reactions

Time Requirements

Teacher Preparation . . . . . 35 minutes
Prelab . . . . . 35 minutes
Investigation 1
- Station 1 (Sugar Test) . . . . . 15 minutes
- Station 2 (Starch Test) . . . . . 5 minutes
- Station 3 (Lipid Test) . . . . . 10 minutes
- Station 4 (Protein Test) . . . . . 5 minutes
- Station 5 (Vitamin C Test) . . . . . 5 minutes

Investigation 2 . . . . . 35 minutes
Investigation 3 . . . . . 25 minutes
Assessment . . . . . 10 minutes