

muse®

Everything Is Chemical

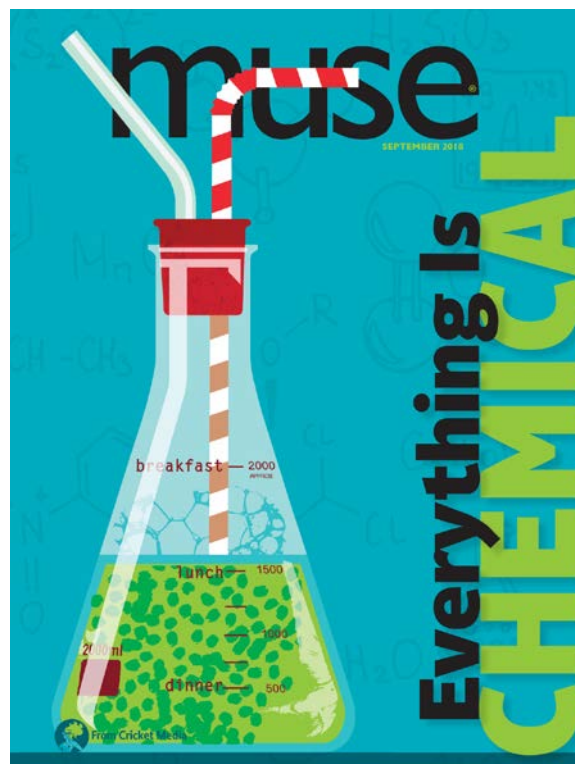
From the air we breathe to the food we eat, chemical reactions occur all around us. These reactions create a state of constant flux that generates astonishing consequences for humankind. This issue of *Muse* promises that you will undergo some changes as you gain interesting scientific insight into the transformative world in which we live.

CONVERSATION QUESTION

How do the chemical reactions that occur all around us affect our quality of life?

TEACHING OBJECTIVES

- Students will learn how human interactions directly affect our air quality.
- Students will learn about the physical and chemical changes that transpire during the breadmaking process.
- Students will learn how new medicines become available to treat the sick.
- Students will analyze cause-and-effect relationships.
- Students will identify the structure and function of a studied process.
- Students will demonstrate understanding of sequence and process.
- Students will conduct research to further their understanding.
- Students will display data visually by creating a graph.
- Students will explore the healing methods of ancient cultures.



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **The Air Around Us**
Expository Nonfiction, ~650L
- **The Magical Transformation of Bread**
Expository Nonfiction, ~750L
- **Making Medicine**
Expository Nonfiction, ~950L

The Air Around Us

pp. 20–23, Expository Nonfiction

Breathe in. . . . Breathe out. . . . Students will learn how air quality is affected by human interactions and what can be done to keep the environment healthy.



RESOURCES

- Take a Deep Breath

OBJECTIVES

- Students will learn how human interactions directly affect our air quality.
- Students will analyze cause-and-effect relationships.
- Students will conduct research to further their understanding.

KEY VOCABULARY

- **index** (p. 22) an indicator or measure of something
- **radiation** (p. 22) emission of energy transmitted in particles
- **regulations** (p. 22) rules made and maintained by an authority

ENGAGE

Conversation Question: How do the chemical reactions that occur all around us affect our quality of life?

Motivate the students to read the article by doing a short breathing exercise/meditation. Have them focus on their breathing. Following the activity, discuss how particles in the air will affect how healthy these breaths are. Introduce the article, “The Air Around Us.”

INTRODUCE VOCABULARY

List the key vocabulary terms on the board and have students use resources to define them accurately. Next, challenge the class to list as many synonyms as they can for each word. Allow them to share their answers aloud.

READ & DISCUSS

Reinforce comprehension of the concepts in this article by using the following prompts to direct discussion.

- What are the components that make up the air that we breathe?
- How do human interactions cause harmful imbalances in our environment?
- Explain what causes “dirty air.”
- How can individuals and the society in which we live protect our air?

CONCEPT/SKILL FOCUS: Cause and Effect

INSTRUCT: Lead the students in a discussion that guides them to recognize the many cause-and-effect relationships that are studied in this article. Introduce the graphic organizer, *Take a Deep Breath*, and advise the students that they will be searching through the article for such relationships. Encourage them to ascertain whether each relationship is harmful or helpful to our Earth and the air we breathe.

ASSESS: Evaluate the students’ work on the graphic organizer. Arrange peer groups if remediation is necessary.

EXTEND

Language Arts Give the class the opportunity to research the air quality index where they live. Have them locate regions with contrasting indexes. Instruct the class to conduct brief research to explore why a particular area may have a high or low index. They may choose to write a short essay or construct a detailed drawing comparing and contrasting the conditions of the regions. Be sure they can provide clear and accurate reasons for the differences and similarities.

Take a Deep Breath

Page #	Cause/Behavior	Effect/Result	Helpful/Harmful
21	Use of nitrogen-based fertilizers to grow crops	Unbalanced nitrogen levels create pollution	Harmful

The Magical

Transformation of Bread

pp. 28–32, Expository Nonfiction

This article will take the reader on a journey through the transformative process of breadmaking. Students will learn about the many chemical and physical changes that basic ingredients must undergo to create this wholesome dietary staple.



RESOURCES

- Do You Know the Muffin Man?

OBJECTIVES

- Students will learn about the physical and chemical changes that transpire during the breadmaking process.
- Students will identify the structure and function of a studied process.
- Students will display data visually by creating a graph.

KEY VOCABULARY

- **compound** (p. 32) something composed of two or more separate elements, a mixture
- **network** (p. 30) a group of interconnected things
- **structure** (p. 31) object formed from other parts
- **transformer** (p. 30) something that changes in form, appearance, or structure

ENGAGE

Conversation Question: How do the chemical reactions that occur all around us affect our quality of life?

Give the students a few minutes to discuss with their classmates what they ate for breakfast and lunch. Generate a list on the board and note the number of times certain items were eaten. Prompt the students to observe how many of these items are bread-based. Introduce the article's title, "The Magical Transformation of Bread," and begin reading.

INTRODUCE VOCABULARY

Post the title of the article and the vocabulary words on the board. Direct the students to copy the words and definitions into their science notebooks. Instruct them to write a sentence for each word, predicting how these words will be relevant in an article with this title. Revisit their predictions after reading.

READ & DISCUSS

Pose the following questions to the students to facilitate meaningful discussion.

- What are the four ingredients needed to make bread? Describe why each ingredient is necessary.
- How does the "magical transformation" of bread occur?
- Read the "Baking Better Bread" text box on page 31. What work is being done at the Bread Lab at Washington State University?
- Explain how bread gets stale.

CONCEPT/SKILL FOCUS: Structure and Function

INSTRUCT: Review the physical and chemical changes that occur when combining the four ingredients needed to make bread. Present the graphic organizer, *Do You Know the Muffin Man?*, and tell the class that they will be using the information from the article to record the function of each component listed.

ASSESS: Circulate and have mini-conversations with the students as they are working on the graphic organizer. Collect and review their work to further assess understanding.

EXTEND

Mathematics Have the students brainstorm a list of different types of bread (white, whole wheat, Italian, croissants, etc.). Advise the students that they will work in small groups to survey other members of the class/grade, inquiring about their favorite type of bread. They will use the survey to create a graph depicting the data. Challenge them to find the mean, median, mode, and range of their collected figures.

Do You Know the Muffin Man?

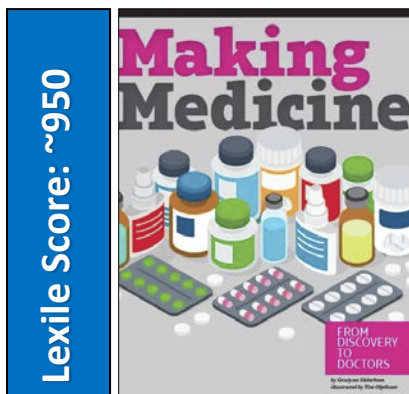
Refer to the article, "The Magical Transformation of Bread," to study the structure and function of each component involved in making this global dietary staple.

Structure	Description	Function
flour		
salt		
yeast		
water		
glutenins		
gliadins		
starch		

Making Medicine

pp. 38–42, Expository Nonfiction

Although modern medicine may appear to be a miracle, making a successful drug is a lengthy and difficult process. Learn about the people, the compounds, and the procedures that are responsible for healing the sick.



RESOURCES

- Clinical Testing . . . 1, 2, 3!

OBJECTIVES

- Students will learn how new medicines become available to treat the sick.
- Students will demonstrate understanding of sequence and process.
- Students will explore the healing methods of primitive cultures.

KEY VOCABULARY

- **culprit** (p. 39) the cause of a problem or defect
- **glitch** (p. 39) a sudden, usually temporary malfunction
- **rogue** (p. 39) a thing that behaves in a faulty or unpredictable way
- **scour** (p. 39) subject to a thorough search in order to locate something
- **tweak** (p. 40) to improve by making fine adjustments
- **vital** (p. 39) absolutely necessary, essential

ENGAGE

Conversation Question: How do the chemical reactions that occur all around us affect our quality of life?

Initiate a class discussion regarding any medical issues that have caused students to miss school or events in the past few months. Discuss the remedies used and how they were obtained. Introduce the title of the article, “Making Medicine,” and tell the class that they will discover how these modern cures become available.

INTRODUCE VOCABULARY

Invite pairs of students to work together to find the definitions for the vocabulary words. Upon completion, post the definitions provided, as some of these words will have alternate meanings. Have students adjust definitions if necessary. Advise the student pairs that they will choose an additional four words from the article and procure definitions. They will then create a crossword puzzle using all ten words. Share puzzles with another class as a prereading exercise for this article.

READ & DISCUSS

Lead a class discussion based on the following prompts.

- What are some of the reasons that we get sick?
- How are new medicines being created?
- Why is clinical testing so important?
- What is the function of the FDA?

CONCEPT/SKILL FOCUS: Sequence and Process

INSTRUCT: The article reveals that there are three main steps in the process of clinical testing. Instruct the students to use the graphic organizer, *Clinical Testing . . . 1, 2, 3!*, to demonstrate their understanding of each phase of the trials. Stress the importance of the proper sequence. Be sure students can verbalize their understanding of the process.

ASSESS: Collect and review the students’ work on the *Clinical Testing . . . 1, 2, 3!* worksheet. If there is an error in their sequencing or a lack of details, guide the students back to the text for corrections.

EXTEND

Social Studies There is evidence that even the most primitive ancient civilizations attempted to produce cures for the ills of their people. Assign the students different areas of the world. Have them locate the region on a map and research the early medicines used by cultures that lived in that area during a specific time period. Combine their research into a class book to be kept in the reading center.

