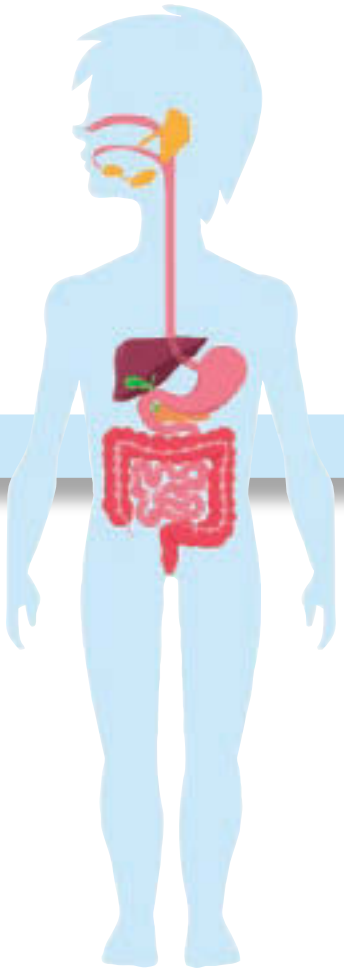
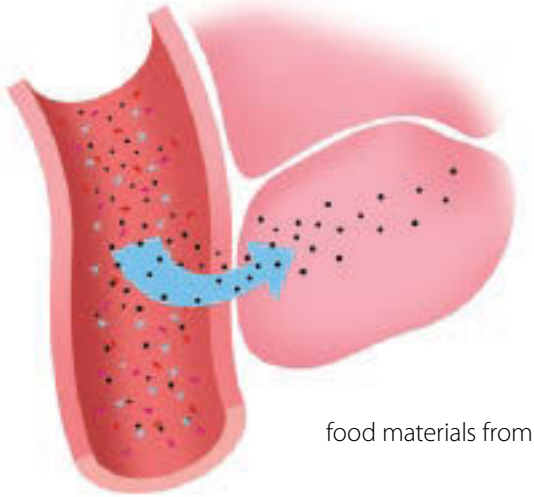
Core Knowledge® SCIENCE

Human Cells and Digestion

Teacher Guide

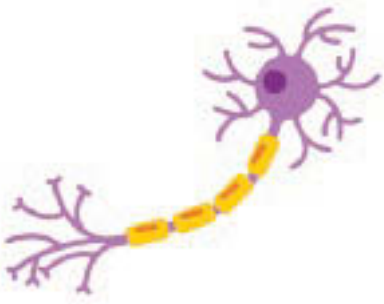


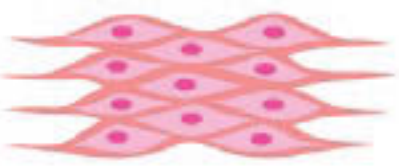


food materials from blood to cells

digestive system

cells of different types





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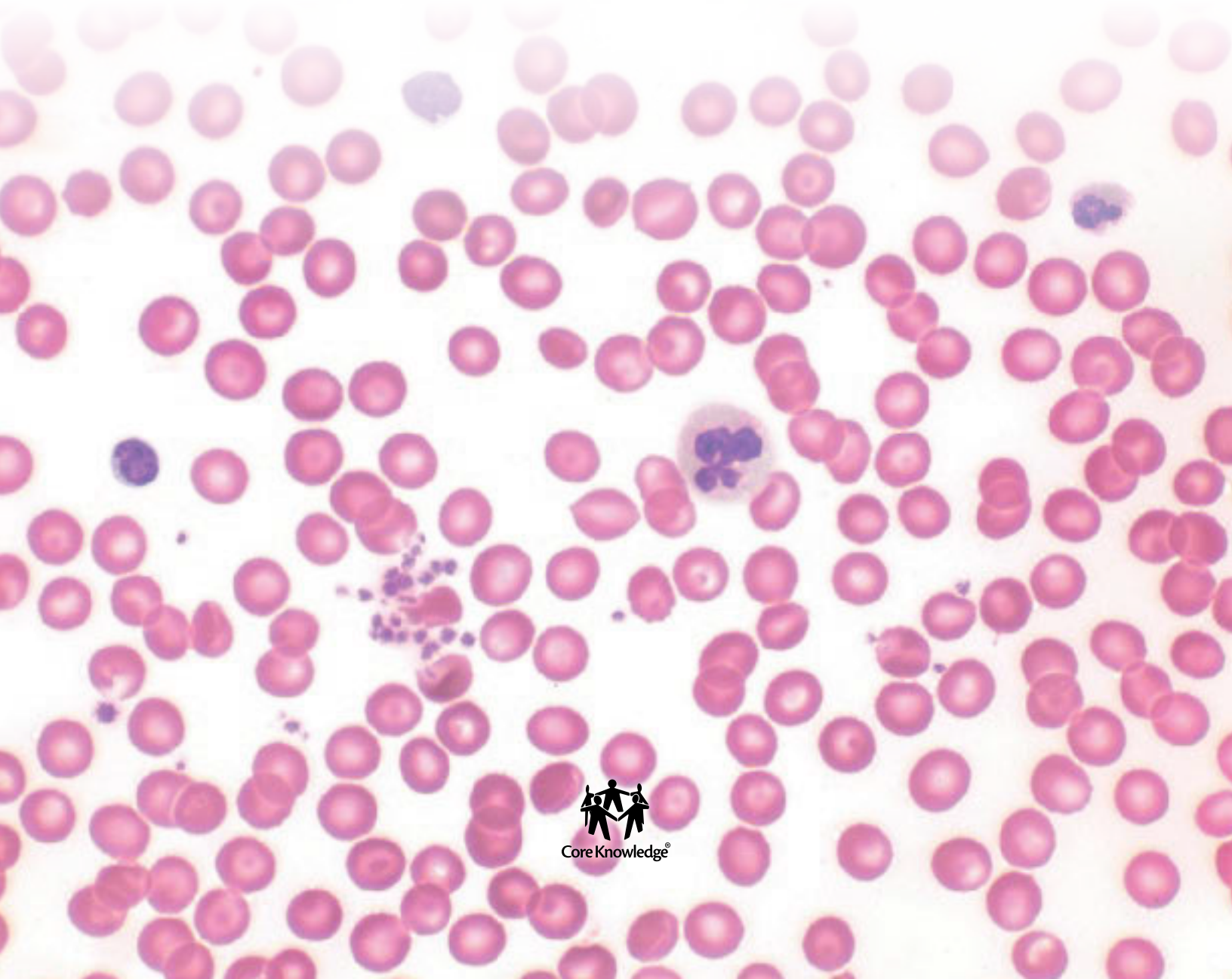

Core Knowledge®

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Human Cells and Digestion

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Human Cells and Digestion

Teacher Guide

Core Knowledge Science™ 2

UNIT 5

Introduction

About this Unit

The Big Idea

This unit focuses on the scientific concept of cells, the human digestive system, and why our bodies need food.

Students know they get hungry, they eat food, and they use the restroom. What students may not understand is how their bodies enage in those processes. What enables students' bodies to break that food down to get nutrients and energy? Students may not know that energy, in the form of chemicals that make up food, goes to cells in the body so they can carry out all the functions people need to live. During the process of breaking down food, not all of it can be used, so some needs to be eliminated as waste. The digestive system is one of the systems in the body that eliminates waste.

In this unit, students will trace the path of the digestive system starting with hunger and the purpose of eating food. Students will explore the digestive system and its different parts, understanding the hierarchy of cells, tissues, organs, and organ systems. Students will also look at the building blocks of the body, cells. Students will end with identifying how waste leaves the body and investigating the nutritional needs of our bodies as well.

In this unit, students investigate the human digestive system to identify how our bodies use food for energy. Students will further investigate living things' need for food in Grade 5 Unit 2 *Energy and Matter in Ecosystems*.

Note to Core Knowledge Teachers

Thanks to ongoing research in the field, our understanding of how children learn continues to evolve. In the subject area of science, students benefit not just from reading about concepts and ideas, but from hands-on experiences. Following the release of the Next Generation Science Standards (NGSS), the Core Knowledge Foundation used this opportunity to update and enhance the science portion of the Core Knowledge Sequence.

While there have been some shifts in the grade levels at which certain topics are recommended, the fundamental principles of pedagogy inherent to the Core Knowledge approach, such as the importance of building a sequential, coherent, and cumulative knowledge base, have been retained.

Although the NGSS guidelines do not reference teaching about the human body, the Core Knowledge Foundation considers student knowledge of this topic, and health, an important part of students' instruction and learning. As a result, this unit can be used in conjunction with the other CKSci units at this

grade level or on its own. You may notice that this unit differs slightly in organization from the NGSS units in the CKSci program. Lessons in the NGSS CKSci units are comprised of multiple segments that build to students' demonstration of a complex Performance Expectation. Because *Human Cells and Digestion* is not designed to support any specific NGSS Performance Expectation, the instructional episodes are not grouped into multipart lessons. As such, they are identified simply as *lessons* instead of *lesson segments*.

Online Resources

To learn more about the changes and to access resources for this unit, please use the links found in the Online Resources Guide.

www.coreknowledge.org/cksci-online-resources

This science unit embodies Core Knowledge's vision of best practices in science instruction and knowledge-based schooling, such as the following:

- building students' knowledge of core ideas in life, physical, and Earth sciences, as well as engineering design;
- developing scientific practices that give students' firsthand experience in scientific inquiry, engineering, and technology; and
- connecting scientific learning to concepts across various disciplines, such as mathematics and literacy.

Related NGSS Dimensions*

This unit, *Human Cells and Digestion*, provides the opportunity to further reinforce the following NGSS Dimensions.

Science and Engineering Practices:

- Asking questions (for science) and defining problems (for engineering)
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence

Crosscutting Concepts:

- Cause and effect
- Structure and function

Online Resources

For detailed information about the NGSS References, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Sources:

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.

National Research Council. 2012. *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K–12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Building Science Knowledge

What Students Should Already Know

The concept of progressions, articulated in the National Research Council's *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*, is very much aligned to the Core Knowledge principle of building new knowledge on prior knowledge. According to the NRC, students build "progressively more sophisticated explanations of natural phenomena" over the course of many years of schooling. "Because learning progressions extend over multiple years, they can prompt educators to consider how topics are presented at each grade level so that they build on prior understanding and can support increasingly sophisticated learning." In schools following NGSS recommendations, teachers can build on the "prior understandings" captured in the following summaries of NGSS Disciplinary Core Ideas:

LS1.C: Organization for Matter and Energy Flow in Organisms

- All animals need food in order to live and grow. They obtain their food from plants or from other animals.

What Students Need to Learn

For this unit, the *Core Knowledge Science Sequence* specifies the following content and skills. Specific learning objectives are provided in each lesson throughout the unit.

Lesson 1: Why Do We Get Hungry?

- Introduce a unifying phenomenon storyline.

Lesson 2: What Is the Digestive System?

- Identify and describe parts of the digestive system.
- Summarize the functions of the digestive system.

Lesson 3: Food Is Fuel

- Explain the purpose of eating and digesting food as fueling the body's cells.
- Describe cells of different types.

Lesson 4: Cells Work Together

- Relate cells to the composition of tissues of different types.

Lesson 5: Tissues Make Up Organs

- Relate tissues to the composition of organs that form systems (such as the endocrine and immune systems).

Lesson 6: Body Wastes

- Identify and describe parts of the body involved in waste elimination.
- Summarize the functions of the excretory system.
- Summarize waste elimination in the digestive system.

Lesson 7: Science in Action: Nutritionist

- Discuss health practices regarding nutrition and vaccines.
- Learn about relevant scientists.

What Teachers Need to Know

Supportive information on the content standards and the science they address is provided throughout the lessons at points of relevance:

Know the Standards: These sections, found later in this Teacher Guide, explain what to teach and why, with reference to NGSS and Core Knowledge expectations, as well as connections to relevant math and reading language arts standards.

Know the Science: These sections provide supporting, adult-level, background information or explanations related to specific science concepts, examples, or Disciplinary Core Ideas.

Using the Student Book

Student Book

The *Human Cells and Digestion* Student Book includes seven chapters, intended to be read aloud by the teacher as the students look at images on each page.

As you will note when you examine the Student Book, minimal text is included on each page. Instead, colorful photos and engaging illustrations dominate the Student Book pages. The design of the Student Book in this way is intentional because students in Kindergarten–Grade 2 are just learning to read. At these grade levels, students are learning how to decode written words, so the complexity and amount of text that these young students can actually read is quite limited.

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

The intent of the Grades K–2 CKSci lessons is to build students' understanding and knowledge of science concepts, as well as of associated practices and skills. It is for this very reason that in Grades K–2 CKSci, the core content of each lesson is reinforced to students using a teacher Read Aloud, accompanied by example images and diagrams. Cognitive science research has clearly documented the fact that students' listening comprehension far surpasses their reading comprehension well into the late elementary and early middle school grades. Said another way, students are able to understand and grasp far more complex ideas and text that they hear read aloud than they would ever be able to read or comprehend when they read to themselves. For a more thorough discussion of listening and reading comprehension and the underlying cognitive science research, teachers may want to refer to Appendix A of the Common Core State Standards for English Language Arts, noting in particular the Speaking and Listening section of the appendix.

Use this link to download the CKSci Online Resources for this unit, where the specific link to this appendix can be found:

www.coreknowledge.org/cksci-online-resources

Using the Teacher Guide

Pacing

The *Human Cells and Digestion* unit is one of five units in the Grade 2 CKSci series. We encourage teachers who are using the full series to complete all units during the school year. Each Core Lesson requires thirty to forty-five minutes of instruction time. The time it takes to complete a full lesson depends on class size and individual circumstances. Each lesson concludes with a Check for Understanding, providing the teacher with an opportunity for formative assessment.

At the end of this unit Introduction, you will find a blank Pacing Guide on page 9, which you may use to plan how you might pace the lessons, as well as when to use the various other resources in this unit. We strongly recommend that you preview the unit in full before beginning and create your pacing guide before teaching the first lesson. As a general rule, we recommend that you spend no more than ten days teaching the *Human Cells and Digestion* unit so that you have time to teach the other units in the Grade 2 CKSci series.

The Core Lessons

- Lesson time: Most Core Lessons constitute one classroom session of thirty to forty-five minutes. Some lessons cover two or three days of instruction. Some single-day activities and performance tasks might require setting aside a longer block of time.

- Lesson order: The lessons are coherently sequenced to build from one to the next, linking student engagement across lessons and helping students build new learning on prior knowledge.

Unit Big Question: What makes you get hungry on a hike?		**Lesson Questions**
Lesson 1	Why Do We Get Hungry?	How does physical activity make you feel?
Lesson 2	What Is the Digestive System?	What is the digestive system?
Lesson 3	Food Is Fuel	What are cells?
Lesson 4	Cells Work Together	How do cells work together?
Lesson 5	Tissues Make Up Organs	What are organs and organ systems?
Lesson 6	Body Wastes	How does the body get rid of waste materials?
Lesson 7	Science in Action: Nutritionist	Why does it matter what we eat?

Activity Pages

Activity Pages

AP 1.1
AP 2.1
AP 4.1
AP 5.1
AP 6.1

Black line reproducible masters for Activity Pages, as well as an Answer Key, are included in Teacher Resources on pages 53–58. The icon shown to the left appears throughout the Teacher Guide wherever Activity Pages (AP) are referenced.

Lesson 1—What Do I Eat? (AP 1.1)

Lesson 2—Build-A-Body (AP 2.1)

Lesson 4—Types of Tissue (AP 4.1)

Lesson 5—Cells, Tissues, Organs (AP 5.1)

Lesson 6—Getting Rid of Wastes (AP 6.1)

Online Resources for Science

Online Resources

For each CKSci unit, the Teacher Guide includes references to online resources (including external websites and downloadable documents) to enhance classroom instruction. Look for the icon on the left.

Use this link to download the CKSci Online Resources for this unit:

www.coreknowledge.org/cksci-online-resources

Teaching Strategies

Start with the familiar.

Lead with an experience. Begin each lesson with a demonstration, activity, or question about a phenomenon to engage students and focus their attention on the topic. Start with the familiar. Every science topic introduced to students relates in some way to their known world and everyday experiences. The purpose of every lesson is to build a bridge between what is familiar to students and broader knowledge about the way the world works.

Ask driving questions.	The unit is governed by a Big Question, and each lesson poses a more specific sub-question as students are introduced to new science content. Use these questions to engage students in conversation and help them think about how their own real-world experiences relate to the topic.
Encourage scientific thinking.	Approach the lessons with students not as learning about science but as learning about the world with a scientific mind. Science learning models science practice. Throughout the lessons, encourage students to ask questions about what they observe, do, and read. Record relevant questions in a prominent place in the classroom. Guide students back to these questions as opportunities to answer them emerge from readings, demonstrations, and activities.
Use continuous Core Vocabulary instruction.	During instruction, emphasize Core Vocabulary terms and their meanings in context rather than relying on isolated drill for memorization of definitions. Through scaffolded questioning, encourage students to come up with definitions in their own words and to use the words in their own sentences. Core Vocabulary words for each lesson, as well as Language of Instruction, other key terms teachers are encouraged to use in discussing topics with students, are provided at the start of each lesson. You can find Core Vocabulary and Language of Instruction definitions in the Glossary on pages 59–60.
Emphasize observation and experience.	Lessons employ various ways for students to learn, including watching, listening, reading, doing, discussing, and writing.
Use science practices.	Give students opportunities to discover new content knowledge through investigation and to use their new knowledge both in problem-solving exercises and as evidence to support reasoning. Students learn what science and engineering practices are by engaging in those same practices as they learn.
Make frequent connections.	Use a combination of demonstrations and reading materials, rich with examples, to help students recognize how the science concepts they are learning apply in their everyday lives. Prompt students to relate lesson content to their own experiences, to relate the new and unfamiliar to the familiar, and to connect ideas and examples across disciplines.
Monitor student progress.	Use verbal questioning, student work, and the Check for Understanding assessments at the end of each lesson to monitor progress during each lesson and to measure understanding at the conclusion of the unit. Many lessons provide tips to help you support students who need further explanations or clarifications.

Effective and Safe Classroom Activities

Online Resources

Conducting safe classroom demonstrations and activities is essential to successful elementary science education. The following resources provide Core Knowledge's recommendations for developing effective science classroom activities.

These resources, included at the back of the Teacher Guide on pages 61–65, consist of the following:

- Classroom Safety for Activities and Demonstrations
- Strategies for Acquiring Materials
- Advance Preparation for Activities and Demonstrations
- What to Do When Activities Don't Give Expected Results

These resources may also be accessed within the CKSci Online Resources Guide for this unit, available at

www.coreknowledge.org/cksci-online-resources

Materials and Equipment

The unit requires a large variety of materials to support various ways of learning (including doing, discussing, listening, watching, reading, and writing). Prepare in advance by collecting the materials and equipment needed for all the demonstrations and hands-on investigations.

- Roll paper, poster board, or a bulletin board should be dedicated at the beginning of the unit to serve as a question board to cumulatively document and return to student questions. The question board is referred to in the materials for lessons in which it is used but is not repeated in the materials listed here.
- Internet access and the means to project images/videos for whole-class viewing are also required in many lessons but are not repeated below.

Lesson 1 Why Do We Get Hungry?

- n/a

Lesson 2 What Is the Digestive System?

- snack foods
- neutral pantyhose (1 per pair)
- tennis balls (1 per pair)
- large rubber playground ball

Lesson 3 Food Is Fuel

- building blocks

Lesson 4 Cells Work Together

- n/a

Lesson 5 Tissues Make Up Organs

- n/a

Lesson 6 Body Wastes

- 2 cups water
- bowl or measuring cup
- pipette or dropper

Lesson 7 Science in Action: Nutritionist

- paper plates (1 per pair)
- black marker
- index cards (or scrap paper, 16–21 per pair)
- plastic bags (1 per pair)

Human Cells and Digestion Pacing

_____**'s Class**

Note to Teacher: When using *Human Cells and Digestion* as part of the Grade 2 CKSci series, this unit is intended to be taught as the fifth unit of Grade 2 CKSci. .

Week 1

Day 1	Day 2	Day 3	Day 4	Day 5

Week 2

Day 6	Day 7	Day 8	Day 9	Day 10

UNIT 5

Human Cells and Digestion

Overview

Big Question: What makes you get hungry on a hike?

Lessons	Lesson Questions	Advance Preparation
1. Why Do We Get Hungry?	How does physical activity make you feel?	Read Student Book, Chapter 1.
2. What Is the Digestive System?	What is the digestive system?	Read Student Book, Chapter 2. Gather and set up materials for student investigation.
3. Food Is Fuel	What are cells?	Read Student Book, Chapter 3. Gather and set up materials for student investigation.
4. Cells Work Together	How do cells work together?	Read Student Book, Chapter 4.
5. Tissues Make Up Organs	What are organs and organ systems?	Read Student Book, Chapter 5.
6. Body Wastes	How does the body get rid of waste materials?	Read Student Book, Chapter 6. Gather and set up materials for student investigation. Prepare a bowl with water.
7. Science in Action: Nutritionist	Why does it matter what we eat?	Read Student Book, Chapter 7. Prepare MyPlates for students.

What's the Story?

The human digestive system is the part of our bodies that breaks food down for chemical energy and that eliminates wastes. All body systems are made up of cells, which make up tissues and organs that work together to perform certain functions. Cells are the smallest living parts in our bodies and need energy from the food we eat.

In Lessons 1–7, students listen and read along with the Teacher Read Aloud of Student Book Chapters 1–7. Students identify the parts of the digestive system, including cells, tissues, and organs. Students also read about the purpose of eating. Reading about cells and the digestive system is reinforced by teacher demonstrations. Students further explore the digestive system through investigations with their own bodies and through manipulation of objects and materials.

LESSON 1

Why Do We Get Hungry?

Big Question: What makes you get hungry on a hike?

Lesson Question: How does physical activity make you feel?

Tie to the Anchoring Phenomenon: People experience the feeling of hunger every day. Students can relate to what this sensation feels like, and they can discuss how their bodies feel after they eat.

At a Glance

Learning Objective

✓ Introduce a unifying phenomenon storyline.

Instructional Activities

- teacher Read Aloud
- class discussion

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

hunger **hungry**

Language of Instruction: The Language of Instruction consists of additional terms, not considered a part of Core Vocabulary, that you should use when talking about any concepts in this exercise. Students will benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves. A Glossary at the end of this Teacher Guide lists definitions for both Core Vocabulary and Language of Instruction.

hike

Instructional Resources

Student Book

Ch. 1

Student Book, Chapter 1
"A Hungry Hiker"

Activity Page

AP 1.1

Activity Page
What Do I Eat? (AP 1.1)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- question board

The Core Lesson 1

1. Focus student attention on the Big Question.

Online Resources

Ask a volunteer to state the Big Question that you'll be answering in this unit—**What makes you get hungry on a hike?**

Play the video about a hungry bear named Winnie the Pooh. Lead student observations as they watch the video. Use the following questions as prompts (see **Know the Science 1**):

- What is Winnie the Pooh's tummy doing?
  - » growling; gurgling
- Why is it growling?
  - » because he is hungry
- What must Winnie the Pooh do to make his tummy happy again?
  - » eat something; find food

Initiate a discussion about hunger. **Ask students** to describe what it feels like when they get hungry. Invite students to share what kinds of foods they eat when they feel hungry. **Ask,** How do you feel after you eat something?

- » Sample answers: I am less hungry. Sometimes I am full. I feel better; I have more energy; I can do more things.

Know the Science

TEACHER DEVELOPMENT

1. A Growling Tummy: The rumbling noise in our bodies that we know as "growling" and associate with hunger is generated by muscular activity known as peristalsis that occurs in the stomach and small intestine. This is a process that is involved in the elimination of waste from the body. When receptors in the stomach sense a lack of food, a series of neurological and muscular processes take place to stimulate these hunger contractions, which cause vibrations. The vibrations are what we hear as "growling."

Tell students that before they can answer the unit's Big Question about feeling hungry while on a hike, they first need to understand more about what it is like to go hiking and how our bodies use food for fuel.

Create a concept question board to answer the Big Question. Refer back to this question board throughout the unit to discuss answers and ideas with students.

See the Online Resources Guide for a link to the recommended video.

www.coreknowledge.org/cksci-online-resources

2. Read together: "A Hungry Hiker."

Student Book

Ch. 1

While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Page 2

Differentiation

Ask students to turn to page 2 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "A Hungry Hiker," and tell them to pay special attention to what Jason eats as you read.

Ask students to look at the picture on page 2. Explain that this is what Jason eats before he leaves for his hike.

SUPPORT—Explain that to eat means to take in food. Eating is what we do when we put food in our mouths, chew it, and swallow it. It's our main way of giving our bodies energy.

CORE VOCABULARY—Explain that **hunger**, or being **hungry**, is the feeling we get when our bodies tell us it is time to eat. Talk with students about when they feel hungriest. **Ask students** if they notice a pattern—for example, whether they are always hungry at the same time of day.

LITERAL—What food does Jason eat for breakfast?

» cereal, berries, apple, orange juice, orange

LITERAL—What is Uncle Bryson doing to prepare for their hike?

» packing a lunch

INFERENTIAL—Why do you think Uncle Bryson is packing a lunch for them?

» so they can eat when they feel hungry

SUPPORT—Draw on student experiences with packed lunches. **Ask students** to describe a time when they packed a lunch for an outing, such as a picnic, a day at the park, or a field trip. **Ask students,** What kind of food did you pack?

Page 3

Ask students to look at the two pictures on page 3. Talk about what students notice in the pictures.

LITERAL—What do Jason and Uncle Bryson pack to eat as a snack?

» carrot sticks and apple

EVALUATIVE—Why are these good choices?

» They are healthy.

EVALUATIVE—Do you think Jason will get hungry on the hike? Why or why not?

» Sample answer: Yes, because the hike will take most of the day and will use up a lot of his energy.

Differentiation

SUPPORT—Explain that food gives us energy. (See **Know the Science 2**.) When we get tired from doing active things, like hiking, running, or playing, food can make us feel better and give us energy to keep going. Invite students to share about a time when they felt tired after doing sports or playing and what they ate or drank that made them feel better.

CHALLENGE—Give students a list of different foods along with the MyPlate diagram from the United States Department of Agriculture. Then have students categorize the foods on the list as dairy, protein, carbohydrates, grains, or fruits/vegetables.

EXTEND—**Ask students** to think of other healthy foods Jason could eat for a snack, besides the carrot sticks and apple.

Page 4

Ask students to look at the picture on page 4. Ask students if this is something that they would choose for a snack. If not, invite students to share what their favorite snack is.

LITERAL—What do Jason and Uncle Bryson do on their first rest break?

» They drink water and eat some nuts and dried fruit.

INFERENTIAL—Do you think the bag of nuts and dried fruit will be enough to keep them full for the rest of the hike?

» Sample answers: No, because it's only a snack; it's not a lot of food; Uncle Bryson said the hike would take most of the day, and they have only walked for one hour so far.

Know the Science

TEACHER DEVELOPMENT

2. Food: The term food can be confusing to students who have not yet learned about chemistry. Students know they eat vegetables or meat, and to them that is food. They know they need food for energy. But the energy is actually the energy of the chemical bonds that make up carbohydrates, fats, and proteins. It is these food materials that enter the blood and are distributed to cells.

INFERENTIAL—Does the water that they drink count as food?

» No, water is a drink, and it doesn't fill you up or give your body nutrients.

Page 5

Ask students to look at the picture on page 5. Explain that Jason is thinking about the sandwich, which is his lunch, but he hasn't had a chance to eat it yet. So far, he has only had snacks.

LITERAL—What is Jason eating for his second snack?

» raisins

Differentiation

SUPPORT—Discuss the question at the end of the page, and talk about students' answers to why Jason is already feeling hungry. Relate Jason's stomach growling to the video students watched at the start of class.

INFERENTIAL—Why do you think the food Jason is eating is not filling him up for long? (See **Know the Standards**.)

» Sample answer: because he is doing a lot of walking/hiking

INFERENTIAL—What would happen if Jason ate those snacks and then sat still for a while? Do you think he would be as hungry?

» Sample answer: No, because he would not be doing as much walking.

3. Make a food journal.

Activity Page

AP 1.1

Distribute What Do I Eat? (AP 1.1). Explain to students that a food journal is a record of the food that someone eats, and when they eat it, in a day. Review the columns with students, and direct them to put the time that they usually eat (this can be an approximation) and the foods they have at that time. (See **Know the Science 3**.) Use sensitivity when discussing what foods students eat, how often students eat, and how much they can eat, since some students may come from homes where food—or access to several meals or snacks a day—is limited.

Know the Standards

TEACHER DEVELOPMENT

CCC 2 Cause and Effect: Physical activity burns calories and can increase the rate at which we need to fuel our bodies with more food. Students can understand a cause-and-effect relationship between physical activity and appetite.

Know the Science

TEACHER DEVELOPMENT

3. Food Deserts: Food deserts are geographical areas where the people who live there have limited access to healthful foods. If your school is located in a food desert, then you may need to alter this activity or use extra sensitivity when discussing food options that certain students have.

Differentiation

SUPPORT—If What Do I Eat? (AP 1.1) will bring up sensitivity issues in the classroom related to some kids not having enough food to eat at home or at school, then modify the activity so that students do not have to record their actual food intake but instead write down what they think Jason, in the story, would eat in a given day.

Students may discuss their answers in pairs or small groups but should record on their own Activity Pages.

Whether students are recording their own food intake or coming up with an imaginary food journal for Jason, circulate around the room, and use prompts such as "Are you hungry when you wake up?" "When is snack time usually?" "Do you ever find yourself skipping a meal because you just aren't hungry?" Encourage students to be as specific as they can when it comes to listing the foods they like to eat.

If time permits, invite students to share their food journals and talk about commonalities among students.

4. Check for understanding.

Monitor Progress

Formative Assessment

Review student responses in the columns to What Do I Eat? (AP 1.1) to determine student understanding of the following concepts:

- People eat when they feel hungry.
- People are hungry throughout the day.
- People who are active may be hungrier more often than people who are not.

See the Activity Page Answer Key for correct answers and sample student responses.

LESSON 2

What Is the Digestive System?

Big Question: What makes you get hungry on a hike?

Lesson Question: What is the digestive system?

Tie to the Anchoring Phenomenon: The digestive system is responsible for how our bodies break down and absorb the food that we eat. The leftover food becomes waste. Students will apply this to the story as they learn why Jason's stomach does not stay full.

At a Glance

Learning Objectives

- ✓ Identify and describe parts of the digestive system.
- ✓ Summarize the functions of the digestive system.

Instructional Activities (2 Days)

- teacher Read Aloud
- class discussion
- student demonstration

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

body parts **digest** **food** **intestine**

stomach

Language of Instruction: The Language of Instruction consists of additional terms, not considered a part of Core Vocabulary, that you should use when talking about any concepts in this exercise. Students will benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves. A Glossary at the end of this Teacher Guide lists definitions for both Core Vocabulary and Language of Instruction.

digestion **digestive system** **energy** **esophagus**

Instructional Resources

Student Book

Ch. 2

Student Book, Chapter 2
"The Digestive System"

Activity Page

AP 2.1

Activity Page
Build-A-Body (AP 2.1)

Materials and Equipment

Collect or prepare the following items:

- snack foods
- neutral pantyhose (1 per pair)
- tennis balls (1 per pair)
- large rubber playground ball

Advanced Preparation

- Make sure the snack foods you select can be enjoyed by all students and do not pose an allergy risk. If necessary, contact parents and guardians ahead of time to get permission to serve a snack in the classroom, or request that students are sent to school with safe and appropriate snacks on this particular day.
- Cut the pantyhose so that student groups get one leg each and the hose is approximately two feet long.

The Core Lesson 2

1. Day 1: Refocus student attention on the Big Question.

Ask a volunteer to state the Big Question that you'll be answering in this unit—**What makes you get hungry on a hike?**

Review with students what happened with Jason in Chapter 1 of the Student Book.

» He ate a big breakfast, he went for a hike, and he stopped for a couple of snacks.

Pass out the snack to students. Prompt students to start eating their snacks, using the following questions as discussion points:

- What is the first thing you do when you put food in your mouth?
  » I start to chew it.
- How long do you chew it?
  » until the food is mushy/soft; until the food is safe for me to swallow
- What happens after you chew it?
  » I swallow the food.
- What do you use to chew your food?
  » teeth and tongue

Explain that all of these little steps are involved in the digestion process, including chewing. (See **Know the Science 1**.)

2. Read together: "The Digestive System."

Student Book

Ch. 2

While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Page 6

Ask students to turn to page 6 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "The Digestive System," and tell them to pay special attention as you read to what our bodies do with the food that we eat.

Ask students to look at the picture on page 6. Explain that the picture shows that Jason and Uncle Bryson are still hiking.

CORE VOCABULARY—Explain that **food** is anything you eat that gives you the chemical energy and substances to run life processes. The USDA classifies food into five categories—fruit, vegetables, grains, dairy, and protein. Have students share the food they have eaten today.

CORE VOCABULARY—Explain that the **stomach** is a body part where food goes after you swallow it. When your stomach is empty for too long, you feel hungry.

INFERENTIAL—Why do you think Jason is so hungry? (See **Know the Standards 1**.)

» He is doing a lot of hiking.

Know the Science

TEACHER DEVELOPMENT

1. Chewing Food: Chewing food is the first step of the digestive process. Once we put food into our mouths, digestion begins. Saliva contains enzymes such as amylase that help break down starches while we chew. The teeth, gums, and tongue work together to make food easier to swallow and move it toward the back of the mouth, where the throat muscles assist with swallowing. Once food is swallowed, it takes a journey, pushed by peristaltic contractions through the stomach, small intestine, and large intestine, where whatever the body does not use is eventually eliminated as waste.

Know the Standards

TEACHER DEVELOPMENT

1. SEP 1 Asking Questions: Scientists ask questions to learn more about the natural world. Here, Jason is wondering about his body and why he still feels hungry. Talk with students about how Jason's curiosity can lead to discoveries about how the body works and why we get hungry. Explain that these are the kinds of questions scientists ask when they want to learn more about the digestive system.

LITERAL—Do you feel full after you drink water?

» Sample answers: Yes, because it fills your stomach; no, because it is not food.

Page 7

Ask students to look at the collage of pictures on page 7. Explain that each picture shows food that someone would eat at a different meal

LITERAL—What does the body use food for?

» growing, moving, staying alive, getting energy

Differentiation

SUPPORT—**Ask students** to recall the activity they did in Lesson 1 for Activity Page 1.1, when they wrote a journal-like entry about the food they eat during the day. Use this to prompt a conversation about how often people eat.

INFERENTIAL—What do you think would happen if you skipped a meal?

» Sample answer: Your body would get hungry, and you could be tired and grumpy.

EXTEND—Invite students to keep a food log or journal for one week, where they write down what they eat and classify it into specific food groups. Then, have students bring the journal into class and discuss the results. Talk about the data related to food groups and which food group is the most popular among students.

Page 8

Ask students to look at the picture on page 8. Explain that this picture shows an inside look at the digestive system. Talk about what students see, starting with the mouth and working down toward the anus, where waste exits the body.

LITERAL—What are some parts of the digestive system?

» esophagus, stomach, small intestine, large intestine

CORE VOCABULARY—Explain that when the body **digests** food, it breaks it down physically and chemically for energy and nutrients. Whatever is not used becomes waste. Different **body parts** in the digestive system help break down the food.

Differentiation

SUPPORT—Clarify for students that the digestive system is a body system that is responsible for how our bodies use the food that we eat.

INFERENTIAL—Draw students' attention to the diagrams. **Ask,** Do you think your mouth is part of the digestive system?

» Sample answer: Yes, because it helps us chew and swallow food.

Page 9

Ask students to look at the diagram on page 9. Review the diagram with students, from top to bottom. Explain that the esophagus is a tubelike body part that connects the throat and the stomach.

LITERAL—What does your tongue do?

» It pushes the food around in your mouth and helps it mix with saliva; it helps with swallowing.

EVALUATIVE—Why is your esophagus important? (See **Know the Science 2**.)

» It carries and moves food from your mouth to your stomach.

INFERENTIAL—Why do you think it is important to chew your food thoroughly?

» It can move through my digestive system more easily; it will keep me from choking; it can aid in breaking down some kinds of food.

Page 10

Ask students to look at the diagram on page 10. Explain that this page and diagram focus on the stomach.

LITERAL—What happens when food reaches your stomach?

» Sample answer: It is broken down by digestive juices and physically churned up to reduce its size and aid in digestion.

LITERAL—What are some body parts that make the juices that help you digest food? (See **Know the Science 3**.)

» liver and gallbladder

INFERENTIAL—What does it mean when you hear your stomach gurgle?

» Sample answer: It means your stomach is empty.

Page 11

Ask students to look at the diagram on page 11. Explain that the text and diagram on this page focus on the large and small intestines.

CORE VOCABULARY—Explain that the **intestines** are hoselike body parts where food goes after it leaves the stomach.

Differentiation

SUPPORT—Explain that both the small and large intestines help absorb nutrients that the body needs from the food. This means that the intestines take what the body needs and put it into the blood. Then, the blood carries those nutrients to the rest of the body.

LITERAL—What happens to the leftover material?

Know the Science

TEACHER DEVELOPMENT

2. The Esophagus: Food does not naturally fall from our throats into our stomachs through the esophagus. Muscles in the throat help push the food down the esophagus until it ends up in the stomach. While this is going on, the epiglottis—a type of flap—helps to make sure that the food does not go into the tubes that lead to the lungs, which could lead to choking. Although swallowing food is a conscious action, these processes involved in keeping food moving along its proper path are autonomic, meaning they happen whether we are aware of them or not.

3. Digestive System Diagram: The esophagus, stomach, small intestine, and large intestine are the major organs of the digestive system. However, other organs aid in the digestive processes. These are called accessory organs and include the liver, salivary glands, gallbladder, and pancreas. These glands and organs play an important role in the breakdown of food.

» Sample answers: It leaves our body as waste; it turns into poop.

Differentiation

EXTEND—Have students research what makes food nutritious and work individually or in groups to make a collage of nutritious foods.

3. Do a demonstration.

Have students form pairs, and then distribute the tennis balls and pantyhose to each pair. Explain to students that they will demonstrate how the esophagus works.

- Have students place the tennis ball into the top of the pantyhose, near the opening.
- Tell students to take turns using their hands to squeeze the tennis ball all the way down to the bottom of the pantyhose.
- Instead of moving the ball down in one continuous motion, have students imitate peristalsis by moving the ball down by a series of squeezes.
- You can also cue students to see what happens when they try to move the ball up instead of down. (Uh-oh! This is what happens when you vomit!)

Circulate around the room as students work, reminding them of how this is similar to the muscular activity in the esophagus that helps food move down to the stomach.

1. Day 2: Review the Lesson Question.

Remind students of the Lesson Question—**What is the digestive system?** Explain to students that they are going to model the digestive system.

Ask for ten volunteers to participate in the activity. Invite the volunteers to stand at the front of the room in a line. Introduce the following roles:

- The student on the right is the mouth.
- The next three students are the esophagus.
- The next two students are the stomach.
- The next three students are the small intestine.
- The student on the left is the large intestine.

Hand the student on the right the large rubber ball. Explain that the ball represents food. You are going to narrate what happens to the food and cue the students to pass the ball down the "body" to show how food moves. The following is a sample script:

It's time to eat! Your mouth is busy chewing the food, moving it around and around. When the food is small enough, you swallow it! Now the food has moved into the esophagus. The muscles in the esophagus work really hard to push the food lower and lower in the body. Now the food is in your stomach. It stays in there while the digestive juices work their magic, breaking it all up. The broken-up food now goes to the small

intestine, where some of the nutrients are taken out and used up by the body. The small intestine passes the food on to the large intestine, and this is where any remaining nutrients are absorbed!

If time permits, repeat until everyone gets a turn.

2. Build a body.

Activity Page

AP 2.1

Distribute Build-A-Body (AP 2.1). Students will label the blank diagram of the digestive system to show where the parts are.

Students may conduct the activity in pairs or small groups but should record their answers on their own Activity Pages.

Before students begin, remind them that they can refer back to Chapter 2 of the Student Book to review the different diagrams.

Circulate around the room, and prompt students to think about how food moves through the body. Remind students that chewing is the first part of digestion and that food moves down (not up). Describe the organs without telling their names. For example, you can say, "Think about which body part is a long tube that helps food move downward," or "Think about which body part stores the food and breaks it down with special juices."

3. Check for understanding.

Monitor Progress

Formative Assessment

Review students' diagrams on Build-A-Body (AP 2.1) to determine student understanding of the following concept:

- Food moves from the mouth down the esophagus, into the stomach, and through the intestines.

See the Activity Page Answer Key for correct answers and sample student responses.

LESSON 3

Food Is Fuel

Big Question: What makes you get hungry on a hike?

Lesson Question: What are cells?

Tie to the Anchoring Phenomenon: Students already know a lot about food, such as the kinds they like and dislike. Here, they will learn about food as fuel and why Jason feels more energetic after eating his lunch.

At a Glance

Learning Objectives

- ✓ Explain the purpose of eating and digesting food as fueling the body's cells.
- ✓ Describe cells of different types.

Instructional Activities

- teacher Read Aloud
- class discussion

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

cell

Language of Instruction: The Language of Instruction consists of additional terms, not considered a part of Core Vocabulary, that you should use when talking about any concepts in this exercise. Students will benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves. A Glossary at the end of this Teacher Guide lists definitions for both Core Vocabulary and Language of Instruction.

alive/living **unit**

Instructional Resources

Student Book

Ch. 3

Student Book, Chapter 3
"Cells"

Materials and Equipment

Collect or prepare the following items:

- building blocks
- internet access and the means to project images/video for whole-class viewing
- question board

The Core Lesson 3

1. Focus student attention on the Lesson Question.

Ask a volunteer to read the Lesson Question that you'll be answering in this lesson—**What are cells?** Explain that in the human body, cells are like building blocks.

Prepare a table in the classroom where all students can see you, and spread the blocks out there.

Invite four students to come up to the table. Tell each student to build a small, simple wall out of a few blocks. Talk about what the class sees. **Ask,** What are all of the walls made of?

» blocks

Discuss with students that the walls are made up of blocks. Emphasize that small things make up bigger things and they all work together.

2. Read together: "Cells."

Student Book

Ch. 3

While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Page 12

Ask students to turn to page 12 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "Cells." Tell them to keep the building block activity in mind as they read about cells in the human body.

Ask students to look at the two pictures on page 12. Discuss what students see in the pictures.

LITERAL—What do Jason and Uncle Bryson do when they get to the waterfalls?

» They eat lunch.

LITERAL—How does Jason feel before he eats lunch? How does he feel after he eats lunch? (See **Know the Standards 1**.)

» Sample answer: He feels tired and hungry before lunch. After lunch, he feels more energetic again.

Page 13

Ask students to look at the three diagrams on page 13. Explain that the first diagram shows the digestive system. This should look familiar to students from the previous chapter. The middle diagram focuses on the stomach and what it is made of (smooth muscle tissue). The third diagram shows what the muscle tissue is made of (muscle cells). (See **Know the Standards 2**.)

INFERENTIAL—How is each part of the diagram different?

» Each diagram shows a closer look at the stomach and what it is made of.

LITERAL—Which is larger: a cell or an organ?

» organ

LITERAL—What makes up tissue in the human body?

» many cells of the same type

Page 14

Ask students to look at the picture on page 14. Explain that the picture shows what cells look like under a microscope. The picture shows skin cells. Remind students that microscopes are tools scientists use to look at things that are too small to see with the unaided eye.

CORE VOCABULARY—Explain that **cells** are the smallest living things in the body. They make up its tissues.

LITERAL—What do cells do?

» Sample answer: They use energy from food.

SUPPORT—Explain for students that cells go through a life cycle, just like organisms. When new cells are made, they carry out the work that they are supposed to do. And when a certain time comes, they die and are replaced by new cells. This happens many times throughout a person's lifetime and is a

Know the Standards

TEACHER DEVELOPMENT

1. CCC 2 Cause and Effect: Students can start to understand the cause-and-effect relationship between eating food and feeling energized. This observation will help them as they continue to learn about how and why food gives people energy.

2. SEP 2 Developing and Using Models: Learning how to read and interpret models like diagrams is a skill that takes practice. Here, students can get some experience interpreting what each diagram shows. The main takeaway from this style of diagram is that the reader is getting a closer and closer look at what is inside the body.

natural process. (It may be necessary to clarify to students that just because a cell dies, it does not mean that the organism dies.)

CHALLENGE—Invite students to work in pairs and define—in their own words—what *living* means, based on what they have learned so far about cells.

Page 15

Ask students to look at the two pictures on page 15. Explain that these are two more pictures that show magnified cells. The first picture shows whiteblood cells, and the second picture shows red blood cells. Talk about similarities or differences that students notice.

LITERAL—How big are cells?

» Sample answer: They are very tiny. You cannot see them with your unaided eye.

EVALUATIVE—Why are microscopes important?

» Sample answer: They help doctors and scientists see cells.

Page 16

Ask students to look on page 16. Explain that this illustration shows simple pictures of different kinds of cells that are found in the human body. Call on student volunteers to read the types of cells in the illustration. (See **Know the Science 1**.)

EVALUATIVE—Why do you think there are so many different types of cells?

» Sample answers: Different cells have different jobs; cells are found in different parts of the body.

INFERENTIAL—What do all cells have in common?

» Sample answers: They all use chemical energy and nutrients from food; they all carry out tasks that support life.

Page 17

Ask students to look at the diagram on page 17. Explain that this diagram shows a cross section of a blood vessel next to a cell. The little circle dots in the diagram represent nutrients. Clarify that a cross section diagram is a type of diagram that helps you see inside something.

INFERENTIAL—What do you interpret from the diagram? What is it showing you?

» Sample answer: It shows how nutrients go from a blood vessel into a cell and how waste from a cell gets carried away by blood vessels.

Know the Science

TEACHER DEVELOPMENT

1. Stem Cells: Stem cells are types of cells that turn into other kinds of cells. For instance, stem cells can become muscle cells or brain cells. These cells help support the body's organs (and tissues). Babies, kids, and adults all have stem cells. Students are not expected to recall different types of cells but should know that cells occur in different types.

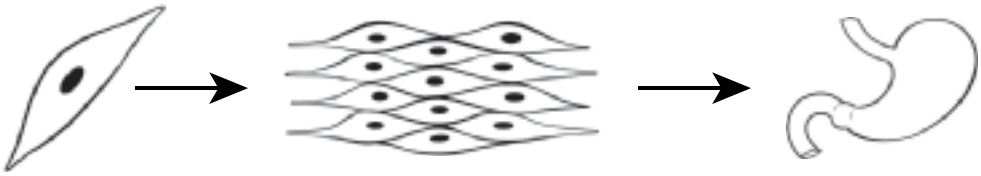
INFERENTIAL—What do you think would happen if you did not drink enough water?

» Sample answer: Cells would not be able to do their work.

3. Do a demonstration.

Help students visualize the progression from cells to tissues to organs by doing the following:

- Draw a cell on the board.
- From the cell, draw an arrow that points to the right.
- Draw a tissue (a collection of similar cells), followed by another arrow pointing to the right.
- Finally, draw an organ. (See **Know the Science 2**.)



4. Watch a video.

Online Resources

Play a video for students on levels of organization.

Lead student observations as they watch the video. Remind students that they did a demonstration with blocks at the beginning of class. Use the following questions to elicit a discussion after the video:

What part of the body do the blocks represent?

» cells

What part of the body do the walls represent?

» tissues

What part of the body would buildings represent?

» organs

Know the Science

TEACHER DEVELOPMENT

2. Structural Organization: The concept that our bodies are composed of smaller parts that work together is known as the structural (hierarchical) organization of the human body. The levels of organization range from the simplest to the most complex and are as follows: cells, tissues, organs, organ systems, and organisms.

Continue the discussion to draw parallels between building blocks and cells. It is important for students to understand that cells of a similar type work together to make up tissues (similarly to how similar building materials work together to make a wall). Students will learn more about cells working together in Lesson 4.

See the Online Resources Guide for a link to the recommended video.

www.coreknowledge.org/cksci-online-resources

5. Check for understanding.

Monitor Progress

Formative Assessment

Call attention to the question board. Revisit the questions recorded so far, and **ask students** how the activity they did today with blocks might answer any of those questions. Encourage students to suggest additions for you to make to the board of any questions or new observations they have.

Gauge student understanding of the following concepts based on their responses to your questions after watching the video:

- Cells make up tissues.
- Tissues make up organs.
- The body is made up of different types of cells.
- Different cells do different things.
- Cells need chemical energy, oxygen, water, and nutrients.

LESSON 4

Cells Work Together

Big Question: What makes you get hungry on a hike?

Lesson Question: How do cells work together?

Tie to the Anchoring Phenomenon: Jason learned a lot about what makes him hungry on a hike and why he feels better after eating lunch. Students will read that similar types of cells work together to make tissues, and learn how these benefit the body.

At a Glance

Learning Objective

✓ Relate cells to the composition of tissues of different types.

Instructional Activities

- teacher Read Aloud
- class discussion
- graphic organizer

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

cell **muscle** **tissue**

Language of Instruction: The Language of Instruction consists of additional terms, not considered a part of Core Vocabulary, that you should use when talking about any concepts in this exercise. Students will benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves. A Glossary at the end of this Teacher Guide lists definitions for both Core Vocabulary and Language of Instruction.

connective tissue **epithelial tissue** **nervous tissue**

Instructional Resources

Student Book

Ch. 4

Student Book, Chapter 4
"Cells Work Together"

Activity Page

AP 4.1

Activity Page
Types of Tissue (AP 4.1)

The Core Lesson 4

1. Review the Lesson Question.

Share the Big Question for today's lesson—**How do cells work together?**

Tell students it's time to "cell-a-brate" their cells with a little dance party! Prompt students to stand up from their desks and jump or hop in place. Have students wave their hands in the air or boogie and dance. Now have students bend down to touch their toes. Explain that all of these movements are made possible because of trillions of cells and how they work together in the body.

Differentiation

SUPPORT—Explain to students that scientists have come a long way in estimating the number of cells in the average human body. The most recent estimates put the number of cells at around thirty trillion. Write this out on the board for students to visualize: that's 30,000,000,000,000!

Activity Page

AP 4.1

Distribute Types of Tissue (AP 4.1) to each student. Explain that students will complete the graphic organizer as they read about the four types of tissues in Chapter 4. Let students know that you will prompt them to fill out their graphic organizers as you work through the chapter.

2. Read together: "Cells Work Together."

Student Book

Ch. 4

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Read Aloud Support

Page 18

Ask students to turn to page 18 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "Cells Work Together," and tell them to pay special attention to the different types of tissue as you read. Tell students they will also complete the graphic organizer on Types of Tissue (AP 4.1) as they read.

Ask students to look at the picture on page 18. Discuss what students see.

LITERAL—How do cells get the materials they need?

» Food the organism eats is broken down in the digestive system and then delivered to cells by the blood.

LITERAL—What gets absorbed from the food Jason eats?

» the chemicals cells need

Differentiation

SUPPORT—Talk about why cells have to keep building more cells. (See **Know the Science 1**.)

Page 19

Ask students to look at the picture on page 19. Explain that the kid in the picture is contracting an arm muscle called a bicep. Invite students to contract and feel their own biceps. For the illustration on top of the photograph, clarify that this is a collection of muscle cells that form muscle tissue and that muscle tissues form muscles, which are organs. Prompt students to fill out the section on muscle tissue on their graphic organizers.

LITERAL—What do similar cells working together form?

» tissues

CORE VOCABULARY—Explain that **tissue** is a structure made up of a group of similar cells.

CORE VOCABULARY—Explain that **muscle** is a type of tissue that allows the body to stretch and move. (See **Know the Science 2**.)

LITERAL—How do muscles work?

» by contracting and relaxing

EVALUATIVE—How are muscles in the arms and muscles in the intestines different?

» You can control the muscles in your arms but not the ones in your intestines.

Differentiation

SUPPORT—Explain that contracting makes the muscle shorter and relaxing makes the muscle longer. Have students practice contracting and relaxing their biceps and say the words *contracting, relaxing, longer,* and *shorter* as they do the movements.

EXTEND—As a homework assignment, invite students to keep a log of how they use their muscles to move throughout the day. Students will acknowledge just how much movement they do on a daily basis and that all of those movements are possible because of muscle tissue.

Page 20

Ask students to look at the picture on page 20. Explain that this picture may look just like the last one, but here the arm bones and elbow cartilage are shown in the boy's arm. Prompt students to fill out the section of the chart on Activity Page 4.1 for connective tissue.

Know the Science

TEACHER DEVELOPMENT

1. Making New Cells: Mitosis—a type of cell division—is the name of the biological process in which cells make nearly identical new cells. A cell (called the parent cell) splits into two new cells (called daughter cells). This process is essential for life. The new cells are critical for growth and repair.

2. Misconceptions About Muscles: Address any misconceptions that muscles are only the parts of the body that students can consciously contract or relax (such as the arms, legs, and shoulders). Clarify that there are muscles all over the body and that many of them are muscles we cannot see or control. These muscles do their work without us even knowing it.

Differentiation

SUPPORT—Explain that connective tissue is a type of tissue that helps body parts join, especially at the joints. If necessary, review with students where on the body different joints are located.

LITERAL—What does connective tissue do?

» It can connect bones to muscles or bones to bones.

LITERAL—What parts of your body are made from cartilage?

» outer ear, front of the nose, and parts of the rib cage

Page 21

Ask students to look at the picture on page 21. As you work through this page, prompt students to complete the section of the graphic organizer on Activity Page 4.1 for epithelial tissue.

Differentiation

SUPPORT—Explain that epithelial tissue is a type of tissue that covers some internal and external body parts. It covers parts that are on the inside of the body, including some organs. It also makes up tissue that is on the body's surface, including skin.

INFERENTIAL—What can you infer about someone who has healthy skin?

» Sample answer: They have healthy epithelial cells.

INFERENTIAL—Sometimes people say that epithelial tissue acts like a barrier. Do you think this is true? Why or why not?

» Sample answer: Yes, because it covers and protects body parts.

Page 22

Ask students to look at the diagram on page 22. Explain that this diagram shows parts of the body that belong to the nervous system. It is made up of the brain, spinal cord, and nerves. Prompt students to fill out the graphic organizer portion of Activity Page 4.1 that describes nervous tissue.

Differentiation

SUPPORT—To help students make a connection between nervous tissue and a common, everyday phenomenon, explain that nervous tissue is like a letter carrier. It carries signals and messages to and from parts of the body, just like a letter carrier carries mail to and from our homes.

LITERAL—What are some of the things nervous tissue lets us do?

» Sample answer: It lets us move, sense things, and do things like digest and breathe.

LITERAL—What are some of the things your body does without you having to think about it?

» breathing, digestion, and heartbeat

INFERENTIAL—How do you think nervous tissue is different from muscle tissue? (See **Know the Science 3**.)

» Sample answer: They are made up of different cells. Muscle tissue makes things move, but nervous tissue carries signals.

Page 23

Ask students to look at the diagrams on page 23.

LITERAL—What are some other kinds of tissues?

» blood and body fat

LITERAL—What makes blood and body fat types of tissue?

» Sample answer: They are made up of similar kinds of cells.

3. Check for understanding.

Have students turn their attention to Types of Tissue (AP 4.1) and record words about the four types of tissue they learned about in the Student Book chapter.

Students can work in pairs but should record on their own Activity Pages.

Circulate the room and provide examples of ways for students to show the types of tissue. For example, epithelial tissue can be shown as hair or nails, while connective tissue can be shown as veins or muscles running through the body.

Monitor Progress

Formative Assessment

Review student responses on Activity Page 4.1 to determine student understanding of the following concepts:

- Cells make up tissues.
- There are four types of tissues: muscle, connective, epithelial, and nervous.
- Muscle tissue helps body parts move. Connective tissue helps connect parts of the body. Epithelial tissue covers body parts (on the inside and outside of the body) to protect them. Nervous tissue sends signals.
- Each type of tissue is made of its own type of specialized cells.

See the Activity Page Answer Key for correct answers and sample student responses.

Know the Science

TEACHER DEVELOPMENT

3. Tissues Work Together, Too: Different types of tissues are made up of different types of cells. However, different tissues work together to support bodily processes and functions. For example, nervous tissue sends signals to your muscles, telling them to move. The muscle tissue then contracts or relaxes based on the signal it received from the nervous tissue. Muscle tissue and nervous tissue are very different types of tissues, but they work together to help people move.

LESSON 5

Tissues Make Up Organs

Big Question: What makes you get hungry on a hike?

Lesson Question: What are organs and organ systems?

Tie to the Anchoring Phenomenon: Now that Jason knows more about cells and tissues, he will discover more about how organs are supported by the nutrients that he gets from food.

At a Glance

Learning Objective

✓ Relate tissues to the composition of organs that form systems (such as the endocrine and immune systems).

Instructional Activities

- teacher Read Aloud
- class discussion

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

organ

Language of Instruction: The Language of Instruction consists of additional terms, not considered a part of Core Vocabulary, that you should use when talking about any concepts in this exercise. Students will benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves. A Glossary at the end of this Teacher Guide lists definitions for both Core Vocabulary and Language of Instruction.

bones **nervous system** **organ system**

Instructional Resources

Student Book

Ch. 5

Student Book, Chapter 5
"Tissues Make Up Organs"

Activity Page

AP 5.1

Activity Page
Cells, Tissues, Organs (AP 5.1)

The Core Lesson 5

1. Focus student attention on the Lesson Question.

Ask a volunteer to state the Lesson Question that you'll be investigating in this lesson—**What are organs and organ systems?**

Review with students that a system is a group of parts that work together. **Ask students** if they can name other kinds of systems that they know about, such as cars. Discuss the parts of each example that students give. Then discuss how these parts work together to make the entire system function.

Explain that in this chapter, students will read about how organs work together to form organ systems and that all of these organ systems work together to help the human body work as it should.

2. Read together: "Tissues Make Up Organs."

Student Book

Ch. 5

While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Page 24

Ask students to turn to page 24 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "Tissues Make Up Organs," and tell them to pay special attention to what organs do as you read.

Ask students to look at the picture on page 24. Discuss what students see.

LITERAL—What are Jason and Uncle Bryson doing now?

» They are hiking back down from the falls.

LITERAL—What is Jason thinking about?

» what he is going to eat for his next snack

INFERENTIAL—Why do you think Uncle Bryson tells Jason that you get hungry when you are growing?

» Sample answer: Your body needs more nutrients and chemical energy when you are growing because it uses them up more quickly.

Page 25

Ask students to look at the picture on page 25. Have students describe what they see.

CORE VOCABULARY—Explain that **organs** are body parts that are made up of different kinds of tissues. Organs do specific tasks in the body.

LITERAL—What does Jason's digestive system do?

» It physically and chemically breaks down what he eats.

LITERAL—What makes up organs?

» different kinds of tissues

Differentiation

SUPPORT—If necessary, review with students the progression of cells to tissues to organs by drawing it on the board so students can visualize it. A group of cells make up tissues, and tissues form organs. **Ask students,** Does this mean that organs are also made up of cells?

» yes

CHALLENGE—Challenge students to name organs in the body. Fun fact: tell students that the skin is actually one giant organ!

Page 26

Ask students to look at the pictures on page 26. Explain that the left picture shows the kid's stomach and that the stomach is an organ in the digestive system.

INFERENTIAL—What do all organs have in common?

» Sample answer: They are made of living cells.

LITERAL—What are some organs that are mentioned on this page?

» heart, intestines, and liver

EXTEND—Have students select different types of organs and look up what kind of tissues they are made of. For instance, the heart is primarily made of muscle tissue, but the skin is primarily made of epithelial tissue.

Page 27

Ask students to look at the pictures on page 27. Talk about what students see in the pictures.

LITERAL—What organs are shown on this page?

» brain and eyes

LITERAL—What do the brain and eyes have in common?

» Sample answers: They are both organs; they are made of tissues; they are made of cells.

INFERENTIAL—How does the stomach affect how your brain and eyes work? (See **Know the Standards**.)

» Sample answer: The stomach digests food. Then the food gives cells energy and nutrients that other parts of the body need to stay healthy, including the brain and eyes.

Page 28

Ask students to look at the pictures on page 28. Talk about what students notice in each picture. One picture shows the skin, and the other emphasizes bone. Explain that the purpose of the diagram is to show the bone underneath the skin.

LITERAL—What do your bones and skin need to stay healthy?

» chemical energy and nutrients

LITERAL—Where do the chemical energy and nutrients come from?

» the food you eat

EVALUATIVE—How are the bones and skin like the brain and eyes?

» Sample answers: Each is made of tissues; they all are made of cells; they all need nutrients and chemical energy to work.

Page 29

Ask students to look at the diagram on page 29. Talk through the diagram, and ask students to describe what they see. Explain that the diagram shows different organ systems. Explain that organ systems are a set of different organs that work together to perform a specific function for the body.

Call on one student at a time to name one body system until all the body systems on page 29 are mentioned. (See **Know the Science**.)

Know the Standards

TEACHER DEVELOPMENT

CCC 2 Cause and Effect: There is a cause-and-effect relationship between nutrients and the functionality of organs. Poor nutrition can have an adverse effect on body parts. Organs, like the eyes and brain, need nutrients to stay healthy. Nutrients can often be found in fresh fruits and vegetables, whole grains, and fats and proteins.

Know the Science

TEACHER DEVELOPMENT

Body Systems Work Together: The human body contains eleven organ systems that work together to maintain homeostasis. These are the integumentary, muscular, nervous, endocrine, skeletal, cardiovascular, digestive, excretory, reproductive, respiratory, and lymphatic systems. Generally, organs belong to specific organ systems. However, it is possible for an organ to belong to more than one organ system, depending on its function. In this unit, students are focusing on the digestive system, but it is important to emphasize the interconnectedness of all of the different parts of the body for sustaining life.

EVALUATIVE—What do you think each of the organ systems in the diagram does?

- » Sample answer: The skeletal system gives your body a frame.
- » Sample answer: The muscular system helps you move.
- » Sample answer: The nervous system tells your body to do things.
- » Sample answer: The circulatory system moves your blood around.
- » Sample answer: The respiratory system helps you breathe.

Differentiation

EXTEND—Have students select an organ system to research. Students should find out what the main function of the organ system is and what its primary organs are.

3. Check for understanding.

Activity Page

AP 5.1

Distribute Cells, Tissues, Organs (AP 5.1), and review the diagram with students so they understand how to label it using the words from the word box.

Students can work in pairs but should record on their own Activity Pages.

Circulate around the room, and remind students that the diagram progresses from biggest (the whole human) to smallest (cells). If necessary, give students clues as they work, such as, "Cells are the smallest parts on this diagram."

Monitor Progress

Formative Assessment

Review student responses on Cells, Tissues, Organs (AP 5.1) to determine student understanding of the following concepts:

- Cells make up tissues.
- Tissues make up organs.
- Organs make up organ systems.

See the Activity Page Answer Key for correct answers and sample student responses.

LESSON 6

Body Wastes

Big Question: What makes you get hungry on a hike?

Lesson Question: How does the body get rid of waste materials?

Tie to the Anchoring Phenomenon: Now that Jason knows more about how the cells, tissues, organs, and organ systems in the body use nutrients and chemical energy from food, it's time to learn what happens with the leftover waste material. Needing to eliminate waste is something that Jason experiences at the end of his hike and is something all students can relate to as well.

At a Glance

Learning Objectives

- ✓ Identify and describe parts of the body involved in waste elimination.
- ✓ Summarize the functions of the excretory system.
- ✓ Summarize waste elimination in the digestive system.

Instructional Activities

- teacher Read Aloud
- class discussion
- teacher demonstration

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

feces **urine** **waste**

Language of Instruction: The Language of Instruction consists of additional terms, not considered a part of Core Vocabulary, that you should use when talking about any concepts in this exercise. Students will benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves. A Glossary at the end of this Teacher Guide lists definitions for both Core Vocabulary and Language of Instruction.

bladder **excretory system** **kidneys**

Instructional Resources

Student Book

Ch. 6

Student Book, Chapter 6
"Body Waste"

Activity Page

AP 6.1

Activity Page
Getting Rid of Wastes (AP 6.1)

Materials and Equipment

Collect or prepare the following items:

- 2 cups water
- bowl or measuring cup
- pipette or dropper

Advance Preparation

Pour the water into a bowl or measuring cup. Be prepared to walk around the classroom holding the bowl and using the pipette, or dropper, to drop water onto students' hands.

The Core Lesson 6

1. Focus student attention on the Lesson Question.

Ask a volunteer to state the Lesson Question that you'll be answering in this lesson—**How does the body get rid of waste materials?**

Walk around the classroom, and carefully drop three drops of the water onto the back of each student's hand. Tell students to gently rub the water on their skin and then blow on the part of the skin where the water is.

Ask students to describe what it feels like.

» Sample answer: It makes my skin feel cool.

Explain that this is how sweat works. **Ask students** if they have ever felt sweaty. Talk about how sweat comes out of the skin and helps cool the body down. Explain that students will learn more in this chapter about why sweat is an important way for our bodies to get rid of waste.

2. Read together: "Body Wastes."

Student Book

Ch. 6

While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Page 30

Ask students to turn to page 30 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "Body Wastes," and tell them to pay special attention to how the body eliminates the leftover waste as you read.

Ask students to look at the picture on page 30. Discuss what students see, and **ask students** if they have ever used a restroom at a public park before.

LITERAL—What do Jason and Uncle Bryson have to do?

» use the restroom

INFERENTIAL—Do you think drinking a lot of water or eating a lot of food has anything to do with Jason needing to use the restroom? Why or why not?

» Sample answer: Yes, because drinking a lot of water and eating a lot of food makes you have to go to the restroom.

Page 31

Ask students to look at the diagram on page 31. Have students describe what they see. Explain that the diagram shows the digestive system, starting with the mouth. The large intestine, which is where waste collects and eventually exits the body, is emphasized.

LITERAL—What body part is the diagram focusing on?

» large intestine

CORE VOCABULARY—Explain that **waste** is the material that is left over from food and liquids that the body does not use or need.

CORE VOCABULARY—Explain that **feces** is the solid waste left over from the digestive system. Students will know it as poop.

LITERAL—What is another name for poop?

» feces or stool

LITERAL—Where does waste go?

» Sample answer: It moves through the intestines and exits the body.

INFERENTIAL—Where in the body do you think waste starts to form?

» Sample answer: It probably forms in the intestines with whatever the body does not use.

EVALUATIVE—Why do you think waste has to leave the body?

» Sample answer: It can become toxic/harmful if it stays inside the body for too long.

Page 32

Ask students to look at the diagram on page 32. Explain that the diagram shows a cross section of a blood vessel next to a cell. The red circle dots represent waste in the blood vessel and moving out of the cell.

INFERENTIAL—What can you tell from the diagram about waste?

» Sample answer: It moves out of cells.

LITERAL—What carries waste material away from cells?

» blood

LITERAL—What happens to the waste in the blood?

» Sample answer: The waste leaves the blood, and the body gets rid of it.

Page 33

Ask students to look at the diagram on page 33. Talk about what students see in the diagram. Name the body parts shown: bladder, kidneys, and urethra.

LITERAL—What organs help the body remove liquid waste?

» bladder, kidneys, urethra

CORE VOCABULARY—Explain that **urine** is a liquid form of body waste. Students will know it as pee.

LITERAL—What is the name of the organ system that removes liquid waste from the body? (See **Know the Science 1** and **Know the Standards**.)

» excretory system

Know the Science

TEACHER DEVELOPMENT

1. Excretory System: The excretory system works alongside the digestive system to eliminate waste from the body. Excretion is an essential process for maintaining homeostasis. As wastes build up in the body, they can become toxic and spread to cells through the bloodstream. The kidneys, bladder, and urethra are some of the primary organs involved in the excretory system, an organ system. The skin is another organ that belongs to the excretory system. Sweat, for example, is a type of waste material that exits the body through pores in the skin.

Know the Standards

TEACHER DEVELOPMENT

CCC 4 Systems and System Models: In Grade 2, students understand that a system is an organized group of related objects or components. The human body is, itself, a system that is comprised of various parts that are interconnected. Certain organs, for instance, can belong to different organ systems but still work together to support the larger system of the human body as a whole. Here, students understand that the organs of the excretory system must work with other parts of the body in order to eliminate waste.

Page 34

Ask students to look at the pictures on page 34. Talk about what students notice in each picture.

LITERAL—What are the people in the pictures doing?

» sweating

Differentiation

SUPPORT—Refer back to the demonstration at the beginning of class. Talk with students about what makes them sweat, such as very hot weather or exertion during physical activity and sports. **Ask students** what they usually do to cool off (such as wiping off their sweat with a towel, drinking water, or sitting in front of a fan). Emphasize that sweat is a form of waste that leaves the body through the skin. Explain that everybody sweats, so encourage students to not feel bad or embarrassed about it.

LITERAL—How were Jason's and Uncle Bryson's bodies getting rid of waste materials while they were hiking?

» by sweating

CHALLENGE—Challenge students to discuss, in pairs, why they think sweat is considered the body's natural "cooling system." Once students have had a chance to share their ideas with each other, discuss how this mechanism works. (See **Know the Science 2**.)

EXTEND—Have students research the composition of sweat to learn that it is made up mostly of water with trace amounts of other elements, like salts, sugars, ammonia, and urea. These are part of the waste that the body needs to eliminate.

Page 35

Ask students to look at the diagram on page 35. Talk through the diagram, and **ask students** to describe what they see. They should be able to recognize the lungs. Explain that this is the respiratory system. (See **Know the Science 3**.)

LITERAL—What gas do the cells need to carry on life activities?

» oxygen

Know the Science

TEACHER DEVELOPMENT

2. Sweating and Cooling: Sweat can contain waste materials from the body. But sweat evaporates when it hits the air. The evaporation causes a cooling effect on the skin, known as evaporative cooling. Thus, sweating is actually a mechanism that the body uses to help cool itself down so that it does not overheat. This process is one part of thermoregulation, which helps maintain thermal stability in the body. When the body realizes that it is overheated, it triggers sweat glands to produce sweat to help bring its internal temperature back down.

3. Body Systems Working Together: By now, students may notice that different body systems are involved in getting rid of different kinds of waste from the body. This means that these body parts and systems (such as the skin/integumentary system and the lungs/respiratory system) are also part of the excretory system.

LITERAL—What gas do the cells need to get rid of so that cells are not harmed?

» carbon dioxide

Differentiation

SUPPORT—Invite students to take a deep breath in and then let it out slowly. Have students repeat this exercise a few times. Explain that each time students breathe in, they are inhaling air that contains oxygen. Each time they breathe out, they are releasing air containing waste from their bodies in the form of carbon dioxide.

3. Check for understanding.

Activity Page

AP 6.1

Distribute Getting Rid of Wastes (AP 6.1), and review what the students will need to write or draw in the boxes.

Students can work in pairs but should record on their own Activity Pages.

Circulate around the room, and let students know that they can go back through Chapter 6 to find their answers.

Monitor Progress

Formative Assessment

Review student responses and drawings on Getting Rid of Wastes (AP 6.1) to determine student understanding of the following concepts:

- Sweat, urine, feces, and carbon dioxide are types of wastes.
- The lungs, skin, bladder, kidneys, and urethra help get rid of waste.
- Cells and lungs move waste out of them.

Do not score students based on artistic abilities, but ensure they understand the correct concepts.

See the Activity Page Answer Key for correct answers and sample student responses.

LESSON 7

Science in Action: Nutrition and Staying Well

Big Question: What makes you get hungry on a hike?

Lesson Question: Why does it matter what we eat?

Tie to the Anchoring Phenomenon: Students join Jason as he discovers more about the kinds of foods he ate during his hike with Uncle Bryson and why it is important to pay attention to the foods that he consumes.

At a Glance

Learning Objectives

- ✓ Discuss health practices regarding nutrition and vaccines.
- ✓ Learn about relevant scientists.

Instructional Activities (2 Days)

- teacher Read Aloud
- class discussion

Core Vocabulary

Core Vocabulary: Core Vocabulary terms are those that students should learn to use accurately in discussion and in written responses. During instruction, expose students repeatedly to these terms. However, these terms are not intended for isolated drill or memorization.

health **healthy** **healthful** **nutrition**

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balanced diet **food safety** **pathogen** **vaccine**

Instructional Resources

Student Book

Ch. 7

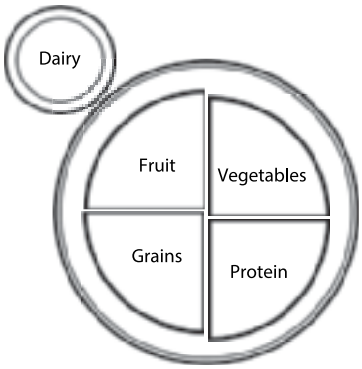
Student Book, Chapter 7
"Science in Action: Nutritionist"

Materials and Equipment

Collect or prepare the following items:

- paper plates (1 per pair)
- black marker
- index cards (or scrap paper) (15–20 plus one for dairy per pair)
- plastic bags (1 per pair)

Advance Preparation



- Make the MyPlate plates for students. Using a black marker, draw the sections onto the paper plates and add the labels for each section, using the Use an index card for the offset dairy section.
- Make the food cards on index cards (or scrap paper). Alternatively, you can print food cards from the computer and make enough copies for all the groups. Food cards should give the names of foods (if you use the computer, you can include pictures, too). Aim for an assortment of around fifteen to twenty foods total per student group. Place the food cards into plastic bags so they are ready to distribute to each group on Day 2.

The Core Lesson 7

1. Day 1: Introduce the topic.

Remind students that they read about Jason and his hike with Uncle Bryson throughout the unit. **Ask students** to recall what Jason was mostly thinking about during their hike: eating! Explain that today students will read more about why it is important for people to pay attention to the types of foods they choose to eat.

2. Read together: "Science in Action: Nutritionist."

Student Book

Ch. 7

While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Page 36

Ask students to turn to page 36 of the Student Book and look at the images as you read aloud. Remind them that the title of this chapter is "Science in Action: Nutritionist," and tell them to pay special attention to the many ways people can stay healthy as you read.

Ask students to look at the picture on page 36. Talk about what they see on the plate.

LITERAL—What does Uncle Bryson do for a living? (See **Know the Standards 1**.)

» He is a nutritionist.

CORE VOCABULARY—Explain that **health** is a state in which your body is at a **healthy** weight and does not have an illness or injury. **Healthful** refers to the quality of substances that result in good health.

CORE VOCABULARY—Explain that a nutritionist is someone who specializes in helping people identify and eat nutritious foods that will best support their health. **Nutrition** refers to eating foods that are good for you.

INFERENTIAL—Who does Uncle Bryson care about as a nutritionist?

» Sample answer: He cares about people: he cares about what people eat, how people can be healthy, how people can be a healthy weight, and how people can get exercise.

INFERENTIAL—Do you think the food in the picture looks healthful?

» Sample answer: Yes, there are different kinds of foods on the plate and some fruit and vegetables.

Differentiation

CHALLENGE—Challenge students to think about and discuss whether there is a relationship between nutrition and health.

Page 37

Ask students to look at the two pictures on page 37. Talk about the foods students see in the pictures.

Keep in mind that the goal of this page is not to food-shame but rather to bring student awareness to the healthy options that are available. Keep in mind that not all students have access to healthy foods at home or in school, especially those who live in areas that are considered food deserts.

Know the Standards

TEACHER DEVELOPMENT

1. Nature of Science—Science Is a Human Endeavor: People of any race, gender, or ethnicity, such as Uncle Bryson, can work as nutritionists. They can also work in other fields that use science, such as engineering, mathematics, robotics, and medicine.

EVALUATIVE—Which food do you think is healthier: the leafy vegetables or the cookie?

» the leafy vegetables

INFERENTIAL—Why are food choices important?

» Sample answer: Too much or too little of some things in food can make you sick. Healthy food choices keep your body healthy.

LITERAL—What is the difference between a cookie and an orange? Both are sweet.

» Sample answer: An orange has nutrients that the body needs, but a cookie doesn't.

Page 38

Ask students to look at the pictures on page 38. Explain that the pictures show a variety of foods. The center picture shows the MyPlate diagram recommending relative portions of types of foods. Help students interpret the MyPlate diagram.

Differentiation

SUPPORT—Explain that a portion is how much of a food a person eats at one time. People can have big portions or small ones. Invite students to use the word *portion* in a sentence to clarify their understanding.

LITERAL—How do nutritionists group foods?

» by different types

EVALUATIVE—According to the diagram, which types of food should you have the most of and the least of on your plate?

» the most vegetables; the least dairy

LITERAL—What are the different types of foods?

» vegetables, fruits, grains, proteins, and dairy

Page 39

Ask students to look at the picture on page 39. Talk about what is wrong with the food shown in the picture. Explain that when something is spoiled, it means that it is not good to eat anymore. It is rotten.

LITERAL—What could happen if you eat something that is old or spoiled?

» It can make you sick.

LITERAL—What do you call germs that make food unsafe to eat?

» pathogens

EVALUATIVE—What are some ways you and your family can keep your food safe?

» Sample answers: We can wash our hands before and after we make food; we can make sure we cook our food completely; we can look at the dates on food packages; we can check food for bad smells.

Page 40

Ask students to look at the two pictures on page 40. Students should be able to recognize that the first picture shows milk. Explain that the second picture is a portrait of Louis Pasteur. (See **Know the Standards 2** and **3**.)

LITERAL—What did Louis Pasteur investigate and study?

» Sample answers: He investigated how tiny organisms make food decay and cause illness; he studied how to keep unsafe germs out of food.

LITERAL—What is Pasteur famous for inventing?

» a heating process called pasteurization to kill germs in certain foods

LITERAL—What are the effects of pasteurization?

» It makes foods safer and last longer.

Page 41

Ask students to look at the two pictures on page 41. Explain that the first picture shows a child getting a shot. **Ask students** to share a time when they got a shot at the doctor's office and to describe their experience with it. The second picture shows a portrait of Edward Jenner.

LITERAL—What are some ways that germs enter our bodies?

» from food, from air, from surfaces we touch

LITERAL—What did Edward Jenner study? (See **Know the Standards 4**.)

» vaccinations

Differentiation

SUPPORT—Explain that vaccination is a way of exposing healthy people to small amounts of germs. This method "teaches" the body's immune system to fight off the germs if it contacts them later. There are more than fifteen diseases that the Centers for Disease Control and Prevention (CDC) recommends vaccination against. (See **Know the Science**.)

Know the Standards

TEACHER DEVELOPMENT

2. Nature of Science—Scientific Investigations Use a Variety of Methods: There are different ways that scientists can study the natural world. Some scientists study things by experiencing and observing them. Other scientists perform tests or create models that they can use to study their ideas. Louis Pasteur investigated food pathogens and how they responded under certain conditions to keep them out of foods.

3. SEP 1 Asking Questions: Scientific investigations begin with a question about the natural world. Louis Pasteur most likely asked questions about food safety to lead him to his discovery. Talk with students about what questions Pasteur may have asked to prompt his investigations.

Know the Science

TEACHER DEVELOPMENT

Vaccines: Vaccinations prompt the body's white blood cells and other specialized cells to start making proteins called antibodies. A vaccine promotes antibodies specific to a certain antigen, not to all antigens. The antibodies are part of the body's immune system. These unique antiboides travel through the blood and help fight off diseases.

SUPPORT—Keep in mind that some students may come from households where parents or guardians do not believe in vaccinations. It may be necessary to explain that some families have different beliefs about what they choose to do with their bodies.

1. Day 2: Facilitate the activity.

Remind students that they previously read about Uncle Bryson, who works as a nutritionist. Tell them that today they will work on an activity where they get to put together a plate for a meal using foods that they think are healthy and nutritious.

Have students form pairs, and then distribute the materials to them. Each pair of students should get a labeled plate and a variety of food cards.

Explain that students will work together to discuss each food card and decide where it belongs on the plate.

Differentiation

SUPPORT—Use fewer food cards with students who may need additional support with this activity.

Circulate around the room as students work, and assist as necessary. Remind students that they are trying to make healthy and nutritious plates, so this means that they should pay careful attention to the portion size for each section. Bring attention to the fact that vegetables and grains have the largest sections on the plate, followed by fruit and protein, and then dairy with the smallest section.

Let students know that they do not need to use all the food cards to make their plates. For instance, they might choose to only include one food card for dairy, since that portion is the smallest on the MyPlate diagram.

2. Check for understanding.

Formative Assessment

Review students' completed plates to ensure the following:

- Each section of the plate has appropriate food cards in it.
- Vegetables and grains have the most food cards, followed by fruit and protein, and dairy with the fewest.

Know the Standards

TEACHER DEVELOPMENT

4. CCC 1 Patterns: Germs, or pathogens, exist in nature, and scientists look for patterns when studying them. Patterns can help scientists better understand how things work in nature, because patterns are things that repeat themselves. Edward Jenner studied the patterns of pathogens by observing how they reacted to vaccination. He learned that vaccinations keep people healthy.

UNIT 5

Teacher Resources

Activity Pages

Name _____ Date _____

Activity Page 1.1 Use with Lesson 1

What Do I Eat?

Write what you eat during the day and when.

My Food Journal	
Time of Day	**Food**

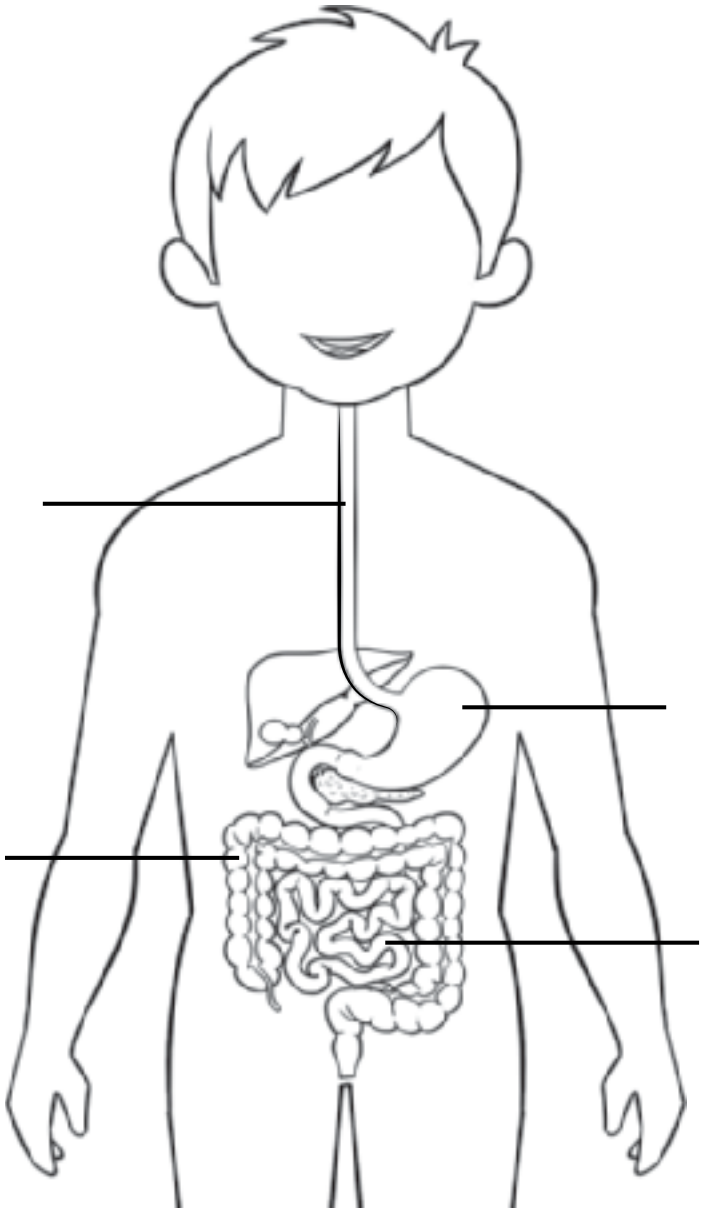
Name _____ Date _____

Activity Page 2.1 Use with Lesson 2

Build-A-Body

Label the digestive system. Use the words in the box.

esophagus	stomach	small intestine	large intestine



Name _____ Date _____

Activity Page 4.1 Use with Lesson 4

Types of Tissue

Fill in the chart as you read along.

Muscle Tissue	**Connective Tissue**
Function: _____ _____ _____ Examples: _____ _____ _____	Function: _____ _____ _____ Examples: _____ _____ _____
Epithelial Tissue	**Nervous Tissue**
Function: _____ _____ _____ Examples: _____ _____ _____	Function: _____ _____ _____ Examples: _____ _____ _____

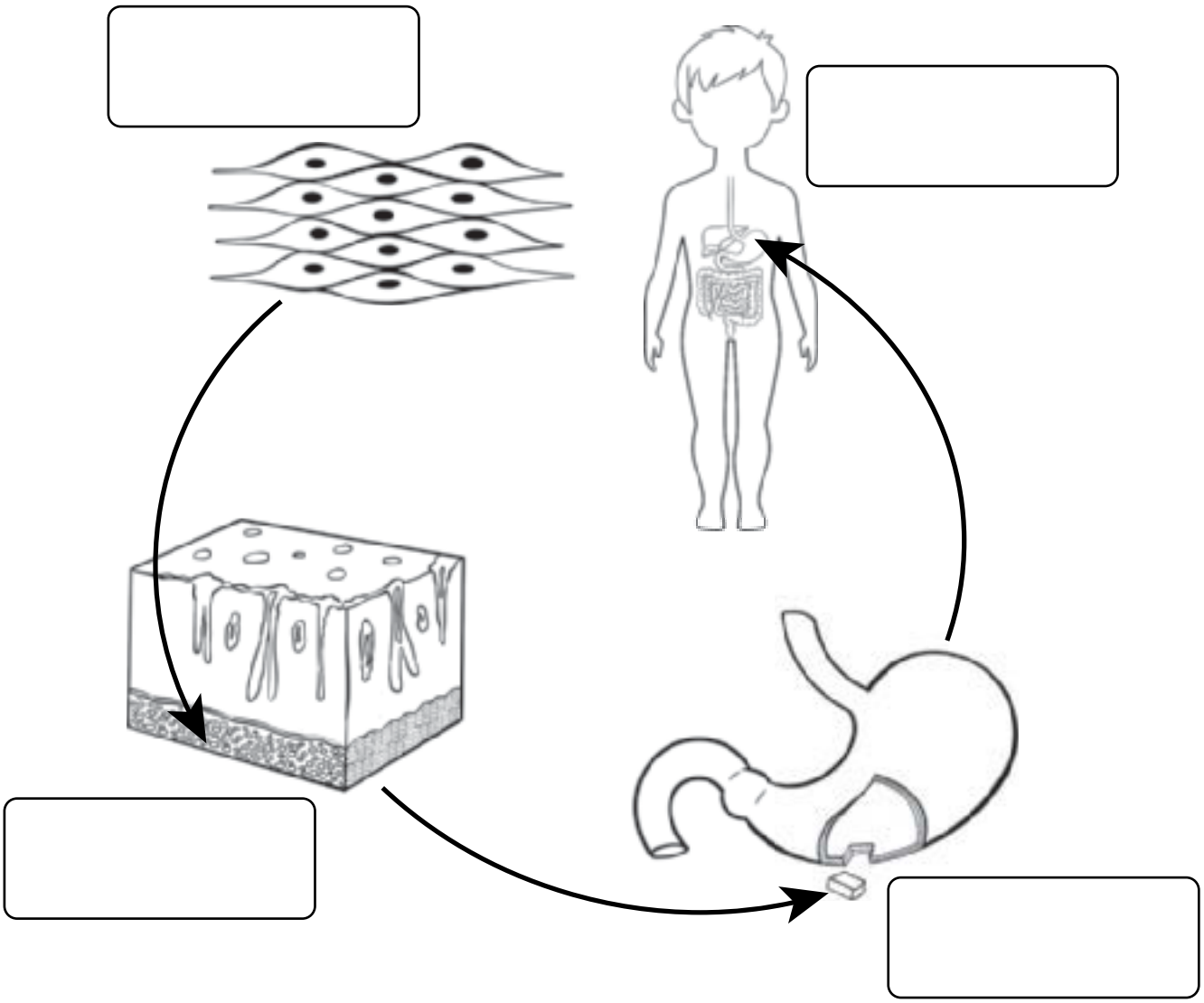
Name _____ Date _____

Activity Page 5.1 Use with Lesson 5

Cells, Tissues, Organs

Label the diagram. Use the words in the word box.

cell	tissue	organ	organ system



Name _____ Date _____

Activity Page 6.1 Use with Lesson 6

Getting Rid of Wastes

Write your answers in the boxes.

Name four types of waste:	Name three body parts that help get rid of waste:
Draw a cell getting rid of waste:	Draw carbon dioxide leaving your body:

Activity Pages Answer Key: *Human Cells and Digestion*

This answer key offers guidance to help you assess your students' learning progress. Here you will find descriptions of the expectations and correct answers for each Activity Page of this unit.

What Do I Eat? (AP 1.1) (page 53)

Students' responses will vary.

Build-A-Body (AP 2.1) (page 54)

Students should label the diagram in the following order: esophagus, stomach, small intestine, large intestine.

Types of Tissue (AP 4.1) (page 55)

Accept all reasonable examples.

Muscle Tissue
Function: movement
Examples: arm muscle (bicep)

Connective Tissue
Function: joins parts of the bodyExamples: elbow connective tissue (tendons)

Epithelial Tissue
Function: coverings
Examples: skin

Nervous Tissue
Function: carries signals
Examples:

Cells, Tissues, Organs (AP 5.1) (page 56)

Students should label the diagram in the following order: cell, tissue, organ, organ system.

Getting Rid of Wastes (AP 6.1) (page 57)

Students should answer top/left: sweat, urine, feces, and carbon dioxide; top/right: lungs, skin, kidneys, bladder, urethra, intestines; bottom/left: students may use arrows to show waste being eliminated from a cell; bottom/right: students should show a person exhaling.

Appendix A

Glossary

Blue words and phrases are Core Vocabulary for the unit. **Bold-faced words and phrases** are Language of Instruction, additional vocabulary terms related to the unit that you should model for students during instruction. Vocabulary words are not intended for use in isolated drill or memorization.

A

alive/living, adj. having life, not dead

B

balanced diet, n. a diet with food that is in proper amounts and has a healthy distribution of nutrients

bladder, n. an organ that is a hollow sac that collects urine

body parts, n. all the parts that make up you

bone, n. hard structure in the body that does not bend

C

cell, n. the smallest living thing in the body

connective tissue, n. a type of fibrous tissue that supports and connects other types of tissue in the body

D

different types, n. variation in different kinds of things

digest, v. to break down physically and chemically for energy and nutrients

digestion, n. the process the body goes through to break down food

digestive system, n. the group of organs that take food in, break it down, absorb nutrients, and excrete wastes

E

energy, n. (food energy) allows the body to do work and carry out life processes

epithelial tissue, n. a type of tissue that makes up the skin and covers the internal surfaces within the body

esophagus, n. a tube within the body that connects the throat to the stomach

excretory system, n. the group of organs that remove wastes from within the body and excrete them from the body

F

feces, n. the solid waste left over from the digestive system

food, n. anything you eat that gives you the chemical energy and substances to run life processes

food safety, n. the handling, preparing, and storing of food that reduces the risk of spoiling or becoming contaminated

H

health, n. the condition of the mind and body

healthful nutrition, n. quality of food that is good for you and improves your health

healthy, adj. being in good health

hike, n. a long walk in a natural setting

hunger, n. the feeling we get when our bodies tell us it is time to eat

hungry, adj. having the feeling of wanting to eat

I

intestine, n. the hoselike body part where food goes after it leaves stomach

K

kidneys, n. a pair of organs that filter and remove waste from the blood in the form of urine

M

muscle tissue, n. a type of tissue that allows the body to stretch and move

N

nervous system, n. the group of organs, tissues, and nerves that receive and respond to stimuli

nervous tissue, n. made up of nerve cells that carry sensory signals

O

organ, n. a body part, made of tissues, that serves a specific function in the body

organ system, n. a group of organs that work together to do a job

P

pathogen, n. a microorganism that causes disease

S

stomach, n. a body part where food goes after you swallow it

T

tissue, n. a structure made up of a group of similar cells

U

unit, n. a defined, single part of a whole

urine, n. a liquid form of body waste

V

vaccine, n. a treatment that stimulates the body to fight a pathogen once it gets inside the body

W

waste, n. the material that is left over from food and liquids that the body does not use or need

Appendix B

Classroom Safety for Activities and Demonstrations

In the Core Knowledge Science program (CKSci), activities and demonstrations are a vital part of the curriculum and provide students with active engagement related to the lesson content. The activities and demonstrations in this unit have been selected and designed to engage students in a safe manner. The activities and demonstrations make use of materials and equipment that are typically deemed classroom safe and readily available.

Safety should be a priority when engaged in science activities. With that in mind, observe the following safety procedures when the class is engaged in activities and demonstrations:

- Be aware of students who have food allergies, and adjust related activities or make materials substitutions as necessary. Check the ingredients of all food to make sure known allergies are not listed. Students with food allergies can still be affected even if they do not ingest the food item. Some common food allergies are peanuts, tree nuts (e.g., almonds, walnuts, hazelnuts, etc.), and cow's milk (rice milk is a good nut-free alternative).
- Report and treat any injuries immediately.
- Check equipment prior to usage, and make sure everything is clean and ready for use.
- Clean up spills or broken equipment immediately using the appropriate tools.
- Monitor student behavior to ensure they are following proper classroom and activity procedures.
- Do not touch your eyes, ears, face, or mouth while engaging in an activity or demonstration.
- Review each step of the lesson to determine if there are any safety measures or materials necessary in advance.
- Wear personal protective equipment (e.g., safety goggles, aprons, etc.) as appropriate.
- Check for allergies to latex and other materials that students may have, and take appropriate measures.
- Secure loose clothing, hair, or jewelry.
- Establish storage and disposal procedures for chemicals as per their Safety Data Sheet (SDS), including household substances such as vinegar and baking soda.

Copy and distribute the Student Safety Contract, found on the next page. Have a read-along, and have students agree to the expectations for students when engaged in science activities prior to the start of the first unit.

Online Resources

For additional support for safety in the science classroom, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Student Safety Contract

When doing science activities, I will do the following:

- Report spills, breakages, or injuries to the teacher right away.
- Listen to the teacher for special instructions and safety directions. If I have questions, I will ask the teacher.
- Avoid eating or drinking anything during the activity unless told to by my teacher.
- Review the steps of the activity before I begin. If I have questions, I will ask the teacher.
- Wear safety goggles when working with liquids or things that can fly into my eyes.
- Be careful around electric appliances and unplug them, just by pulling on the plug, when a teacher is supervising.
- Keep my hands dry when using tools and devices that use electricity.
- Be careful to use safety equipment like gloves or tongs when handling materials that may be hot.
- Know when a hot plate is on or off and let it cool before touching it.
- Roll or push up long sleeves, keep my hair tied back, and secure any jewelry I am wearing.
- Return unused materials to the teacher.
- Clean up my area after the activity and wash my hands.
- Treat all living things and the environment with respect.

I have read and agree to the safety rules in this contract.

_____ _____/_____/_____/

Student signature and date

_____

Print name

Dear Parent or Guardian,

During science class, we want to create and maintain a safe classroom. With this in mind, we are making sure students are aware of the expectations for their behavior while engaged in science activities. We are asking you to review the safety rules with your student and sign this contract. If you have any questions, please feel free to contact me.

_____ _____/_____/_____/

Parent or guardian signature and date

Appendix C

Strategies for Acquiring Materials

The materials used in the Core Knowledge Science program (CKSci) are readily available and can be acquired through both retail and online stores. Some of the materials will be reusable and are meant to be used repeatedly. This includes equipment such as scales, beakers, and safety goggles but also items such as plastic cups that can be safely used again. Often these materials are durable, can be cleaned, and will last for more than one activity or even one school year. Other materials are classified as consumable and are not able to be used more than once, such as glue, baking soda, and aluminum foil.

Online Resources

The Material Supply List for this unit's activities can be found online. Follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Ways to Engage with Your Community

The total cost of materials can add up for an entire unit, even when the materials required for activities and demonstrations have been selected to be individually affordable. And the time needed to acquire the materials adds up too. Reaching out to your community to help support STEM education is a great way to engage parents, guardians, and others with the teaching of science, as well as to reduce the cost and time of collecting the materials. With that in mind, the materials list can be distributed or used as a reference for the materials teachers will need to acquire to teach the unit.

Consider some of the following as methods for acquiring the science materials:

- School Supply Drive—If your school has a supply drive at any point in the year, consider distributing materials lists as wish lists for the science department.
- Open Houses—Have materials lists available during open houses. Consider having teams of volunteers perform an activity to show attendees how the materials will be used throughout the year.
- Parent-Teacher Organizations—Reach out to the local PTO for assistance with acquiring materials.
- Science Fair Drive—Consider adding a table to your science fair as part of a science materials drive for future units.
- College or University Service Project—Ask service organizations affiliated with your local higher education institutions to sponsor your program by providing materials.
- Local Businesses—Some businesses have discounts for teachers to purchase school supplies. Others may want to advertise as sponsors for your school/programs. Usually you will be asked for verifiable proof that you are a teacher and/or for examples of how their sponsorship will benefit students.

Remember: If your school is public, it will be tax exempt, so make sure to have a Tax Identification Number (TIN) when purchasing materials. If your school is private, you may need proof of 501(c)(3) status to gain tax exemption. Check with your school for any required documentation.

Appendix D

Advance Preparation for Activities and Demonstrations

Being properly prepared for classroom activities and demonstrations is the first step to having a successful and enriching science program. Advance preparation is critical to effectively support student learning and understanding of the content in a lesson.

Before doing demonstrations and activities with the class, do the following:

- Familiarize yourself with the activity by performing the activity yourself or with a team, and identify any issues or talking points that could be brought up.
- Gather the necessary materials for class usage. Consider if students will gather their materials at stations or if you will preassemble the materials to be distributed to the students and/or groups.
- Identify safety issues, such as food allergies, that could occur during an activity or demonstration, and plan and prepare how to address them.
- Review the Teacher's Guide before teaching, and identify opportunities for instructional support during activities and demonstrations. Consider other Support and/or Challenge opportunities that may arise as you work to keep students engaged with the content.
- Prepare a plan for postactivity collection and disposal of materials/equipment.

While engaged in the activity or demonstration, do the following:

- Address any emergencies immediately.
- Check that students are observing proper science safety practices as well as wearing any necessary safety gear, such as goggles, aprons, or gloves.
- When possible, circulate around the room, and provide support for the activity. Return to the Teacher Guide as students work, to utilize any Support and Challenge opportunities that will make the learning experience most meaningful for your students.

After the activity or demonstration, do the following:

- Use your plan for students to set aside or dispose of their materials as necessary.
- Have students wash their hands after any activity in which they could come in contact with any potentially harmful substances.

When engaging students in activities and demonstrations, model good science practices, such as wearing proper safety equipment, never eating during an investigation, etc. Good science practices at a young age will lead to students observing good science practices themselves and being better prepared as they move into upper-level science classes.

Appendix E

What to Do When Activities Don't Give Expected Results

Science activities and experiments do not always go according to plan. Microwave ovens, super glue, and X-rays are just some of the discoveries made when people were practicing science and something did not go according to plan. In your classroom, however, you should be prepared for what to do when activities don't give the expected results or when an activity doesn't work.

When going over an activity with an unexpected result, consider these points in discussion with your students:

- Was there an error in following the steps in order? You or the student may have skipped a step. To help control for this, have students review the steps to an investigation in advance and make a check mark next to each step as they complete it.
- Did students design their own investigation? Perhaps their steps are out of sequence, or they missed a step when performing the activity. Review and provide feedback on students' investigation plan to ensure the work is done in proper sequence and that it supports the lesson segment's guiding question.
- When measurements were taken, were they done correctly? It is possible a number was written down incorrectly; a measurement was made in error, such as a wrong unit of measure or quantity; or the starting or ending point of a measurement was not accurate.
- Did the equipment or materials contribute to the situation? For example, chemicals that have lost their potency or a scale that is not measuring accurately can contribute to the success or failure of an activity.

One of the greatest gifts a student can learn when engaged in science is to develop a curiosity for *why something happened*. Students may find it challenging or frustrating to work through a problem during an activity, but guiding them through the problem to figure out *why* something happened will help them to develop a better sense of how to do science.

CKSci™

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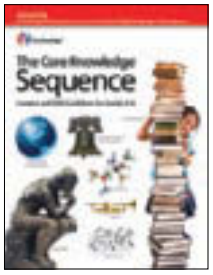
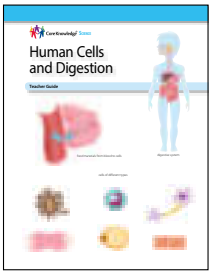


What is the Core Knowledge Sequence?
The *Core Knowledge Sequence* is a detailed guide to specific content and skills to be taught in Grades K–8 in language arts, history, geography, mathematics, science, and the fine arts. In the domains of science, including Earth and space, physical, and life sciences, the *Core Knowledge Sequence* outlines topics that build systematically grade by grade to support student learning progressions coherently and comprehensively over time.



For which grade levels is this book intended?
In general, the content and presentation are appropriate for students in the early elementary grades. For teachers and schools following the *Core Knowledge Sequence*, this book is intended for Grade 2 and is part of a series of **Core Knowledge SCIENCE** units of study.

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