

TEACHER'S GUIDE



Adventurer

March 2016

In This Guide

In this guide, you will find language arts and science lessons for the stories in the March issue of EXPLORER ADVENTURER.

Explorer Magazine

EXPLORER magazine is a classroom magazine specifically written for each grade, 2-5. Each grade's magazine contains a grade-appropriate reading experience, develops literacy skills and teaches standards-based science content. Great storytelling and stunning photographs teach your students about our planet and the people, plants, and animals that live on it. Use EXPLORER in your classroom to encourage students to explore our world and make it a better place.

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LANGUAGE ARTS

Objectives

- Students will identify the main idea of the article and each section.
- Students will explain concepts based on information in the text.
- Students will summarize the article.

Resources

- Vocabulary Assessment Master (page 6)
- Language Arts Assessment Master (page 7)

Summary

- The article “Chameleons” investigates unique adaptations of chameleons, including how they communicate with color.

BUILD VOCABULARY AND CONCEPTS

- **adaptation**
- **cells**
- **melanin**
- **pigment**

Display the vocabulary words on a word wall or on the whiteboard. Point out to students that when they read they will encounter words they don't know. Remind them that using context clues such as the sentences before and after an unknown word and photographs on the page can help them figure out what the unfamiliar word means.

Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to record each vocabulary word from the article. Then have them scan the article to locate each bold word within the text.

Have students record text and photo clues from the article that are related to each vocabulary word. Then instruct each student to record his or her own idea about what each word means.

Invite volunteers to read aloud the definitions on page 9 of the article. Encourage students to compare the definitions they wrote with those in the text. Discuss how context clues helped them to understand the meaning of each word.

READ

Give students a few minutes to scan the article in their magazines. **Then ask:** *What do you think this article is about? Why?* Encourage students to share their ideas.

Explain to students what they just attempted to identify was the main idea or overall topic of the article. Tell students that everything in the article is connected to the main idea. Each section has a main idea. Everything in a section is connected to the main idea of that section.

Display pages 2-3 of the projectable magazine. Model how to identify the main idea of the article.

Say: *When I look at these pages, it's impossible to miss the animal in the photo. Just in case I don't recognize that animal, the headline tells me that it is a chameleon. Based on these clues, I know this article is about chameleons. But what exactly is it going to tell me? What is the main idea? To find that, I just have to look for other clues. Point out the subhead and read it aloud. **Then say:** After reading this, I know exactly what this article is about. As I read, I learn about unique adaptations that chameleons have, including how they communicate with color.*

Have students read the article on their own. As students read, encourage them to search for details that support the main idea of the article.

TURN AND TALK

Have students turn and talk to discuss what they learned about unique adaptations that chameleons have, including how they communicate with color. **Ask:** *Which body part helps chameleons communicate? (skin) What does it do to help them communicate? (changes color) What is a chameleon saying if its skin is brightly colored? ("Stay away!")* Discuss how other skin colors help chameleons communicate. **Then ask:** *What are some other reasons a chameleon's skin might change color? (in response to temperature and mood)*

- **Identify Main Ideas** Remind students that the article has a main idea. But each section has its own main idea, too. Explain that they can find the main idea of a section the same way they found the main idea of the article. They search for important clues. Give each student a copy of the **Language Arts Assessment Master**. Instruct students to write the title and record the main idea of the article. Then assign each student a partner. Have pairs record the name of each section and skim the text to determine the main idea of each. Once students are finished, challenge them to analyze the information and write a brief summary of the article.

- **Explain Concepts** After reading the article, **say:** *One way to see if you understand information is to try to tell someone else about the topic. If you can't explain the concept, you might need to read the article again.* Have students turn and talk to explain to a partner how a chameleon's adaptations help it survive. Prompt discussion with questions such as: *How is a chameleon's tongue adapted to help it catch prey? (It's very long and moves very quickly.) What is unique about a chameleon's eyes? (They are cone-shaped, can swivel in all directions, and can look in different directions at the same time.) What are a chameleon's feet and tail adapted to do? (It's feet help it grab onto branches. It's tail helps it balance.)*

- **Summarize the Text** Tell students that summarizing an article is also a good strategy to check their understanding. **Say:** *When you summarize, you restate the major ideas of the article in your own words. If you are unable to do this, you may not fully understand what you read.* Have students turn and talk with a partner who investigated the same sections. Tell students to share the summaries they wrote on their **Language Arts Assessment Masters**. If partners find that their summaries are vastly different, encourage them to review the sections together, analyze each summary, and rewrite one or both of their summaries to more closely summarize what the section is about.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What adaptations help a chameleon survive?*
- *Which adaptation do you think is most important to a chameleon? Why?*
- *What surprised you about what you read?*

SCIENCE

Objectives

- Students will recognize adaptations that help chameleons survive.
- Students will understand how and why a chameleon's skin changes color.

Resources

- Content Assessment Master (page 8)
- "Chameleons" poster (Teacher's Edition)
- Comprehension Check (page 9)
- "Chameleons" Interactive Whiteboard (optional)

Science Background

Chameleons are reptiles that mostly live in the rain forests and deserts of Africa and the Middle East. There are more than 150 different species.

Chameleons have several adaptations that help them survive. One is their long, sticky tongues. A chameleon's tongue can move at a rate of nearly 21 kph. When it hits the intended prey, it forms a small suction cup that pulls the prey in.

Chameleons live in trees and bushes. Their feet and tails help them stay in place. A chameleon's toes are divided into groups. These groupings allow chameleons to grab branches as they walk. Their prehensile tails coil around branches so they can balance.

The chameleon's eyes are cone-shaped and can rotate and focus in different directions at the same time. This gives them a 360-degree view of their surroundings.

The ability to change color is a chameleon's most notable adaptation. Chameleons can't change any color they want to, and contrary to popular belief, they don't form a perfect match with their surroundings. But they do change color to communicate or to respond to changes in mood or temperature. Nerve impulses and hormone changes in their four layers of skin cause color cells to expand or shrink. This creates the colors and patterns we see.

ENGAGE

Tap Prior Knowledge

Ask students if they've ever seen a chameleon. Have them describe what the chameleon looked like and what it was doing. Challenge them to explain why they think the chameleon looked and acted this way.

EXPLORE

Preview the Lesson

Display pages 2-3 of the projectable magazine. Tell students to examine the photo and describe the chameleon. Invite a volunteer to read aloud the headline and subhead. **Ask:** *According to the subhead, what is unique about a chameleon's color? (They use it to communicate)* Encourage students to explain how they think this might be possible. Then challenge them to identify other unique adaptations that might be addressed in the article.

Set a Purpose and Read

Have students read the article in order to recognize adaptations that help chameleons survive and understand how and why a chameleon's skin changes color.

EXPLAIN

Identifying Adaptations

Display the "**Chameleons**" poster. Invite a volunteer to read aloud the information related to the chameleon's skin. **Ask:** *Why might a chameleon's skin change color? (to communicate or respond to temperature and mood changes)* *Based on what you learned in the article, what do bright skin colors help a chameleon do? (stand out)* *Why might a chameleon want to do this? (to warn other chameleons to stay away)* Invite volunteers to read aloud the remaining captions. Have students identify each body part and discuss what it does. Then give each student a copy of the **Content Activity Master**. Instruct students to each draw and color a picture of a chameleon holding onto a branch. Using the poster as a guide, tell students to insert a caption for each body part that identifies the adaptation and explains how it helps the chameleon survive.

SCIENCE

EXPLAIN

(continued)

Understanding Chameleon Skin

Display page 7 of the projectable magazine. Invite volunteers to read aloud the information in the three text blocks above the diagram. **Ask:** *What is melanin?* (a substance that darkens skin) *Why does it make a chameleon's skin look dark?* (It absorbs most of the light that strikes the skin.) *What color is a chameleon when the nanocrystals in its skin are close together?* (green) *Why?* (The nanocrystals reflect blue light, which mixes with light reflected by the yellow pigments in the top layers of skin.) *Why do excited chameleons look yellow, orange, or red?* (The nanocrystals are farther apart and reflect longer wavelengths of light.)

Display page 6 of the projectable magazine. Invite a volunteer to read the copy aloud. Then **ask:** *Which chameleon won?* (The top one) *How do you know?* (It has brighter colors.) Discuss how the ability to change color helps chameleons survive in their environment

ELABORATE

Find Out More

Remind students that organisms can only survive where their particular needs are met. Instruct students to conduct research to learn more about different kinds of chameleons and their environments. Create a chart tracking where different species live. Examine the results to see how the ability to change color helps chameleons survive in environments with widely varying landscapes.

Extend Your Thinking About Chameleons

Inform students that there are more than 150 species of chameleons. Some species have unique adaptations. The male Jackson's chameleon, for example, has three giant horns. Give students time to find images of other unique chameleons. Challenge them to explain how each unique adaptation helps that kind of chameleon survive.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *Why do excited chameleons look yellow, orange, or red?* (Nanocrystals in their skin are farther apart and reflect longer wavelengths of light. This makes the skin change to warmer colors.)
- *Why does a chameleon's foot look like a mitten?* (It has groups of two and three toes.)
- *How do a chameleon's eyes keep it safe from danger?* (They can look in different directions at the same time. This allows the chameleon to see everything at once.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article. You may also wish to examine the optional **Interactive Whiteboard** lesson that accompanies this article.

Name _____

Date _____

VOCABULARY ASSESSMENT : Chameleons

Record information from the article about each vocabulary word .

Word				
Text Clues				
Photo Clues				
What I Think the Word Means				
Definition				

LANGUAGE ARTS ASSESSMENT: Chameleons

Record the headline and main idea of the article and each section.
Summarize the text.

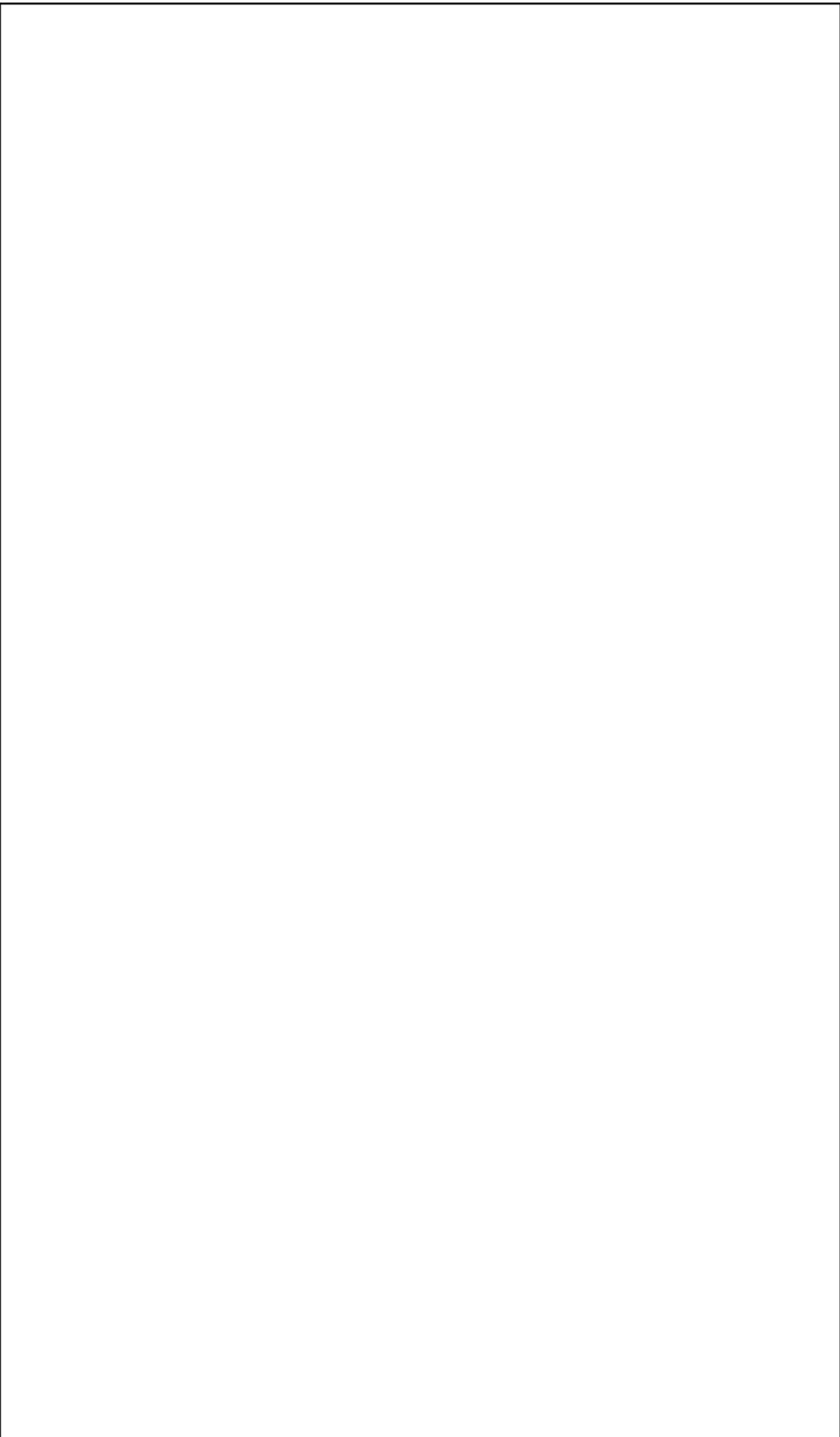
Article Headline	Main Idea
Subhead	Main Idea
<p>Summary</p>	

Name _____

Date _____

CONTENT ASSESSMENT: Chameleons

Draw and color a picture of a chameleon. Write captions that identify each body part and tell how the adaptations help the chameleon survive.



COMPREHENSION CHECK: Chameleons

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

1. What is a chameleon's "normal" color?
A the color that matches its surroundings
B the color reflected by longer wavelengths of light
C the color reflected by shorter wavelengths of light
2. What do nanocrystals do?
A reflect light
B absorb light
C create light
3. Which part of a chameleon's body moves very fast?
A eyes
B feet
C tongue
4. Why can a chameleon grip branches with its feet?
A It has big feet.
B Its feet are sticky.
C Its toes are divided into groups.
5. What are three reasons a chameleon might change its skin color?

The Elements of Life

LANGUAGE ARTS

Objectives

- Students will assess their familiarity with and knowledge of vocabulary words.
- Students will understand the relationship between examples and scientific concepts.

Resources

- Vocabulary Assessment Master (page 14)
- Language Arts Assessment Master (page 15)

Summary

- The article “The Elements of Life” introduces readers to chemical elements and explores how and why they can change.

BUILD VOCABULARY AND CONCEPTS

- atom
- chemical reaction
- compound
- element

As a class, discuss the difference between familiarity and knowledge. Guide students to recognize that the more familiar you are with something, the more knowledge you have. Challenge students to explain how this concept applies to words when they read.

Display the vocabulary words on a word wall or on the whiteboard. Give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write each word on their papers. Review the categories under the header “Familiarity with the Word.” Tell students to make a checkmark to indicate how well they know each word.

Instruct students to write what they think each word means on their worksheets. Then display the Wordwise feature on page 15 of the projectable magazine. Have students write those definitions on their worksheets and compare them with the definitions they wrote.

READ

Inform students that the purpose of this article is to introduce them to chemical elements and to explore how and why elements can change. Tell students that throughout the article the writer gives examples that help explain scientific concepts. If readers understand the relationship between items in the examples, they will understand the scientific concepts introduced.

Display pages 10-11 of the projectable magazine. Read aloud the headline. Then draw students' attention to yellow cube and the round gray object in the photo. **Say:** *As I look at these images, I'm not sure what they show. But based on the article's headline, I can assume that they are examples of elements. That would make sense. But why are fire and water shown here? And what is bubbling in the glass at the bottom?* Invite volunteers to share their opinions. Then read aloud the comprehension strategy in the upper left corner. **Say:** *Based on this new information, I'm guessing that a chemical reaction is taking place in the glass. Perhaps fire caused it to occur. I know that fire does make things change. And I know that water isn't an element, so maybe water is what it produced.*

Point out to students that readers often use what they already know to identify relationships within the text. They use examples and information in the text to fully understand the concepts.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to identify three scientific concepts introduced in the text. Challenge them to find an example that explains each. Then have them explain how the examples helped them understand each scientific concept.

The Elements of Life

LANGUAGE ARTS

TURN AND TALK

Revisit the comprehension strategy on page 10 of the article. Have students turn and talk to discuss what happens when elements are mixed. **Ask:** *Is the product you get when you mix elements always like the ingredients you started with? (no) Why?* (If a chemical reaction took place, the elements will combine to create something new.) As a class, discuss what happened when the author created water and table salt.

- **Understanding Relationships** Remind students that identifying relationships is a strategy to help them understand scientific concepts when they read. **Say:** *Sometimes when we read, we encounter ideas we're unfamiliar with. Scientific concepts, in particular, can be difficult to understand if they're new. Examples help readers visualize the ideas. They give readers the pieces they need to put the ideas together so they can understand.* Have students compare their **Language Arts Assessment Masters** with a partner. Did partners cite the same scientific concepts? Did they find the same examples? If partners used the same information to come to different understandings, encourage them to reread the text and review the information again.

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *Do hydrogen and oxygen create a chemical reaction when they combine to form water? How do you know?*
- *Why did the author need a fan to create table salt?*
- *What surprised you about what you read?*

SCIENCE

Objectives

- Students will understand that elements have unique properties.
- Students will learn how to read the Periodic Table.
- Students will recognize that elements are the building blocks of every living thing.

Resources

- Content Assessment Master (page 16)
- "The Elements" poster (Teacher's Edition)
- Comprehension Check (page 17)

Science Background

An element is a pure substance composed of only one type of atom. All matter is composed of elements.

Currently, there are 118 known chemical elements, about 20 percent of which are either man-made or exist in trace amounts in nature.

The Periodic Table is a way of listing the elements. This table arranges elements from left to right and top to bottom in order of increasing atomic number.

Each block of the Periodic Table lists the name of an element along with three vital pieces of information about that element:

- The atomic number is the number of protons in an atom's nucleus. This number defines what the element is.
- The atomic symbol is a one or two letter symbol that represents the element on the chart.
- The atomic mass, is the average mass of an element. It compares how heavy an element is when compared to hydrogen, which is the lightest element known.

A compound is a substance created when the atoms of two or more elements combine. When a chemical reaction takes place, a new substance is formed.

ENGAGE

Tap Prior Knowledge

Write the chemical formula for water, H_2O , on the board. Ask students to raise their hands if they've ever seen this combination of numbers and letters before. Challenge students to explain what it represents and why.

EXPLORE

Preview the Lesson

Display pages 10-11 of the projectable magazine. Have students examine the headline and images. Discuss what an element is, and ask students which images most likely show elements. (the yellow cube and gray circle) **Ask:** *What do you think the liquid in the lower right corner might be?* (Possible response: water) Point out that water isn't an element. It's a substance formed when two elements combine. Tell students that fire, which they also see on these pages, is one thing that can cause elements to combine. They'll learn about other ways—and how change affects elements—as they read the article.

Set a Purpose and Read

Have students read the article in order to understand that elements have unique properties, how to read the Periodic Table, and how elements can be used or combined to create products we use.

EXPLAIN

Recognizing Properties of Elements

Inform students that each element has specific properties. Identifying those properties helps people figure out what an element is. **Ask:** *Have you ever crushed an aluminum can or wondered how a gold ring is formed. Aluminum and gold are both elements. They are also both metals. Changing shape is one thing metals can do.* Point out that metals can also carry heat and electricity. **Say:** *If you've ever gone down a slide on a really hot day, you can feel the heat that a metal slide carries.* Tell students that some elements have properties that are unique. Display the sidebar on page 13 of the projectable magazine. Review the information about mercury, copper, and calcium.

SCIENCE

EXPLAIN

(continued)

Reading the Periodic Table

Display "**The Elements**" poster. Inform students that this poster shows the Periodic Table, a chart that lists the elements. Draw students' attention to the key in the center of the poster. Explain that each block on the Periodic Table gives information about a different element. The blocks here show the element's name, symbol, and atomic number. **Say:** *The atomic number is the number of protons in an atom's nucleus. The symbol is one or two letters used to represent an element on the table. Some symbols make sense, such as H for hydrogen. Others may not be so obvious. The symbol for gold, for example, is Au. This only makes sense if you know Latin because that symbol is based on the Latin word for gold. (aurum)* Draw students' attention to the blocks at the bottom of the poster. Point out that each color represents a different type of element on the chart. Explore the table with the class. Name different elements. Challenge students to tell what the Periodic Table relates about each.

Understanding the Elements of Life

Display pages 10-11 of the projectable magazine. **Ask:** *Why do you think the editors chose this headline for the article?* (Everything in the universe is made of elements.) Give each student a copy of the **Content Assessment Master**. Instruct students to review the article to answer questions about elements. When they are finished, have students review their answers with a partner. As a class, discuss reasons why carbon is such an important element.

ELABORATE

Find Out More

Inform students that chemical reactions take place all the time. Assign each student a partner. Instruct pairs to conduct research to identify another common chemical reaction. Encourage them to create an informative display that identifies the ingredients, outlines the process, and shows what is produced. Have students share what they learned with the class.

Extend Your Thinking About Elements

Remind students that Theodore Gray, the article's author, collects chemical elements as a hobby. As a class, identify objects that could be collected to represent some of the well-known elements on the Periodic Table. Encourage students to conduct research to find examples for less familiar elements.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is a chemical reaction?* (the process in which atoms break bonds with one another or form new bonds to create a new substance)
- *Why is mercury unique?* (It's the only metal that is liquid at room temperature.)
- *What could you collect to show carbon in its purest form?* (a diamond)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article.

Name _____

Date _____

VOCABULARY ASSESSMENT: The Elements of Life

Record information from the article about each vocabulary word.

Word	Familiarity with the Word			Knowledge of the Word	
	I know the word very well.	I've seen or heard the word before.	I don't know the word.	What I think the word means:	How the article defines the word:

Name _____

Date _____

LANGUAGE ARTS ASSESSMENT : The Elements of Life

Identify three scientific concepts from the article. Give an example of each. Explain how the examples help you understand each concept.

Scientific Concept	Example	What I Understand

CONTENT ASSESSMENT: The Elements of Life

Use information in the article to answer the following questions.

1. What is an element?

2. Where do elements come from? How do they form?

3. What does the article tell you about carbon?

4. Would life exist without carbon? Why or why not?

COMPREHENSION CHECK: The Elements of Life

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

- Which of these is a process?
A an atom
B a compound
C a chemical reaction
- Which of these is an element?
A water
B mercury
C table salt
- Which element holds everything in the universe together?
A copper
B calcium
C carbon
- Why does your body need the element calcium?
A to kill germs
B to build strong bones
C to add flavor to popcorn

5. Describe how the author created water.

LANGUAGE ARTS

Objectives

- Students will create sketches to understand the meaning of unfamiliar words.
- Students will integrate information from the text, photos, and diagrams to explain scientific concepts about the Sahara.

Resources

- Vocabulary Assessment Master (page 22)
- Language Arts Assessment Master (page 23)

Summary

- The article “Sahara ” examines how wind and weather continually reshape the Sahara.

BUILD VOCABULARY AND CONCEPTS

- **climate**
- **desert**
- **desertification**
- **erosion**
- **landform**
- **oasis**
- **weathering**

Display the vocabulary words on a word wall or on the whiteboard. Point out to students that when they read they will encounter words they don't know. Remind them that using context clues such as the sentences before and after an unknown word and photographs on the page can help them figure out what the unfamiliar word means.

Invite a volunteer to read aloud the definition of *climate* in the Wordwise feature on page 23 of the article. Examine this word in context. Then give each student a copy of the **Vocabulary Assessment Master**. Instruct students to write the word's definition and create a detailed sketch showing what it means. Inform students that their drawings won't all be the same. The point is for students to draw the word in a way that will help them remember its definition. Examine the other words in this way, too.

READ

Inform students that the purpose of this article is to introduce them to the Sahara. As they read, they will learn about the desert's landscape, history, and people.

Display pages 16-17 of the projectable edition. Have students read the headline and subhead. Then ask them examine the three photos. Model how to integrate information between text and photos. **Say:** *When I first looked at these photographs, I just saw a bunch of sand. Then I looked closer and saw that the sand in each photo looks different. The top photo has sand dunes surrounding a pool of water. The middle photo shows tall, smooth dunes. I didn't even notice that there wasn't much sand in the bottom photo because I was paying attention to the rocky landforms sticking up from the ground.* Point out that each of these photos was taken in the Sahara, and each one is an example of the giant desert's shifting sand.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them to use text, photos, and diagrams to learn about three types of sand dunes in the Sahara.

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about sand dunes in the Sahara. **Ask:** *What changes the shape and position of a sand dune?* (wind) *What determines the size of a sand dune?* (how much sand is in an area) *What determines the shape of a sand dune?* (direction and force of the wind)

- **Interpret Visual Information** Explain to students that reading definitions tells people what words mean. But sometimes readers have to "see" words to really understand them. Point out that this is exactly what they did when they drew sketches of the vocabulary words in the article. They drew the words in a way that had meaning to them. Instruct students to turn and share the sketches they created on their **Vocabulary Assessment Masters** with a partner. Encourage them to explain how their drawings reflect the meaning of each word.

- **Integrate Information** After reading the article, have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare their insights and what they each learned from integrating information from text, photos, and diagrams. Then display pages 18-19 of the projectable magazine. Encourage students to explain what the photo and diagrams on these pages reveal about the Sahara. (The diagrams show exactly where the desert is located in Africa. The photo shows what the landscape is like and gives an example of a plant and animal that live there.)

WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- *What is the climate like in the Sahara?*
- *Why do different types of sand dunes form?*
- *What surprised you about what you read?*

SCIENCE

Objectives

- Students will identify examples of weathering and erosion in the Sahara.
- Students will understand what the Sahara reveals about Earth's history.

Resources

- Content Assessment Master (page 24)
- Comprehension Check (page 25)

Science Background

The Sahara is a subtropical desert located in northern Africa. It covers 8.6 million square km, or about 25 percent of the continent. It is the largest desert in the world.

The Sahara contains many different types of landforms including green oases, rock-covered plateaus, and steep mountains. But it is best known for its sand dunes.

Sand dunes cover about 25 percent of the Sahara's surface. They can grow up hundreds of meters high. Winds cause them to shift a few meters each year. If the wind is violent enough, it can move a dune 20 meters in a single day.

During a sandstorm, Sahara winds can blow up to 100 km per hour. That is strong enough to send sand across the Atlantic Ocean. This sometimes causes sunsets on Florida's eastern coast to be tinted yellow.

Despite its dry climate, the Sahara is home to about 4 million people and a host of animals adapted to survive the heat and lack of water. There are also more than 1,600 species of plants growing in this vast desert.

ENGAGE

Tap Prior Knowledge

Give each student a piece of plain white paper. Then give students one minute to draw a picture of a desert. When time is up, give students another minute to list all of the landforms they included in their drawings. Encourage students to compare lists as they share what they know about deserts.

EXPLORE

Preview the Lesson

Display pages 16-17 of the projectable magazine. Inform students that the Sahara is the largest hot desert on Earth. Invite students to describe what it would feel like to be in this place. Then point out that the Sahara wasn't always a desert. Long ago it was covered with grass and low bushes. Tell students they'll learn what happened and why as they read the article.

Set a Purpose and Read

Have students read the article in order to identify examples of weathering and erosion in the Sahara and to understand what the Sahara reveals about Earth's history.

EXPLAIN

Identify Weathering and Erosion

Display page 23 of the projectable magazine. Zoom in on the Wordwise feature and highlight the definitions for *weathering* and *erosion*. Invite volunteers to read aloud each definition. Review with students how wind, water, ice, and other natural forces can change Earth's surface through these processes. **Ask:** *How is a sand dune an example of weathering and erosion?* (Possible responses: Weathering breaks rocks down into sand. Wind blows the sand around.) Divide the class into pairs. Have partners scan the text to identify other landforms found in the Sahara. Challenge students to explain how weathering and erosion formed and continue to change each one.

SCIENCE

EXPLAIN

(continued)

Revealing Earth's History

Display pages 22-23 of the projectable magazine. Highlight the header "Constant Change." Explain to students that some changes in the Sahara happen very quickly. For example, a grain of sand can blow away very quickly in a fast wind. Entire sand dunes can move at a slower pace. Other changes take much longer. Some 10,000 years ago the Saharan region was a grassland. Review the section with students to explore how the Sahara eventually became a desert. Then review the section "Uncertain Future" to examine how the desert continues to change today.

Give each student a copy of the **Content Assessment Master**. Assign each student a partner. Instruct pairs to review the article for details and evidence about changes in the Sahara. Challenge them to explain how these changes are linked to major events in Earth's history.

ELABORATE

Find Out More

Remind students that sand dunes are just one of the many different landforms found in the Sahara. Assign each student a partner. Tell pairs to select one other type of landform mentioned in the article and to conduct research to learn more about it. Challenge them to create a diagram and write a short summary explaining the role of weathering and erosion in the landform's creation.

Extend Your Thinking About the Sahara

Remind students that about four million people live in the Sahara today. Divide the class into small groups. Instruct groups to conduct research to learn more about these people and how they survive in the vast Sahara. Invite groups to share what they learned with the class.

EVALUATE

Have students record their answers to the assessment questions in their science notebooks or on a separate sheet of paper.

- *What is desertification?* (to change from grassland to desert)
- *What do scientists think caused desertification in the Sahara?* (There was a change in Earth's orbit around the sun.)
- *What evidence shows that the process of desertification might be reversing in the Sahara?* (With increased rainfall, some regions of the Sahara are becoming greener. Vegetation is starting to return.)

If you wish, have students complete the **Comprehension Check** to assess their knowledge of concepts mentioned in the article. You may also wish to examine the optional **Interactive Whiteboard** lesson that accompanies this article.

VOCABULARY ASSESSMENT: Sahara

Record the definition of each vocabulary word. Create a sketch to help you remember what each word means.

Word	Definition	Sketch
climate		
desert		
desertification		
erosion		
landform		
oasis		
weathering		

Name _____

Date _____

LANGUAGE ARTS ASSESSMENT: Sahara

Record information about sand dunes from the text, photos, and diagrams in the article. Summarize what you learned about sand dunes.

Type	Text	Photos	Diagram	Summary
Barchan Dunes				
Seif Dunes				
Star Dunes				

CONTENT ASSESSMENT: Sahara

Describe what the Sahara was like at different times in history.

10,000 years ago

4,000 years ago

Now

Explain how changes in the Sahara are linked to major events in Earth's history.

COMPREHENSION CHECK: Sahara

Read each question. Fill in the circle next to the correct answer or write your response on the lines.

- Where is the Sahara located?
A northern Africa
B southern Africa
C South America
- What determines the size of a dune?
A size of the sand grains
B how much sand is in the area
C the direction and force of the wind
- What caused the Sahara to become a desert?
A global warming
B a change in the moon's orbit around Earth
C a change in Earth's orbit around the sun
- What is happening in the Sahara today?
A Oases are drying up.
B It is becoming greener.
C Weathering has stopped.
- Summarize how weathering and erosion form a star-shaped sand dune.

ANSWER KEY

Chameleons

Assess Vocabulary, page 6

Students should record the words and definitions from the Wordwise feature on page 9.

adaptation: a behavior or body part that helps a plant or animal survive

cells: the basic building blocks of all living things

melanin: a pigment that darkens skin

pigment: a material that changes the color of reflected or transmitted light

Text clues, photo clues, and students' definitions will vary. Evaluate each response for accuracy.

Assess Language Arts, page 7

Students should record the article title and each subhead. Information regarding main ideas should accurately reflect the content of each section.

Assess Content, page 8

Students should draw a picture of a chameleon and include captions identifying and describing the function of the skin, feet, tail, eyes, and tongue.

Comprehension Check, page 9

1. A; 2. A; 3. C; 4. C; 5. A chameleon might change its skin color in response to the environment, to show its mood, or to send a message to another chameleon.

The Elements of Life

Assess Vocabulary, page 14

Students should record the vocabulary words from the Wordwise feature on page 15, make checkmarks to show how familiar they are with each word, and write definitions in their own words. Then they should record the definitions from the article.

atom: the smallest part of a substance that has all the traits of that substance

chemical reaction: a process in which atoms break bonds with one another or form new bonds to create a new substance

compound: a substance created by the combination of two or more elements

element: a substance made up of only one kind of atom

Assess Language Arts, page 15

Students may identify different scientific concepts, but at least one should relate to chemical reactions. Examples used to support scientific concepts may also vary, but should come from the text. Explanations should relate to the concepts and examples provided.

Assess Content page, 16

1. An element is a substance made up of only one kind of atom; 2. Elements are found in nature were created in nuclear reactions within stars; 3. Carbon is the sixth element on the Periodic Table. It's symbol is (C). Carbon is the most important element. It is the sixth most abundant element in the universe. Carbon is the glue that holds everything in the universe together; 4. No. Without carbon, living things would be a pile of loose atoms.

Comprehension Check, page 17

1. C; 2. B; 3. C; 4. B; 5. He mixed hydrogen and oxygen inside soap bubbles and added a spark. Light flashed and drops of water sprayed in every direction.

Sahara

Assess Vocabulary, page 22

Students should record the words and definitions from the Wordwise feature on page 23.

climate: the usual weather that occurs in a place, including average temperature and amounts of wind and rain

desert: a place that gets less than 25 centimeters of rain or snow a year

desertification: the change from grassland to desert

erosion: the process in which rock is moved from one place to another

landform: a natural feature on Earth's surface

oasis: a green, fertile area surrounded by a desert

weathering: the process in which rocks are broken into smaller pieces

Sketches will vary depending on students' interpretations of each word. Evaluate each response for accuracy.

Adventurer

ANSWER KEY

Sahara

(continued)

Assess Language Arts, page 23

Students should include the following information from the text:

Barchan dunes are crescent shaped and are found on the edges of sand seas. They form when wind blows steadily in one direction.

Seif dunes have long, straight forms and may extend for kilometers. They are formed by winds that blow from two directions.

Star dunes have a central pyramid-shaped mound with radiating arms. They form in areas with lots of sand, with winds that blow from several directions.

Descriptions of photos and diagrams should be consistent with those from page 21 of the article.

In their summaries, students may note that sand dunes form wherever there's constant wind and sand. The size of a dune depends on how much sand there is in an area. The shape of a dune depends on the direction and force of the wind.

Assess Content, page 24

Students should note that 10,000 years ago the Sahara was a grassland. About 4,000 years ago it began drying up. Now the Sahara is a desert with a variety of different landforms. These changes are linked to a gradual, natural change in Earth's orbit around the sun. Changes in Earth's tilt also caused changes in weather patterns.

Comprehension Check, page 25

1. A; 2. B; 3. C; 4. B; 5: Wind blow from several directions in areas with large amounts of sand. A central pyramid-shaped mound with radiating arms forms.