TEACHER'S GUIDE

Pathfinder
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 Pathfinder.

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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Chameleons

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" examines how adaptations help chameleons survive in their environment.

BUILD VOCABULARY AND CONCEPTS

- **adaptation**
- **cell**
- **melanin**
- **nanocrystals**
- **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. Have them scan the article to locate each bold word in the text.

Tell students to 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 in the Wordwise feature 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 what 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. For instance, the subhead talks about adaptations. That narrows down the topic, but it's still not the main idea of the article.* Point out the comprehension strategy in the upper right corner of the screen. Read it aloud. **Then say:** *Sometimes you have to search to find the best clues. After reading this, I know exactly what this article is about. As I read, I will learn how adaptations help chameleons survive in their environment.*

Give each student a copy of the **Language Arts Assessment Master**. Tell students to record the main idea of the article. (Adaptations help chameleons survive in their environment.) Then have students read the article on their own. As they read, instruct students to select two sections of the article and record important details in each that support the main idea of the text. After reading each section, challenge students to analyze the information they collected and write a brief summary telling what they learned.

Chameleons

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about how adaptations help chameleons survive in their environment. **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)

• **Support the Main Idea** Point out to students that it's easy to fill a page with details. The challenge for writers is to pick details that are important. The challenge for readers is to recognize important details when they see them. Have students share their **Language Arts Assessment Masters** in small groups. If any group members examined the same sections, encourage them to compare their results. Did they record the same details? If not, what important details did students miss?

• **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. Its 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?*

Chameleons

SCIENCE

Objectives

- Students will recognize external body parts that are adapted to help chameleons survive.
- Students will understand how the internal structure of a chameleon's skin helps it quickly change its appearance.

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. Chameleon's 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 in response 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 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 how adaptations help chameleons survive in their environment.

EXPLAIN

Identifying External 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 might change color?* (to communicate or respond to temperature adn 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 nanocrytals its skin are close together?* (green) *Why?* (The nanocrystals reflect blue light, which mixes with the light reflected by 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 read aloud the caption. **Ask:** *Which chameleon won?* (The top one) *How do you know?* (It has brighter colors.)

ELABORATE

Find Out More

Display page 8 of the projectable magazine. Zoom in on the image of the chameleon's toes. Point out that a chameleon's toes function like a person's thumb and fingers. Use this similarity to help the class understand how a chameleon is able to grab branches with its feet. Have students conduct research to find examples that illustrate how a chameleon's other body parts work.

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.

- *What is a nanocrystal?* (a colorless crystal that reflects different amounts of light)
- *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					

Name _____ Date _____

LANGUAGE ARTS ASSESSMENT: Chameleons

Write the main idea of the article. Then pick two sections of the text. Record important details from each. Summarize what you learned in each section.

Main Idea of the Article	

Section	
Important Details	
Summary	

Section	
Important Details	
Summary	

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.

Name _____ Date _____

COMPREHENSION CHECK: Chameleons

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

1. Why might a chameleon that is normally brown live among dead leaves?

   A to warn other chameleons to stay away

   B to blend in with the environment

   C to get warm on a cool day

2. What do a chameleon's feet look like?

   A gloves

   B a cap

   C mittens

3. What color of light is reflected when a chameleon is relaxed?

   A red

   B orange

   C blue

4. Which chameleon body part is shaped like a cone?

   A tongue

   B eye

   C tail

5. How can you identify the winner when two chameleons fight? Why?

_____

_____

_____

_____

The Elements of Life

LANGUAGE ARTS

Objectives

- Students will assess their familiarity with and knowledge of vocabulary words.
- Students will use a variety of techniques to strengthen their understanding of scientific terms.

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. Explain that in order to understand these concepts, readers must have a firm grasp of essential scientific vocabulary.

Give each student a copy of the **Language Arts Assessment Master**. Tell students that they will use this worksheet to explore words in four different ways: writing definitions, identifying the part of speech, recording facts, and making connections.

Display the Wordwise feature on page 15 of the projectable magazine. Highlight the word *atom*. Instruct students to write the word *atom* in the center box of one of their word diagrams. Then have them record its definition. Encourage students to scan the article to find the bold word *atom* in the text. (page 12, column 1) Highlight the word on the screen.

Model how to explore the word's meaning. **Say:** *According to the definition, an atom is the smallest part of a substance that has all the traits of that substance. I know that a part is a thing and a noun is a person, place, or thing. That means that the correct part of speech to list here is noun.* Instruct students to write *noun* in the "Part of Speech" section of their diagrams .

Invite a volunteer to read aloud the paragraph in which the word *atom* appears. Highlight the sentence "Every solid, liquid, and gas is made of atoms." Point out that this sentence is a good example of a fact about atoms. Have students record the sentence on their diagrams.

Have students read the article in on their own. As they do, instruct them to record additional facts about atoms. Tell them to record information about the remaining vocabulary words as well. After reading, challenge students to write at least one way each word is connected to the others.

The Elements of Life

LANGUAGE ARTS

TURN AND TALK

Have students turn and talk to discuss what they learned about the vocabulary words. Encourage them to compare their results in small groups. Check to make sure they recognized all four words as nouns. Then have students share the facts they recorded. If another student mentions something they overlooked, instruct students to add that fact to their lists.

• **Strengthen Understanding** Inform students that it's essential for readers to understand technical terms when studying subjects like chemistry. Without that knowledge, it's very difficult to understand the text. **Say:** *Once you do understand what scientific terms mean, not only can you follow along with the text but you can use the words correctly in new sentences of your own.* Challenge students to make accurate statements using each of the vocabulary words. Encourage them to use their **Vocabulary Assessment Masters** and their **Language Arts Assessment Masters** as resources. But remind them to be original. Students shouldn't restate sentences from the article. They should create new sentences of their own.

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 an element?*
- *Why is it important to understand how elements combine?*
- *What surprised you about what you read?*

The Elements of Life

SCIENCE

Objectives

- Students will understand that elements have unique properties.
- Students will learn how to read the Periodic Table.
- Students will recognize that elements can be changed or combined to create products we use.

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.

The Elements of Life

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.

Changing and Combining Elements

Display pages 12-13 of the projectable magazine. Invite a volunteer to read aloud the second paragraph of the section "Mix and Match." Guide students to recognize that water is a compound formed when a chemical reaction takes place. **Say:** *This chemical reaction takes place naturally, but it can also be created if you have the right ingredients.* Assign each student a partner and give each student a copy of the **Content Assessment Master**. Have pairs record the ingredients and processes the author used to create water and table salt. Then have them scan the article to identify practical applications of other elements mentioned in the article.

ELABORATE

Find Out More

Remind students that carbon is described in the article as "the glue that holds everything together." Assign each student a partner. Instruct pairs to search the article for details that support this statement. Encourage them to conduct research for more information, if necessary. Have partners write a short essay about the essential properties of carbon.

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 is a diamond?* (carbon in its purest form)

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

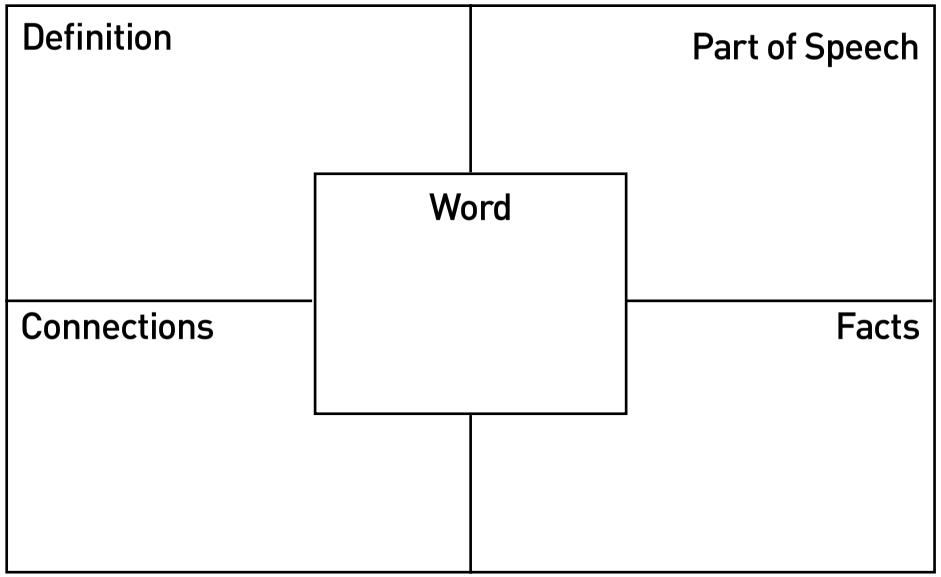
Record information from the article about each vocabulary word.

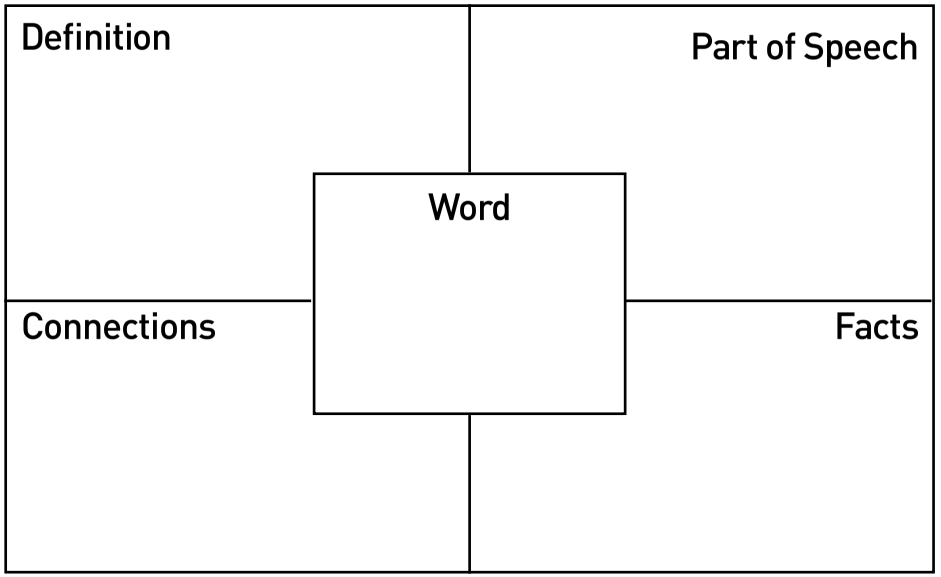
Word	Familiarity with the Word			Knowledge of the Word	
	I know the word very well.	I've seen or heard the word before.	I don't know the word.	What I think the word means:	How the article defines the word:

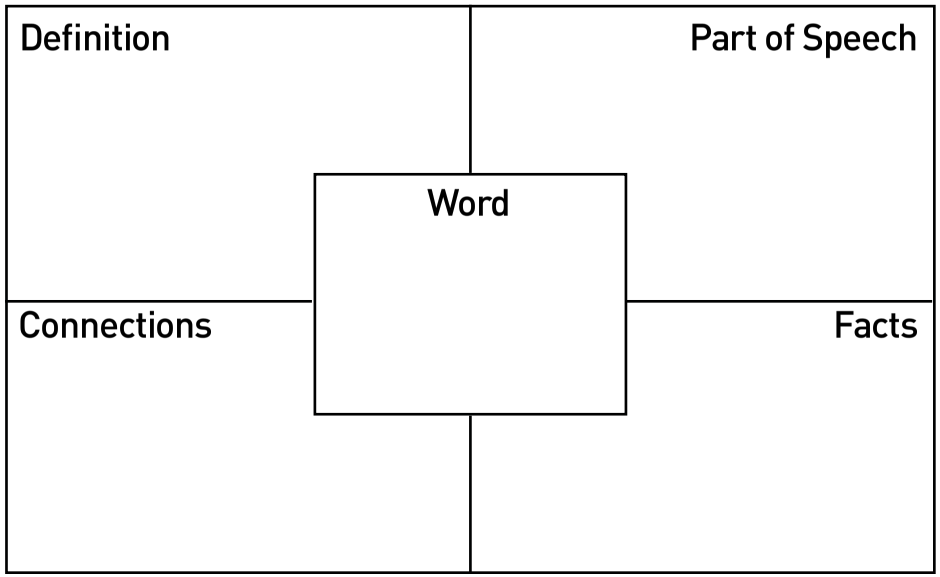
Name _____ Date _____

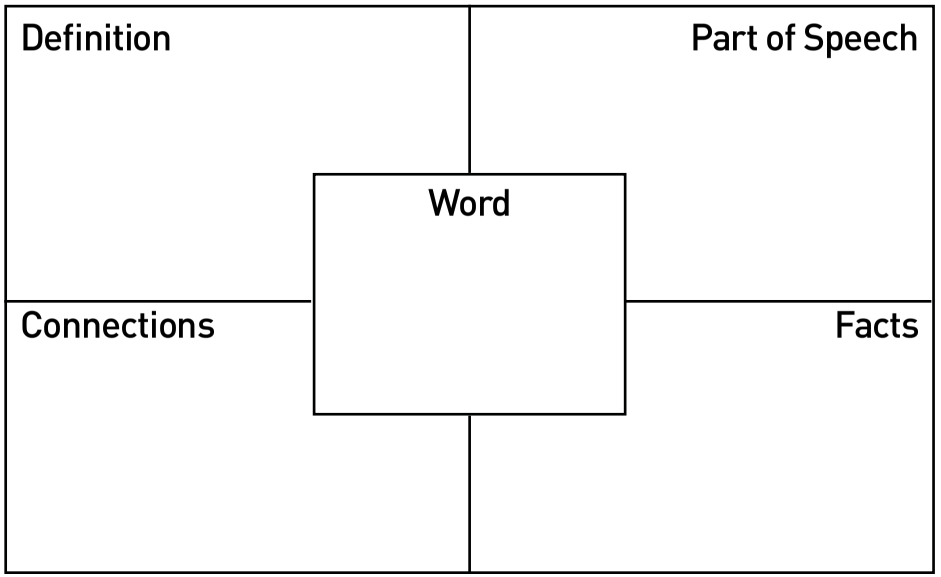
LANGUAGE ARTS ASSESSMENT: The Elements of Life

Use this organizer to explore each vocabulary word from a scientific point of view.









Name _____ Date _____

CONTENT ASSESSMENT: The Elements of Life

Describe how the author created water and table salt.

Water
Ingredients: Process: Results:
Table Salt
Ingredients: Process: Results:

Identify properties of each element. Tell how people use each elements.

Element	Property	Use
gold		
helium		
copper		
fluorine		
phosphorus		

Name _____ Date _____

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.

1. What combines to form water?

   A two atoms of water and one atom of hydrogen

   B two atoms of hydrogen and one atom of oxygen

   C one atom of hydrogen and two atoms of oxygen

2. What happens when you mix sodium and chlorine?

   A nothing

   B a chemical reaction forms table salt

   C the gasses are lighter than air and make things float

3. Which element is in toothpaste?

   A copper

   B calcium

   C fluorine

4. Which element is in the tip of a match?

   A hydrogen

   B phosphorus

   C gold

5. Identify a special property of copper. Describe how people put it to good use.

_____

_____

_____

_____

Sahara

LANGUAGE ARTS

Objectives

- Students will create sketches to understand the meaning of unfamiliar words.
- Students will use information in the text to explain how sand dunes form in the Sahara.

Resources

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

Summary

- The article "Sahara " examines how weathering and erosion continually reshape the land in this great desert.

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 explore the many different ways weathering and erosion continually reshape the land in the Sahara.

Tell students that weathering and erosion are processes. **Say:** *To understand how a process works, you just have to follow the steps. The tricky part is to read closely enough that you find all of the steps. If you skip something important, what you're reading may not make much sense.*

Display page 21 of the projectable magazine. Tell students that this sidebar explains how three different types of sand dunes form. It contains captions, diagrams, and photos. The only thing missing is step-by-step directions telling how each type of sand dune forms. Most of those details are in the text.

Give each student a copy of the **Language Arts Assessment Master**. Have students read the article on their own. As they do, instruct them find and record information about how the three types of sand dunes form. Remind students to search for additional details about the procedure in the text.

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.

• **Identifying Processes** After reading the article, remind students that asking identifying processes is a strategy that people use to better understand what they're reading. Point out all the information they need can be found in order as they read the text. Have students share their **Language Arts Assessment Masters** in small groups. Instruct students to compare the steps they recorded. Then have them analyze how the diagrams they drew help to summarize each process.

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 sand dunes form?*

• *What surprised you about what you read?*

Sahara

SCIENCE

Objectives

- Students will identify examples of weathering and erosion in the Sahara.
- Students will understand how the Sahara formed.

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 hot 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, Saharan 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 it's 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 edition. Read aloud the headline and subhead. Encourage students to explain why the Sahara is described as a "land of shifting sand."

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 how the Sahara formed.

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)

Understand How the Sahara Formed
Remind students that weathering and erosion are processes that work together to change Earth's surface. Deserts are one result of that change. Give each student a copy of the **Content Assessment Master**. Assign each student a partner. Instruct pairs to review the article for details about how the Sahara formed. Have students use their notes to write a short summary telling what they learned. Invite pairs to share their summaries. Guide the class to recognize that weathering and erosion are continuous natural processes.

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.

Name _____ Date _____

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

Identify three types of sand dunes in the Sahara. Write step-by-step directions to show how each one forms. Then draw a diagram of each.

Identify	Explain	Draw
	1. 2. 3.	
	1. 2. 3.	
	1. 2. 3.	

Name _____ Date _____

CONTENT ASSESSMENT: Sahara

Explain how weathering and erosion formed the Sahara. Summarize what you learned.

First:
Next:
Then:
Finally:
Summary:

Name _____ Date _____

COMPREHENSION CHECK: Sahara

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

1. What is the most familiar landform found in the Sahara?

   A dust devils

   B sand dunes

   C rivers

2. What determines the shape 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

3. What was the Sahara like 10,000 year ago?

   A It was completely filled with sand.

   B Half of it was under water.

   C Parts of it were covered with grasslands.

4. Which type of desert landform contains water?

   A an oasis

   B an erg

   C a hamada

5. Summarize how weathering and erosion form a crescent-shaped sand dune.

_____

_____

_____

_____

Pathfinder

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
cell: the building block of all living things
melanin: a substance that darkens skin
nanocrystals: colorless crystals that reflect different amounts of light
pigment: a substance that reflects colors of light

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

Assess Language Arts, page 7
Students should record the main idea of the article. (Adaptations help chameleons survive in their environment.) Details and summaries will vary.

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. B; 2. C; 3. C; 4: B; 5: Students should note that the winner is the brightly colored. The skin of excited chameleons turns yellow, orange, or red. The skin of chameleons who feel defeated looks dark and dull.

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 should record words and definitions from the Wordwise feature on page 15 of the article. They should note that each word is a noun, list facts about each term, and make logical connections between vocabulary words. All information should come from the article.

Assess Content page, 16
Water—Ingredients: hydrogen, oxygen, soap bubbles; Process: mix hydrogen and oxygen in the bubbles. Add a spark; Results—The gases explode, the reaction turns the elements into a compound, and drops of water spray in every direction.

Table salt—Ingredients: sodium and chlorine; Process: Set up fans, melt the sodium, blow chlorine gas at it; Results: The elements burst into flames, huge clouds of white smoke containing specks of table salt rise.

Gold—Properties: rare metal, found in ground, shiny; Use: jewelry; Helium—Properties: gas, lighter than air; Use: fill balloons; Copper: Properties: metal, can kill germs; Use: make doorknobs; Fluorine—Properties: builds strong teeth; Use: toothpaste; Phosphorus—Properties: starts fire; Use: matches

Comprehension Check, page 17
1. B; 2. B; 3. C; 4: B; 5: Copper can kill germs. People use it on doorknobs and other surfaces in hospitals.

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

ANSWER KEY

Sahara

(continued)

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.

Assess Language Arts, page 23
Students should identify barchan dunes, seif dunes, and star dunes. Diagrams should resemble those on page 21 of the article. Explanations should resemble the following:

Barchan dune: 1. Sand collects around the edge of a sand sea; 2. Wind blows steadily in one direction; 3. A crescent-shaped dune forms.

Seif dune: 1. Sand collects in areas with moderate sand; 2. Winds blow together from different directions; 3. Long, narrow dunes of sand form.

Star dunes: 1. Sand collects in areas with lots of sand; 2. Winds blow from several directions; 3. Sand piles into a star shape.

Assess Content, page 24
Students should outline a sequence of events explaining how weathering and erosion formed the Sahara. They may choose to outline details in different ways. They should summarize what they learned about how these processes formed the desert.

Comprehension Check, page 25
1. B; 2. C; 3. C; 4: A; 5: Sand collects around the edge of a sand sea. Wind blows steadily in one direction. A crescent-shaped dune forms.