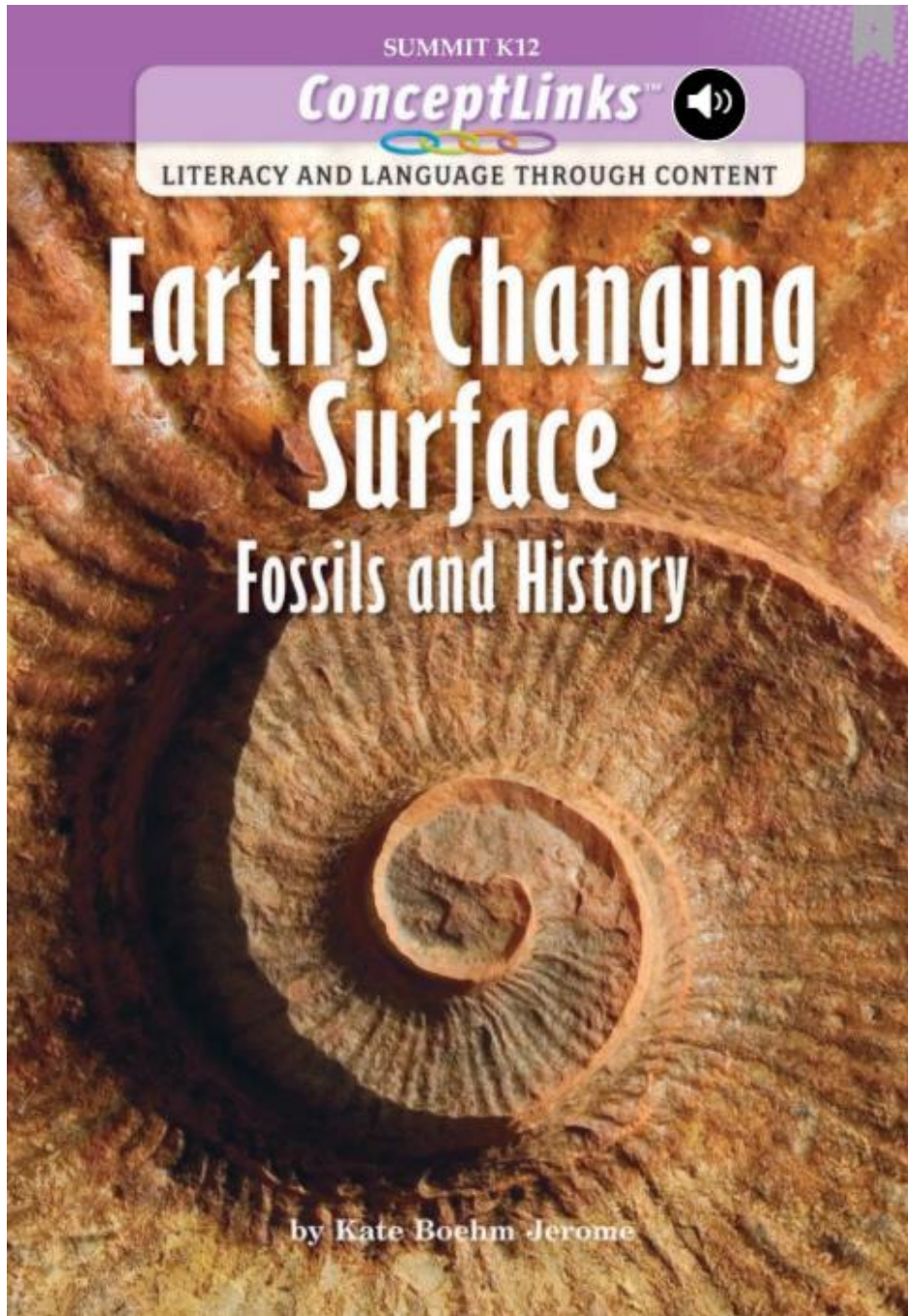


Hello everyone!

Suggestions for this week's assignment: Read a Chapter every day and make notes. When you are ready, use your notes to complete the chapter worksheet.



BE A STRATEGIC LEARNER

Explore Word Meanings

Say these words. What do you know about these words?



Science Vocabulary Words

fossil* sedimentary extinct
 mineral* rock* relative age*
 property metamorphic absolute age*
 texture rock* radioactive
 igneous rock* weathering* element*
 magma erosion* geologic
 crystal rock cycle* time scale*
 lava gravity era*
 index fossil*

Useful Words

clue process
 form preserve
 structure area
 identify

*KEY WORD

Make It a **READING** Habit!

STRATEGY FOCUS SYNTHESIZE

- As you read, add your own thoughts to what is stated in the text. Use what you know already. See what new ideas you come up with.
- Gather facts from the text.
 - Add your own thoughts and opinions.
 - In your own words, synthesize everything in a brief statement.

Think About Language that **Describes**

- One way to describe is to tell how something is done.
- As you read, look for sentences that describe in this way.

Magma cools slowly below Earth's surface.

Set a Purpose for Reading

Learn how rocks form and give clues to life in the past.

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Guided Reading: T-U; Lexile™: 810; TESOL: Bridging: Reading Recovery: 50-60; DRA: 50-60

Earth's Changing Surface

Fossils and History

by Kate Boehm Jerome

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DEVELOP LANGUAGE

How do we know that millions of years ago dinosaurs lived on Earth?

Fossils give scientists clues about some of the animals and plants that lived long ago.

Dinosaur National Monument is a protected area in Colorado and Utah. Many dinosaur fossils have been uncovered there.

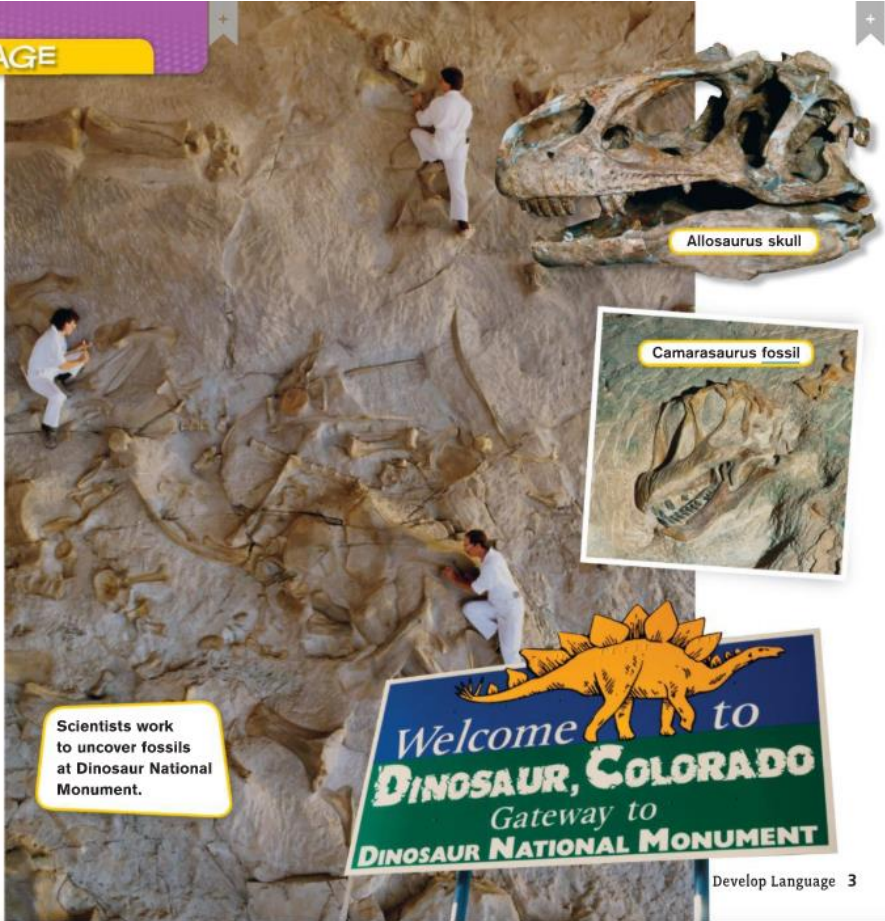
Look at the photos on these pages. Ask and answer questions like these:

Compare the skulls of the Allosaurus and Camarasaurus. What differences do you see? How are they similar?

The dinosaur on the sign is a Stegosaurus. Stegosaurus means "plated lizard." Why do you think it has this name?

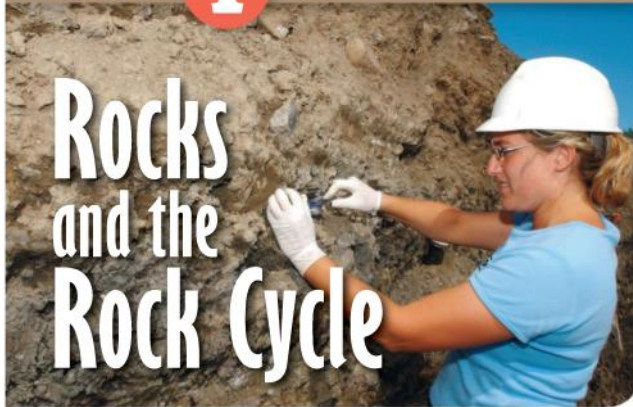
Do you know other things about dinosaurs? Talk about what you know.

fossils – the remains or signs of living things from long ago





Rocks and the Rock Cycle



The rocks all around us are full of information. The way rocks form and what they contain give scientists many clues about the history of Earth.

To understand these clues, you have to know some things about rocks. First, you need to know that rocks are made of **minerals**.

Minerals are solid elements or compounds that occur in nature. Some rocks are made of only one **mineral**, but most rocks are made of a mixture of minerals.

minerals – natural solid elements or compounds with a definite structure

KEY IDEA Rocks are made of minerals.

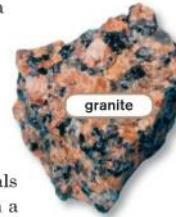
Minerals have **properties** that help identify them. Color and hardness are two useful properties. For example, a diamond can be identified as the hardest **mineral** on Earth.

The minerals in a specific rock help identify the type of rock. For example, granite often contains mica, quartz, and feldspar.

You can also identify a rock by the way its minerals fit together. The conglomerate rock in the photo below can be identified by the chunky arrangement of its minerals. Minerals can also fit together in a way that makes a rock look like one solid piece.

Texture is another property. The texture of a rock is based on the size and shape of the materials that make up the rock. The obsidian rock in the picture has a smooth and glassy texture. The granite has a coarse texture.

properties – qualities of matter that can be observed or measured



granite



obsidian



conglomerate rock

BY THE WAY...

Some rocks contain rare minerals called gems. When they are cut and polished, gems can be made into jewelry.



Three Groups of Rocks

Even though there are many different rocks, all rocks can be classified into three groups. Rocks are placed into a group based on how they form.

Igneous rock forms from hot, melted rock called **magma**. As magma rises from within Earth, it begins to cool and harden. When magma cools slowly underground, it can form igneous rock with large **crystals**.

► Gabbro is igneous rock formed below ground.

▼ Basalt is igneous rock formed above ground.



6 Earth's Changing Surface: Fossils and History

Igneous rock forms above ground, too. When hot, melted rock reaches Earth's surface, it is called lava. Lava cools and hardens more quickly above ground. So igneous rocks that form above ground have smaller crystals than those formed below ground.

igneous rock – rock formed when hot, melted rock cools

magma – hot, melted rock under Earth's surface

crystals – solids made up of elements or compounds arranged in an orderly and repeating pattern

Sedimentary rock is another group of rocks. Some sedimentary rock forms when tiny bits of rock and other sediments pile up in layers.

Over a long period of time, the sediments at the bottom of the pile are squeezed together. The sediments can stick together and form sedimentary rock.

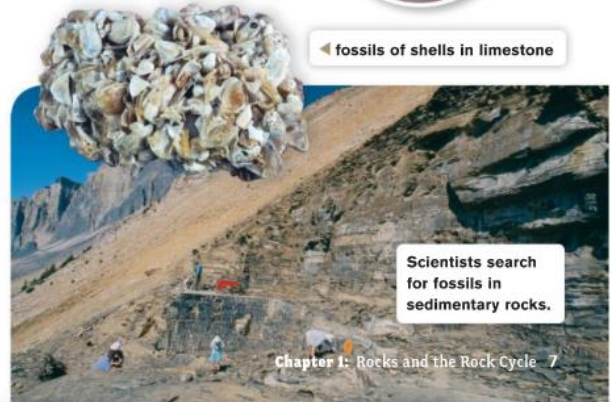
Sometimes the sediments that form sedimentary rocks contain the remains of plants or animals. This is why fossils are often found in sedimentary rocks.

Sedimentary rocks can form in other ways, too. For example rock salt, or halite, is found in sedimentary layers. It forms when water dries up and leaves **mineral** crystals of halite behind.

sedimentary rock – rock formed when tiny pieces of rock and other particles get squeezed together



◀ fossils of shells in limestone



Chapter 1: Rocks and the Rock Cycle 7



Metamorphic rock is the third group of rocks. It forms when extreme heat and pressure change one type of rock into another type of rock. For example, sandstone is a sedimentary rock. However, extreme heat and pressure can change sandstone to a metamorphic rock called quartzite.

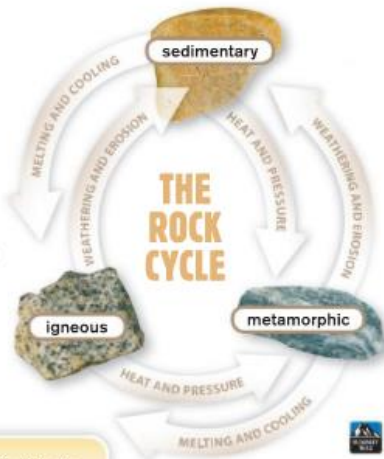
metamorphic rock – rock formed when extreme heat and pressure change one type of rock into another

weathering – how rocks break down and change

erosion – the movement of small rocks and other particles from one place to another

rock cycle – a constant process in which one type of rock changes into another type of rock

All rocks are constantly changing. Heat, pressure, and chemical processes change rocks. **Weathering** and **erosion** break down rocks and move them from one place to another. All of these processes combined cause rocks to change, in a never-ending process called the **rock cycle**.



KEY IDEAS Rocks are classified into three groups: igneous, sedimentary and metamorphic. Rocks are constantly changing from one type to another in the rock cycle.

NAME _____

Study Guide

Earth's Changing Surface: Fossils and History
Chapter 1: Rocks and the Rock Cycle

PURPLE LEVEL
Student Book,
pages 4-8

USE KEY WORDS

Look at the Key Words on page 23 of your book.

Answer these questions about the Key Words in Chapter 1. Circle your answer.

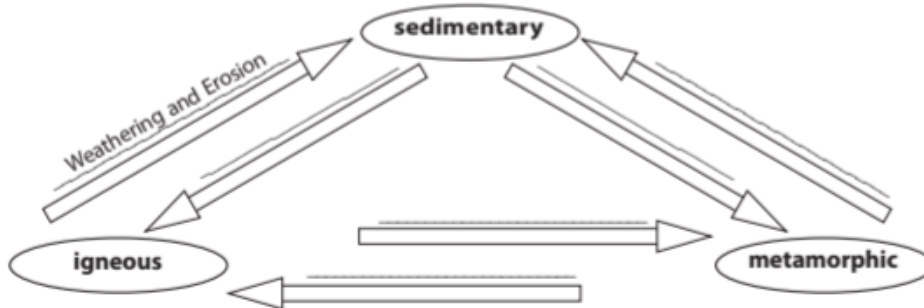
1. A natural solid element or compound with a definite structure is a _____.
A. property B. mineral C. rock cycle
2. A rock that forms when hot, melted rock cools is _____.
A. igneous rock B. sedimentary rock C. metamorphic rock
3. The processes of **weathering** and _____ are important parts of the **rock cycle**.
A. magma B. crystals C. erosion

KEY WORDS

erosion
igneous rock
metamorphic rock
mineral
rock cycle
sedimentary rock
weathering

ORGANIZE IDEAS

As you read Chapter 1, complete the rock cycle diagram by labeling the arrows.



STRATEGY FOCUS: SYNTHESIZE

Reread the ideas on page 7. Think about what you already know about what happens when things pack together, such as mud or snow. Then write one sentence that includes most of the information.



Uncovering Clues to the Past

The Grand Canyon in Arizona is one of the best places on Earth to see amazing layers of rock. The miles of rocks along the canyon walls contain clues to millions of years of Earth's history.

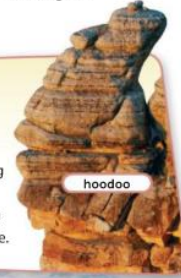
You may think the Grand Canyon always looks the same. But it is changing all the time. The natural forces that cause **weathering** and erosion are always changing the rocks. Wind and water are continually breaking down rocks into small pieces and carrying the pieces away.

Ice also causes changes in the Grand Canyon's walls. Water creeps into small cracks in the rocks and freezes. When water freezes, it expands, or gets larger. This pushes against the rock and can break the rock into smaller pieces.

The force of gravity often takes over. Gravity causes rocks to fall down. Falling rocks can strike other rocks and cause them to break apart. As natural forces uncover more layers of rock, scientists get more clues to life in the past.

BY THE WAY...

Hoodoos in the Grand Canyon are caused by two types of weathering. Chemical weathering changes the rock's chemical make up. Mechanical weathering changes the rock's size and shape.



hoodoo

KEY IDEA Moving water, wind, ice, and the force of gravity continually change Earth's surface.

What Fossils Tell Us

When plants and animals die, their bodies usually decay or are eaten. But sometimes a dead plant or animal is quickly covered in sediment. If this happens, at least part of the plant or animal may become a fossil.

▼ In rare cases, whole animals are found as fossils. This *Tyrannosaurus rex* fossil was found in South Dakota in 1990.



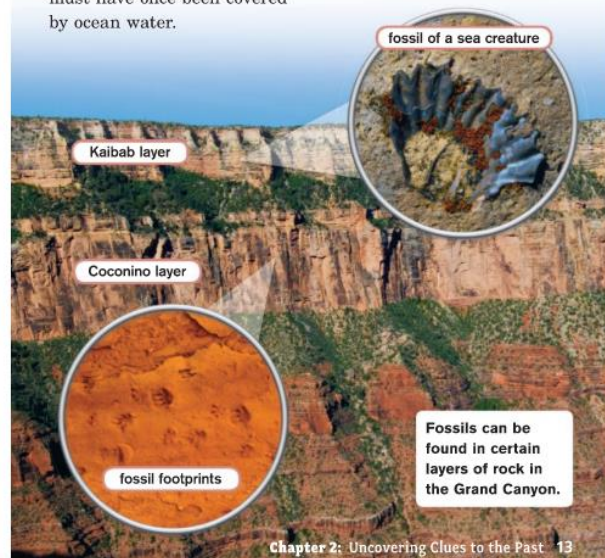
12 Earth's Changing Surface: Fossils and History

Any sign of living things from long ago is a fossil. Hard body parts such as teeth and bone are most often preserved as fossils. But a footprint preserved in rock can be a fossil, too. Fossils tell us a lot about living things in the past.

SHARE IDEAS With a friend, **discuss** how fossils become part of sedimentary rock.

Fossils can also tell us other things. Sometimes they provide clues to what a certain area was like in the past. For example, in an area at the top of the Grand Canyon, called the Kaibab layer, fossils of sea creatures have been uncovered. This tells scientists that this area must have once been covered by ocean water.

One of the layers below the Kaibab layer shows different kinds of fossils. In the Coconino layer, footprints of animals are found. Scientists think these footprints were made in sand. This means that at least part of this area was probably hot and dry when these animals were alive.



Chapter 2: Uncovering Clues to the Past 13

Index Fossils



Sometimes a fossil tells us about the age of the rock it was found in. **Index fossils** are the remains of living things that were once widespread during a part of Earth's history.

For example, sea creatures called trilobites once lived all around the world. But then all the trilobites became extinct, or died out.

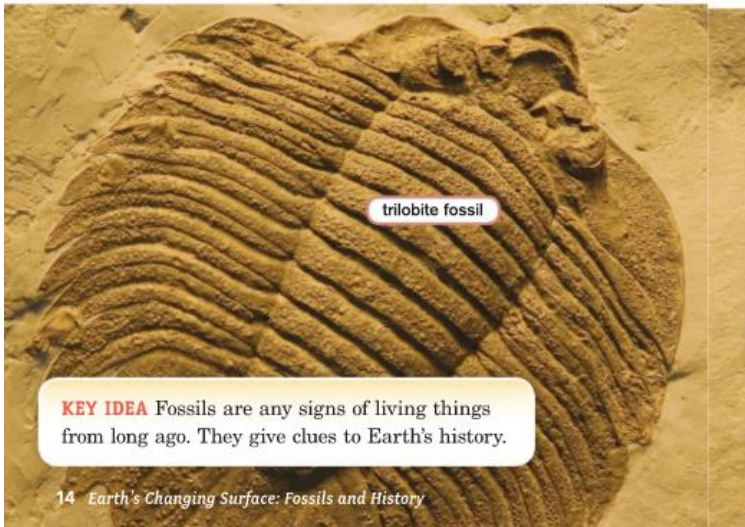
Scientists now think that any rocks with trilobite fossils probably date back to the same period in Earth's history.

Explore Language

GREEK WORD ROOTS

tri- (three) + *lobos* (lobe; rounded part of the body) = **trilobite**

index fossils – remains of living things that were widespread during a certain period of Earth's history



KEY IDEA Fossils are any signs of living things from long ago. They give clues to Earth's history.

NAME _____

Study Guide

Earth's Changing Surface: Fossils and History
Chapter 2: Uncovering Clues to the Past

PURPLE LEVEL
Student Book,
pages 10-14

USE KEY WORDS

Look at the Key Words on page 23 of your book.
Answer these questions about the Key Words in Chapter 2.

KEY WORDS

fossils
index fossils
sedimentary rock

1. What are **fossils**?

2. Why are **fossils** often found in **sedimentary rock**?

3. What are **index fossils**?

ORGANIZE IDEAS

As you read Chapter 2, complete the chart.

What Fossils Can Tell Us

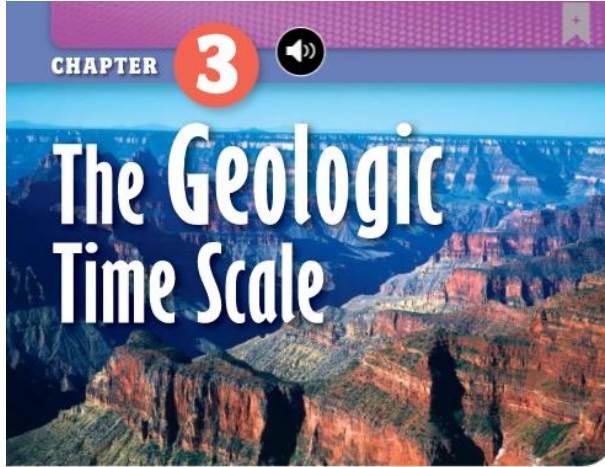
1. what a certain area was like in the past
- 2.
- 3.
- 4.
- 5.

STRATEGY FOCUS: SYNTHESIZE

Reread pages 12-13. Add what you already know about how footprints can be clues.
Make one statement that includes most of the information.



The Geologic Time Scale



Fossils help scientists learn about the history of Earth. But they need more information to complete the picture.

Figuring out the age of rocks helps scientists determine how old Earth may be. One way to do this is to find out the **relative age** of a rock, or how old the rock is compared to other rocks.

For example, scientists can often tell which layers are older than others in the Grand Canyon. This is because rocks in the bottom layers are older than rocks in the top layers. But this is only true if the rock layers have not been disturbed or moved.

relative age – how old something is in comparison to something else

Another way to tell the age of a rock is to determine its **absolute age**, or age in real years. But how can you tell the age of a rock that may be millions of years old? Scientists use **radioactive elements** to help. Certain radioactive elements in rocks break down into other elements at a constant rate.

Scientists can measure how much of the original radioactive element is left in a rock. They also can measure how much of the other elements are in the rock. By comparing the measurements, scientists can get a good idea of how long the rock has been around.

▶ This rock was found in New York state and is more than 1 billion years old.

By studying fossils and rock ages, scientists have learned a lot about Earth's history. They think Earth is about 4.6 billion years old. They use the **geologic time scale** to describe different time periods in Earth's long history.

absolute age – how old something is in calendar years

radioactive elements – elements that give off extra energy and break into new elements at a known rate

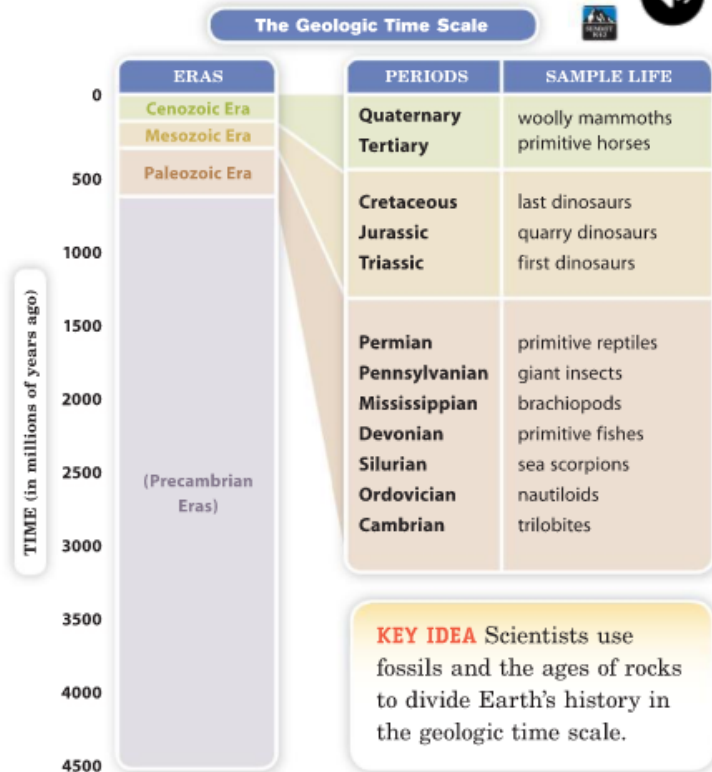
geologic time scale – Earth's history described in certain lengths of time



The geologic time scale below shows some **eras**, or long lengths of time in Earth's history. This scale also shows some periods, or shorter lengths of time, and lists creatures that probably lived during these periods.

Before the Paleozoic Era are Precambrian Eras. During the Precambrian Eras, the first rocks formed and single-celled living things first appeared.

eras – certain lengths of time within the geologic time scale



NAME _____

Study Guide

Earth's Changing Surface: Fossils and History
Chapter 3: The Geologic Time Scale

PURPLE LEVEL
Student Book,
pages 16-18

USE KEY WORDS

Look at the Key Words on page 23 of your book.
Answer these questions about the Key Words in Chapter 3.

KEY WORDS

absolute age
geologic time scale
radioactive elements
relative age

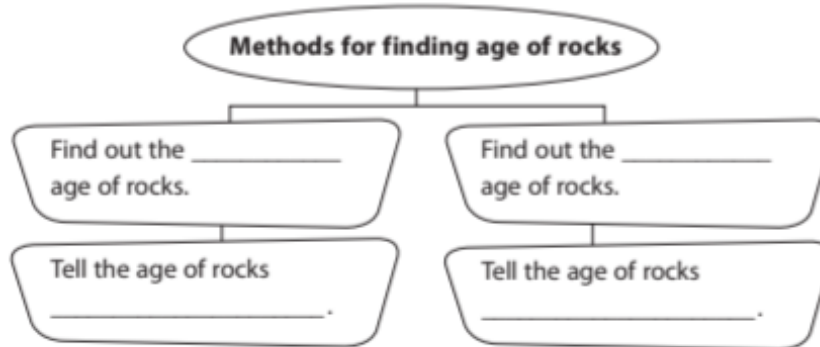
1. What is the difference between **absolute age** and **relative age**?

2. What information can you find in the **geologic time scale**?

3. What are **radioactive elements**?

ORGANIZE IDEAS

As you read Chapter 3, complete the chart.



STRATEGY FOCUS: SYNTHESIZE

Review the geologic time scale on page 18. Add what you already know about life in the past, such as dinosaurs. Make one statement that includes most of the information.

Key Words

absolute age how old something is in calendar years
Scientists use radioactive elements to determine the **absolute age** of rocks.

era (eras) a certain length of time within the geologic time scale
Dinosaurs lived during the Jurassic **era**.

erosion the movement of small rocks and other particles from one place to another
A landslide can cause quick **erosion**.

fossil (fossils) the remains or signs of living things from long ago
Fossils tell scientists about living things that lived long ago.

geologic time scale Earth's history described in certain lengths of time
The **geologic time scale** is divided into eras and periods.

igneous rock (igneous rocks) rock formed when hot, melted rock cools
Igneous rock can form above or below ground.

index fossil (index fossils) remains of living things that were widespread during a certain period of Earth's history
Trilobites are an **index fossil** that people use to determine the age of rocks.

metamorphic rock (metamorphic rocks) rock formed when extreme heat and pressure change one type of rock into another
Sedimentary rock can change into **metamorphic** rock.

mineral (minerals) a natural solid element or compound with a definite structure
A diamond is the hardest **mineral**.

radioactive element (radioactive elements) an element that gives off extra energy and breaks into new elements at a known rate
Radioactive elements help determine the absolute age of rocks.

relative age (relative ages) how old something is in comparison to something else
Fossils help determine the **relative age** of rocks.

rock cycle the process that happens over a long period of time in which one type of rock changes into another type of rock
Rocks are changed in the **rock cycle**.

sedimentary rock (sedimentary rocks) rock formed when tiny pieces of rock and other particles get squeezed together
Fossils are found in **sedimentary rock**.

weathering how rocks break down and change
Ice causes **weathering** of rocks.

