# Lesson 4 | The Cenozoic Era

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## Assessment

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### Teacher Support

Answers (with Lesson Outlines) T8

AL Approaching Level  OL On Level  BL Beyond Level  ELL English-Language Learner

Teacher evaluation will determine which activities to use or modify to meet any ELL student’s proficiency level.
What evidence do you have that you went to kindergarten?

Rocks and fossils provide evidence about Earth’s past. The more recent the era, the more evidence exists. Is this true for you, too?

**Procedure**

1. Make a list of items you have, such as a diploma, that could provide evidence about what you did and what you learned in kindergarten.

2. Make another list of items that could provide evidence about your school experience during the past year.

**Data and Observations**

**Think About This**

1. Which list is longer? Why?

2. **Key Concept** How do you think the items on your lists are like evidence from the first and last eras of the Phanerozoic eon?
The Cenozoic Era

Directions: Answer each question or respond to each statement on the lines provided. Use complete sentences.

Cenozoic glacial groove Holocene epoch hypothesize
ice age mega-mammal Pleistocene epoch

1. What are two examples of mega-mammals?

2. When was the Pleistocene epoch in relation to the Holocene epoch?

3. What is the span of the Holocene epoch?

4. What does it mean to hypothesize?

5. Explain how glacial grooves are formed.

6. Define ice age.

7. What range of time is included in the Cenozoic era?
The Cenozoic Era

A. Geology of the Cenozoic Era

1. People know more about the __________________ era than any other because its fossils and rocks are well preserved.

2. The Cenozoic era is divided into the __________________ period and the Quaternary period. The present epoch, the __________________, began 10,000 years ago.

3. At the beginning of the Cenozoic era, some __________________ collided, forming mountain ranges.
   a. Collisions formed the __________________ in Asia and the Alps in Europe.
   b. The Cascades and the __________________ rose on the coast of North America.

4. The Early Cenozoic era was __________________, but the climate began to cool.
   a. By the __________________ epoch, ice covered the poles and high mountains.
   b. During the first epoch of the Quaternary period, the __________________, glaciers advanced and retreated many times.
   c. During the __________________, glaciers covered as much as 30 percent of Earth’s land surface.
   d. The deep grooves made by rocks carried in glaciers are called __________________.
   e. Because glaciers contained so much water, __________________ dropped and inland seas drained.

B. Cenozoic Life—The Age of Mammals

1. Flowering __________________ evolved and began to dominate the land.

2. Some Cenozoic mammals were so large that they are called __________________.

3. Fossils of these animals have been discovered, preserved in tar pits and in __________________.
Lesson Outline continued

4. Different mammals evolved on different continents because they became geographically _________________.
   a. Most mammals in Australia are ________________, which carry their young in pouches.
   b. Scientists hypothesize that the ancestors of Australian marsupials migrated from ________________ when these landmasses were connected to Australia.

5. The oldest human fossils have been discovered in _________________.
   a. Modern humans did not evolve until the ________________ epoch.
   b. Early humans migrated to North America from ________________ across a land bridge.

6. Many scientists hypothesize that present-day Earth is undergoing a(n) ________________ climate change. Humans are contributing to this climate change by using _________________.


What happened to the Bering land bridge?

Pleistocene animals and humans likely crossed into North America from Asia using the Bering land bridge. Why did this bridge disappear?

**Procedure**

1. Read and complete a lab safety form.

2. Form two pieces of modeling clay into continents, each with a continental shelf.

3. Place the clay models into a watertight container with the continental shelves touching. Add water, leaving the continental shelves exposed. Place a dozen or more ice cubes on the continents.

4. After an hour or two, look at the container. Write your observations below.

**Data and Observations**

**Analyze and Conclude**

**Key Concept** How does your model represent what happened at the end of the end of the Pleistocene epoch?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
The Cenozoic Era

Directions: On the line before each statement, write T if the statement is true or F if the statement is false.

____ 1. Africa pushed into Europe and formed the Alps during the Cenozoic era.

____ 2. Earth’s climate began to cool during the Cenozoic era.

____ 3. During the Pleistocene epoch, glaciers extended into North America.

____ 4. Water contained in glaciers made Earth’s oceans rise.

____ 5. Inland seas flooded much of North America during the Cenozoic era.

____ 6. Mega-mammals were large mammals that evolved during the Cenozoic era.

____ 7. The saber-toothed cat and woolly mammoth are two examples of mega-mammals.

____ 8. A land bridge once connected Australia with Antarctica.

____ 9. The earliest fossil remains of humans are almost 6 million years old.

____ 10. The Pleistocene extinction occurred when a meteorite struck Earth.
The Cenozoic Era

Directions: Answer each question on the lines provided. Use complete sentences.

1. Why is the Cenozoic era considered to be a mountain-building era?

2. What was the Pleistocene Ice Age?

3. Why is the Cenozoic era also called the age of mammals?

4. When and where did the rise of humans occur?

5. What happened to mammals as the Pleistocene epoch came to a close 10,000 years ago?
Editing Activity: Simple Past Tense

The simple past tense is used to write about actions and events that happened in the past.

Dinosaurs lived during the Mesozoic era.

Some Mesozoic reptiles swam in the oceans, and others flew in the skies.

At the end of the Mesozoic era, many reptiles became extinct.

The simple past tense is used for actions that were completed in the past and for events that took place in the past and do not continue into the present. Sometimes words in the sentence can be clues to use the simple past tense.

Hundreds of millions of years ago, the North American continent straddled the equator.

In the Late Paleozoic period, Earth’s landmasses combined into the supercontinent Pangaea.

For regular verbs, the past tense is formed by adding –ed to the base verb (verb + –ed; for example: expanded).

Practicing the Skill

Directions: The paragraph below should be written in the simple past tense. Circle eight verb errors in the paragraph. Rewrite the paragraph with the correct verbs on a separate sheet of paper.

At that time, most people think that mammals evolve after dinosaurs. In fact, mammals probably evolve during the Triassic period, along with the dinosaurs. Early mammals are small in size. They are not numerous or diverse for most of the Mesozoic era. Then in the Late Cretaceous period, they begin to expand in number and diversity. By the start of the Cenozoic era, the modern groups of mammals evolve. In about 20 million years, all the modern orders of mammals evolve.
Language Arts Support

LESSON 4

Word-Usage Activity: Understanding Capitalization

Capitalize all proper names, including:

• Names of particular people—Marie Curie, Isaac Newton
• Names of particular places:
  • Cities—Los Angeles
  • Countries—India
• Other specific places, including peninsulas, mountains, and rivers—Mississippi River, Sierra Nevada, Keweenaw Peninsula, Earth
• Names of the epochs, periods, eras, and eons of the geologic time scale—Phanerozoic eon, Cenozoic era, Quaternary period, Holocene epoch
• Names that are derived from the scientific names for organisms—Archaeopteryx, Tiktaalik

Practicing the Skill

Directions: Study the information above. Then circle the 14 capitalization errors in the passage below.

Extinction is quite common. Ninety-nine percent of all species that ever lived on earth are now extinct. You probably know that animals such as tyrannosaurus and brontosaurus died off. However, you might not have heard of cloudina or dunkleosteus. The catalog of extinct organisms is enormous.

As they studied the past, geologists saw evidence that many organisms became extinct at the same time. The division between the paleozoic era and the mesozoic era marks one of those times. The division between the mesozoic era and the cenozoic era marks another one. One of the largest mass extinctions in earth’s history marks the end of the ordovician period that followed the cambrian. Scientists hypothesize that the Cretaceous extinction was caused when a large asteroid hit earth and produced enough dust to block sunlight from plants and animals for a long period of time.
Use Percentages

A percentage compares a partial amount to a whole amount. A whole amount is equal to 100%. To calculate percentage, change a ratio to a decimal, multiply by 100, and then add a percent symbol. For example, $\frac{1}{4}$ is equal to 0.25 and to 25%.

Earth is around 4.6 billion years old. The Cenozoic era began 65.5 mya and continues today. What percentage of Earth’s history is the Cenozoic era?

Step 1 Identify the ratio and write it as a fraction. The numerator of the ratio shows the partial amount, and the denominator shows the whole amount.

\[
\frac{65,500,000}{4,600,000,000}
\]

Step 2 Divide to change the ratio to a decimal.

\[
\frac{65,500,000}{4,600,000,000} = 0.014
\]

Step 3 Multiply by 100 and add the percent symbol.

\[
0.014 \times 100 = 1.4\%
\]

The Cenozoic era represents 1.4% of Earth’s history.

Practice

1. The earliest fossil evidence of life is approximately 3.5 billion years old. If Earth is 4.6 billion years old, for what percentage of Earth’s history has life existed?

2. The Cenozoic era began 65.5 million years ago. This era is part of the Phanerozoic eon, which has lasted 542 million years. What percentage of the Phanerozoic eon is the Cenozoic era?

3. The Mesozoic era lasted from 251 mya to 65.5 mya. It occurred during the Phanerozoic eon, which has lasted 542 million years. What percentage of the Phanerozoic eon is the Mesozoic era?

4. The Mesozoic era lasted from 251 mya to 65.5 mya. The Jurassic period, which is part of the Mesozoic era, lasted around 55 million years. What percentage of the Mesozoic era is the Jurassic period?
The Cenozoic Era

Directions: Use your textbook to answer each question.

1. We are currently in the Holocene epoch, which is part of the Cenozoic era. The Cenozoic era started about 10,000 years ago.
   How is it possible that scientists know more about the Cenozoic era, even the earliest epochs, than other eras?

2. The Himalayas, the Alps, the Sierra Nevada, and the Cascade Range formed during the Cenozoic era.
   Why did the Appalachian Mountains shrink in size during the Cenozoic era, while so many other ranges formed or grew in size?

3. During the Pleistocene Ice Age, glaciers covered nearly 30 percent of Earth’s land surface. The glaciers moved large rocks and boulders as the ice grew and then receded.
   What landforms were formed by the movement of glaciers during the Pleistocene Ice Age?

4. An increase in food sources enabled mammals to increase in population during the Cenozoic era. The mammals survived so well that this is called the age of mammals.
   What are some types of mammals that thrived during this era? Which mammals did not?
The Cenozoic Era

Key Concept: What major geologic events occurred during the Cenozoic era?

<table>
<thead>
<tr>
<th>Eon</th>
<th>Era</th>
<th>Period</th>
<th>Epoch</th>
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<tbody>
<tr>
<td>Phanerozoic</td>
<td>Cenozoic</td>
<td>Tertiary</td>
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<td>Quaternary</td>
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Directions: Put a check mark in the space that correctly identifies when each geologic event occurred.

1. India crashes into Asia.
2. The climate begins to cool.
3. Glaciers cover 30 percent of Earth’s land surface.
4. The Alps form.
5. Glaciers advance and retreat several times.
6. Antarctica links Australia to South America.
7. The Himalayas form.
8. The Sierra Nevadas form.
10. The climate is warm.
11. Ice covers poles during the Pliocene epoch.
12. Inland seas that had covered the land drain away.
13. Australia is located near India.
Key Concept Builder

LESSON 4

The Cenozoic Era

Key Concept  What major geologic events occurred during the Cenozoic era?

Directions: Respond to each statement on the lines provided.

1. Explain what is meant by the Pleistocene Ice Age.

2. Describe how the Cascades and Sierra Nevadas formed during the Cenozoic era.

3. Describe how the Alps formed during the Cenozoic era.

Directions: Use the diagram to answer the question below.

4. The white parts of the map show the presence of glaciers. Did glaciers cover the area where you live during the Pleistocene Ice Age? Explain.
**The Cenozoic Era**

**Key Concept** What does fossil evidence reveal about the Cenozoic era?

**Directions:** On each line, write the term from the word bank that correctly completes each sentence. Each term is used only once.

<table>
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<th>climate</th>
<th>flowering trees</th>
<th>fossil</th>
<th>grass</th>
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<td>Holocene</td>
<td>Homo sapiens</td>
<td>land bridge</td>
<td>mega-mammals</td>
</tr>
<tr>
<td>Miocene</td>
<td>Oligocene</td>
<td>Pleistocene</td>
<td>Pliocene</td>
</tr>
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</table>

1. Large mammals that evolved during the Cenozoic era are called ____________________.

2. Some of the largest mammals lived during the ______________ and ______________ epochs.

3. The ______________ epoch was warmer and drier than the Pleistocene epoch.

4. The oldest ______________ remains of human beings were discovered on the continent of Africa.

5. ____________________ appeared during the Cenozoic era and provided a new food source for mammals.

6. Scientists hypothesize that Lucy is a 3.2-million-year-old skeleton of ______________ that lived during the Cenozoic era.

7. A(n) ______________ change occurred about 10,000 mya.

8. Early humans most likely used a(n) ______________ to move across what today is an ocean.

9. The ______________ and ______________ epochs were home to such large mammals as the saber-toothed cat and the woolly mammoth.

10. Large mammals survived during the Cenozoic era because ______________ and grass provided a ready food source.
The Cenozoic Era

Key Concept  What does fossil evidence reveal about the Cenozoic era?

Directions: On the line before each statement, write T if the statement is true or F if the statement is false.

_____  1. Animals that evolved in Europe, Asia, North America, and South America were different from ones that lived in Australia.

_____  2. The most common type of animal living in Australia today are primates.

_____  3. Mammals that carry their young on their backs are called marsupials.

_____  4. A land bridge once existed between South America and Antarctica and between Antarctica and Australia.

_____  5. Australia gradually moved away from Antarctica.

_____  6. Marsupials might have originated somewhere other than Australia.

_____  7. Animals might have used a land bridge to migrate from Africa to Australia.

_____  8. Because ancestor marsupials became geographically isolated, they evolved into the type of marsupials that are in Australia today.