Senior High School

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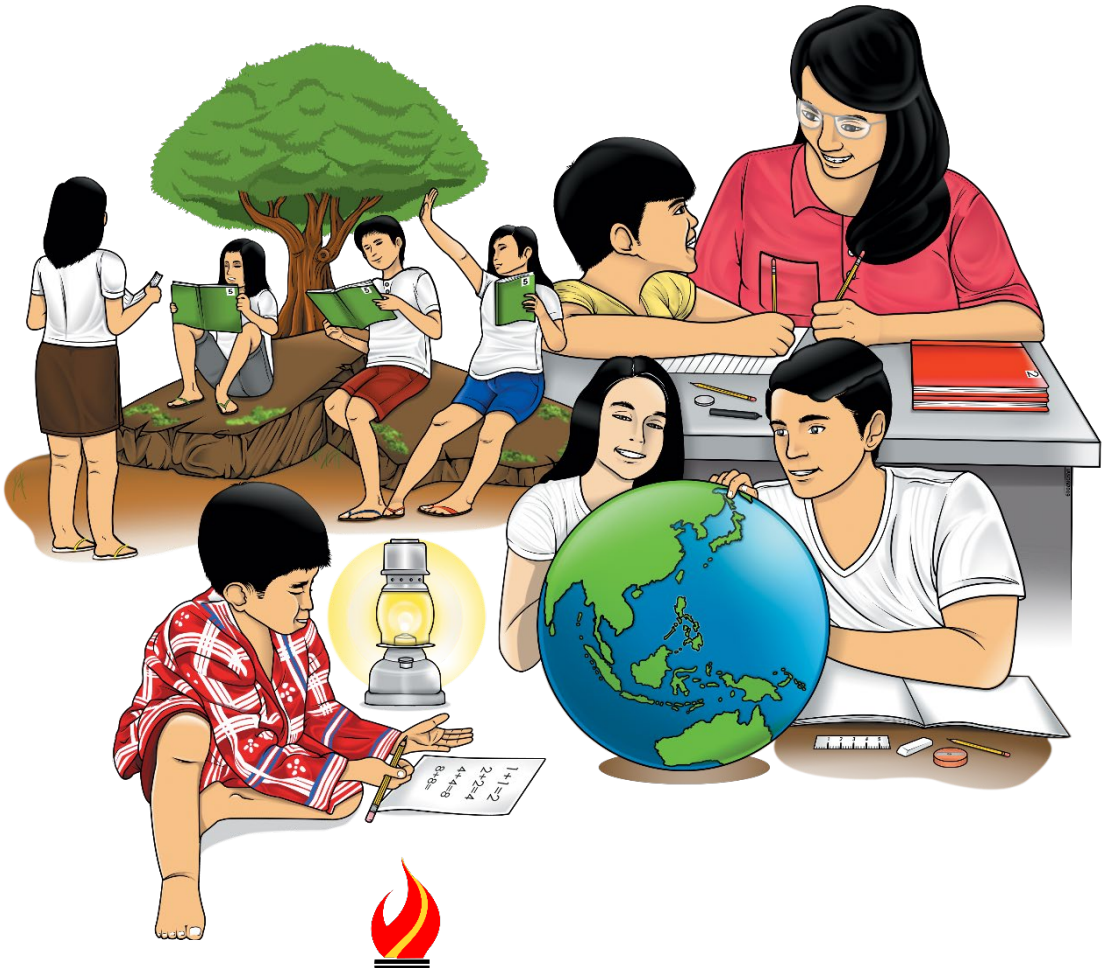
# Earth and Life Science

## Quarter 1 – Module 14:
## Geologic Timeline



ALTERNATIVE DELIVERY MODE
ADM

**Earth and Life Science**
**Alternative Delivery Mode**
**Quarter 1 – Module 14: Geologic Timeline**
**First Edition, 2021**



Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

**Development Team of the Module**

**Writer:** Christian Jay D. Salazar

**Editors:** Melanie I. Samudio
Jocelyn M. Manset

**Reviewers:** Jason Ricaforte, Angelica Beriña, Princess Paolah L. De Guzman, Marissa C. Betchaida, Louie L. Alvarez, Gregorio M. De Chavez, Jr., Jocelyn M. Manset, Mario B. Maramot, Elaine T. Balaogan, Job S. Zape Jr., Jonathan V. Mayo

**Illustrator:** Ednelinda Robles, Lovely Joy La Rosa, Charles Erick A. Jusay, Sandro Carlo B. Tablizo

**Layout Artist:** Elizalde L. Piol, Anselma M. Ebero, Jocelyn M. Manset

**Management Team:** Francis Cesar B. Bringas
Job S. Zape, Jr.
Ramonito Elumbaring
Reicon C. Condes
Elaine T. Balaogan
Fe M. Ong-ongowan
Merthel M. Evardome
Nadine C. Celindro
Nicolas M. Burgos
Mario B. Maramot
Fe M. Ong-ongowan
Rosalinda A. Mendoza

**Printed in the Philippines by _____**

**Department of Education – Region IV-A CALABARZON**

Office Address: Gate 2 Karangalan Village, Barangay San Isidro
Cainta, Rizal 1800
Telefax: 02-8682-5773/8684-4914/8647-7487
E-mail Address: region4a@deped.gov.ph

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# Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

# *What I Need to Know*

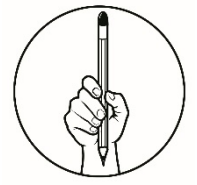
This module was designed and written with you in mind. It is here to help you master the nature of Biology. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module covers:

- Lesson 1 – Geologic Timeline

After going through this module, you are expected to:

1. Describe how the Earth's history can be interpreted from the geologic time scale.
2. Define fossils and its type.
3. Determine the guide fossils that are used to define and identify subdivision of the geologic time scale.
4. Track the Earth's history using the geologic time scale.
5. Identify the different divisions in the geologic time scale.



# *What I Know*

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following does NOT belong to Paleozoic Era?
   A. Cambrian
   B. Devonian
   C. Jurassic
   D. Ordovician

2. What do you call the remains or evidence used as markers when building up the geologic time scale?
   A. fossil
   B. minerals
   C. piles of rock
   D. sandstone

3. Why do most of the eons and eras end in “zoic”?
    A. because these time periods were recognized by the plants present at that time
    B. because these time periods were recognized by the animal life present at that time
    C. A and B
    D. none of the above

4. In what type of rocks are fossils made up of?
    A. igneous rock
    B. metamorphic rock
    C. sedimentary rock
    D. all of the above

5. What do you call the person who studies fossils and ancient life?
    A. anthropologist
    B. archeologist
    C. biologist
    D. paleontologist

6. What do you call the process by which the remains of ancient living things are turned into rock?
    A. fertilization
    B. fossilization
    C. fragmentation
    D. metamorphosis

7. How were the scientists able to arrange the fossils they gathered?
    A. They were able to arrange the fossils according to age.
    B. They were able to arrange the fossils according to structure.
    C. They were able to arrange the fossils according to chemical content.
    D. They were able to arrange the fossils according to place of discovery.

8. In what era did the rocks with fossils of animals and plants such as dinosaurs, mammals, and trees form?
    A. Cenozoic Era
    B. Mesozoic Era
    C. Paleozoic Era
    D. Phanerozoic Era

9. In what era did the first skeletal elements, soft-bodies metazoans, and animal traces exist?
    A. Cenozoic Era
    B. Late Proterozoic
    C. Mesozoic Era
    D. Paleozoic Era

10. What period the first mammals and dinosaurs existed?
    A. Cretaceous
    B. Jurassic
    C. Permian
    D. Triassic

11. In Paleozoic Era, in what period did the first vascular land planet exist?
    A. Cambrian
    B. Devonian
    C. Ordovician
    D. Silurian

12. These marine animals lived inside their shells, taking up the whole inside of the long shell.
    A. echinoderms
    B. gastropods
    C. mollusks
    D. sea arthropods

13. In what phylum do crinoids belong?
    A. echinoderms
    B. arthropods
    C. gastropods
    D. mollusks

14. What do you call the marine arthropods that were made of chitin, like some insects and other organisms like lobsters?
    A. crinoids
    B. fossil clam
    C. gastropods
    D. trilobites

15. Which of the following marine animals are bivalves with two symmetrical shells – the shells are mirror images of each other?
    A. crinoids
    B. fossil clam
    C. gastropods
    D. trilobites

# Lesson 1 Geologic Timeline

Fossils are the remains or evidence of prehistoric plants and animals that have fossilized. Fossils were used as markers when building up the geologic time scale. The names of most of the eons and eras end in "zoic", because these time periods were recognized by the animal life present at the time. Rocks formed during the Proterozoic Eon have fossil evidence of simple organisms, such as bacteria, algae, and wormlike animals. In the Phanerozoic Eon, the rocks formed have fossils of animals and plants such as dinosaurs, mammals, and trees.

And with that, geologists have developed the geological time scale, which divides the Earth's history into eons that are subdivided into eras, which are further divided into periods and then into epochs. The geologic time scale is the "calendar" for events in Earth's history. It subdivides all time since the end of the Earth's formative period as a planet (nearly 4 billion years ago) into named units of abstract time: in descending order of duration, which are eons, eras, periods, and epochs.

The geologic time scale provides a system of chronologic measurement relating stratigraphy to time that is used by geologists, paleontologists, and other Earth scientists to describe the timing and relationships between events that have occurred during the history of the Earth. The detailed studies made of rocks throughout the world have allowed geologists to correlate rock units globally, and break them into time units. The result is the Geologic Time Scale, usually presented in a chart like form with the oldest event and time unit at the bottom and the youngest at the top.

## *What's In*

### Activity 1

Review the vocabulary words and complete the activity on the other side of this worksheet.

1. **Fossils –** remains of ancient life that have been turned to stone
2. **Body Fossils –** actual parts of plants and animals that have been turned to stone (i.e. bone, shells, leaves)
3. **Coprolite –** fossilized dinosaur dung (scat)
4. **Fossilization –** process by which the remains of ancient living things are turned to rock
5. **Paleontologist –** a scientist who studies fossils and ancient life
6. **Sedimentary Rock –** rock made of layers of tightly packed sand and clay

7. **Sandstone –** a type of sedimentary rock that is made of sand
8. **Trace Fossil –** a fossilized sign that a plant or animal once lived in an area (i.e. footprints, coprolite)
9. **Porous –** full of tiny holes that water, air, and light can pass through
10. **Mineralization –** to convert into a mineral substance; to fill with a mineral substance

Instructions: Fill in the blanks, using vocabulary words.

Jay, a famous **p** ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ **t**, was hiking in the Cordillera mountains searching for **f** ___ ___ ___ ___ ___ ___, which are remains of ancient life that have turned to stone. All of a sudden, the ground shook beneath him. Jay ran over a hill and saw that there had been a huge landslide. He went over to look at the piles of rocks and saw layers of s ___ ___ ___ **s** ___ ___ ___ ___**,** a type of sedimentary rock. Fossils are found in sandstone, so Jay was excited to search through the rocks! Just as he began to dig, he found fossilized bones. The bones had turned to stone through a process called ___ ___ **s s** ___ ___ ___ ___ ___ ___ ___ ___ ___**.** Jay saw that the fossils belonged to an Apatosaurus. These bones are examples of **b** ___ ___ ___ ___ ___ ___ ___ **i l** ___**,** which are fossilized parts of plants and animals. Jay hiked further up the mountain and found fossilized dinosaur dung, called **c** ___ ___ ___ ___ ___ ___ ___ ___**.** He also found a huge footprint, which is an example of a **t** ___ ___ ___ ___ **f** ___ ___ ___ ___ ___**.** Jay carefully removed the fossils from the rocks and donated them to a museum.

## Activity 2: Find Me

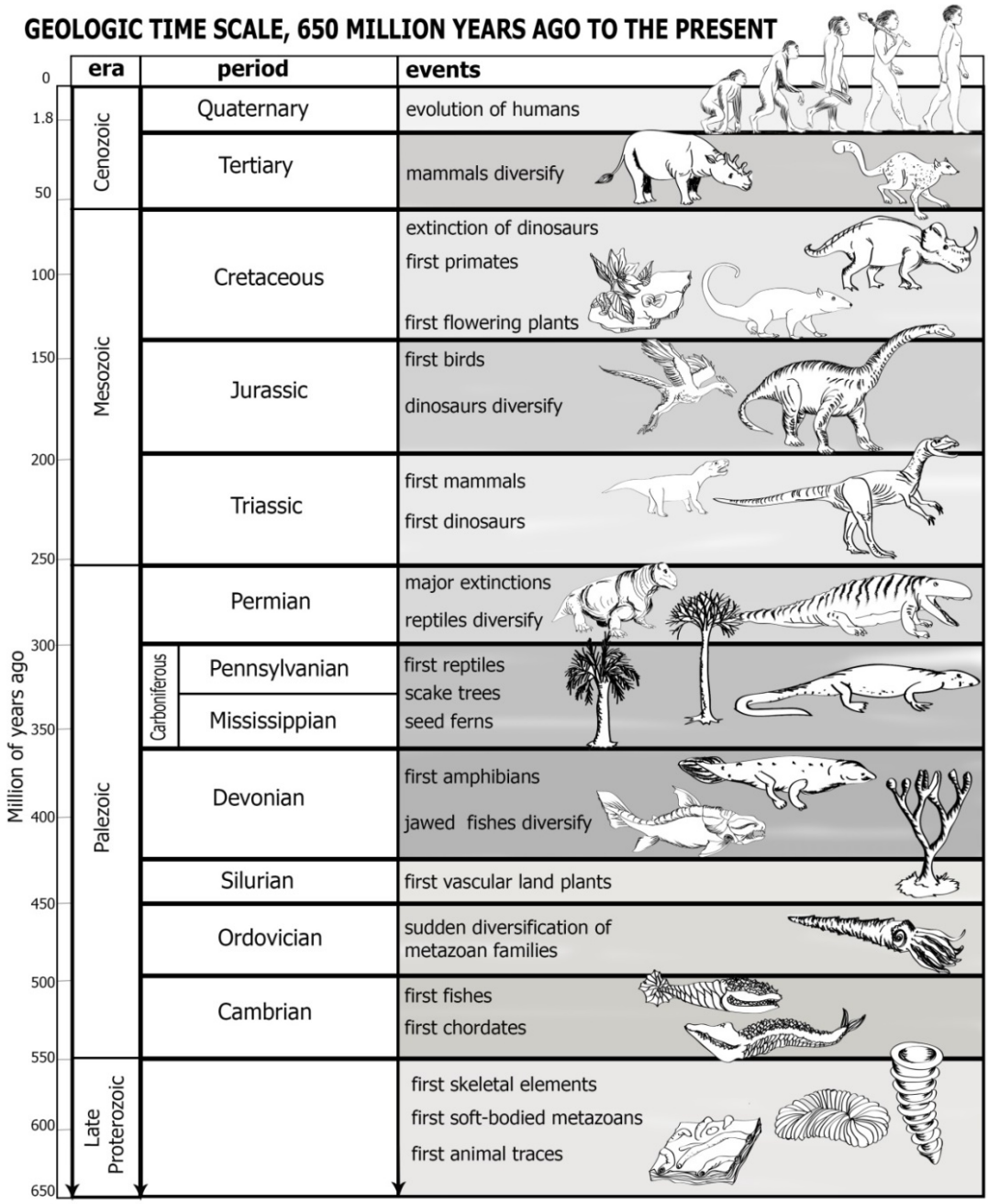
**Directions**. Encircle the 8 words listed below. Words may appear straight across, back-word straight across, up, and down.

| | |
|---|---|
| **COPROLITE** | **PALEONTOLOGIST** |
| **FOSSILS** | **MINERALIZATION** |
| **SEDIMENTARY** | **SANDSTONE** |
| **FOSSILIZATION** | **POROUS** |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L | N | O | I | T | A | Z | I | L | A | R | E | N | I | M |
| S | T | S | I | G | O | L | O | T | N | O | E | L | A | P |
| E | K | B | K | S | D | Z | U | I | L | I | H | K | M | F |
| D | C | L | T | J | Q | L | W | O | G | B | M | I | N | O |
| I | Y | E | I | N | M | P | Q | R | K | J | P | A | T | S |
| M | F | P | D | L | S | A | N | D | S | T | O | N | E | S |
| E | R | O | I | M | I | X | Y | U | E | R | J | P | J | I |
| N | D | K | S | Z | R | F | Z | T | J | A | X | T | Q | L |
| T | E | B | P | S | M | E | I | L | W | B | P | I | Y | I |
| A | Q | V | Y | E | I | L | X | V | Y | O | F | Q | V | Z |
| R | Z | I | K | F | O | L | P | M | R | A | M | R | G | A |
| Y | C | V | W | R | H | R | Y | O | K | V | F | I | L | T |
| M | L | S | P | Q | U | N | U | P | I | P | W | E | H | I |
| T | V | O | F | M | B | S | A | R | T | F | N | F | B | O |
| N | C | G | Z | U | R | N | L | O | N | I | H | O | A | N |

## Activity 3: Let's Trace

Look and analyze at the illustration below and answer the question listed below.




1. For how long has there been life on Earth?

_____

_____

_____

2. For what percentage of time has life existed on Earth (round to the nearest whole number)?

_____
_____
_____

3. For about how many years of geological time have humans existed on Earth?

_____
_____
_____

4. For about how many years of geological time have the dinosaurs existed on Earth?

_____
_____
_____

5. Did dinosaurs exist at the same time as humans?

_____
_____
_____

6. How do scientists determine when an era begins and when it ends?

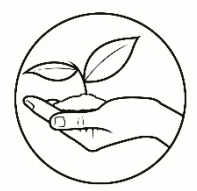
_____
_____
_____

7. What is the purpose of making a geological timeline?

_____
_____
_____

***Notes to the Teacher***

This module will help you understand the concepts about animal reproduction. All parts are comprised of activities. Be guided with the instructions on how you will answer each. Expectedly, you will meet the target at the end of the module.



# *What's New*

## The Story of Fossils *by Patti Hutchison*

Imagine you are hiking in the woods. As you walk up a steep hill, you find a fossil. It is a mold of many tiny seashells. What would seashells be doing in the middle of the woods?

Most fossils are found in sedimentary rocks. These rocks form on the surface of the earth. They record the processes that have happened on the surface, including life. Scientists are able to arrange fossils according to age. This is called the fossil record. By studying the fossil record, scientists have found that the earth and its life forms have gone through many changes in the past.

Fossils have taught us how and when rock layers have formed. They have also helped scientists learn about life forms that have come and gone. Fossils have even taught us about the climate of the earth long ago.

The Geologic Time Scale is divided into huge blocks of time called eras. Eras are defined by major changes in the fossils found in the sedimentary rock layers that were formed during those time spans.

## Activity 4

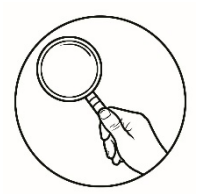
Directions: Read the story entitled **"The Story of Fossil"** by *Patti Hutchison*. Answer the guide questions stated below.

1. In what type of rocks are FOSSILS made of?
   _____
   _____
   _____

2. How do scientists arrange discovered fossils?
   _____
   _____
   _____

3. How did fossils help and teach scientist about the history of the earth?
   _____
   _____
   _____

4. Aside from geological aspect, what other aspects can be predicted by guide fossils? How? (climatic, organismic etc.)
   _____
   _____
   _____



## *What is It*

### Activity 5

Read and analyze the statements below. Write T if the statement is TRUE and F if the statement is FALSE.

_____ 1. Scientists determine when an era begins and when it ends through geological timeline.
_____ 2. Dinosaurs exist at the same time as humans.
_____ 3. The purpose of making a geological timeline is to identify age of organism through its fossils.
_____ 4. Quaternary period of geological time has humans evolved on Earth.
_____ 5. Triassic Period of geological time have the dinosaurs existed on Earth.

## *What's More*

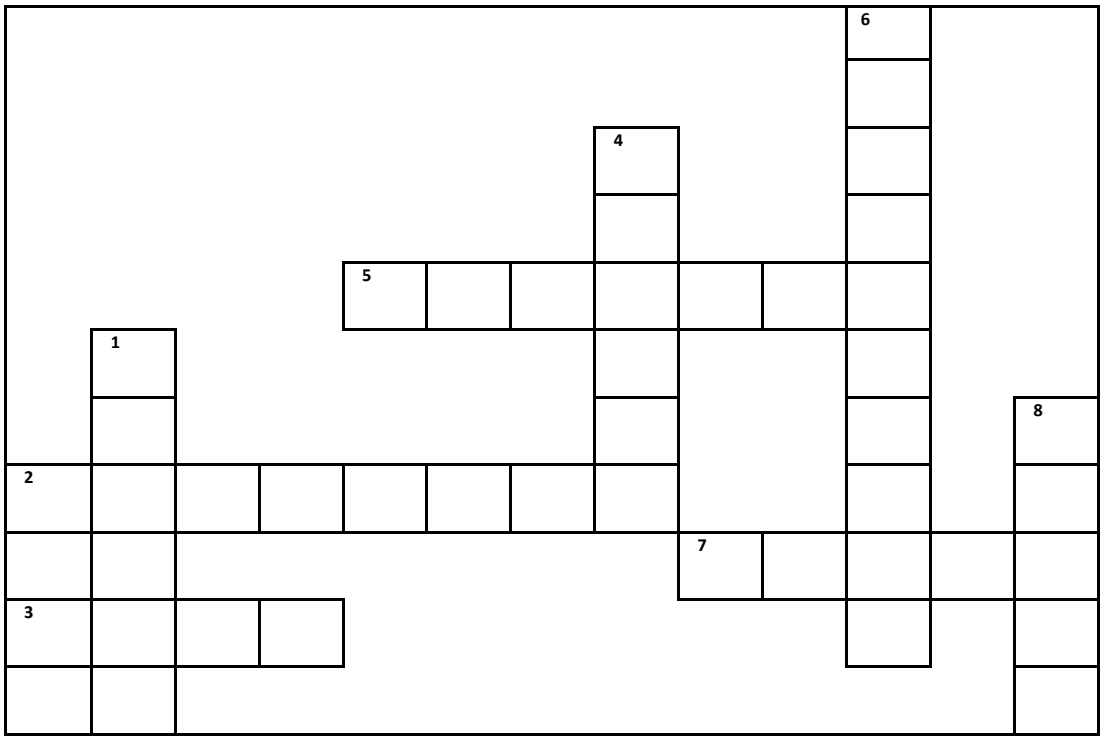
### Activity 6

Directions: Write the division and period of the listed organism below. Refer to geological time scale.

| | **Era** | **Period** |
|---|---|---|
| 1. first vascular land plants | _____ | _____ |
| 2. jawed fish diversity | _____ | _____ |
| 3. evolution of humans | _____ | _____ |
| 4. first chordates | _____ | _____ |
| 5. mammals diversify | _____ | _____ |
| 6. first primates | _____ | _____ |
| 7. dinosaurs' diversity | _____ | _____ |
| 8. major extinctions of reptiles' diversity | _____ | _____ |
| 9. sudden diversification of metazoan families | _____ | _____ |
| 10. first flowering plants | _____ | _____ |

## Activity 7: Crossword Puzzle

**Directions**. Complete the crossword by filling in the word that describes each clue.




**Across:**

2. a term used with two symmetrical shells - mirror images of each other.
3. the term “crinoid” means
5. type of proteins that make up the skin, hair and nails.
7. multicellular organisms in the sea that often live in colonies and served as habitat of marine organisms

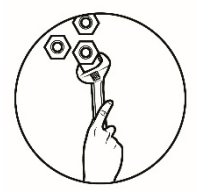
**Down:**

1. exoskeletons are made up of this material
4. common slow-moving gastropod lived inside their shells
6. phylum where starfish and sea urchins belong
8. individuality of coral is called _____.

# *What I Have Learned*

Fill in the blanks. Read and analyze the statements below. Write the word that will complete the sentence/paragraph.

1. _____ are the remains or evidence of prehistoric plants and animals that have fossilized.
2. Fossils were used as markers when building up the geologic time scale. The names of most of the eons and eras end in "zoic" because these time periods were recognized by the _____ present at the time.
3. The geologic time scale is the "calendar" for events in Earth's history. It subdivides all time since the end of the Earth's formative period as a planet (nearly 4 billion years ago) into named units of abstract time: in descending order of duration, which are _____, _____, _____ and _____.
4. The _____ provides a system of chronologic measurement relating stratigraphy to time that is used by geologists, paleontologists and other Earth scientists to describe the timing and relationships between events that have occurred during the history of the Earth.
5. The Geologic Time Scale is divided into huge blocks of time called eras. Eras are defined by major changes in the fossils found in the _____ rock layers that were formed during those time spans.



# *What I Can Do*

## Activity 7

There are tables of fossils presented below. In the first box, choose an example and draw its physical structure. Second box and third box are references that serve as your guide to choose what organism you prefer to draw. Check the example. Good luck!

Example:

| | | |
|---|---|---|
|  | **Branching Tabulate Coral**<br>Age: Devonian (approximately 416 to 359 million years ago)<br>Class: Anthozoa<br>Modern Relatives: Corals still exists today. | **Branching Tabulate Coral** is a marine animal. Corals are multicellular organisms that often live in colonies. The individual animal is called a polyp. There are many different species of coral, with different forms, shapes, and sizes. |

| | | |
|---|---|---|
| 1. | **TRILOBITE**<br>Age: Devonian (approximately 416 to 359 million year ago)<br>Phylum: Arthropod<br>Modern Relatives: **Crabs, Spiders and insects** | Trilobites were marine arthropods. The first trilobites show up in the fossil record dating back to about 525 million years ago. There were many different types of trilobites, ranging in size from 1mm to 72mm (28 inches long!) Trilobite species went extinct by 250 million years ago.<br>Trilobite fossils are formed from the exoskeletons. These were made of chitin, like some insects and others organisms like lobsters. They split apart and shed their shell as they grow, just like lobsters do. |

| | | |
|---|---|---|
| 2. | **Crinoid**<br>Age: Devonian (approximately 416 to 359 million years ago)<br>Phylum: Echinoderm<br>Modern Relatives: **Starfish, sea urchins and sea cucumbers** | Crinoids were marine animals. Its name means "Lily". It is in the same phylum (Echinoderm) as starfish and sea urchins. Crinoids ate by filtering food out of the water with it arms. Its mouth and anus were next to each other in the calyx. It "rooted" in place with a holdfast. When crinoids die, their stems quickly break apart. The most common fossils of crinoids are the stem which is sometimes broken into little "cheerio" like pieces. |

| | | |
|---|---|---|
| 3. | **Gastropod**<br>Age: Cretaceous (Approximately 146 to 65 million years ago)<br>Phylum: Mollusk<br>Modern Relatives: **Snails, Slugs and Whelks** | Gastropods were marine animals. There were many different species of gastropods. All had coiled shells, but some were tightly coiled while some were loosely coiled. They had many different shapes and surface texture. The animals lived inside their shells, taking up the whole inside of the long shell. They could retract into their shells, covering the opening with their foot. |

| | | |
|---|---|---|
| 4. | **Fossil Clam**<br>Age: Cretaceous (approximately 146 to 65 million years ago)<br>Class: Bivalve<br>Modern Relatives: **Oysters, Scallops and Mussels** | Fossil clams are marine animals. Clams are bivalves, with two symmetrical shells - the shells are mirror images of each other. Fossil clams range in size from a few millimeters to up to 2 meters (about 6 feet) in diameter. Clams lived inside their shells and had a muscular foot they used to borrow and move around. They lived in colonies on the ocean floor. Some clams had smooth shells while some were rough. |

# *Assessment*

Multiple Choice. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Why do most of the eons and eras end in “zoic”?
    A. because these time periods were recognized by the animal life present at that time
    B. because these time periods were recognized by the plants present at that time
    C. A and B
    D. none of the above

2. Which of the following marine animals are bivalves with two symmetrical shells – the shells are mirror images of each other?
    A. crinoids
    B. fossil clam
    C. gastropods
    D. trilobites

3. How were the scientists able to arrange the fossils they gathered?
    A. They were able to arrange the fossils according to age.
    B. They were able to arrange the fossils according to structure.
    C. They were able to arrange the fossils according to chemical content.
    D. They were able to arrange the fossils according to place of discovery.

4. What do you call the marine arthropods that were made of chitin, like some insects and other organisms like lobsters?
    A. crinoids
    B. fossil clam
    C. gastropods
    D. trilobites

5. What do you call the process by which the remains of ancient living things are turned into rock?
    A. fertilization
    B. fossilization
    C. fragmentation
    D. metamorphosis

6. In what phylum do crinoids belong?
    A. arthropods
    B. echinoderms
    C. gastropods
    D. mollusks

7. What do you call the person who studies fossils and ancient life?
    A. anthropologist
    B. archeologist
    C. biologist
    D. paleontologist

8. Which of the following marine animals lived inside their shells, taking up the whole inside of the long shell?
    A. echinoderms
    B. gastropods
    C. mollusks
    D. sea arthropods

9. In what type of rocks are fossils made of?
    A. igneous rock
    B. metamorphic rock
    C. sedimentary rock
    D. all of the above

10. In Paleozoic Era, in what period did the first vascular land planet exist?
    A. Cambrian
    B. Devonian
    C. Ordovician
    D. Silurian

11. In what period the first mammals and dinosaurs existed?
    A. Cretaceous
    B. Jurassic
    C. Permian
    D. Triassic

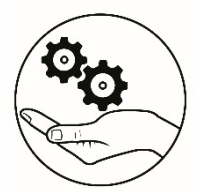
12. What do you call the remains or evidence used as markers when building up the geologic time scale?
    A. fossil
    B. minerals
    C. piles of rock
    D. sandstone

13. In what era did the first skeletal elements, soft-bodies metazoans, and animal traces exist?
    A. Cenozoic Era

B. Late Proterozoic
C. Mesozoic Era
D. Paleozoic Era

14. Which of the following does NOT belong to Paleozoic Era?
    A. Cambrian
    B. Devonian
    C. Jurassic
    D. Silurian

15. In what era did the rocks with fossils of animals and plants such as dinosaurs, mammals and trees form?
    A. Cenozoic Era
    B. Mesozoic Era
    C. Paleozoic Era
    D. Phanerozoic Era



## *Additional Activities*

Do you think that the average annual global temperature and carbon dioxide levels have been consistent throughout the history of earth? Justify your answer.

# *Answer Key*

**What I Know**

1. C
2. A
3. B
4. C
5. D
6. B
7. A
8. D
9. B
10. D
11. D
12. B
13. A
14. D
15. B

**What's in**

Activity 1

Paleontologist
Fossils
Sandstone
Fossilization
Body fossils
Coprolite
Trace fossil

Activity 2

1. Answer may vary according to student's perception

**Assessment**

1. A
2. B
3. A
4. D
5. B
6. B
7. D
8. B
9. C
10. D
11. D
12. A
13. B
14. C
15. D

**What's More**

Activity 6

1. Paleozoic -Silurian
2. Paleozoic - Devonian
3. Cenozoic - Quaternary
4. Paleozoic - Cambrian
5. Cenozoic - Tertiary
6. Mesozoic – Cretaceous
7. Mesozoic - Jurassic
8. Paleozoic – Permian
9. Paleozoic – Ordovician
10. Mesozoic – Cretaceous

Activity 7

Across

2. Bivalves
3. Lily
5. Keratin
7. Coral

Down

1. Chitin
4. Snails
6. Echinoderm
8. Polyp

**What's It**

Activity 5

1. T
2. F
3. T
4. T
5. F

**What's New**

Activity 4

Answer may vary according to student's perception

Activity 3

Answer may vary according to student's perception

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**For inquiries or feedback, please write or call:**

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph