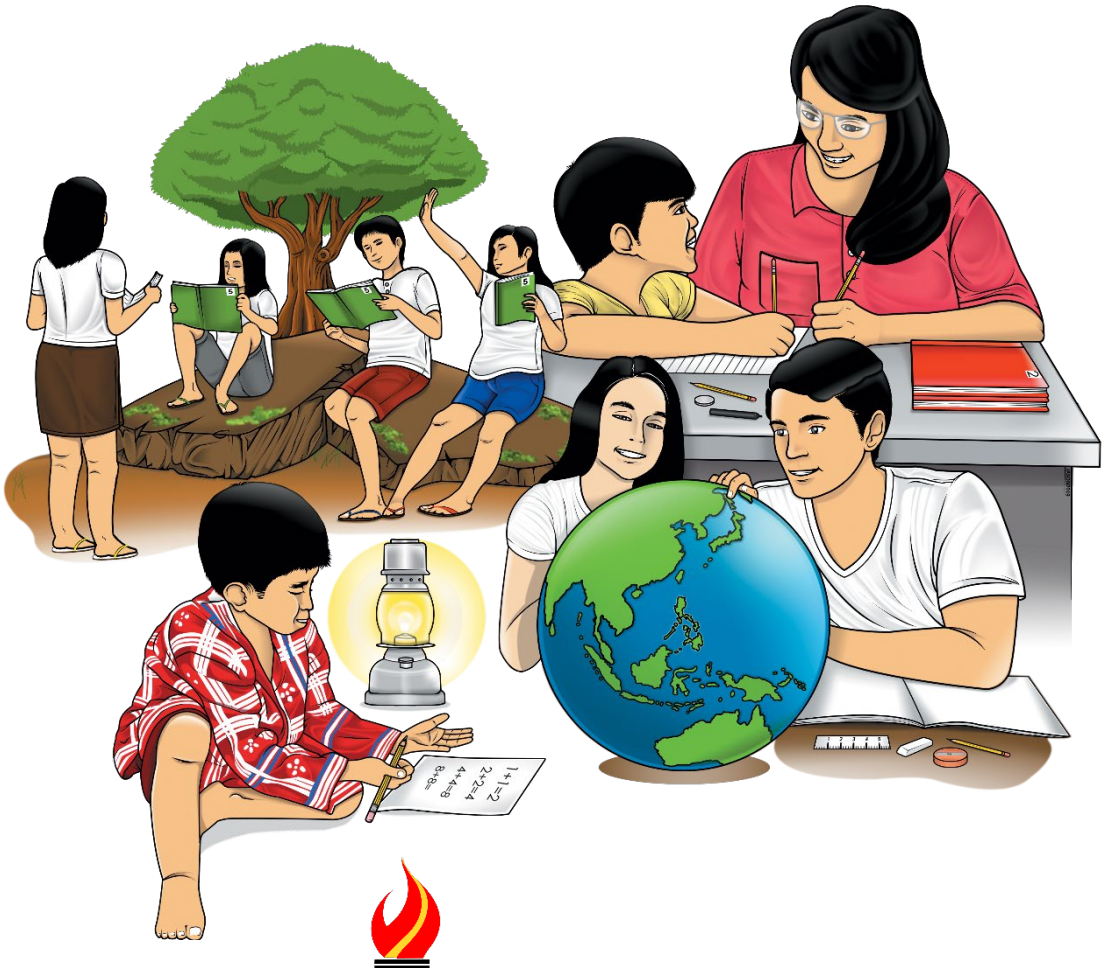
Senior High School

DepED
DEPARTMENT OF EDUCATION

# Earth and Life Science

## Quarter 1 – Module 10: Movements of Plates and Formation of Folds and Faults



ALTERNATIVE DELIVERY MODE
ADM

**Earth and Life Science**
**Alternative Delivery Mode**
**Quarter 1 – Module 10: Movements of Plates and Formation of Folds and Faults**
**First Edition, 2021**



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

**Development Team of the Module**

**Writer:** Chris B. De Jesus

**Editors:** Erwin R. Abrencillo
Jocelyn M. Manset

**Reviewers:** Dominic P. Almirez, Franz Kevin Manalo
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., Avelyn A. Cajayon, Victoria M. Magpantay, Fernando M. Villanueva

**Illustrator:** Ednelinda Robles, Cherry Amor Laroza
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.
Eugenio S. Adrao
Elaine T. Balaogan
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 4A CALABARZON**

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

Senior High School

# Earth and Life Science

## Quarter 1 – Module 10: Movements of Plates and Formation of Folds and Faults

DepED
DEPARTMENT OF EDUCATION

# 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 you're 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.

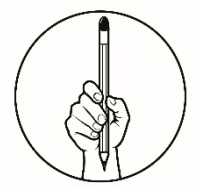
# *What I Need to Know*

This module was designed and written with you, the learner in mind. This aims to help you master the Nature of Earth and Life Science. The scope of this module permits can be used in 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 included lesson about the Movements of Plates and Formation of Folds and Faults.

After going through this module, you are expected to:

1. Identify the three types of plate movements from a short excerpt.
2. Expound three types of plate movement based on plate tectonics theory using an illustration.
1. Cite specific examples of landforms as outcomes of plate movement.



# *What I Know*

Read and analyze each statement and choose the letter which corresponds to the correct answer. Write your answer in your notebook.

1. What geologic feature will be formed if the continents riding on top of two converging plates collide?
   A. faults
   B. mountain
   C. island
   D. ocean

2. Which of the following refers to the region where plates meet?
   A. fault
   B. mountain
   C. plate boundary
   A. volcanic arc

3. Which type of plate boundary creates a zone of tension by moving the plates apart?
   A. convergent boundary
   B. divergent boundary
   C. transform fault
   D. none of these

4. When two tectonic plates collide, the oceanic crust usually subducts beneath the continental crust because it is
   A. denser than continental crust
   B. thicker than continental crust
   C. thinner than continental crust
   D. less dense than continental crust

5. What geologic features could result out of the direction of movement indicated in the arrows below? (There are three possible answers)

6. Which of the following diagrams shows transform fault boundary movement?
   A. 
   B. 
   C. 
   D. 

7. Which of the diagrams shows divergent fault movement?

A. 

B. 

C. 

D. 

8. Where does new oceanic lithosphere form?
   A. convergent boundary
   B. divergent boundary
   C. transform fault
   D. none of these

9. In which type of plate boundary does the shallow focus earthquake occur?
   A. convergent
   B. divergent
   C. transform
   D. all of these

10. Which of the following is not associated with convergent plate movement/margin?
   A. deep-focus earthquake
   B. trench
   C. valley
   D. volcanic Arc

11. Which of the following is associated with the discovery of seafloor spreading?
   A. Mountains and Volcanoes are denser than mantle
   B. Rotational pole of the earth has migrated or moved.
   C. The crust of the continents is denser than the crust of the ocean
   D. The crust of the oceans is very young relative to the age of the crust of the continents

12. Which of the following is associated with volcanic arcs?
   A. convergent
   E. divergent
   F. transform
   G. all of these

13. which of the following best describe the direction of divergent plates movement?
   A. It moves alongside
   B. It moves towards each other
   C. It moves in opposite directions
   D. It moves in either opposite or alongside

14. Which of the following completes the analogy?

Folds: occurs when flat surface bent

Faults: _____

A. It forms from subducting plates
B. fracture or discontinuity in volume of rocks
C. Occur when plates moving alongside and toward to each other.
D. Occur when plates moving alongside and away from each other.

15. Which of the following is said to be a chain of mountains?

A. Arc
B. Ridges
C. Trench
D. Valley

# Lesson 1 Movements of Plates and Formation of Folds and Faults

This module contains topics about plate movement leading to the formation of folds and faults. Students must explain how the movement of plates leads to the formation of folds and faults by doing different activities included in this module. Likewise, a discussion on the concept about plate movement is available for the students' reference in doing each activity incorporated in the procedure.

## *What's In*

Cross out the words in the first box which are not associated with plate tectonics. Then, put the remaining words and write your understanding about these words on the box that follows.

| | | |
|---|---|---|
| FAULT | WEATHERING | CONVERGENT |
| PLATES | SUBDUCTION | VOLCANIC ARC |
| RIDGE | MOUNTAIN | MESOSAURUS |
| FOLD | DIVERGENT | |

| ***Words*** | ***Your Own Understanding*** |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

***Notes to the Teacher***

***General Notes:***

- ***Extend:*** *Provide the materials to the students.*
- ***Explore:*** *Allow the students to explore and check the given materials.*
- ***Explain:*** *Describe each part of the instructional material or the module.*
- ***Enable:*** *Let the students perform or accomplish the module.*
- ***Evaluate:*** *Assess learners' output and get back to them.*
  ***Specific Note: Remind the students to collect their scores.***

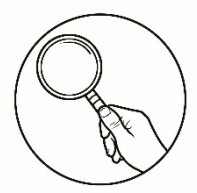
## *What's New*

Read and analyze the excerpt. Identify the three indicated types of plate movement. Illustrate it on the box provided below (10 points).

**TYPE OF PLATE BOUNDARIES**

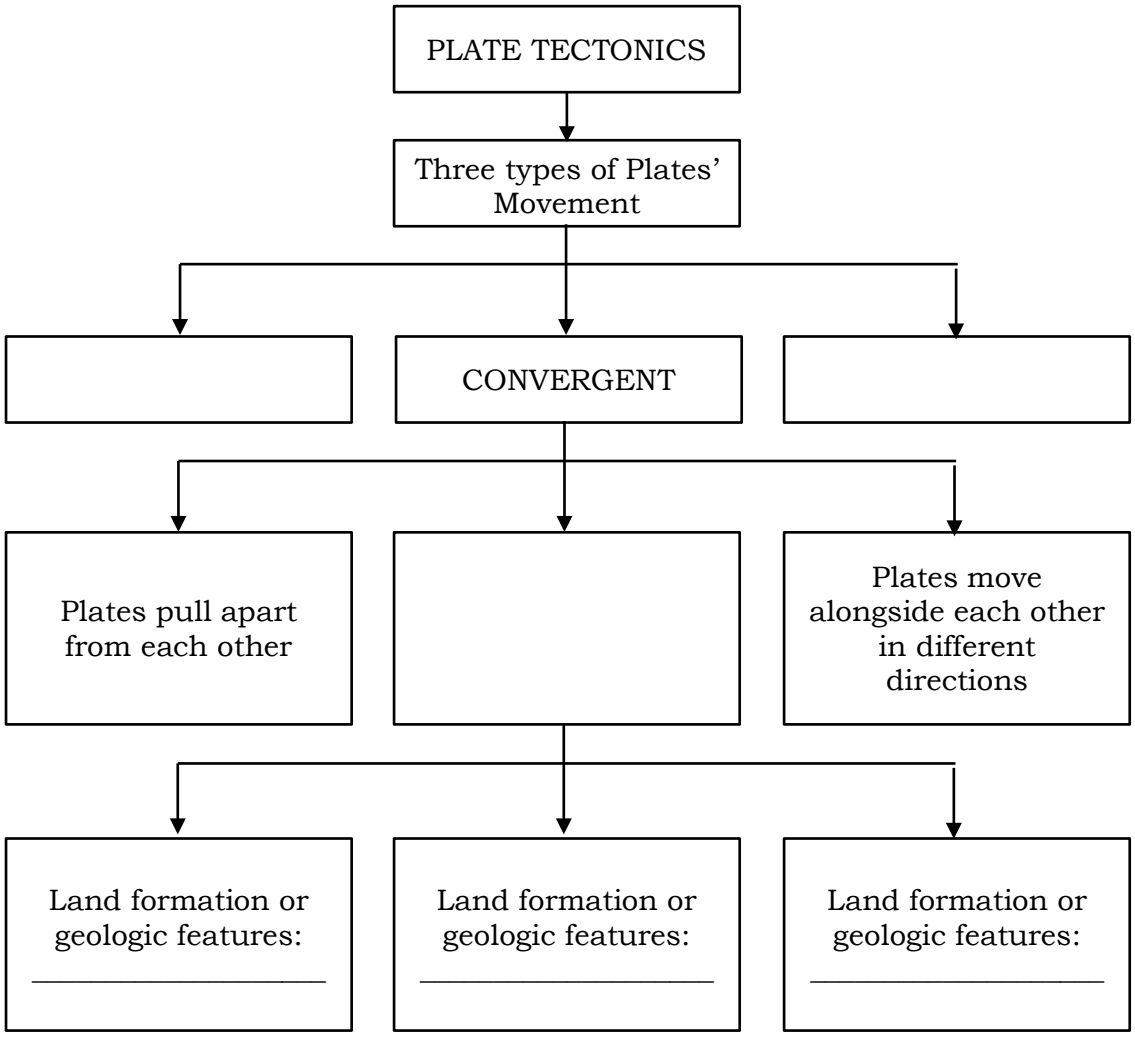
Studying plate boundaries is important because along these boundaries, the deformation of the lithosphere is happening. Divergent plate movement occurs when plates pull apart from each other. When two (2) plates diverge, pieces from such plates sink towards the Earth's mantle. On the other hand, convergent movement occurs when plates crush into each other and land crumples, forming trenches and mountains. Lateral or transform fault movement occurs when plates move alongside each other in different directions.

| Illustration 1. | Illustration 2. | Illustration 3. |
|---|---|---|
| _____ | _____ | _____ |
| | | |

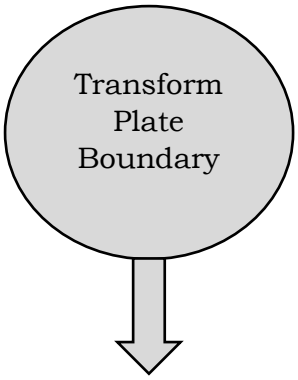


## *What is It*

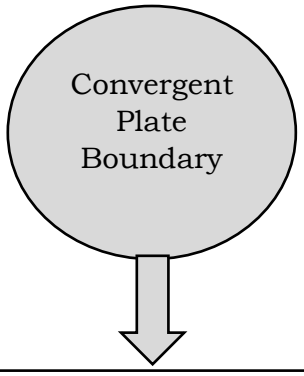
A. Complete the diagram below by filling in the boxes with the corresponding terms/phrases.



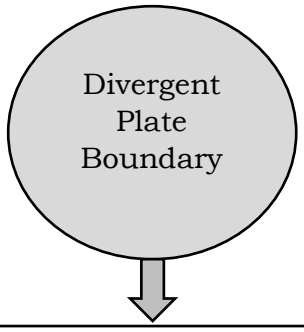
A. Read and analyze the diagram below which will provide you background information on plate boundaries.




It is also called as **strike slip fault boundary**, the plates slide past each other horizontally. This is a type of boundary that cuts through California, the well-known San Andreas Fault. The San Andreas Fault Zone, which is about 1300 km long and is tens of kilometer wide, slice through two thirds of the length of California. Along with it, the Pacific Plate has been moving for 10 million years, at an average rate of about 5 cm/yr (Pavico and Faraon, 2007, 193).




The heavier oceanic crust sinks below the lighter continental crust. It happens along convergent boundaries where plates are moving toward each other and sometimes one plate sinks under another (subduction). Marianas Trench marks where the fast-moving Pacific Plate converges against the slower moving Philippine Plate. This boundary is often where major volcanoes such as Mount Fuji in Japan can be located. In a collision of two pieces of oceanic crust, the result is a chain of volcanic islands, of which Indonesia is a prime example. Where oceanic crust collides with a plate carrying the continent, the result is a chain of volcanoes on the continent, such as the Cascade of volcanic chain in Pacific Northwest of the US and the Andes Mountains of South America. When two continental crusts collide, the result is a range of mountains such as the Himalayan Mountain (Pavico and Faraon, 2007, 193-194).

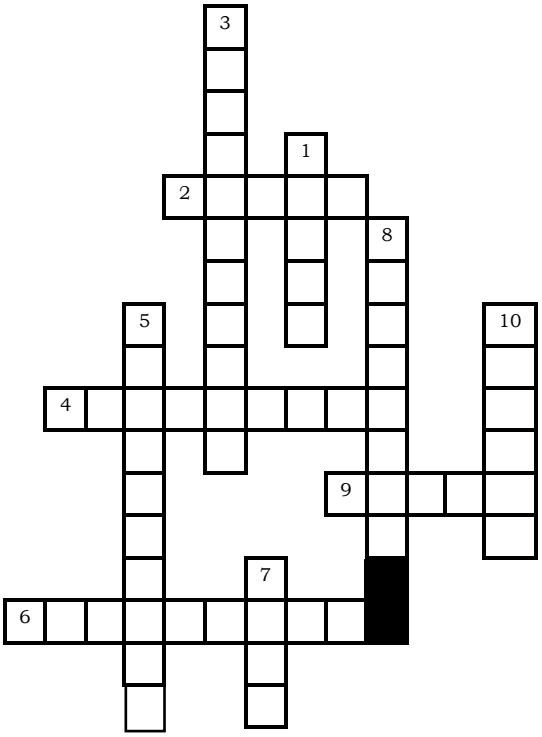



Divergent Plate Boundaries are boundaries where the earth's tectonic plates are moving apart. For the most part, these boundaries are located on the ocean floors, where they form a continuous chain of volcanic mountains and rift called mid-ocean ridges that extend throughout the earth's oceans. The Mid-Atlantic Ridge is a good example, which runs down the middle of the Atlantic Ocean. As the plates move apart, magma wells up to fill the space between them, and this is why divergent plate boundaries are the sites of volcanic activity. It is also a set where the earth's crust is growing (Pavico and Faraon, 2007, 194).

## *What's More*

### Activity A: Crossword Puzzle

Fill out the crossword puzzle with the correct terms using the given clues.




**Across**

2. Fracture or discontinuity in a volume of rocks.
4. Plates are moving away from each other.
6. Horizontal motion movement of plates.
9. A chain of mountains.

**Down**

1. Earth's crust and uppermost mantle
3. A chain of volcanoes formed from subducting plates.
5. Plates are moving toward each other and collide.
7. Occur when flat surface bent or curved.
8. A large landform formed from tectonic forces.
10. Low area between hills and mountain

## Activity B: My Understanding of Plate Movement

Complete the paragraph below. The first part is already given.

Faults, folding, ridges, mountains, valleys and volcanic arc are formed when the plates move because

_____
_____
_____
_____
_____**(5 points).**

Criteria: 3 points: Appropriateness and relation to the topic
2 points: Neatness and free from grammatical errors

## Activity C: Plate Boundaries

Perform the activity below by following the instructions.

A. There are two tables below. Table A includes the three types of plate boundaries with their respective descriptions and illustrations, while Table B is where you can write your answer.
B. Observe Table A by making sure that all the descriptions and illustrations referring to a specific type of plate boundary are properly placed.
C. In case you noticed errors, rewrite the content of table A into table B with the correct classification of all the descriptions.

*Table A*

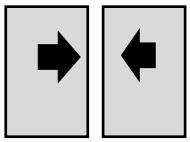
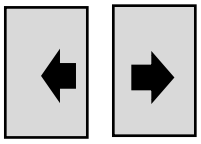
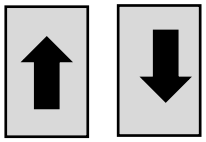
| ***CONVERGENT*** | ***DIVERGENT*** | ***TRANSFORM*** |
|---|---|---|
|  | When it occurs between two oceanic plates, one of those plates will subduct beneath the other. | Most of it are found in the ocean basin and connect offsets in the mid ocean ridges |
| Plates move apart | When it happens, the new crust is forming from magma that rises to the earth surface between the two plates |  |
| Two plates are moving toward each other | Also known as strike slip or sliding boundaries | Best example of this plate is San Andreas fault |
|  | Creating a zone of tension | Often sites of major volcanoes |

*Table B*

| ***CONVERGENT*** | ***DIVERGENT*** | ***TRANSFORM*** |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

## Activity D: READ! ASK! RESPOND!

Read and analyze the diagram below. Take note of some important details which will be used in the next activities and questions.

**READ**

Plates move relative to each other and to fixed locations in the mantle of the Earth. The absolute motion of the plates can lead to the formation of strings of volcanoes. On the other hand, their relative motion can lead to the different types of plate boundaries. If three plates meet in one place, they form a triple junction (Kasten 2012, 241)

**ASK**

1. What motion or movement can lead to the formation of strings of volcanoes?
2. What will be formed if the three plate boundaries meet in one place?

**RESPOND**

1

2.

**READ**

Currently, the size of oceans and shape of continents are changed due to the movement of plates. Because of the movement of plates in North and South America, the Pacific Ocean is becoming smaller. However, the Atlantic Ocean is becoming larger as North and South America move away from Europe and Africa. The Himalayas Mountains are becoming taller. The plate that includes Australia is now beginning to collide with the plate that includes Southeast Asia. India's plate is also colliding with Asia, while Australia is moving farther away from Antarctica (Kasten 2012, 241).

**ASK**

1. What will happen to the Pacific Ocean if the North and South American Plates continue to move to the west?
2. What caused the enlargement of the Atlantic Ocean?
3. What will happen to the Himalayas Mountains when two large landmasses, Eurasia and India driven by plate movement and collide?

**RESPOND**

1.

2.

3.

## *What I Have Learned*

From the word pool given below, identify the term being described in the following statements.

_____1. This phenomenon is created during transformation of plate's movement, and it is a kinematic phenomenon caused by the relative density of oceanic lithosphere and relative weakness of asthenosphere.

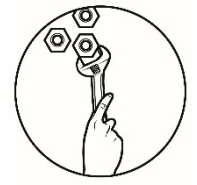
_____2. This plate's movement creates mountain and volcanic arc. Marianas Trench is also created by this movement.

_____3. The movement of this plate is towards the opposite direction or moving away from each other.

_____4. It is a process of rising up hot, dense liquid materials and creates new seafloor.

_____5. This is a theory that supports continental drift theory and seafloor spreading.

| | |
|---|---|
| Plate Tectonic | Seafloor Spreading |
| Transform fault | Divergent |
| Convergent | |



## *What I Can Do*

Supply the needed information by writing it on the space provided.

A. "Everything happens for a reason." How will I relate the given quotation to the lesson?

_____

_____

_____

_____

_____

B. In your area, what natural scenery do you think is a result of colliding plates?

_____

_____

_____

_____

_____

C. How will you justify that plate tectonics or movement of plate boundaries is also beneficial to us?
(Cite your reference.)

_____

_____

_____

_____

_____

## *Assessment*

Read and analyze each statement and choose the letter which corresponds to the correct answer. Write your answer in your notebook.

1. Movement of plate boundaries results to many events or land formations. Which of the following is the reason behind mountain formations?
   A. Converging Plates
   B. Both A and B
   C. Diverging Plates
   D. Neither A nor B

2. Which of the following refers to a region where plates meet?
   A. Fault
   B. Plate Boundary
   C. Mountain
   D. Volcanic Arc

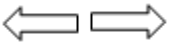
3. There are three distinct types of plate boundaries. Which of those types creates a zone of tension by moving the plates apart?
   A. Convergent Boundary
   B. Divergent Boundary
   C. Transform Fault
   D. None of these

4. When two tectonic plates collide, the continental crust usually rises over the oceanic crust. What is the reason behind this?
   A. Denser than continental crust
   B. Thicker than continental crust
   C. Thinner than continental crust
   D. Less dense than oceanic crust

5. What geologic feature could result out of the direction of movement indicated in the arrows below?

   A. mild-oceanic ridge
   B. mountain
   C. mountain ranges
   D. volcanic arc

6. Which of the following diagrams shows a strike slip fault?

   A. 
   B. 
   C. 
   D. 

7. Which of the following resulted to the formation of new crust from magma that rises to the earth's surface between two plate boundaries?
   A. convergent boundary
   B. divergent boundary
   C. strike fault
   D. transform boundary

8. Which of the following results to the formation of a new oceanic lithosphere?
   A. Convergent Boundary
   B. Divergent Boundary
   C. Transform Boundary
   D. None of these

9. Which type of plate boundary does the shallow focus earthquake occur wherein it appears to be associated with mid-ocean ridges and mountain ranges?
   A. Convergent
   B. B. Divergent
   C. Transform
   D. All of these

10. Which of the following land formation or events is not connected to convergent plate movement/margin?
   A. deep-focus earthquake
   B. trench
   C. valleys
   D. volcanic arc

11. Which of the following is associated with the discovery of seafloor spreading?
   A. Mountains and Volcanoes are denser than mantle
   B. Rotational pole of the earth has migrated or moved.
   C. The crust of the continents is denser than the crust of the ocean
   D. The crust of the oceans is very young relative to the age of the crust of the continents

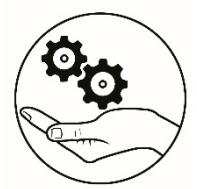
12. Convergent plate boundaries create land formations which later become scenery. Which of the following is one of the best examples of the land formations due to a convergent plate boundary?
   A. Arc
   B. Boundary
   C. Valley
   D. Volcanic Arc

13. Which of the following types of plate boundary move alongside?
   A. Convergent
   B. Divergent
   C. Transform
   D. None of these

14. Which of the following completes the analogy?

Faults: A fracture or discontinuity in volume of rocks
Folds: _____.
   A. It forms from subducting plates
   B. It occurs when a flat surface bent
   C. Occur when plates moving alongside and toward to each other.
   D. Occur when plates moving alongside and away from each other.

15. Which of the following landforms is said to be a low area between hills or mountains?
    A. Arc
    B. Valley
    C. Ridge
    D. Trench



## *Additional Activities*

A. **Directions.** Conduct a short interview with one or two of your family members. Ask them about how they think the mountain, valley, ridges and volcanoes were formed. List all of their responses. Afterwards, inform them on how those formations formed based on what you have learned from this lesson.

Interview Guide Format:

| ***Questions*** | ***Responses*** | ***Your Feedback*** |
|---|---|---|
| | | |

B. Based on the results of your interview, make a wide dissemination on how different landforms were created according to what you have learned into this module. Listed below are the two options in which you may do it.

1. Flyers
2. Vlog which will be post on your social media account.

**Rubrics:**

5 points: Innovation (It should show creativity)
10 points: Content (It should include explanations based on the lesson)

# Answer Key

**What is it?**

**A.**




**What's New**



**What's in**

Words to be crossed
out: Weathering
Mesosaurus

**What I Know**

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

**What's More**

**A**

1. Plate
2. Fault
3. Volcanic Arc
4. Divergent
5. Convergent
6. Transform
7. Fold
8. Mountain
9. Ridge
10. Valley

**B.** Your answer should touch the three movements of plates. Divergent, convergent and transform fault movement.

Note: Rubrics is attached after the activity.

**C**

| CONVERGENT | DIVERGENT | TRANSFORM |
|---|---|---|
| Often sites of the major volcanoes | When it happens, the new crust is forming from magma that rises to the earth surface between the two plates | Most of it are found in the ocean basin and connect offsets in the mid ocean ridges |
| two plates are moving toward each other | plates move apart | best example of this plate is San Andreas fault |
| When it occurs between two oceanic plates, one of those plates will subduct beneath the other. | creating a zone of tension | Also know as strike slip or sliding boundaries |

**D.**

1. Absolute motion
2. Triple Junction
3. Smaller
4. North and South
America move away
from Europe and
Africa
5. Taller

**What I have Learned**

1 Transform Fault
2 Convergent
3 Divergent
4 Seafloor Spreading
5 Plate Tectonics

**Assessment**

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

**What I can Do**

**B.**

Students own
understanding or based
on research.

# *References*

## A. Books


Acosta Herma D. et al. Science Learners Material Grade 10,2015

Commission on Higher Educvation. Earth and Life Science for Senior High School. C.P. Garcia Ave., Diliman, Quezon City Philippines. Commission on Higher Education, 2016

Kasten Lileth P. Secondary Education Curriculum: Integrated Science, 2012

Pavico-Ferriols Josefina and Faraon-Darvin Genevieve, Exploring Life Though Science: Integrated Science, 2007

Vengco Lilia G. and Religioso Teresita F. You and the Natural World: Integrated Science, 3rd Edition 2008.

**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