

Senior High School

Earth and Life Science

Quarter 1 – Module 4:

Rocks



**Earth and Life Science
Alternative Delivery Mode
Quarter 1 – Module 4: Rocks
First Edition, 2021**

Republic Act 8293, section 176 states that: No copyright shall subsist in any work of the Government of the Philippines. However, prior approval of the government agency or office wherein the work is created shall be necessary for exploitation of such work for profit. Such agency or office may, among other things, impose as a condition the payment of royalties.

Borrowed materials (i.e., songs, stories, poems, pictures, photos, brand names, trademarks, etc.) included in this module are owned by their respective copyright holders. Every effort has been exerted to locate and seek permission to use these materials from their respective copyright owners. The publisher and authors do not represent nor claim ownership over them.

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

Development Team of the Module

Writers: Josephine P. Jacinto

Editors: Melanie I. Samudio, Jocelyn M. Manset

Reviewer: 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., Niña Grace T. Aquino

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: Wilfredo E. Cabral

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 4:

Rocks

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

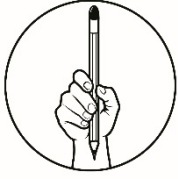
This module was designed and written with you in mind. It is here to help you master the properties of rocks. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow 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 – Types of Rocks and their Properties
MELC: Classify rocks into igneous, sedimentary and metamorphic. S11/12ES-Ib-10.

After going through this module, you are expected to:

1. identify the three types of rocks;
2. classify rocks as to igneous, sedimentary and metamorphic rocks; and
3. appreciate the importance of rocks in our daily life.



What I Know

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

1. Rocks vary in color, size, texture and shape. They are classified based on how they were formed. Which of the following deals with the study of rocks?
 - A. Biology
 - B. Geology
 - C. Paleontology
 - D. Petrology
2. Halite is made when a body of seawater becomes closed off and evaporates and salt precipitates out and is deposited as crystallized halite. What type of sedimentary rock is formed?
 - A. Clastic
 - B. Chemical
 - C. Organic
 - D. Pyroclastic
3. Igneous rock is divided into two groups, extrusive and intrusive. Extrusive igneous rocks form when magma makes its way to its surface as lava and then cools, forming rocks. Which will be the characteristics of the crystals?
 - A. Crystals are coarse grained.
 - B. Crystals are fine grained.
 - C. Crystals are very large.
 - D. Crystals are phaneritic
4. Regional metamorphism occurs due to changes in pressure and temperature over a large region of the crust. It may happen when rock is buried deep below the surface or where pieces of the Earth's crust collide. Which is a metamorphic rock?
 - A. Breccia
 - B. Conglomerate
 - C. Marble
 - D. Sandstone
5. Igneous and metamorphic rock can be buried and undergo tremendous heating and stress. What is the process of transformation of one rock type into another?
 - A. Compaction
 - B. Lithification
 - C. Metamorphism
 - D. weathering
6. What type of rocks are formed from sediments over long period of time?
 - A. Igneous Rocks
 - B. Sedimentary Rocks
 - C. Metamorphic Rocks
 - D. Minerals
7. This refers to type of rock that was heated and compressed over time.
 - A. Igneous
 - B. Sedimentary
 - C. Metamorphic
 - D. All of the above

8. What is the natural process that causes one kind of rock to change into another kind?
- A. Weathering
 - B. Rock Cycle
 - C. Sediments
 - D. Metamorphism
9. A rock that forms when magma hardens beneath Earth's surface is termed as:
- A. Intrusive metamorphic rock
 - B. Extrusive sedimentary rock
 - C. Intrusive igneous rock
 - D. Extrusive igneous rock
10. Which of the following is an example of an igneous rock?
- A. Limestone
 - B. Coal
 - C. Sandstone
 - D. Granite
11. Which of the following represents the correct order of the processes responsible for the formation of sedimentary rocks?
- A. Erosion, weathering, compaction, cementation, deposition
 - B. Compaction, cementation, deposition, weathering, erosion
 - C. Deposition, cementation, compaction, erosion, weathering
 - D. Weathering, erosion, deposition, compaction, cementation
12. A student obtained a cup of quartz sand from a beach. A saltwater solution is poured into the sand and allowed to evaporate. The mineral residue from salt water solution bonds the sand grains together, forming a material that is most likely an:
- A. extrusive igneous rock
 - B. intrusive igneous rock
 - C. metamorphic rock
 - D. sedimentary rock
13. Which of the following is true about rocks?
- A. Rocks are composed of only one mineral.
 - B. Most rocks are a mixture of minerals.
 - C. Rocks do not contain minerals.
 - D. Coal is not considered a rock.
14. What is the type of rock formed from lava that cools quickly that results to finer grain and smaller size of crystals?
- A. Extrusive igneous rock
 - B. Intrusive igneous rock
 - C. Sedimentary rock
 - D. Metamorphic rock
15. Fossils are found on this type of rocks.
- A. Extrusive igneous rock
 - B. Intrusive igneous rock
 - C. Sedimentary rock
 - D. Metamorphic rock

Lesson

1

Rocks

Petrology is the scientific study of rocks. Rocks are combined aggregation of minerals. Petrologist classified rocks based on how they were formed. In general, rocks are classified as igneous, sedimentary, and metamorphic rock.



What's In

This module contains activities that will enhance the teaching-learning process among learners about the rocks. It deals with the characteristics of rocks and the properties exhibited by the rock. As the learner answers the questions, they will be able to classify and understand the concepts about three types of rocks. They will understand the process of their formation. Moreover, they will develop awareness on the importance of rocks to our daily life.



Notes to the Teacher

This module aims to develop learner's awareness on the characteristics of rocks and the processes of their formation. This further develop their skills in classifying the rocks.



What's New

Activity 1 Word Cryptogram

Directions: Arrange the letters to form the correct words by placing the correct letter sequence in the shaded box. Then, answer the riddle below by using the corresponding letters found in the numbered boxes in each item.

E	M	N	I	S	T	D	A	Y	E	R
S	E	D	I	M	E	N	T	A	R	Y
1										

E	M	A	I	H	T	P	C	M	E	R
		2								

G	E	N	O	S	U	C		O	R	I	K
								3			

V	A	C	N	I	O	L
				4		

C	A	S	I	L	T	C
		6		5		

S					
1	2	3	4	5	6

Riddle: the layers of sediments that accumulated and carry the records of the Earth's history.



What is It

Earth is a solid rock to a depth of 2,900 kilometers, where mantle meets the liquid outer core. A **rock** is a naturally occurring solid aggregate of one or more minerals. The aggregate minerals forming the rocks are held together by chemical bonds. Grains can be different in color, texture, and sizes. Geologists then group rocks into three categories based on how the rocks form: igneous sedimentary and metamorphic rock. **Petrology** is the scientific study of rocks. Petrologists classify rocks based on how they were formed.

Three types of Rocks

Igneous- formed from hardening and **crystallization of magma** or molten material that originates deep within the earth.

Two types of igneous rock:

- A. Extrusive/Volcanic rock** - forms when magma makes its way to Earth's surface as lava and then cools. The crystals are very small (fine-grained) since the cooling process is fast.
- B. Intrusive/Plutonic** - It cools slowly beneath the Earth surface and are created by magma. The intrusive igneous rocks have very large crystals (coarse grained).

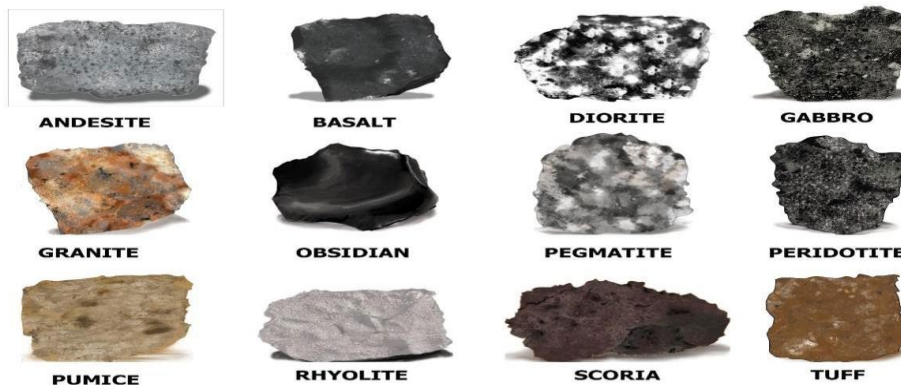
Igneous rocks are classified based on

1. *Composition*- it refers to rock's mineral and chemical make-up.
 - Felsic* – igneous rocks that are light in colors; feldspar and silicates
 - Mafic* – dark-colored igneous rocks made up of magnesium, calcium and iron
 - Intermediate* – refers to igneous rocks between mafic and felsic composition.
 - Ultramafic* – denotes igneous rocks that composed chiefly of mafic minerals.
2. *Texture* - overall appearance of a rock based on the size, shape, and arrangement of interlocking mineral crystals.
 - Aphanitic* – fine-grained rocks with crystals seen by aid of microscope.
 - Phaneritic* - coarse-grained rocks
 - Porphyritic* – large crystals with small crystals
 - Glassy* - a rock that looks like colored glass with no visible mineral crystal.
 - Pyroclastic*- results from explosive fragmentation of volcanic material.

Examples:

Obsidian, pumice, basalt, granite, diorite, gabbro

IGNEOUS ROCKS



Metamorphic - forms from pre-existing rocks: either metamorphic, igneous, sedimentary or other metamorphic rocks that have been altered by agents of metamorphism.

Examples: quartzite, marble, slate, phyllite

Metamorphism - transformation of one rock type into another.

2 types of metamorphism

1. Regional-due to changes in pressure and temperature over large region of the crust. It may happen when rock is buried deep below the surface of the earth.
2. Contact-the rock minerals and textures are changed mainly by heat due to contact with magma.

Classification:

1. Texture - refers to the size arrangement and grains within the rock.

Foliation - any planar arrangement of mineral grains or structural features within the rock.

- a. Foliated rocks – can be arranged in terms of increasing metamorphism, and it appeared layered or banded with compressed mineral grains. Example: mica
- b. Non-foliated rocks – usually made up of only few minerals.

EXAMPLES OF METAMORPHIC ROCKS



Sedimentary rocks provide information about surface conditions that existed in the Earth's past.

- Particles of sand, shells, pebbles, and other fragments of materials called sediments, accumulate in layers and over long period of time harden into rocks.
- Compaction-due to increase of pressure of layered sediments it bind together to form the sedimentary rocks.

Three types of sedimentary rocks

- a. Clastic Sedimentary rock - formed from accumulation of clasts: little pieces of broken rocks and shells. Examples: conglomerate, breccia, sandstone, shale
- b. Chemical - formed when dissolved minerals precipitate from a solution. Example: Halite - formed when a body of seawater becomes closed off and evaporates.
- c. Organic - rocks formed from the accumulation of animal debris Example: Coal - composed of organic matter in the form of plants fragments.

SEDIMENTARY ROCKS



CHALK



LIMESTONE



SANDSTONE

Activity 2 Name It!

Identify and classify the types of rocks below as to igneous, sedimentary and metamorphic rock.



1. _____



2. _____



3. _____



4. _____



5. _____

Activity 3 Picture Perfect!

Collect at least five rock samples in your place and take a photo of the samples. Describe the characteristics of each rock depending on their appearance, texture, color, and layers (or bands). Then classify them as to igneous, sedimentary, or metamorphic rock. Place the photo of rocks on the box and the needed data on the space provided.



Type of Rock: _____

Description: _____

Importance: _____



Type of Rock: _____

Description: _____

Importance: _____



Type of Rock: _____

Description: _____

Importance: _____



Type of Rock: _____

Description: _____

Importance: _____



Type of Rock: _____

Description: _____

Importance: _____



What I Have Learned

Activity 5 Let's Compare!

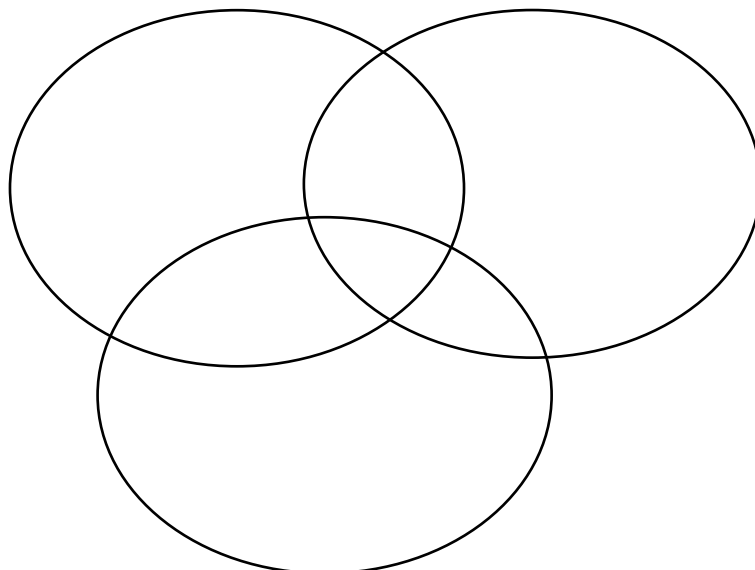
Fill in the table below by providing basic information about the types of rocks. You may refer to the words in the box below.

	<i>Igneous</i>	<i>Sedimentary</i>	<i>Metamorphic</i>
Types			
Examples			
Process of formation			

WORD LISTS		
lithification	pumice	clastic
metamorphism	sandstone	intrusive
cooling	andesite	extrusive
cementation	slate	non- clastic
deposition	marble	contact

Activity 6 Compare Me!

Fill in the Venn Diagram to determine the similarities and differences of the three types of rocks.





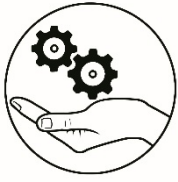
Assessment

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

1. Petrologist classifies rocks based on how they were formed. What is the branch that deals with the study of rocks?
 - A. Biology
 - B. Geology
 - C. Paleontology
 - D. Petrology
2. Halite is made when a body of seawater becomes closed off and evaporates and salt precipitates out and is deposited as crystallized halite. What type of sedimentary rock is formed?
 - A. Clastic
 - B. Chemical
 - C. Organic
 - D. Pyroclastic
3. Igneous rock is divided into two groups, extrusive and intrusive. Extrusive igneous rocks form when magma makes its way to its surface as lava and the cools forming rocks. Which of the following will be the characteristics of the crystals?
 - A. Crystals are coarse-grained.
 - B. Crystals are fine-grained.
 - C. Crystals are very large.
 - D. Crystals are phaneritic
4. Regional metamorphism occurs due to changes in pressure and temperature over a large region of the crust. It may happen when rock is buried deep below the surface or where pieces of the Earth's crust collide. Which is a metamorphic rock?
 - A. Breccia
 - B. Conglomerate
 - C. Marble
 - D. Sandstone
5. Igneous and metamorphic rock can be buried and undergo tremendous heating and stress. What is the process of transformation of one rock type into another?
 - A. Compaction
 - B. Lithification
 - C. Metamorphism
 - D. Weathering
6. What type of rocks are formed from sediments over long period of time?
 - A. Igneous Rocks
 - B. Sedimentary Rocks
 - C. Metamorphic Rocks
 - D. Minerals

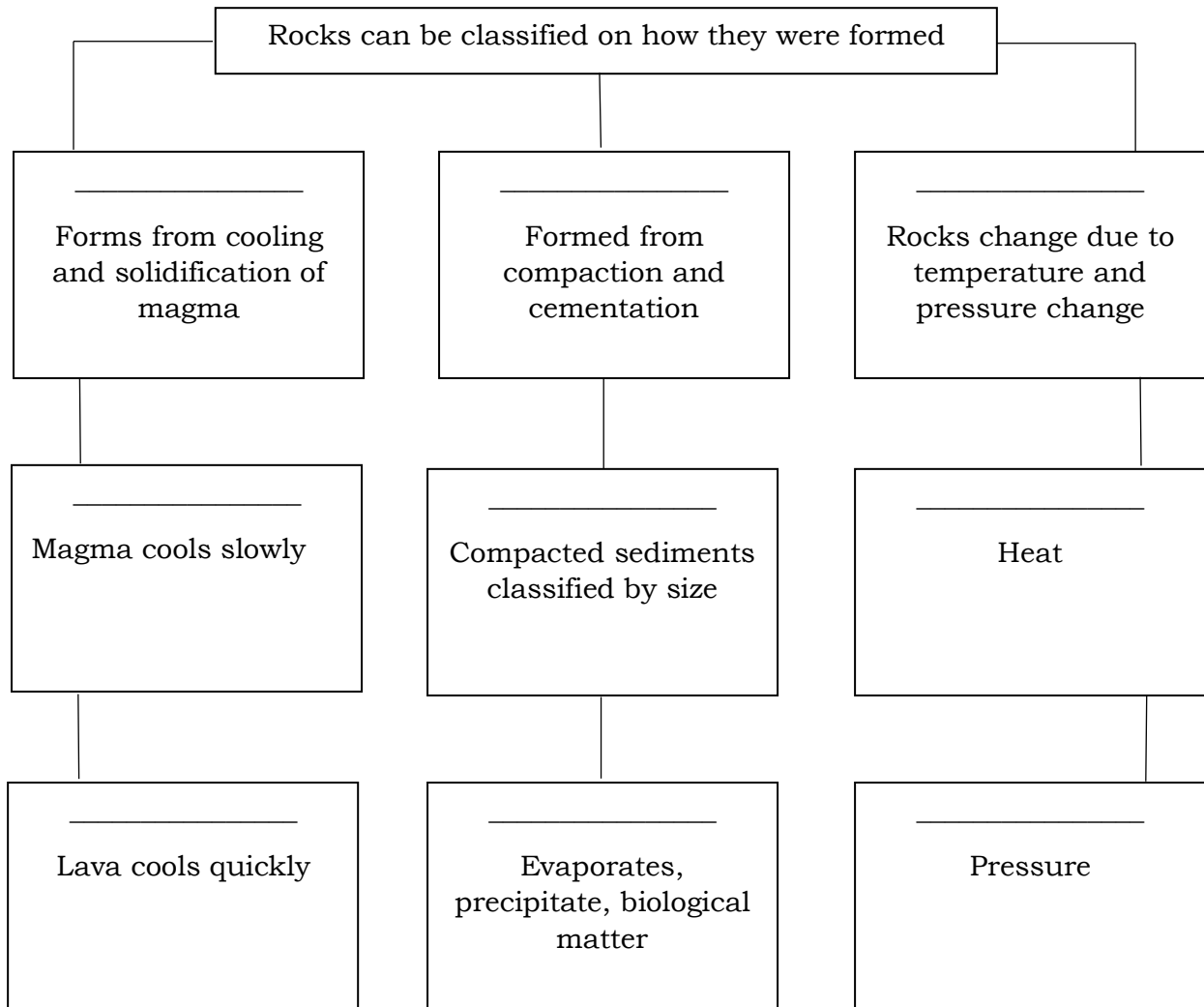
7. This refers to a type of rock that was heated and compressed over time. Which best fits the description?
 - A. Igneous
 - B. Metamorphic
 - C. Sedimentary
 - D. All of the above
8. What is the natural process that causes one kind of rock to change into another kind?
 - A. Weathering
 - B. Rock Cycle
 - C. Sediments
 - D. Metamorphism
9. A rock that forms when magma hardens beneath Earth's surface is called an:
 - A. Intrusive metamorphic rock
 - B. Extrusive sedimentary rock
 - C. Intrusive igneous rock
 - D. Extrusive igneous rock
10. Which of the following is an example of an igneous rock?
 - A. Limestone
 - B. Coal
 - C. Sandstone
 - D. Granite
11. Which of the following represents the correct order of the processes responsible for the formation of sedimentary rocks?
 - A. Erosion, weathering, compaction, cementation, deposition
 - B. Compaction, cementation, deposition, weathering, erosion
 - C. Deposition, cementation, compaction, erosion, weathering
 - D. Weathering, erosion, deposition, compaction, cementation
12. A student obtain a cup of quartz sand from a beach. A saltwater solution is poured into the sand and allowed to evaporate. The mineral residue from salt water solution cements the sand grains together, forming a material that is most likely an:
 - A. Extrusive igneous rock
 - B. intrusive igneous rock
 - C. sedimentary rock
 - D. metamorphic rock
13. Which of the following is true about rocks?
 - A. Rocks are composed of only one mineral.
 - B. Most rocks are a mixture of minerals.
 - C. Rocks do not contain minerals.
 - D. Coal is not considered a rock.
14. What is the type of rock formed from lava that cools quickly that results to finer grain and smaller size of crystals?
 - A. Extrusive igneous rock
 - B. Intrusive igneous rock
 - C. Sedimentary rock
 - D. Metamorphic rock
15. Fossils are found on this type of rocks.

<ol style="list-style-type: none"> A. Extrusive igneous rock C. Metamorphic rock 	<ol style="list-style-type: none"> B. Intrusive igneous rock D. Sedimentary rock
--	--



Additional Activities

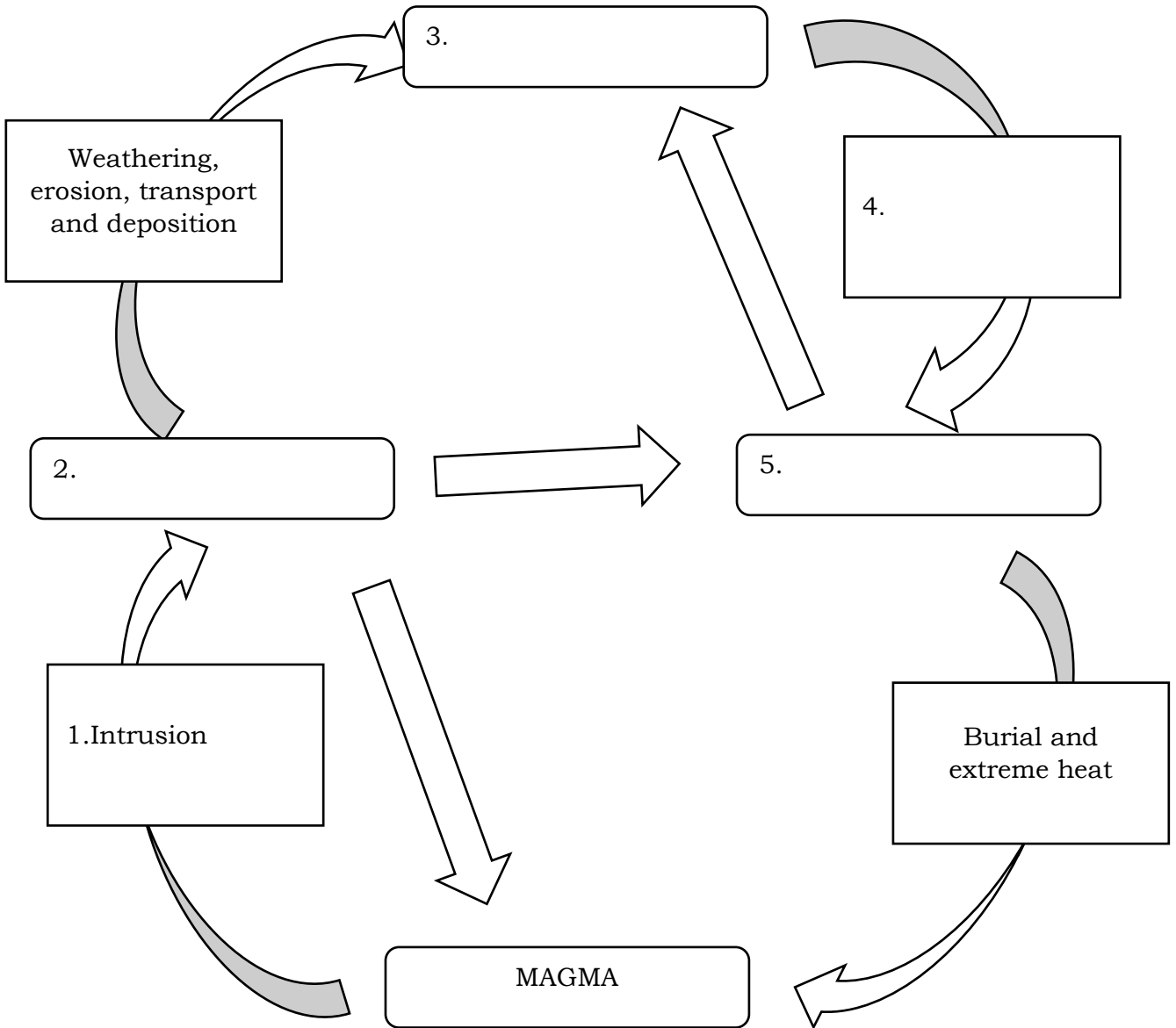
A. Complete the concept map using the words below.



Metamorphic	Clastic	Contact metamorphism
Sedimentary	Extrusive	Regional Metamorphism
Non- Clastic	Igneous	Intrusive

B. Fill in the missing word/term to complete the rock cycle. You may refer to the box below.

ROCK CYCLE



- | | | | |
|----------|--------------|-------------------|----------------------|
| Igneous | Metamorphic | Sedimentary | Heat and/or pressure |
| Minerals | Metamorphism | Thermal Expansion | Intrusion/eruption |

References

Olivar II, J.S., Rodolfo, R.S. and Cabria, H.B. (2016) Exploring Life Through Science Series: Earth Sence. Phoenix Publishing House

Religioso, T. F. and Vengco, L. G.(2016) You and the Natural World: Earth and Life Science. Phoenix Publishing House

Thompson G.R. and Turk J. (2012).Introduction to Earth Science. Cengage Learning Asia PTE Ltd.(Philippine Branch)

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