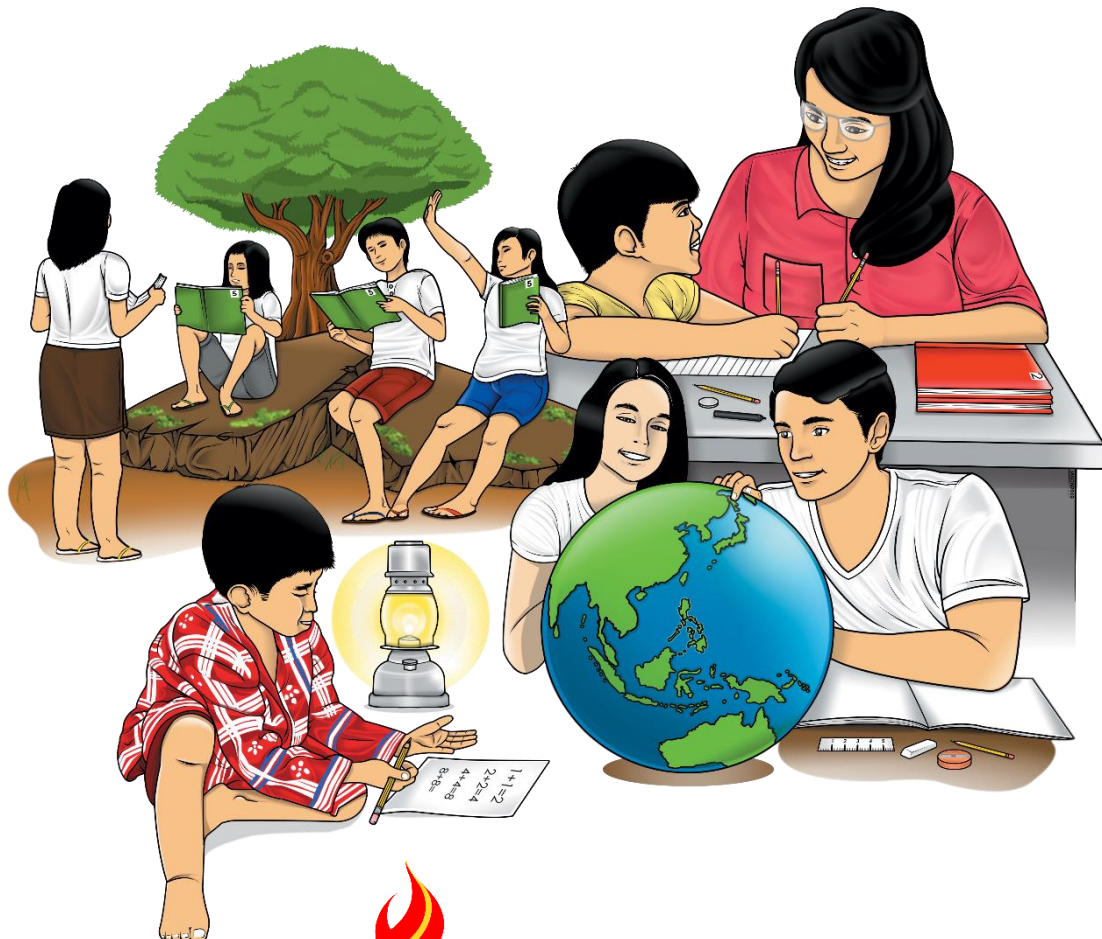


Senior High School

Earth Science for Stem

Quarter 1 – Module 4: Classification of Rocks



**Earth Science for STEM
Alternative Delivery Mode
Quarter 1 – Module 4: Classification of Rocks
First Edition, 2021**

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Earth Science for STEM

Quarter 1 – Module 4: Classification of 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 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 contains lesson on classification of rocks into igneous, sedimentary, and metamorphic.

After going through this module, you are expected to:

1. describe igneous, sedimentary, and metamorphic rocks based on their characteristics and how they are formed;
2. explain the process of the formation of igneous, sedimentary, and metamorphic rocks; and
3. give examples of igneous, sedimentary, and metamorphic rocks.



What I Know

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

Note: If your answer to this pre-assessment is one hundred percent correct, you may skip and proceed to the next module.

1. Which of the following is the least description of a rock?
 - a. solid
 - b. heavy
 - c. naturally occurring
 - d. aggregate of minerals
2. Which of the following is **NOT** a classification of sedimentary rock?
 - a. clastic rock
 - b. organic rock
 - c. chemical rock
 - d. non-foliated rock
3. A rock sample was recovered from Taal Volcano Island by a local. The resident volcanologist was on - site and identified that the rock was formed from the material ejected by the volcano during its eruption. What type of rock did the local recover?
 - a. igneous rock
 - b. ore body rock
 - c. sedimentary rock
 - d. metamorphic rock
4. While walking at the beach, Angela found a rock sample with shells and pebbles embedded. What type of rock did she find?
 - a. igneous rock
 - b. ore body rock
 - c. sedimentary rock
 - d. metamorphic rock
5. Which of the following statements is **TRUE** about metamorphic rocks?
 - a. It formed from existing rocks.
 - b. It is subjected to cold and high pressure.
 - c. It is composed of plants and animals' materials.
 - d. It is formed from the deposition and cementation of minerals and organic particles.

6. When the magma solidifies below the surface of the Earth, what possible igneous rock may form?
- scoria
 - basalt
 - granite
 - andesite
7. Rinzen found an igneous rock from the school ground. Out of curiosity, she strongly hit the rock sample with a hammer and found out that it contained large crystals. What is the **CORRECT** inference on the formation of the rock sample?
- It formed over time through a slow process of crystallization at the surface of the Earth.
 - It formed over time through a fast process of crystallization at the surface of the Earth.
 - It formed over time through a slow process of crystallization beneath the surface of the Earth.
 - It formed over time through a fast process of crystallization beneath the surface of the Earth.
8. Which type of rock may contain plants' and animals' remains?
- igneous rock
 - ore body rock
 - sedimentary rock
 - metamorphic rock
9. Which of the following is **EXCLUDED** from the group?
- coal
 - shale
 - granite
 - rock salt
10. Ava collected samples of sedimentary rocks from the riverbank of Pansit. She grouped the rocks according to their characteristics. In the first group, she observed attached weathered rock on the samples. While in the second group, she observed shells attached to it. What type of sedimentary rocks had been collected by Ava from the riverbank?
- The first group is clastic sedimentary rocks while the second is chemical sedimentary rock.
 - The first group is clastic sedimentary rocks while the second is an organic sedimentary rock.
 - The first group is chemical sedimentary rocks while the second is a clastic sedimentary rock.
 - The first group is organic sedimentary rocks while the second is a clastic sedimentary rock.

11. Foliation occurs when a certain rock was subject to intense heat and pressure. Which of the following rocks is most likely to have foliation?
- slate
 - marble
 - hornfels
 - quartzite
12. Scoria is a rock formed through fast solidification on air when a volcano erupts. What type of rock is scoria?
- extrusive igneous rock
 - extensive igneous rock
 - intrusive igneous rock
 - intensive igneous rock
13. Which of the following statement is **TRUE** about sedimentary rocks?
- It is formed from plant and animal debris.
 - It is formed when subjected to high heat and pressure.
 - Schist, phyllite, and gneiss are examples of sedimentary rocks.
 - Foliated and non-foliated are classifications of sedimentary rocks.
14. Which of the following rock contains large crystals?
- diorite
 - scoria
 - basalt
 - andesite
15. Which group of rocks was formed through compressing and heating?
- clastic rock
 - igneous rock
 - sedimentary rock
 - metamorphic rock

Lesson

5

Important Minerals to Society

This lesson will explore the different types of rocks existing in our environment. The learner is expected to identify and classify rocks into igneous, sedimentary, and metamorphic.



What's In

In the previous module, you have learned the common naturally occurring minerals such as feldspar, quartz, mica, and alike. Those minerals are called rock-forming minerals because they are the building blocks of rocks. For example, when quartz, feldspar, and mica come together, they form a certain type of rock. Different combinations of minerals form different types of rock. In this lesson, you will learn how rocks are grouped or classified with their distinguishing characteristics.



Notes to the Teacher

Hello dear teachers, this module may be used by learners with minimal supervision. The activities included are suitable for their level and capacity. As pre-requisite to this module, make sure that the learners had finished the previous module on minerals. Thank you.



What's New

Collect ten rock samples from your garden or yard. Using a magnifying glass, observe the rocks. Create a grouping of the rocks based on your observation. Label your rock samples as samples 1 to 10. You may use the data table below for your observation. *(You may coordinate with your teacher how to submit your output for this activity)*

Data Table

Rock sample	Observed properties/characteristics	Rock sample	Observed properties/characteristics
1		6	
2		7	
3		8	
4		9	
5		10	

Guide Questions:

1. How many groups did you form for your collected samples of rocks?
2. What basis of grouping or classification did you use?
3. Can you describe the common features of each group?



What is It

How can we classify rocks? Would it be by color, hardness, texture, density, or other physical properties? Is it by chemical composition? You may have a little knowledge that rocks can be Igneous, Sedimentary, or Metamorphic. But how did geologists come into these three classifications? What do you think was their basis for classification?

Rock is a naturally occurring solid aggregate of minerals sometime with nonmineral solid particles.

Classification of Rocks

Igneous rocks or magmatic rocks are formed through the cooling and solidification of magma or lava. Igneous rock can be classified into:



Granite rock (own photo)

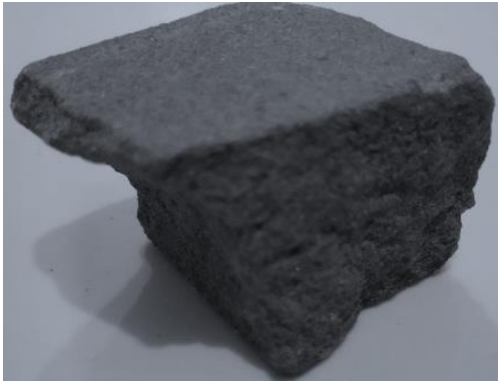
Intrusive igneous rocks. This type of igneous rock is formed from solidification of magma below the surface. They have large crystals of minerals that formed over time through the slow process of crystallization in a magma. Granite, diorite, gabbro, pegmatite, and peridotite are examples of this type of rock.



Scoria (own photo)

Extrusive igneous rocks. This type of igneous rock is formed through a faster rate of solidification of lava on the surface of Earth. They can become glassy in appearance due to less crystallization or vesicular like Scoria, due to the air that was trapped inside when they solidified and formed on the surface of the earth. Other examples of this type of rock are andesite, basalt, dacite, obsidian, pumice, rhyolite, and tuff.

Sedimentary rock is formed by the deposition and cementation of mineral or organic particles on the floor of oceans and other bodies of water at the Earth's surface. Sedimentary rocks can be classified into clastic, chemical, and organic.



Sandstone (own photo)

Clastic sedimentary rock. It is formed from the mechanical weathering debris of rocks. Examples are breccia, conglomerate, sandstone, siltstone, and shale.

Chemical sedimentary rock. It is formed when dissolved materials precipitate from the solution. Examples of these are rock salt, iron ore, chert, flint, some dolomites.

Organic sedimentary rock. It is formed from the build-up of plant or animal debris. Examples of this type are coal and fossiliferous limestone.

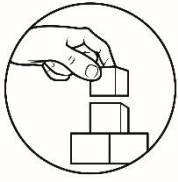
Metamorphic rock forms from existing rock types called “parent rock” in the process called metamorphism, which means a change in form. The original rock which can be an igneous, sedimentary, or another metamorphic rock is subjected to **heat** and **pressure**, causing a profound chemical or physical change. Metamorphic rocks can be classified into:



Marble (own photo)

Foliated metamorphic rock. It is formed through pressure due to compression of rocks that create bands called foliation. Examples are gneiss, phyllite, schist, and slate.

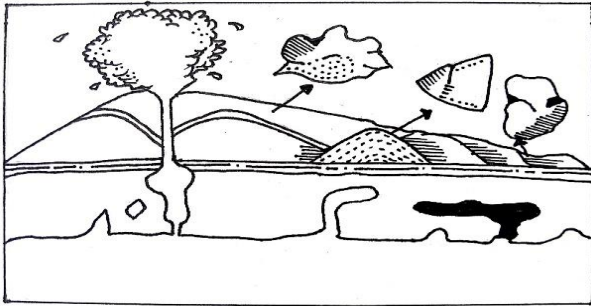
Non-foliated metamorphic rocks. It has no foliation or bands. Examples of this type are hornfels, marble, quartzite, and novaculite.



What's More

A. Observe the pictures and answer the questions that follow.

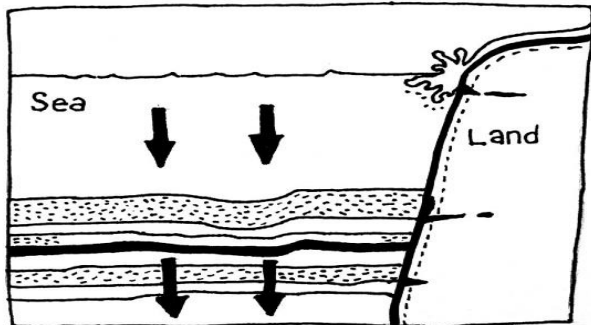
Picture 1.



Questions:

1. What type of rock do you think will be formed through this geologic activity?
2. How was the rock formed in this geologic activity?
3. How will you describe the types of rock formed?

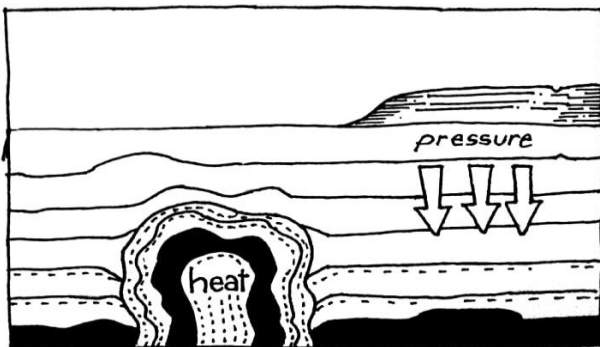
Picture 2.



Questions:

1. What type of rock is formed in this event?
2. What are the required factors to form a rock on this event?
3. What are the possible types of rock that will be formed in this event?

Picture 3.



Questions:

1. What type of rock will be formed in this scenario?
2. What are the important factors needed to form a rock in this scenario?
3. What are the characteristics of rock formed in this scenario?

B. Complete the table below.

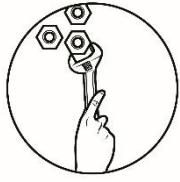
Rock Sample	Classification (Igneous/Sedimentary/Metamorphic)	Subclassification
1. Quartzite		
2.		Chemical
3.		Intrusive
4. Gneiss		
5.		Clastic



What I Have Learned

Fill in the correct information to complete the concept about rocks. Write your answer on a piece of paper.

- _____ is a naturally occurring solid aggregate of minerals and sometime with nonmineral solid particles.
- Rocks can be classified based on _____.
- _____ are formed through solidification or crystallization of molten materials such as magma and lava.
- _____ are formed through compaction and cementation of sediments and other materials usually under the ocean or other bodies of water.
- _____ are formed either by heat such as those near a magma chamber or by pressure such as those in the area with compression of rock layers.
- Granite is an example of _____ with visible large crystals because it solidified underneath the Earth surface.
- Sandstone is an example of _____ rock from compaction and cementation of sand under the ocean.
- Marble is an example of _____ that has been formed due to heat and appears physically different from its parent-rock called _____.
- Igneous rock can be classified into _____ and _____.
- _____ metamorphic rock contains bands and _____ metamorphic rocks do not have bands.
- Sedimentary rocks can be grouped according to _____, _____ and _____.
- _____ formed from the mechanical weathering debris of rocks.
- Chemical sedimentary rocks are formed when _____.
- _____ are formed from the debris of plants and animals.
- _____ are metamorphic rocks that has no foliation.



What I Can Do

Answer the question below.

While mountain trekking, Mayumi found several rocks that contained remains of aquatic plants and animals. What kind of rock did she find? What can you infer from the formation of the rock?

Rubric for Assessment

Key elements	Very satisfactory (3 pts)	Satisfactory (2 pts)	Needs Improvement (1 pt.)
Concept Basis	<ul style="list-style-type: none">• Argument is based on facts learned from the module.• Inference makes use of evidence.	Only one indicator is evident.	None of the indicators is present.
Writing Skill	<ul style="list-style-type: none">• Clear and concise explanation of argument is organized.• Understanding of the topic is clearly manifested.	Only one indicator is evident.	None of the indicators is present.



Assessment

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

1. Ava collected samples of sedimentary rocks from the riverbank of Pansipit. She grouped the rocks according to their characteristics. In the first group, she observed attached shells on the samples. While in the second group, she observed pebbles attached to it. What type of sedimentary rocks did Ava collect from the riverbank?
 - A. The first group is clastic sedimentary rocks while the second is a chemical sedimentary rock.
 - B. The first group is clastic sedimentary rocks while the second is an organic sedimentary rock.
 - C. The first group is chemical sedimentary rocks while the second is a clastic sedimentary rock.
 - D. The first group is organic sedimentary rocks while the second is a clastic sedimentary rock.

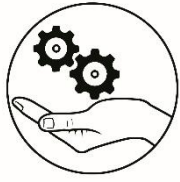
2. Which of the following describes a rock?
 - I. Solid
 - II. Heavy
 - III. Naturally occurring
 - IV. Aggregate of minerals
 - A. I, II, and III
 - B. I, III, and IV
 - C. I, II, and IV
 - D. II, III, and IV

3. Which of the following is a classification of sedimentary rock?
 - A. intrusive rock
 - B. foliated rock
 - C. chemical rock
 - D. non-foliated rock

4. A rock sample was recovered from Taal Volcano Island by a local. The resident volcanologist was on-site and identified the rock was formed from the material ejected by the volcano during its eruption. He further observed that the rock sample had a glassy appearance. What type of rock did the local recover?
 - A. extrusive rock
 - B. intrusive rock

- C. metamorphic rock
 - D. sedimentary rock
5. Which of the following statement is **NOT TRUE** about metamorphic rocks?
- A. It is formed when subjected to high heat and pressure.
 - B. It is formed from plant and animal debris.
 - C. Schist, phyllite, and gneiss are examples of sedimentary rocks.
 - D. Foliated and non-foliated are classifications of sedimentary rocks.
6. While walking at the beach, Angela found a rock sample with a crystal white appearance which according to her friend was halite – a rock salt. What type of rock did she find?
- A. clastic rock
 - B. organic rock
 - C. chemical rock
 - D. metamorphic rock
7. When the magma solidifies on the surface of the Earth, what possible igneous rock may be formed?
- A. scoria
 - B. gabbro
 - C. granite
 - D. peridotite
8. Obsidian is a rock formed through fast solidification on air when a volcano erupts. What type of rock is obsidian?
- A. extrusive igneous rock
 - B. extensive igneous rock
 - C. intrusive igneous rock
 - D. intensive igneous rock
9. Rinzen found an igneous rock from the school ground. Out of curiosity, she strongly hit the rock sample with a hammer and found out that it had a glassy appearance. What is the correct inference on the formation of the rock sample?
- A. It formed over time through a slow process of crystallization beneath the surface of the Earth.
 - B. It formed over time through a fast process of crystallization beneath the surface of the Earth.
 - C. It formed over time through a slow process of crystallization at the surface of the Earth.
 - D. It formed overtime through a fast process of crystallization at the surface of the Earth.

10. Which type of rock contains plants' and animals' remains?
- A. clastic rock
 - B. foliated rock
 - C. organic rock
 - D. chemical rock
11. Which of the following statements is **NOT TRUE** about igneous rocks?
- A. It formed crystals.
 - B. It is formed from magma.
 - C. It can become glassy in appearance.
 - D. It can be formed from an existing rock.
12. Which of the following is **EXCLUDED** from the group?
- A. shale
 - B. gabbro
 - C. granite
 - D. pegmatite
13. Despite of intense heat and pressure, nonfoliated rocks did not formed bands. Which of the following rocks is non-foliate?
- A. slate
 - B. gneiss
 - C. marble
 - D. phyllite
14. Which of the following rock contains fewer crystals?
- A. diorite
 - B. granite
 - C. rhyolite
 - D. pegmatite
15. Which group of rocks formed from precipitate of dissolved materials?
- A. clastic rock
 - B. foliated rock
 - C. organic rock
 - D. chemical rock



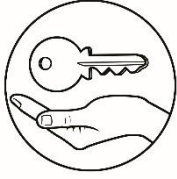
Additional Activities

There are more examples of rocks other than what you recognized in this lesson. This time, I want you to widen your knowledge about rocks by identifying more examples of igneous, sedimentary, and metamorphic rocks in your area. Make a log and collect pictures of your samples and form a gallery. You may search on the internet or ask an expert to assist you in identifying the samples you have collected. *(You may coordinate with your teacher how to submit your output for this activity)*

Rubric

Key elements	Very Satisfactory (5pts.)	Satisfactory (3pts.)	Needs Improvement (1pt.)
Organization	<ul style="list-style-type: none"> Organizers such as but not limited to tables, graphic organizer, shapes, etc. are used/utilized. Labels are used to showcase information. Organization is evident to enhance the over-all presentation of the gallery. 	Only two of the indicators are evident.	Only one of the indicators is evident.
Ideas	<ul style="list-style-type: none"> At least two characteristics about the rock are presented based on observation made. Correct information about the rock is evident based on the module. Pictures/images contain captions. 	Only two of the indicators are evident.	Only one of the indicators is evident.
Convention	<ul style="list-style-type: none"> A standard writing convention such as but not limited to spelling, capitalization, grammar, and paragraphing is correctly demonstrated. Writing convention enhances readability. 	Only two of the indicators are evident.	Only one of the indicators is evident.

	<ul style="list-style-type: none">• Few minor errors are evident but they do not interfere with the meaning.		
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Answer Key

<p>What's More</p> <p>A.</p> <ol style="list-style-type: none"> 1. Igneous 2. Solidification and cooling of magma or lava 3. Intrusive and extrusive rock 4. Sedimentary rocks 5. Cement and minerals or organic particles 6. Clastic, chemical, and organic 7. Metamorphic 8. Heat and pressure 9. Foliated or non-foliated <p>B.</p> <ol style="list-style-type: none"> 1. metamorphic – non-foliated 2. rock salt/iron ore/chert/flint/some dolomites – sedimentary rocks 3. granite/diorite/gabbro/pegmatite / periodite – igneous 4. metamorphic – foliated 5. recia/ conglomerate/ sandstone/ siltstone/ shale – sedimentary 	<p>What I Know</p> <ol style="list-style-type: none"> 1. B 2. D 3. A 4. C 5. A 6. C 7. C 8. C 9. C 10. B 11. A 12. A 13. A 14. A 15. D
<p>Assessment</p> <ol style="list-style-type: none"> 1. D 2. B 3. C 4. A 5. B 6. C 7. A 8. A 9. D 10. C 11. D 12. A 13. C 14. C 15. D 	<p>What I Have Learned</p> <ol style="list-style-type: none"> 1. Rock 2. Formation 3. Igneous 4. Sedimentary 5. Metamorphic 6. Intrusive rocks 7. Sedimentary 8. Metamorphic 9. Intrusive – extrusive 10. Foliated – non-foliated 11. Clastic – chemical – organic 12. clastic 13. dissolved materials precipitate from solution 14. organic 15. non-foliated

References

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Tarbuck, Edward J., Lutgens, Frederick, K. *Earth Science* 10th Edition. Pearson Education, Inc. Upper Saddle River, New Jersey. 2003.

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