CHAPTER 6

Study Guide

STUDY TO GO

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BIG Idea Most rocks are formed from preexisting rocks through external and internal geologic processes.

Section 6.1 Formation of Sedimentary Rocks

Vocabulary

- bedding (p. 137)
- cementation (p. 137)
- cross-bedding (p. 138)
- graded bedding (p. 138)
- lithification (p. 136)
- sediment (p. 134)

Key Concepts

MAIN Idea Sediments produced by weathering and erosion form sedimentary rocks through the process of lithification.

- The processes of weathering, erosion, deposition, and lithification form sedimentary rocks.
- Sediments are lithified into rock by the processes of compaction and cementation.
- Fossils are the remains or other evidence of once-living organisms that are preserved in sedimentary rocks.
- Sedimentary rocks might contain features such as horizontal bedding, cross-bedding, and ripple marks.

Section 6.2 Types of Sedimentary Rocks

- clastic (p. 141)
- clastic sedimentary rock (p. 141)
- evaporite (p. 143)
- porosity (p. 142)

MAIN Idea Sedimentary rocks are classified by their mode of formation.

- Sedimentary rocks can be clastic, chemical, or biochemical.
- Clastic rocks form from sediments and are classified by particle size and shape.
- Chemical rocks form primarily from minerals precipitated from water.
- Biochemical rocks form from the remains of once-living organisms.
- Sedimentary rocks provide geologists with information about surface conditions that existed in Earth's past.

Section 6.3 Metamorphic Rocks

- contact metamorphism (p. 149)
- foliated (p. 146)
- hydrothermal metamorphism (p. 149)
- nonfoliated (p. 147)
- regional metamorphism (p. 149)
- rock cycle (p. 151)

MAIN Idea Metamorphic rocks form when preexisting rocks are exposed to increases in temperature and pressure and to hydrothermal solutions.

- The three main types of metamorphism are regional, contact, and hydrothermal.
- The texture of metamorphic rocks can be foliated or nonfoliated.
- During metamorphism, new minerals form that are stable under the increased temperature and pressure conditions.
- The rock cycle is the set of processes through which rocks continuously change into other types of rocks.

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CHAPTER 6 Assessment

Vocabulary Review

Complete the sentences below using vocabulary terms from the Study Guide.

1. Compaction and cementation of clastic sediments result in _____.
2. Sedimentary layers that are deposited on an angle are called _____.
3. Cooling and crystallization, igneous rocks, uplift, and weathering and erosion describe a path along the _____.
4. Hot fluids that come in contact with solid rock result in _____.

Replace the italicized word with the correct vocabulary term from the Study Guide.

5. *Cementation* occurs when sediment gets deposited as the energy of the water decreases.
6. *Foliated* rocks have square, blocky crystals.

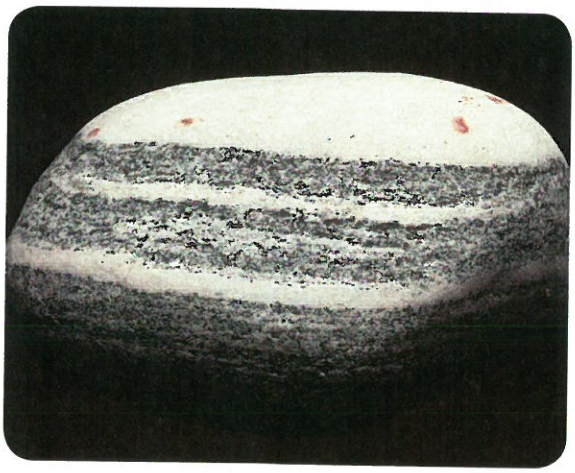
Write a sentence using each pair of words.

7. contact metamorphism, regional metamorphism
8. porosity, clastic sedimentary rock
9. sediment, bedding
10. clastic, evaporite

Understand Key Concepts

11. Which clastic sediment has the smallest grain size?
    A. sand
    B. clay
    C. pebbles
    D. silt
12. Which is a coarse-grained clastic rock that contains angular fragments?
    A. limestone
    B. conglomerate
    C. sandstone
    D. breccia
13. Which is a biochemical rock that contains fossils?
    A. chert
    B. limestone
    C. sandstone
    D. breccia
14. Which process forms salt beds?
    A. deposition
    B. cementation
    C. evaporation
    D. lithification
15. Which does not cause metamorphism?
    A. lithification
    B. hydrothermal solutions
    C. heat
    D. pressure

Use the diagram below to answers Questions 16 and 17.



16. Which term best describes this rock's texture?
    A. crystalline
    B. nonfoliated
    C. foliated
    D. clastic
17. From what igneous rock does this sample usually form?
    A. rhyolite
    B. basalt
    C. granite
    D. gabbro

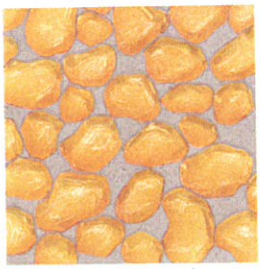
18. Which agent of erosion can usually move only sand-sized or smaller particles?
   A. landslides
   B. glaciers
   C. water
   D. wind

19. Which would you expect to have the greatest porosity?
   A. sandstone
   B. gneiss
   C. shale
   D. quartzite

20. By what process are surface materials removed and transported from one location to another?
   A. weathering
   B. erosion
   C. deposition
   D. cementation

Constructed Response

Use the diagram to answer Question 21.



21. **Describe** how the grains in the diagram become glued together.

22. **Summarize** the main difference between coquina and fossiliferous limestone. Use **Table 6.1** for help.

23. **Calculate** A sandstone block has a volume of 1 m^3 and a porosity of 30 percent. How many liters of water can this block hold?

24. **Illustrate** the two conditions necessary to form a foliated metamorphic rock.

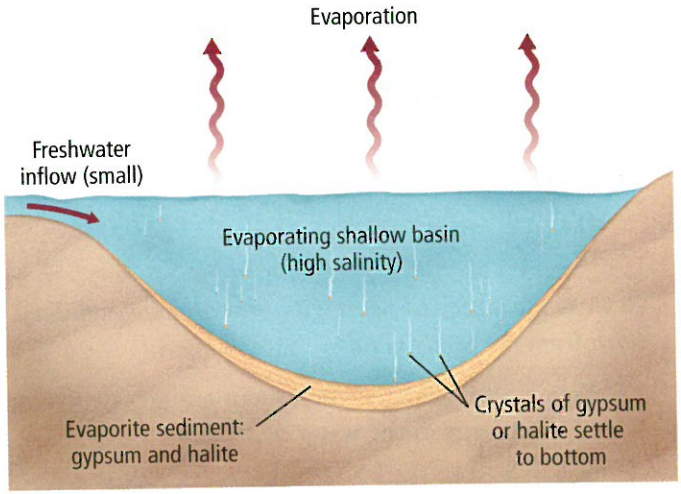
25. **Compare and contrast** the modes of lithification for sand and mud.

26. **Classify** the following types of sediments as either poorly sorted or well sorted: dune sand, landslide material, glacial deposits, and beach sand.

27. **Analyze** the effect that precipitation of calcite or iron oxide minerals has on clastic sediments.

28. **Compare and contrast** the character and formation of breccia and conglomerate.

Use the diagram below to answer Question 29.



29. **Evaluate** the effect that an opening to the ocean would have on this environment.

Think Critically

30. **Incorporate** what you know about crystal form to explain why marble, even if formed under high pressure, does not show foliation.

31. **Compose** a statement to explain why the sedimentary rock coal does not meet the standard definition of a rock—an aggregate of minerals.

32. **CAREERS IN EARTH SCIENCE** Some sedimentologists work in sand and gravel pits where they analyze the material to best decide where and how it should be used. Infer why it is important for the sedimentologists to understand what would happen to the porosity of sand if finer-grained sediment were mixed in with the sand.

33. **Illustrate** an oil reservoir made up of layers of sandstone and shale. Indicate the position of the oil within the rocks.

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34. **Assess** whether ripple marks and animal footprints preserved in sandstone are fossils. Explain your reasoning.

Use the figure below to answer Questions 35 and 36.

35. **Evaluate** the sediment in the layers in the figure. What type of bedding is this, and how well is it sorted? Explain.

36. **Infer** Look at **Figure 6.2** and explain which agents of erosion can produce the layers shown.

37. **Deduce** why glass on a quartz sand beach becomes rounded and frosted, while glass on a carbonate sand beach stays sharp and glassy.

Concept Mapping

38. Use the following terms to create a concept map that organizes sedimentary features: *ripple marks, graded bedding, horizontal bedding, asymmetrical, symmetrical, river current, wave action, wind deposited,* and *water deposited.* Some terms can be used more than once.

Challenge Question

39. **Hypothesize** At an approximate ocean depth of 4000 km, the carbonate compensation depth occurs. Below this depth, no calcium carbonate precipitates and no shells accumulate on the ocean floor. Hypothesize why this condition exists.

Additional Assessment

40. **WRITING in Earth Science** Imagine that you are planning a geologic walking tour of your community. Create a brochure highlighting the various natural building stones that are used in homes and buildings in your town or neighborhood.

DBQ Document–Based Questions

Data obtained from: Mineral Commodity Summaries. January 2006. *United States Geological Survey.*

Dimension stone is natural rock material used in construction, for monuments, and home interiors, such as kitchen countertops and floors. The principal rock types used are granite, limestone, marble, sandstone, and slate. Global resources of dimension stone are virtually limitless. Production of dimension stone in the United States and elsewhere has been steadily increasing.

Dimension Stone Production	U.S. Sold or Used (tonnage)	U.S. Sales or Uses (by value)
Limestone	39%	34%
Granite	29%	39%
Sandstone	14%	9%
Misc. stone	10%	7%
Marble	7%	6%
Slate	1%	5%

41. Construct a graph comparing the amount of dimension stone used by the value of the types of dimension stone.

42. Propose an explanation for why the value of granite is the highest of the dimension stones listed.

Cumulative Review

43. Compare and contrast the terms *science* and *technology.* **(Chapter 1)**

44. What is the formula of the ionic compound magnesium chloride? **(Chapter 3)**

45. Explain the concepts of partial melting and fractional crystallization. **(Chapter 5)**

Standardized Test Practice

Multiple Choice

Use the illustration below to answer Questions 1 and 2.

1. Which rocks are most likely to metamorphose from the lava flow?
   - **A.** only the rocks in the crater of the volcano, where the lava is hottest
   - **B.** rocks in the crater and rocks along the top half of the mountain
   - **C.** all the rocks on the mountain
   - **D.** all the rocks reached by the lava flow

2. As the lava cools and crystallizes, what type of rock will form?
   - **A.** sedimentary
   - **B.** metamorphic
   - **C.** extrusive igneous
   - **D.** intrusive igneous

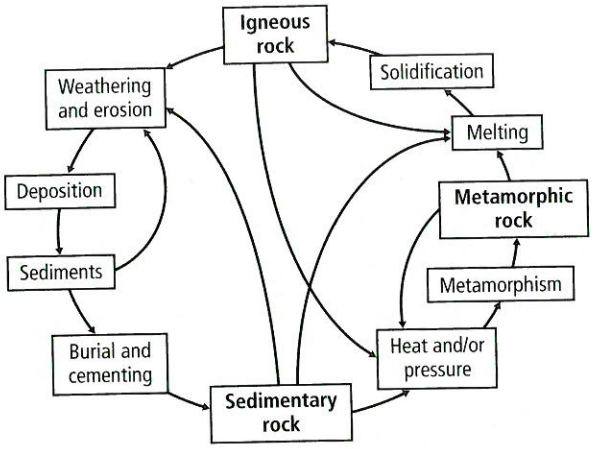
3. What is NaCl commonly known as?
   - **A.** table salt
   - **B.** sugar
   - **C.** water
   - **D.** natural chlorine

4. What initiates the process that changes sediments into sedimentary rocks?
   - **A.** bedding
   - **B.** burial
   - **C.** cementation
   - **D.** compaction

5. Identify the unit that is NOT an example of the Le Système International D'Unités (SI).
   - **A.** metric ton
   - **B.** kilogram
   - **C.** ampere
   - **D.** Fahrenheit

6. Which rocks are composed of minerals that form with blocky crystal shapes?
   - **A.** foliated
   - **B.** nonfoliated
   - **C.** porphyroblasts
   - **D.** phenocrysts

Use the diagram below to answer Questions 7 and 8.



7. Based on the diagram, which is the most reasonable hypothesis?
   - **A.** Igneous rocks have layers caused by deposition.
   - **B.** Sedimentary rocks contain grains of other rocks.
   - **C.** Metamorphic rocks never have layers.
   - **D.** Sedimentary rocks are always the same color.

8. According to the rock cycle shown above, what most likely happens after the deposition of sediment?
   - **A.** Weathering forms more sediment.
   - **B.** Magma cools and forms igneous rock.
   - **C.** Heat and pressure cause the sediment to melt.
   - **D.** Cementation occurs and forms sedimentary rock.

9. Where are valence electrons located?
   - **A.** every energy level
   - **B.** middle energy levels
   - **C.** the outermost energy level
   - **D.** the innermost energy level

10. Which sedimentary rock is used to make cement for the construction industry?
    - **A.** shale
    - **B.** sandstone
    - **C.** phosphate
    - **D.** limestone

Short Answer

Use the illustration below to answer Questions 11 and 12.

11. What do you notice about the formation of sedimentary rock above?

12. Does this process represent compaction or cementation? Describe the difference between the two.

13. The results of an experiment show that as temperature increases, enzyme activity decreases. Describe what a line graph made from this data would look like.

14. Define *luster.* Why is it difficult to use luster to identify minerals?

15. What process does Bowen's reaction series illustrate?

16. Boron has an atomic number of 5. Describe an atom of boron with a mass number of 10 and an atom of boron with a mass number of 11 in terms of their atomic particles. What is unique about these two atoms of boron?

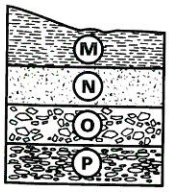
17. Briefly describe the process by which magma becomes igneous rock.

18. How does studying sedimentary rock layers and understanding how they form help paleontologists learn about Earth's history?

Reading for Comprehension

Sedimentary Rock Layers

Paleontologists wanted to study the sedimentary rock layers and their contents of a particular area. The diagram shows a cross section of the rock layers they studied. The table shows the data the scientists were able to collect.



Age of Sedimentary Rock Layers			
Layer	**Composition**	**Estimated Age (years)**	**Depth (meters)**
M	sedimentary rock	100,000	0–4
N	sedimentary rock	Unknown	5–7
O	sedimentary rock	6 million	8–9
P	sedimentary rock	6.1 million	9–10

19. What could the paleontologists have recorded to improve their study?

A. time of year

B. age of layer N

C. location of the work site

D. mass of the sedimentary rocks

20. If fossils of a species were found in Layers O and P, but not M and N, which could you conclude?

A. The species does not exist anywhere on Earth today.

B. The species evolved into a completely different species.

C. The species became extinct less than 100,000 years ago.

D. The species disappeared from the area around 6 mya.

NEED EXTRA HELP?																		
If You Missed Question . . .	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Review Section . . .	6.3	5.1	3.2	6.1	1.2	6.3	6.3	6.3	3.1	6.2	6.1	6.1	1.3	4.1	5.1	3.1	5.1	6.1