



Name: \_\_\_\_\_

ID: A

- \_\_\_\_ 15. What results when rocks come in contact with molten rocks such as those in an igneous intrusion?
- a. precipitation
  - b. regional
  - c. contact metamorphism
  - d. hydrothermal metamorphism
- \_\_\_\_ 16. The metamorphism of limestone results in the formation of \_\_\_\_.
- a. quartzite
  - b. marble
  - c. gneiss
  - d. silver

### Completion

*Complete each sentence or statement.*

17. Much of Earth's surface is covered not by solid rock, but by \_\_\_\_\_.
18. Weathering of rock produces worn surfaces and rounded corners that are characteristic of some \_\_\_\_\_ sediment particles.
19. Landslides, moving water, wind, and glaciers cause \_\_\_\_\_ of surface materials.
20. \_\_\_\_\_ are characteristic of sediments transported by water and wind.
21. The primary feature of sedimentary rocks is horizontal layering called \_\_\_\_\_.
22. The percentage of open spaces between mineral grains in clastic rocks is its \_\_\_\_\_.
23. The most abundant organic sedimentary rock is calcite-rich \_\_\_\_\_.

### Matching

*Match each item with the correct statement below.*

- a. cross bedding
  - b. evaporite
  - c. foliated metamorphic rock
  - d. hydrothermal fluid
  - e. limestone
  - f. nonfoliated metamorphic rock
  - g. porphyroblasts
- \_\_\_\_ 24. Layers of chemical sedimentary rocks that form from precipitated minerals
- \_\_\_\_ 25. Composed of minerals with crystals that have their long axes perpendicular to pressure
- \_\_\_\_ 26. Composed of minerals that form blocky crystal shapes
- \_\_\_\_ 27. Organic sedimentary rock
- \_\_\_\_ 28. Large metamorphic crystals
- \_\_\_\_ 29. Reacts with rock to change its mineralogy, texture, and chemistry
- \_\_\_\_ 30. Inclined sediment layers that migrate forward across a horizontal surface

*Match each item with the correct statement below.*

- |                  |                          |
|------------------|--------------------------|
| a. clastic       | e. regional metamorphism |
| b. deposition    | f. rock cycle            |
| c. lithification | g. sediment              |
| d. porosity      |                          |

- \_\_\_\_\_ 31. Physical and chemical processes that compact and transform sediments into sedimentary rocks  
\_\_\_\_\_ 32. Percentage of open spaces between grains in a rock  
\_\_\_\_\_ 33. Continuous changing and remaking of rocks  
\_\_\_\_\_ 34. Process of sediments being laid down on the ground or sinking to the bottom of water  
\_\_\_\_\_ 35. Pieces of solid material deposited on Earth's surface  
\_\_\_\_\_ 36. Produced when high temperature and pressure affect large areas of Earth's crust  
\_\_\_\_\_ 37. Type of sediment made up of rock and mineral fragments produced by weathering

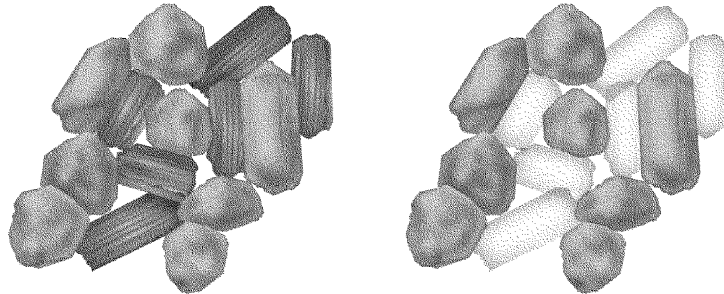
*Match each item with the correct process below.*

- Asymmetrical ripple marks
- Cross bedding
- Deposition of only fine sands
- Deposition of marine fossils
- Deposition of four-footed animal fossils
- Graded bedding
- Sorted deposition
- Symmetrical ripple marks
- Unsorted deposition
- Unsorted deposition

- \_\_\_\_\_ 38. Marine landslide  
\_\_\_\_\_ 39. Landslide  
\_\_\_\_\_ 40. Presence of dry land  
\_\_\_\_\_ 41. One-way wave action of wind or water  
\_\_\_\_\_ 42. Glacier  
\_\_\_\_\_ 43. Wind or water action  
\_\_\_\_\_ 44. Presence of a sea  
\_\_\_\_\_ 45. Wind or water action  
\_\_\_\_\_ 46. Wind action  
\_\_\_\_\_ 47. Back-and-forth wave action

**Short Answer**

48. The diagram below shows chemical weathering. What has happened to the long, block-shaped fragments? How do these fragments differ from the fragments that are preserved?

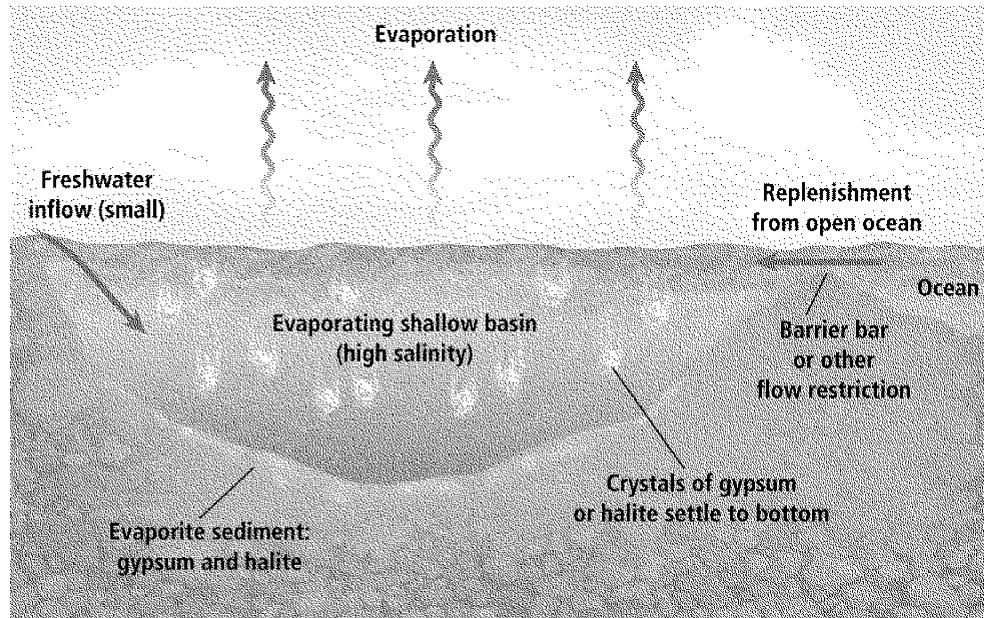


49. List the four classifications of clastic sediments in order from smallest to largest particle size.
50. How does lithification relate to the process of fossilization?
51. Why is evaporite formation most common in arid regions and in restricted ocean basins and closed drainage basins?
52. How is coal formed?
53. How can geologists infer from sedimentary rocks what the surface conditions of Earth's past were like?
54. Why would hydrothermal metamorphism be common around igneous intrusions and active volcanoes?
55. What might happen to the rock cycle if the forces that cause weathering were absent on Earth?

Compare and contrast each pair of related terms or phrases.

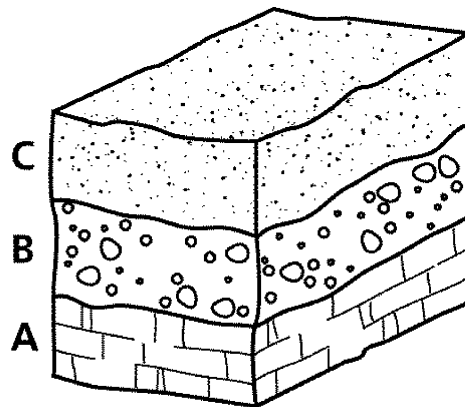
56. sedimentary, metamorphic
57. conglomerate, evaporite
58. foliated, nonfoliated
59. What is the sequence of events that form clastic sedimentary rocks from solid rocks?
60. How do chemical sedimentary rocks form?
61. Why might sandstone act as a reservoir for groundwater or oil, while shale would not?
62. When does contact metamorphism occur?
63. How does foliation form?

Use the diagram below to answer the following questions.



64. How would a decrease in the level of the barrier to freshwater inflow affect the rate of evaporation formation? Explain your answer.
65. Even though flow from the ocean would add saltwater to the basin, the formation of evaporites depends on a barrier to flow to and from the ocean. Why is this so?
66. What might happen over geologic time if the shallow basin was to evaporate completely?

The figure below represents sedimentary layers in a single geographic location. Use your completed Feature and Probable Cause chart from the Matching section and the diagram below to answer the questions. More than one item from the chart may be required to answer some of the questions.

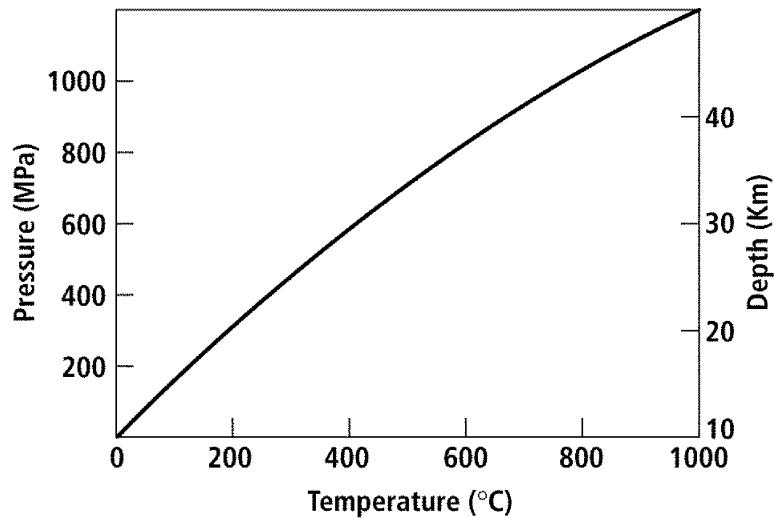


67. Layer C is a fine-grained sandstone with cross-bedding and land animal fossils. No marine fossils are present. Under what conditions did it most likely form?

68. Layer B is a coarse-grained sandstone with graded bedding. It contains marine fossils throughout. Under what conditions did it most likely form?
69. Layer A is a fossiliferous limestone. The fossils are of marine organisms. Under what conditions did the rock most likely form?
70. Based on the data and your deductions, what do you think occurred in the location over time? Write a brief description beginning with events that happened first.

**Problem**

71. According to the graph below, temperature rises to 500° C at about 400 MPa. At what pressure is temperature about 1000° C, and considering this, does temperature double each time pressure doubles?



## Sedimentary and Metamorphic Rock Study Guide Answer Section

### MODIFIED TRUE/FALSE

1. F, the rock cycle
2. T
3. F, after
4. F, high-energy
5. F, sedimentary
6. T
7. T
8. F, downhill
9. F, unsorted
10. T
11. T

### MULTIPLE CHOICE

12. C
13. A
14. D
15. C
16. B

### COMPLETION

17. sediments
18. clastic
19. erosion
20. Sorted deposits
21. bedding
22. porosity
23. limestone

### MATCHING

24. B
25. C
26. F
27. E
28. G
29. D

- 30. A
- 31. C
- 32. D
- 33. F
- 34. B
- 35. G
- 36. E
- 37. A
  
- 38. D
- 39. F
- 40. I
- 41. G
- 42. C
- 43. A
- 44. H
- 45. J
- 46. B
- 47. E

#### SHORT ANSWER

- 48. The block-shaped fragments have been chemically broken down. This happens because they are less resistant than the preserved fragments.
- 49. The four classifications of clastic sediments are shale, siltstone, sandstone, and conglomerate.
- 50. During lithification, parts of an organism are replaced by minerals and turned into rock.
- 51. The flow of freshwater in these areas is low, and therefore concentration of dissolved minerals remains high.
- 52. Over long periods of time, thick layers of vegetation slowly accumulate in swamps and coastal area. When these layers are buried and compressed, they are slowly lithified into coal.
- 53. Some sedimentary rocks contain sedimentary structures that indicate the location and direction of flow of ancient rivers, the wave or wind direction over lakes and deserts, and ancient shoreline positions.
- 54. Hydrothermal metamorphism occurs when very hot water migrates into and out of rocks during metamorphosis. Igneous intrusions and active volcanoes would provide the heat source for these fluids.
- 55. If weathering did not occur, sedimentary rock would not form. Its absence would likely affect the formation of igneous and metamorphic rock as well.
- 56. Both are types of rocks. Sedimentary rocks form when sediments are cemented together. Metamorphic rocks form when high temperature and pressure cause the texture, mineralogy, or chemical composition of a rock to change without melting it.



57. Both are sedimentary rocks. Conglomerates form from deposits of loose sediments on Earth's surface. Evaporites form when water evaporates from mineral-rich solutions, causing the minerals to precipitate out of the solutions.
58. Both are textures of metamorphic rocks. Foliated rocks have distinct banding or layers that formed perpendicular to pressure. Nonfoliated rocks are crystals with blocky shapes and do not have banding.
59. 1. Chemical and physical weathering break rocks into clastic sediments. 2. The sediments are then eroded. 3. The eroded sediments are deposited. 4. Then they are buried. 5. Finally they are lithified.
60. During chemical weathering, minerals can be dissolved and carried into lakes and oceans. When evaporation causes the body of water to become saturated with dissolved minerals, crystals precipitate out of solution. They settle to the bottom, creating layers of sedimentary rock.
61. Sandstone is porous. When its pore spaces are connected to one another, fluids can move through the sandstone, making sandstone layers valuable as underground reservoirs. However, shale has low porosity, meaning that the pore spaces are small. This hinders the movement of fluids.
62. Contact metamorphism occurs when molten rock such as an igneous intrusion comes into contact with the surrounding solid rock. It tends to occur at high temperatures and moderate-to-low pressure.
63. Compressive pressure causes minerals with elongate crystal forms to line up in bands, or layers. These bands form perpendicular to the direction of the pressure.
64. The rate of evaporite formation would slow or stop. If the barrier to freshwater inflow were decreased, more freshwater would flow into the basin, reducing the salinity of the water. If the salinity was reduced significantly, the saltwater solution would not reach saturation, and formation of evaporites would cease because the salts would not crystallize out of the solution.
65. Although ocean water is salty, it is not saturated. A barrier to the flow of ocean water is necessary to form the shallow, enclosed basin where evaporation and, therefore, saturation can occur.
66. Possible responses: Evaporite formation would cease. After that, the layer of evaporites might become buried under transported sediments to form a bed of evaporite. Or, the evaporites might themselves be eroded and transported away to become part of sediment deposits elsewhere.
67. Fine sands are generally deposited by wind. The absence of marine fossils and the presence of land animal fossils suggest that the area was dry, sandy land, such as a desert.
68. Graded bedding is found as a result of underwater landslides. The presence of marine fossils confirms that the area was under the sea at one time.
69. The presence of marine fossils in a limestone confirms that this rock layer formed in an ocean.
70. As the bottom-most, oldest layer shows, the area was once the floor of a sea that supported marine life. At a later time, the area was disrupted by an underwater landslide. Later still, sea level lowered and terrestrial animals inhabited dry, sandy land.

## PROBLEM

71. Pressure is about 1200 MPa C when temperature is about 1000° C. Pressure does not double each time temperature doubles, rather, it rises faster than does temperature.