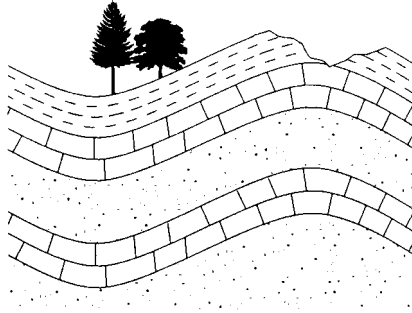


1. The diagram below shows a cross section of sedimentary rock layers.



Which statement about the deposition of the sediments best explains why these layers have the curved shape shown?

- 1) Sediments were deposited in horizontal layers and later disturbed by crustal activity.
- 2) Sediments were deposited on an uneven curving seafloor.
- 3) Sediments were deposited after widespread volcanic eruptions.
- 4) Sediments were deposited between two diverging oceanic plates.

2. Rock strata containing fossils of shark's teeth are found at an elevation of 5,000 meters. Which process most likely caused the shark's teeth to be located at this elevation?

- 1) crustal subsidence
- 2) ocean floor spreading
- 3) crustal uplift
- 4) continental glaciation

3. Shallow-water fossils are found in rock layers that are deep beneath the ocean floor. This suggests that

- 1) shallow-water organisms always migrate to the deeper waters to die
- 2) parts of the ocean floor have been uplifted
- 3) parts of the ocean floor have subsided
- 4) the surface water cooled off, killing the organisms

4. Which statement about the Earth's crust in California is best supported by the many faults found in the crust?

- 1) The crust has moved in the geologic past.
- 2) The crust has been inactive throughout the geologic past.
- 3) New faults will probably not develop in the crust.
- 4) An earthquake epicenter has not been located in the crust.

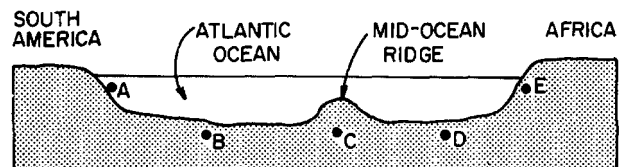
5. The Himalaya Mountains are located along a portion of the southern boundary of the Eurasian Plate. At the top of Mt. Everest (29,028 feet) in the Himalaya Mountains, climbers have found fossilized marine shells in the surface bedrock. From this observation, which statement is the best inference about the origin of the Himalaya Mountains?

- 1) The Himalaya Mountains were formed by volcanic activity.
- 2) Sea level has been lowered more than 29,000 feet since the shells were fossilized.
- 3) The bedrock containing the fossil shells is part of an uplifted seafloor.
- 4) The Himalaya Mountains formed at a divergent plate boundary.

6. Which best describes a major characteristic of both volcanoes and earthquakes?

- 1) They are centered at the poles.
- 2) They are located in the same geographic areas.
- 3) They are related to the formation of glaciers.
- 4) They are restricted to the Southern Hemisphere.

7. The diagram below represents a cross section of the Atlantic Ocean from the eastern coast of South America to the western coast of Africa along the Equator.



At what point would evidence of a rising convection current in the mantle most likely be found?

- 1) A
- 2) B
- 3) C
- 4) E

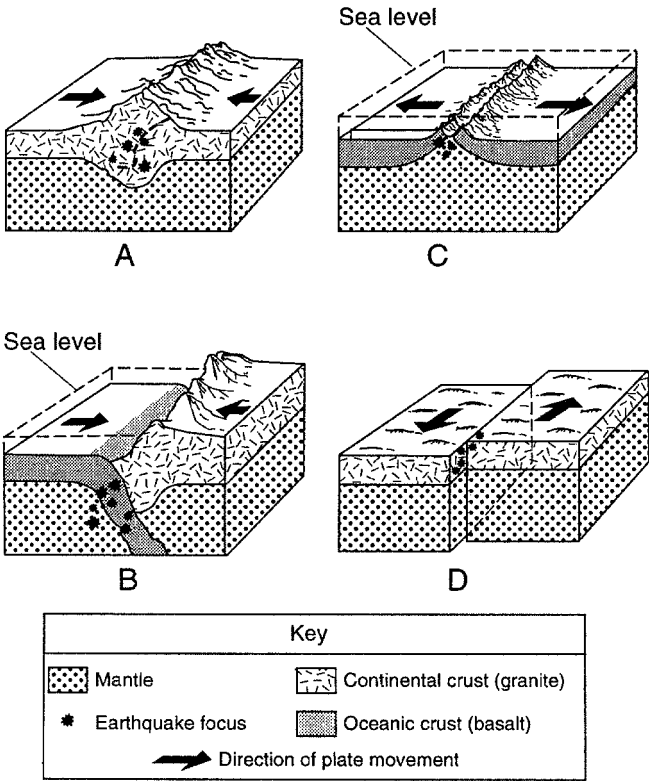
8. The border between the South American plate and the African plate is best described as

- 1) converging and located at an oceanic ridge
- 2) converging and located at an oceanic trench
- 3) diverging and located at an oceanic ridge
- 4) diverging and located at an oceanic trench

9. Seafloor spreading is occurring at the boundary between the

- 1) African plate and Antarctic plate
- 2) Nazca plate and South American plate
- 3) China plate and Philippine plate
- 4) Australian plate and Eurasian plate

Base your answers to questions 10 and 11 on the diagrams below of geologic cross sections of the upper mantle and crust at four different Earth locations, A, B, C, and D. Movement of the crustal sections (plates) is indicated by arrows, and the locations of frequent earthquakes are indicated by *. Diagrams are not drawn to scale.



10. Which diagram represents plate movement associated with transform faults such as those causing California earthquakes?

- 1) A
- 2) B
- 3) C
- 4) D

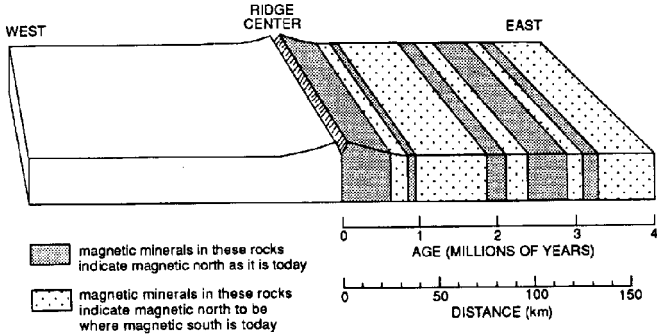
11. Which location best represents the boundary between the African plate and the South American plate?

- 1) A
- 2) B
- 3) C
- 4) D

12. Living corals are found in warm, shallow seas. Coral fossils have been found in the sedimentary rocks of Alaska. These findings suggest that

- 1) Alaska once had a tropical marine environment
- 2) Alaska's cold climate fossilized the coral
- 3) coral usually develops in cold climates
- 4) ocean currents carried the coral to Alaska

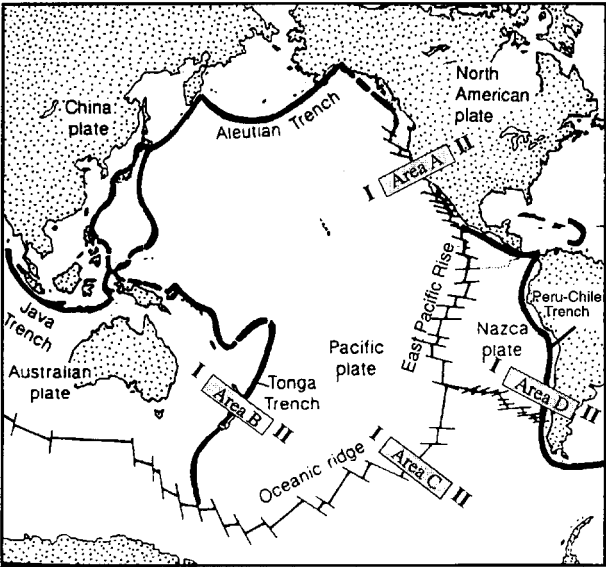
13. Base your answer to the following question on the diagram below which shows the magnetic orientation of igneous rock on the seafloor on the east (right) side of a mid-ocean ridge. The pattern on the west (left) side of the ridge has been omitted. The age of the igneous rock and its distance from the ridge center are shown.



As distance from the center of the ridge increases, the age of the rocks

- 1) decreases
- 2) increases
- 3) remains the same

14. Base your answer to the following question on the map below which shows mid-ocean ridges and trenches in the Pacific Ocean. Specific areas A, B, C, and D are indicated by shaded rectangles.



The crust at the mid-ocean ridges is composed mainly of

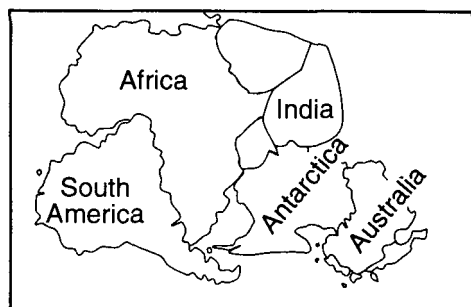
- 1) shale
- 2) limestone
- 3) granite
- 4) basalt

15. Which statement best supports the theory that all the continents were once a single landmass?
- 1) Rocks of the ocean ridges are older than those of the adjacent sea floor.
 - 2) Rock and fossil correlation can be made where the continents appear to fit together.
 - 3) Marine fossils can be found at high elevations above sea level on all continents.
 - 4) Great thicknesses of shallow-water sediments are found at interior locations on some continents.
-
-

16. The Hawaiian Islands form a long chain of volcanic mountains in the Pacific Ocean. Today only the big island of Hawaii has active volcanoes while the volcanoes on the other islands are extinct. This provides evidence that

- 1) All volcanoes have a definite life-span.
 - 2) As volcanoes move northward the cooler climate causes them to lose heat energy and become extinct.
 - 3) Chain volcanoes form as a tectonic plate slowly moves over a stable hot spot in the Earth's mantle.
 - 4) Over time the forces of erosion have worn away the volcanoes on the other islands because they were formed from softer, less resistant rock.
-
-

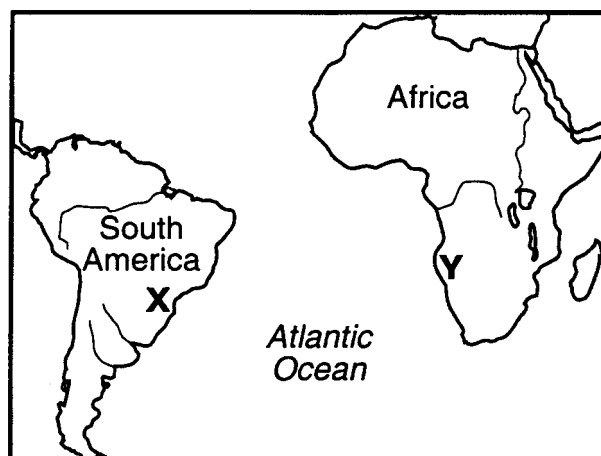
17. The diagram below shows how scientists think some of Earth's continents were joined together in the geologic past.



When do scientists think these continents were joined together?

- 1) during the Tertiary Period, only
 - 2) from the Cretaceous Period through the Tertiary Period
 - 3) from the Devonian Period through the Triassic Period
 - 4) during the Cambrian Period, only
-
-

18. The map below shows the present-day locations of South America and Africa. Remains of *Mesosaurus*, an extinct freshwater reptile, have been found in similarly aged bedrock formed from lake sediments at locations X and Y.



Which statement represents the most logical conclusion to draw from this evidence?

- 1) *Mesosaurus* migrated across the ocean from location X to location Y.
 - 2) *Mesosaurus* came into existence on several widely separated continents at different times.
 - 3) The continents of South America and Africa were joined when *Mesosaurus* lived.
 - 4) The present climates at locations X and Y are similar.
-
-

19. According to plate tectonic theory, during which geologic time interval did the continents of North America and Africa separate, resulting in the initial opening of the Atlantic Ocean?

- | | |
|------------------|--------------------|
| 1) Mesozoic Era | 3) Proterozoic Eon |
| 2) Paleozoic Era | 4) Archean Eon |
-
-

20. To get sample material from the mantle, drilling will be done through the oceanic crust rather than through the continental crust because oceanic crust is

- 1) more dense than continental crust
 - 2) softer than continental crust
 - 3) thinner than continental crust
 - 4) younger than continental crust
-
-

21. Compared to Earth's oceanic crust, Earth's continental crust is

- 1) thinner and composed of granite
 - 2) thinner and composed of basalt
 - 3) thicker and composed of granite
 - 4) thicker and composed of basalt
-
-

22. Which statement most accurately compares Earth's crust and Earth's mantle?
- 1) The crust is thinner and less dense than the mantle.
 - 2) The crust is thinner and more dense than the mantle.
 - 3) The crust is thicker and less dense than the mantle.
 - 4) The crust is thicker and more dense than the mantle.
-
-

23. Which two elements listed below are most abundant by mass in the Earth's crust?

- | | |
|-----------------------|-------------------------|
| 1) silicon and oxygen | 3) oxygen and magnesium |
| 2) hydrogen and iron | 4) hydrogen and calcium |
-
-

24. Which two elements make up the greatest volume of the Earth's crust?

- | | |
|--------------------------|-------------------------|
| 1) silicon and potassium | 3) iron and nickel |
| 2) silicon and iron | 4) oxygen and potassium |
-
-

25. The *rate* of temperature increase below the Earth's surface is greatest between depths of

- | | |
|---------------------|---------------------|
| 1) 250 and 500 km | 3) 2500 and 3500 km |
| 2) 1500 and 2500 km | 4) 3500 and 4000 km |
-
-

26. In which group are the zones of the Earth's interior correctly arranged in order of increasing average density?

- 1) crust, mantle, outer core, inner core
 - 2) crust, mantle, inner core, outer core
 - 3) inner core, outer core, mantle, crust
 - 4) outer core, inner core, mantle, crust
-
-

27. In which zone of the Earth's interior is the melting point of the rock inferred to be lower than the actual temperature of the rock?

- | | |
|---------------|-----------|
| 1) outer core | 3) crust |
| 2) inner core | 4) mantle |
-
-

28. What is the relationship between density, temperature, and pressure inside the Earth?

- 1) As depth increases, density, temperature, and pressure decrease.
 - 2) As depth increases, density and temperature increase, but pressure decreases.
 - 3) As depth increases, density increases, but temperature and pressure decrease.
 - 4) As depth increases, density, temperature, and pressure increase.
-
-

29. A part of which zone of the Earth's interior is inferred to have a density of 10.0 grams per cubic centimeter?

- | | |
|-----------|---------------|
| 1) crust | 3) outer core |
| 2) mantle | 4) inner core |
-
-

30. Which statement best explains why the direction of some seismic waves changes sharply as the waves travel through the Earth?

- 1) The Earth is spherical.
 - 2) Seismic waves tend to travel in curved paths.
 - 3) The temperature of the Earth's interior decreases with depth.
 - 4) Different parts of the Earth's interior have different densities.
-
-

31. The source of energy for the high temperatures found deep within the Earth is

- 1) tidal friction
 - 2) incoming solar radiation
 - 3) decay of radioactive materials
 - 4) meteorite bombardment of the Earth
-
-

32. In which part of the Earth is a rock temperature of 2,000°C most likely to occur?

- 1) continental crust
 - 2) asthenosphere (plastic mantle)
 - 3) stiffer mantle
 - 4) outer core
-
-

33. In which area of Earth's interior is the pressure most likely to be 2.5 million atmospheres?

- | | |
|-------------------|---------------|
| 1) asthenosphere | 3) inner core |
| 2) stiffer mantle | 4) outer core |
-
-

34. What is the approximate temperature at the mantle-outer core boundary?

- | | |
|------------|------------|
| 1) 1,500°C | 3) 5,000°C |
| 2) 4,500°C | 4) 7,000°C |
-
-

35. Theories about the composition of the Earth's core are supported by meteorites that are composed primarily of

- | | |
|-----------------------|------------------------|
| 1) oxygen and silicon | 3) aluminum and oxygen |
| 2) aluminum and iron | 4) iron and nickel |
-
-

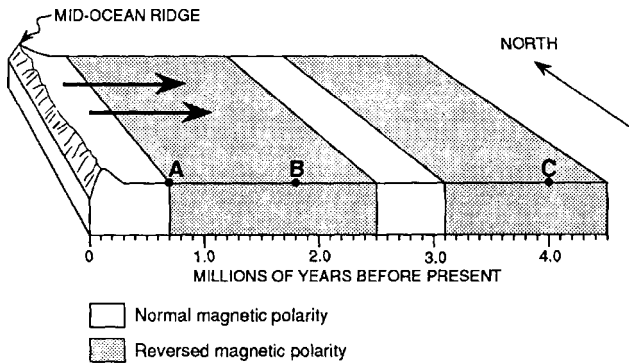
36. Most inferences about the characteristics of Earth's mantle and core are based on

- 1) the behavior of seismic waves in Earth's interior
 - 2) well drillings from Earth's mantle and core
 - 3) chemical changes in exposed and weathered metamorphic rocks
 - 4) comparisons between Moon rocks and Earth rocks
-
-

Base your answers to questions 37 through 39 on the information and diagram below.

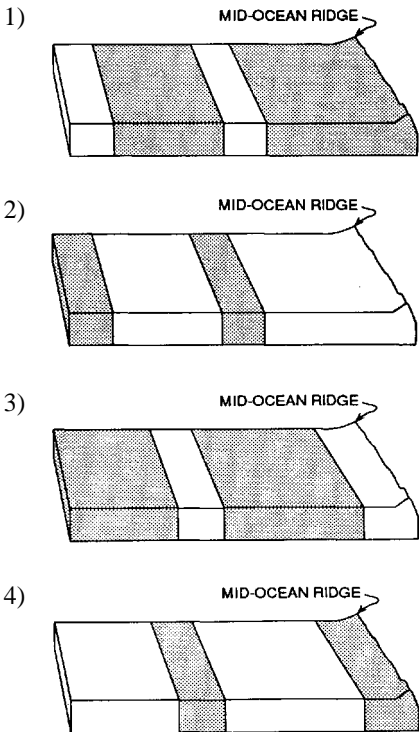
At intervals in the past, the Earth's magnetic field has reversed. The present North magnetic pole was once the South magnetic pole, and the present South magnetic pole was once the North magnetic pole. A record of these changes is preserved in the igneous rocks that formed at mid-ocean ridges and moved away from the ridges.

The diagram below represents the pattern of normal and reversed magnetic polarity in the igneous rocks composing the ocean crust on the east side of a mid-ocean ridge.

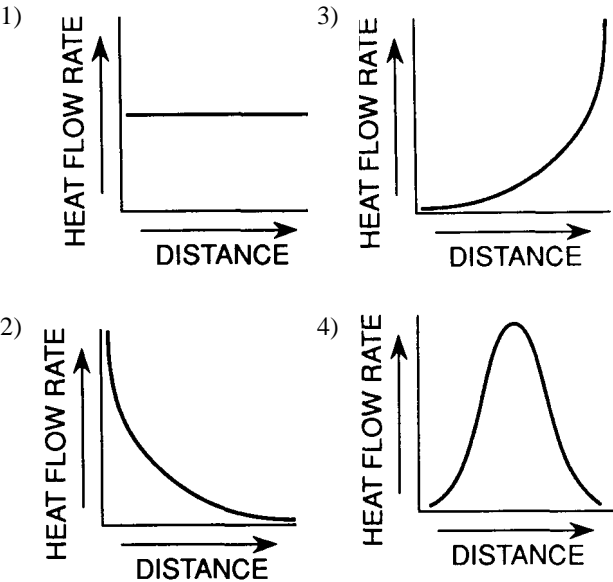


37. The igneous material along this mid-ocean ridge was found to be younger than the igneous material farther from the ridge. This fact supports the theory of
- 1) crustal subsidence
 - 2) seafloor spreading
 - 3) superposition
 - 4) dynamic equilibrium

38. Which diagram below best shows the pattern of normal and reversed polarity on the west side of the mid-ocean ridge?

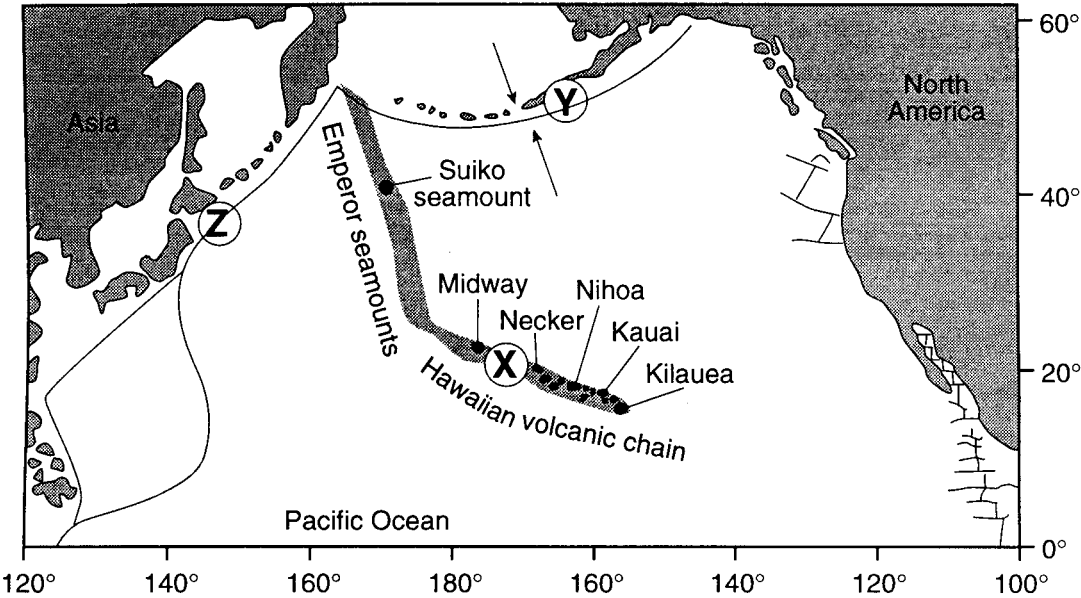


39. The younger extrusive igneous rocks on the ocean floor have a higher heat flow rate than older extrusive igneous rocks. Which graph best shows the relationship between heat flow rate and distance from the mid ocean ridge?



40. Base your answer to the following question on the map and data table below. The map shows the locations of volcanic islands and seamounts that erupted on the seafloor of the Pacific Plate as it moved northwest over a stationary mantle hotspot beneath the lithosphere. The hotspot is currently under Kilauea. Island size is not drawn to scale. Locations X, Y and Z are on Earth's surface.

Map of Volcanic Features



Data Table
Age of Volcanic Features

Volcanic Feature	Distance from Kilauea (km)	Age (millions of years)
Kauai	545	5.6
Nihoa	800	6.9
Necker	1,070	10.4
Midway	2,450	16.2
Suiko seamount	4,950	41.0

According to the data table, what is the approximate speed at which the island of Kauai has been moving away from the mantle hotspot, in kilometers per million years?

- 1) 1 2) 10 3) 100 4) 1,000
