Base your answers to questions 1 through 3 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.

1. Movement of the crustal plates shown in the diagram is most likely caused by
   (A) the revolution of the Earth
   (B) the erosion of the Earth's crust
   (C) shifting of the Earth's magnetic poles
   (D) convection currents in the Earth's mantle

2. The crust at the mid-ocean ridges is composed mainly of
   (A) shale
   (B) limestone
   (C) granite
   (D) basalt

3. Mid-ocean ridges such as the East Pacific Rise and the Oceanic Ridge are best described as
   (A) mountains containing folded sedimentary rocks
   (B) mountains containing fossils of present-day marine life
   (C) sections of the ocean floor that contain the youngest oceanic crust
   (D) sections of the ocean floor that are the remains of a submerged continent

Base your answers to questions 4 through 8 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.

4. Which diagram below best represents the pattern of magnetic orientation in the seafloor on the west (left) side of the ocean ridge?
   (A) [Diagram A]
   (B) [Diagram B]
   (C) [Diagram C]
   (D) [Diagram D]

5. According to the diagram, what is the approximate rate of seafloor spreading?
   (A) 1 km/million years
   (B) 2 km/million years
   (C) 40 km/million years
   (D) 50 km/million years
6. Which inference can best be made from the diagram?
   (A) The orientation of the Earth's magnetic field has reversed with time.
   (B) The size of the continents has changed with time.
   (C) The elevation of sea level has changed with time.
   (D) The amount of fossil material preserved in the igneous rock has changed with time.

7. The occurrence of high-heat floors at the ridge center provides evidence of the
   (A) destruction of oceanic crust
   (B) destruction of continental crust
   (C) existence of ancestral mountains
   (D) existence of rising mantle convection currents

8. As distance from the center of the ridge increases, the age of the rocks
   (A) decreases  (C) remains the same
   (B) increases

9. According to tectonic plate maps, New York State is presently located
   (A) at a convergent plate boundary
   (B) above a mantle hot spot
   (C) above a mid-ocean ridge
   (D) near the center of a large plate

10. At the Aleutian Trench and the Peru-Chile Trench, tectonic plates are generally
    (A) moving along a transform boundary
    (B) moving over a mantle hot spot
    (C) diverging
    (D) converging

11. Earth's early atmosphere formed during the Early Archean Era. Which gas was generally absent from the atmosphere at that time?
    (A) water vapor  (C) nitrogen
    (B) carbon dioxide  (D) oxygen

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Hint:

Use your plate tectonics map in the ESRT to find the locations mentioned.
12. The Tonga Trench is located at the tectonic boundary between the Pacific Plate and the
   (A) Antarctic Plate  (C) Indian-Australian Plate
   (B) Philippine Plate  (D) Nazca Plate

13. The greatest number of earthquakes shown in the cross section occurred
   (A) at sea level  (C) at a depth between 100 and 300 km
   (B) between sea level and a depth of 100 km  (D) at a depth between 300 and 600 km

14. A stream with a velocity of 100 centimeters per second flows into a lake. Which sediment-size
    particles would the stream most likely deposit first as it enters the lake?
    (A) boulders  (C) pebbles
    (B) cobbles  (D) sand
15. Which features are commonly formed at the plate boundaries where continental crust converges with oceanic crust?
(A) large volcanic mountain ranges parallel to the coast at the center of the continents
(B) a deep ocean trench and a continental volcanic mountain range near the coast
(C) an underwater volcanic mountain range and rift valley on the ocean ridge near the coast
(D) long chains of mid-ocean volcanic islands perpendicular to the coast

16. Which diagram best shows the type of plate boundary found between the China Plate and the Philippine Plate?

17. What do mid-ocean ridges and hot spots beneath ocean plates have in common?
(A) Rising magma moves due to density differences
(B) They are located along crustal plate boundaries
(C) Local earthquakes originate at great depths
(D) Neither is associated with plate motions

18. The diagram below shows a tectonic plate boundary.

Oceanic Ridge at a Divergent Plate Boundary

Which mantle hot spot is at a plate boundary like the one shown in this diagram?
(A) Hawaii Hot Spot
(B) Yellowstone Hot Spot
(C) Galapagos Hot Spot
(D) Canary Hot Spot

19. The large coal fields found in Pennsylvania provide evidence that the climate of the northeastern United States was much warmer during the Carboniferous Period. This change in climate over time is best explained by the
(A) movements of tectonic plates
(B) effects of seasons
(C) changes in the environment caused by humans
(D) evolution of life
Fire and Ice — and Sluggish Magma

On the night of November 13, 1985, Nevada del Ruiz, a 16,200-foot (4,938 meter) snowcapped volcano in northwestern Colombia, erupted. Snow melted, sending a wall of mud and water raging through towns as far as 50 kilometers away, and killing 25,000 people.

Long before disaster struck, Nevada del Ruiz was marked as a trouble spot. Like Mexico City, where an earthquake killed at least 7,000 people in October 1985, Nevada del Ruiz is located along the Ring of Fire.

This ring of islands and the coastal lands along the edge of the Pacific Ocean are prone to volcanic eruptions and crustal movements. The ring gets its turbulent characteristics from the motion of the tectonic plates under it. The perimeter of the Pacific, unlike that of the Atlantic, is located above active tectonic plates.

Nevado del Ruiz happens to be located near the junction of four plate boundaries. In this area an enormous amount of heat is created, which melts the rock 100 to 200 kilometers below Earth’s surface and creates magma. Nevado del Ruiz hadn’t had a major eruption for 400 years before this tragedy. The reason: sluggish magma. Unlike the runny, mafic magma that makes up the lava flows of oceanic volcanoes such as those in Hawaii, the magma at this type of subduction plate boundary tends to be sticky and slow moving, forming the rock andesite when it cools. This andesitic magma tends to plug up the opening of the volcano. It sits in a magma chamber underground with pressure continually building up. Suddenly, tiny cracks develop in Earth’s crust, causing the pressure to drop. This causes the steam and other gases dissolved in the magma to violently expand, blowing the magma plug free. Huge amounts of ash and debris are sent flying, creating what is called an explosive eruption.

Oddly enough, the actual eruption of Nevado del Ruiz didn’t cause most of the destruction. It was caused not by lava but by the towering walls of sliding mud created when large chunks of hot ash and pumice mixed with melted snow.

20. What are the names of the four tectonic plates located near the Nevado del Ruiz volcano?
21. What caused most of the destruction associated with the eruption of Nevado del Ruiz?

22. What caused the magma to expand, blowing the magma plug free?

23. Vesicular texture is very common in igneous rocks formed during andesitic eruptions. Explain how this texture is formed.
Practice Test Plate Tectonics

Base your answers to questions 24 and 25 on the diagram below, which shows an incomplete concept map identifying the types of plate boundaries. Information in the boxes labeled A, B, C, D, and E has been deliberately omitted.

24. On the chart above, write the information that should be placed in the boxes labeled A, B, and C that will correctly complete those portions of the concept map.

25. On the geographic map shown above, write the letters D and E on the plate boundary locations where the indicated movements are occurring. Write the letters approximately the same size as shown on the concept map and locate the letters directly on the plate boundary.
1. D
2. D
3. C
4. B
5. C
6. A
7. D
8. B
9. D
10. D
11. D
12. C
13. D
14. C
15. B
16. C
17. A
18. C
19. A
20. 1. South American Plate  
   2. Cocos Plate  
   3. Caribbean Plate  
   4. Naza Plate
21. Examples: mass movement of mud down the mountain — a mud avalanche — It melted
22. Examples: — a drop in pressure on the magma — Steam and gases that were dissolved in the magma violently expanded. — Cracks in Earth’s crust lowered pressure on the magma. — Magma pressure cracked the overlying rocks, releasing the gases.
23. Examples: — Escaping gas bubbles are trapped in the rapidly cooling magma. — Gas/air pockets form in the rock as it cools.
24. | Letter | Information That Should Be Placed in Each Box |
   | A     | Convergent boundary                          |
   | B     | Move apart or separate                       |
   | C     | Two continental plates collide.              |
25. Practice Test Plate Tectonics  
   Answer Key