Name _____ Date _____

Earth Layers & Plate Tectonics

Use the text to answer each question below.

1. Deep in the Earth's crust, almost a mile beneath the ocean floor, a pool of superheated magma pushes against the surface layer of rock. At several thousand degrees Fahrenheit, the heat and pressure are awesome. The rock layer buckles, and a ridge on the ocean floor rises several meters before slamming downward and outward. The molten rock and superheated steam explode, and two huge rock plates, each thousands of miles wide, are pushed a few centimeters apart.

A few centimeters doesn't sound like much, but an entire continent has suddenly moved. The resulting earthquake sends an undersea shock wave across the ocean. Minutes later, thousands of miles away, that shock wave, called a tsunami, crashes into shore.

The explanation for the forces that unleash killer tsunamis, massive earthquakes, and exploding volcanoes, lies in tectonic plates. These are the huge rock plates underneath the continents.

What can happen when tectonic plates move a few centimeters?

A. The atmosphere can become cooler.
B. Whole continents can move.
C. The ozone layer can thicken.
D. The moon can move closer to Earth.

2. Picture the Earth like a giant peach floating in space. On its surface is a thin skin called the crust. Instead of fleshy fruit, just below that is the rocky mantle. Deep in the center, like the peach's pit, sits the Earth's core.

The inner core is solid, extremely hot and under immense pressure from all the rock above it. The outer core is molten, so it's liquid, and also very hot. This core extends 1,800 miles around from the center of the Earth.

The layer after the core is the mesosphere. This layer is mostly solid and extends outward another 1,500 miles. The asthenosphere is a thin layer, about 150 miles thick, at the border between the mantle and the crust. It is still very hot, and nearly (but not quite) a liquid. Because of this, pieces of the Earth's crust can move very slowly above it.

Which of the following is true about the Earth's layers?

A. The asthenosphere is the thickest of Earth's layers.
B. All of the layers are liquid and extremely hot.
C. There is little to no pressure on the solid core.
D. The Earth's core has two different parts.

3. Tectonic plates move because of the flow of heat inside the Earth. Deep in the asthenosphere, there is a convection current—that's when heated things rise and cooled things fall. Since the asthenosphere is not quite liquid rock, convection currents move rock very slowly. Where the crust is thin, the heated rock may rise. This usually happens in the middle of an ocean, creating an ocean basin. Where the crust is thick, like under a continent, rock sinks deeper into the mantle.

When tectonic plates move, they rub against each other, causing great stress on the rock. When rock is pushed together, the pressure is called compression. When rock is stretched apart, it's called tension. At points of tension, like under the ocean, magma may come to the surface. At points of compression, layers of rock may bend upward, downward or break entirely.

How does convection cause tectonic plates to move?

A. Convection keeps the plates thin enough to move.

B. Convection makes the plates solid enough to move.

C. The rising heat of convection currents moves the almost-liquid rocks.

D. The pressure of convection bends rocks until they break completely.

4. The Earth's crust is made of rock, which is composed of minerals. Minerals are solid, naturally occurring non-living materials that have a structure of crystals. There are hundreds of different kinds of minerals, but about 90% of the ones on Earth are silicates. Silicate minerals include oxygen and silicon along with some other combination of elements like iron, aluminum or potassium. Since each mineral is made of different elements, each has a unique set of properties. For example, diamonds are very hard, iron is strong and halite (salt) tastes good on food.

Which of the following is not true about minerals?

A. They always include oxygen and silicon.

B. They are naturally occurring materials.

C. They each have unique properties.

D. They have a crystalline structure.

5. The outer layer of the crust, the lithosphere, is broken into tectonic plates. The borders between these plates are called faults. When molten rock or magma squeezes to the surface at a fault, it releases pressure, exploding to the surface as a volcano.

Most of the lithosphere is covered by ocean. This water and the atmosphere around it help shape the Earth's crust. Volcanoes bursting from inside the crust can also change the atmosphere and oceans by shooting hot gases or ash into the air, or by boiling water that has seeped down into the crust. When a tectonic plate moves, the Earth shakes, creating an earthquake. If it shakes underwater, the movement can cause tsunamis, which wash away soil, sand, rocks and buildings, effectively changing the shape of the land.

Which of the following best describes the relationship between earthquakes and tsunamis?

A. An underwater earthquake can cause a tsunami.

B. Both are the result of big volcanic explosions.

C. Tsunami waves are the main cause of earthquakes.

D. Earthquakes prevent tsunamis from occurring.

6. According to the theory of continental drift, Earth's continents are a puzzle and millions of years ago they fit together as shown here. The theory states that 250 million years ago, most of today's land areas were connected as one supercontinent that we call Pangaea. Gradually, different tectonic plates pulled Pangaea apart—as some sections of these giant plates rose, others fell back into the Earth's crust or were pushed apart. Similar fossil remains and rock layers on each of the continents support the theory, showing where the continental plates used to be connected.

Which of the following best supports the theory of continental drift?

A. South America and Africa have completely different rock layers.

B. A hurricane hits the Gulf of Mexico at the beginning of June.

C. Similar fossils are found on the coasts of South America and Africa.

D. North America and South America are connected by land.

7. A bending layer of rock is called a fold. Upward folds, or anticlines, can form mountains, while downward folds, or synclines, can create valleys. An entirely broken rock plate forms a fault. A fault block, or huge cracked block of rock, can be pushed upward, also creating a mountain. Many landscapes of our country, like the Appalachian mountains, were formed this way.

Most volcanoes and earthquakes occur along the boundaries of tectonic plates. For example, there is a ring of mountains, faults and volcanoes on the edge of the Pacific Ocean nicknamed the "Ring of Fire." The area includes California, Alaska and Washington, which have all experienced large earthquakes over the years.

We can study the inside of the Earth by using vibrations called seismic waves measured on a machine called a seismograph. We know that the Earth has five layers because seismic waves behave differently in different materials.

Which of the following is true about folds?

A. They do not create mountains.

B. They are entirely broken rock plates.

C. They occur only in the inner core.

D. They can create deep valleys.