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The Ocean Floor

Viewing the depths of the Grand Canyon from the canyon rim is an awesome sight and yet the canyon, with an average depth of 4,000 feet, is shallow compared to the trenches that exist on the ocean floor. The ocean floor has the same type of physical features that are found on the continents, including mountain ranges, volcanoes, ridges, hills, plains and canyons called trenches. In spite of the similarities of these physical features, there are fundamental geological differences between the floor of the ocean and the land mass of continents.

The Earth's Crust

The earth's crust is the outmost layer of the earth and it exists above the mantle. The mantle is a thick layer of rock and some of the mantle is composed of magma which is molten rock. The earth's crust sits above the mantle in huge pieces called tectonic plates. Where tectonic plates meet is called a subduction zone; one tectonic plate slides below the other and returns material to the mantle. Volcanoes and earthquake faults are prevalent in subduction zones.

Subduction zones are home to the deepest depressions in the earth's surface, the deep-sea trenches. The deepest trench exists in the Pacific Ocean; the Mariana Trench is nearly seven miles deep. In an ocean trench, one tectonic plate physically slides under the other and this process can create earthquakes and volcanic eruptions. Since the Pacific Ocean contains numerous subduction zones, it is the center of many of earth's earthquakes and volcanic eruptions. This violent undersea geological activity is the cause of deadly tsunamis which originate at sea and spread to land.

With subduction, the ocean floor is destroyed but new floor is constantly being created through a process known as seafloor spreading. In addition to trenches, the ocean floor contains rift valleys; rift valleys are also found on continents. A rift valley is a valley surrounded by steep mountains and is the location of a geological fault in the earth's crust. The pressure of the geologic fault pushes the mountains apart as tectonic plates move apart. New ocean is formed when magma in the form of lava from active volcanoes seeps into a rift valley. The Mid-Atlantic Ridge and the East Pacific Rise include rift valleys.

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Because of how they are formed, there is a difference between oceanic crust and continental crust. It is clear that the oceanic crust is formed only by volcanic activity so it is composed of basalt, a type of rock that results from volcanic eruptions. Basalt is also found on continents where volcanic activity is or has occurred at some point in geological history. However, continental crust is thicker and is composed of a variety of rock types that form due to environmental conditions over time.

Ocean Floor Characteristics

Continents meet the ocean at the coast of the continent. There are basically two forms of coastline: sandy beaches and rocky shores with possibly step cliffs. Rocky shores and cliffs are found inland from a nearby oceanic subduction zone while continental coastlines with predominantly sandy beaches exist in areas free from volcanic and earthquake activity. The transition area between continental land and the ocean basin is called the continental margin.

The continental shelf is the first part of the continental margin. The continental shelf is an undersea extension of the continent that perhaps once was land when the level of the ocean was lower. The continental shelf begins its drop to the ocean basin with a steep continental slope followed by a shallower continental rise. The continental margin can be visualized as a mesa butted up against a continent. The continental margin leads to the ocean's abyssal plains.

Abyssal plains comprise forty percent of the ocean floor. These are some of the flattest areas on earth and exist below thousands of feet of ocean water. The average depth of the Pacific Ocean is 13,000 feet. The abyssal plains have not been explored extensively. Traveling further into the ocean and away from a continent, the abyssal plain leads to a spreading ridge. Mid-ocean ridges are undersea mountain ranges and the Mid-Atlantic Ridge is the longest mountain range in the world. Since these ridges are close to subduction zones, they are home hydrothermal vents which were discovered in 1977.

Volcanic activity in the oceans has created islands, most notably islands in the Pacific Ocean and Caribbean Sea. Volcanoes that have not created islands and remain under water are called seamounts.

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Circle True or False after analyzing each of the following statements.

1. True False Subduction zones are home to the deepest depressions in the earth's surface, the deep-sea trenches.

2. True False The oceanic crust is formed only by volcanic activity so it is composed of volcanic lava.

3. True False Where tectonic plates meet is called a subduction zone; volcanoes and earthquake faults are prevalent in subduction zones.

4. True False Since the Atlantic Ocean contains numerous subduction zones, it is the center of many of earth's earthquakes and volcanic eruptions.

5. True False The transition area between continental land and the ocean basin is called the continental margin.

6. True False The continental shelf begins its drop to the ocean basin with a steep continental rise followed by a shallower continental slope.

7. True False New ocean floor is constantly being created through a process known as seafloor spreading.

8. True False Abyssal plains are some of the flattest areas on earth.

9. True False The undersea Mid-Atlantic Ridge is the highest mountain ridge in the world.

10. True False Volcanoes that exist under the sea are called subduction volcanoes.

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Answers

1. True
2. False
3. True
4. False
5. True
6. False
7. True
8. True
9. False
10. False

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