

# APES in a BOX: The Review Sessions

## Geology

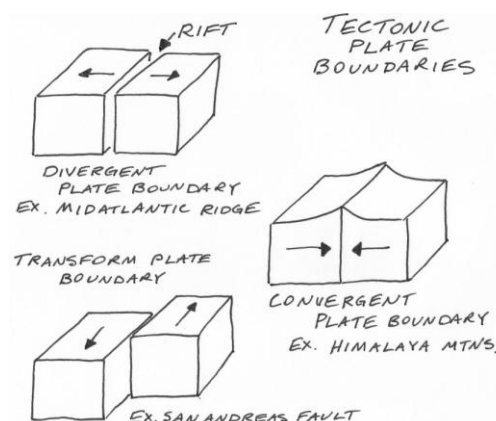
Earth is approximately 4.5 billion years old. Scientists believe that life originated on Earth 3.8 billion years ago. These vast amounts of time are best measured with the geologic time scale. The geologic time scale relates geologic events to important evolutionary events.

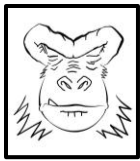
A cross-section of Earth would reveal three distinct zones: the crust, the mantle, and the core. The crust is the outermost layer and is composed of 47% oxygen, 28% silicon, 8% aluminum, and 5% iron. The crust plays a critical part in many biogeochemical cycles and is the source for nonrenewable resources. Below the crust lies the mantle. It consists of iron, silicon, oxygen, and magnesium. The core is the innermost zone. It is believed to have a solid iron and nickel interior surrounded by a liquid iron and sulfur outer core.

The outermost layer of the mantle and the crust make up the **lithosphere**. This layer is rigid and broken into large pieces called tectonic plates. Below these plates is the **asthenosphere**. This thin plastic-like layer of molten rock allows the movement of the tectonic plates and the continents that rest upon them. This phenomenon is known as the theory of continental drift. Volcanoes, earthquakes, mountains, and oceanic trenches are the results of the interaction of these plates.

## Plate Boundaries

**Convergent boundaries** are the result of two plates pushing together. The Himalayas are a result of the Indian-Australian Plate and the Eurasian Plate colliding into one another. When plates move away from one another it is called a **divergent boundary**. One of the best examples of this type of boundary is the Mid-Atlantic Ridge. A **transform fault** occurs when two plates slide past each other in opposite but parallel directions. In the United States, the San Andreas Fault of California is an example of a transform fault.





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## Earthquakes

Earthquakes are violent vibrations that are caused by tectonic activity. The point of the earthquake's origination is called the **focus**. Directly above the focus on the surface is the **epicenter**. Earthquakes are measured by seismographs. Data collected by seismographs are analyzed and reported as a magnitude on the **Richter magnitude scale**. Much like the pH scale, the Richter magnitude scale is logarithmic. **Logarithmic** scales measure values that span a wide range. Moving from one value to the next, on a logarithmic scale, results in a ten-fold increase or decrease.

## Tsunamis

A tsunami is a wave, or waves, caused by an underwater earthquake. When an earthquake occurs at an underwater plate boundary a large volume of water can be displaced. This can trigger a series of waves that push inland whenever they make landfall. Tsunami waves can be very destructive as was seen in both the 2004 Indian Ocean Tsunami, and the Japanese Tsunami of 2011. In both cases an earthquake and subsequent tsunami caused a great deal of destruction.

## Volcanoes

Volcanoes are also a result of tectonic activity. They are associated with subduction zones at convergent plate boundaries and divergent plate boundaries. These areas allow molten rock or magma to flow to the surface where it is then referred to as lava. The **Pacific Ring of Fire** is an area of earthquakes and volcanoes that occur around Asia, North America, and South America due to the subduction zones of the Pacific Plate. Hot spots are also responsible for volcanoes. **Hot spots** are the result of plate movement but are not confined to the boundaries of the plates. Volcanoes caused by hot spots form due to an opening or weak spot in the crust that allows a plume of magma to push to the surface. Once the lava breaches the water's surface and islands form, **pioneer species** like lichens and mosses invade the rocky substrate. These organisms begin the process of **primary succession** which forms soil and allows other organisms to colonize. The Hawaiian Islands were formed in this fashion.

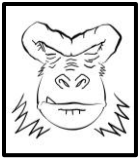
## Rock Cycle

Tectonic activity, wind, water, temperature, and gravity act together to form different types of rocks. The rock cycle describes this process. Magma solidifies and forms igneous rocks. Igneous rocks are then exposed to the forces of erosion and weathering and break down into smaller particles. These sediments undergo



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compaction and cementation and become sedimentary rocks. Temperature, pressure, and chemical reactions can change sedimentary and igneous rocks into metamorphic rocks.



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## **Geology Review Questions**

1. Which of the following types of rock is formed when temperature, pressure, chemical reactions, and time act on sedimentary rock?

- A) Igneous Rock
- B) Metamorphic Rock
- C) Sedimentary Rock
- D) Stalagmites
- E) Transform Rock

## **Use the following answer choices to answer questions 2-6**

- A) Convergent Boundary
  - B) Epicenter
  - C) Divergent Boundary
  - D) Focus
  - E) Transform Fault
2. An area like the mid-atlantic ridge where two plates are moving apart.
3. Area where two plates push together forming mountains.
4. Area where two plates slide past each other causing tremors or earthquakes.
5. The underground point where an earthquake originates.
6. The spot on the surface of the earth directly above the origin of an earthquake.



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7. Which of the following terms best describes a series of large waves that are caused by the water displacement from an underwater earthquake.
- A) Volcano
  - B) Tremors
  - C) Tsunami
  - D) Hurricane
  - E) Typhoons
8. A group of volcanos known as the ring of fire can be found surrounding which part of the earth?
- A) The Pacific ocean
  - B) The Indian Ocean
  - C) The Atlantic Ocean
  - D) The European Mainland
  - E) Northern Canada



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## Multiple Choice Scoring Guidelines

1. B	3. A	5. D	7. C
2. C	4. E	6. B	8. A

Multiple choice points earned/8 \* 100 = Quiz average

( \_\_\_\_\_ ) / 8 \* 100 = \_\_\_\_\_ Quiz Grade