

ESSAY

1. What were the major lines of evidence for continental drift as presented by Wegener in the early 20th century?

ANS:

The glaciations on the Gondwana continents could only have occurred if the continents were joined since the centers of the glaciers would have been in the ocean if they were not. Also, the continents, such as South America and Africa, match like a jigsaw puzzle. Similar fossil plant and animals are separated by oceans leading to the assumption that they must have lived in adjacent regions when they were alive. Finally, similar rock sequences and mountain ranges could be connected across oceans.

PTS: 1

REF: 2.3. What is the

ANS:

Since the Earth has only one magnetic north pole now, it was extremely unlikely that there would have been more than one in the past, though this would have been required to explain the different polar wander paths of the different continents. The only other possible explanation is that the continents were once joined and have since moved apart.

PTS: 1

REF: 2.6. Paleomagnetism and Polar Wandering

6. Briefly explain how magnetic reversals in oceanic crust and fossils in ocean sediments are used to construct a magnetic time scale.

ANS:

A terrestrial sequence of magnetic reversal in volcanic deposits was dated radiometrically. These dates were extrapolated to regions which were not dated, but showed the same pattern of normal and reversed magnetic polarities. Ages of ocean-floor basalts lying within a zone of normal or reversed polarity are dated by the ages of the fossils found in the sediments which directly overlie the basaltic crust. These fossils have already been incorporated within a biostratigraphic zone.

PTS: 1

REF: 2.13. Plate Tectonics and the Distribution of Natural Resources

10. What are four of the many things that plate tectonics theory explains?

ANS:

Plate tectonics explains, at least to some extent, all of the following phenomena: the distribution of earthquakes and volcanoes, the locations of ore deposits and mountain systems, climate and ocean circulation patterns, and the geographic distribution, evolution, and extinction of life forms.

PTS: 1

REF: various

11. Briefly explain why there is so much oil in the Persian Gulf region.

ANS:

During the Mesozoic, the Persian Gulf was a broad, stable marine shelf. Countless microorganisms lived in the surface water and their remains accumulated in the bottom sediments and were buried. The collision between Arabia and Iran has tilted the Arabian plate and crumpled rocks on the

Wegener lacked a plausible mechanism to explain how continental crust could move through the sea floor.

PTS: 1

REF: 2.3. What is the Evidence for Continental Drift?

4. Describe the features of oceanic trenches. For what geological reasons do the trenches appear like this?

ANS:

Oceanic trenches are long, steep sided depressions on the seafloor. They are found near convergent plate boundaries. The deep trench is caused by subduction of oceanic lithosphere beneath an oceanic or continental plate.

PTS: 1

REF: 2.4. Features of the Seafloor

5. What are the three possible explanations for the distribution of paleomagnetic data?

ANS:

PTS: 1 REF: 2.9. The Three Types of Plate Boundaries

10. Draw a cross-section of an oceanic-oceanic convergent plate boundary. Show the directions of relative plate motion. Put stars for the locations of earthquakes. Put triangles with smoke out the top for the locations of volcanoes. Label the trench, back arc basin, and subduction complex.

ANS:
See Figure 2.18a

PTS: 1 REF: 2.9. The Three Types of Plate Boundaries

11. Draw a cross-section of an ocean-continent convergent plate boundary. Show the directions of relative plate motion. Put stars for the locations of earthquakes. Put triangles with smoke out the top for the locations of volcanoes. Label the trench and subduction complex.

ANS:
See Figure 2.18b

PTS: 1 REF: 2.9. The Three Types of Plate Boundaries

12. Draw a cross-section of a continental-continental convergent plate boundary. Show the directions of relative plate motion. Put stars for the locations of earthquakes. Show the location of the mountain range. Label the subduction complex.

16. How does seafloor spreading explain the movement of the continents?

ANS:

With seafloor spreading, the continents and oceanic crust move together as part of large plates. The plate is pushed by the formation of new ocean crust and pulled by the subduction of old ocean crust. New crust forms due to seafloor spreading.

PTS: 1

REF: 2.12. The Driving Mechanism of Plate Tectonics

17. In what ways does plate tectonics theory have economic applications?

ANS:

By understanding the geologic history of a region, geologists can predict whether it will be a worthwhile place to search for petroleum or ore deposits.

PTS: 1

REF: 2.13. Plate Tectonics and the Distribution of Natural Resources

PTS: 1 REF: 2.7. Magnetic Reversals and Seafloor Spreading

6. Radiometric dating shows that the oldest ocean crust is _____ years old, and the oldest continental crust is _____ years old.

ANS: 180 million, 3.96 billion

PTS: 1 REF: 2.7. Magnetic Reversals and Seafloor Spreading

7. At deep sea trenches, _____ is subducted back into the _____.

ANS: lithosphere, mantle

PTS: 1 REF: 2.9. The Three Types of Plate Boundaries

8. At mid-oceanic ridges, hot magma rises from the _____ and forms new _____.

ANS: mantle, seafloor

PTS: 1 REF: 2.9. The Three Types of Plate Boundaries

PTS: 1

REF: 2.9. The Three Types of Plate Boundaries

14. Volcanoes are found at these two types of plate boundaries: _____ and _____.

ANS:

divergent, convergent

convergent, divergent

PTS: 1

REF: 2.9. The Three Types of Plate Boundaries

15. The type of plate boundary that runs through California is called _____, and the name of this plate boundary is _____.

ANS: transform, the San Andreas Fault

PTS:

ANS: B PTS: 1 REF: various

2. Plate tectonic processes have influenced which of the following?
- the distribution of earthquakes and volcanoes
 - the locations of ore deposits and mountain systems
 - climatic patterns and ocean circulation
 - the geographic distribution, evolution, and extinction of life forms
 - all of these

ANS: E PTS: 1 REF: various

3. The first person to suggest that all of the continents had originally been joined together as the supercontinent Pangaea was who?
- Alexander du Toit, 1937
 - Frank Taylor, 1910
 - Alfred Wegener, 1912
 - Snider- Pelligrini, 1858
 - Harry Hess, 1962

ANS: C PTS: 1 REF: 2.2. Early Ideas About Continental Drift

- the South Pole and contiguous
- e. the glacial deposits indicated that climate can change dramatically over geologic time

ANS: D PTS: 1 REF: 2.3. What is the Evidence for Continental Drift?

8. That the northern continents were once joined and located along the equator was shown by what?
- the coal-age plant fossils of North America and Europe
 - the *Glossopteris* flora
 - the distribution of mountain ranges
 - the distributions of Permian and Triassic reptiles
 - the distributions of northern hemisphere glacial tillites

ANS: A PTS: 1 REF: 2.3. What is the Evidence for Continental Drift?

9. Which of the following was not evidence for Wegener's continental drift hypothesis?
- glacial deposits of Gondwana continents
 - fit of African and South American shorelines
 - paleomagnetic striping of the oceanic crust
 - fossil plant and animal distributions
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- b. glacial striations showed that all glaciers on each continent had flowed from a central location
- c. fossil plants indicated tropical climate in the northern continents
- d. a single continent in high latitudes was more sensible than low latitude glaciation on several continents AND glacial striations showed that all glaciers on each continent had flowed from a central location
- e. a single continent in high latitudes was more sensible than low latitude glaciation on several continents AND fossil plants indicated tropical climate in the northern continents

ANS: D PTS: 1 REF: 2.3. What is the Evidence for Continental Drift?

14. Fossil evidence linking the Gondwana continents includes which animal fossils?
- a. lake-dwelling *Mesosaurus* and large land-dwelling reptile *Lystrosaurus* and *Cynognathus*
 - b. freshwater *Mesosaurus* and dinosaurs *Brontosaurus* and *Tyrannosaurus*
 - c. freshwater crocodiles and the large amphibian *Eryops*
 - d. reptile *Dimetrodon* and the first bird *Archaeopteryx*
 - e. lake

- c. the magnetic minerals in rocks disrupt the Earth's magnetic field
- d. the magnetic minerals in a cooling lava point toward the north magnetic pole
- e. none of these

ANS: D PTS: 1 REF: 2.6. Paleomagnetism and Polar Wandering

20. Certain rock types can be used to determine the locations of past magnetic poles because ____.
- a. the Earth's magnetic poles have reversed many times during its history
 - b. the magnetic poles and geographic poles differ slightly
 - c. iron-bearing minerals align themselves in the direction of the current magnetic field when the rock cools below the Curie point
 - d. lava flows in Europe all showed that the continent was once located in the southern hemisphere
 - e. the north magnetic poles of each continent are identical for each geological period

ANS: C PTS: 1 REF: 2.6. Paleomagnetism and Polar Wandering

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- a. radiometric dating of oceanic basalts and sequences from continents
- b. the unusually thin layer of oceanic sediments and ages of contained fossils
- c. the existence of the same magnetic anomaly patterns in all ocean basins
- d. radiometric dating of oceanic basalts and sequences from continents AND the unusually thin layer of oceanic sediments and ages of contained fossils
- e. all of these

ANS: D PTS: 1 REF: 2.7. Magnetic Reversals and Seafloor Spreading

26. The fact that no oceanic crust older than 180 million years (Jurassic) has been found indicates what?
- a. The break-up of Pangaea must have occurred before the Jurassic Period.
 - b. The ocean basins must be older than Jurassic age.
 - c. The movement of continents must have begun no earlier than the Jurassic Period.
 - d. The break-up of Pangaea must have begun at about the same time as these oldest basalts were formed.
 - e. The movement of continents must have begun no earlier than the Jurassic Period AND The break-up of Pangaea must have begun at about the same time as these oldest basalts were formed.

31. Lithospheric plates move on the Earth's surface because ____.
- a. warm mantle ascends at ridges and cool mantle descends at subduction zones
 - b. convection occurs only in the asthenosphere
 - c. cool mantle ascends at ridges and warm mantle descends at subduction zones
 - d. warm mantle ascends at ridges and cool mantle descends at subduction zones AND convection occurs only in the asthenosphere
 - e. convection occurs only in the asthenosphere AND cool mantle ascends at ridges and warm mantle descends at subduction zones

ANS: A

PTS: 1

REF: 2.7. Magnetic Reversals and Seafloor Spreading

32. Old, cold, and dense oceanic crust is ____.
- a. created at spreading ridges
 - b. found closest to continental margins
 - c. destroyed at subduction zones
 - d. eventually becomes incorporated into continental crust
 - e. always found on plate margins

37. Geologists locate plate boundaries ____.
- a. at continental margins
 - b. at volcanoes
 - c. by earthquake epicenters
 - d. at volcanoes AND by earthquake epicenters
 - e. All of these

ANS: C

PTS: 1

REF: 2.9. The Three Types of Plate Boundaries

38. The forces operating at continent-continent convergent boundaries are ____.
- a. transpressional
 - b. compressional
 - c. tensional
 - d. lateral shearing
 - e. compressional and tensional

ANS: B

PTS: 1

REF: 2.9. The Three Types of Plate Boundaries

- a. is a line of active volcanoes.
- b. is a line of extinct volcanic structures.
- c. results from volcanism along a mid-ocean ridge.
- d. records the direction of plate motion.

ANS: D

PTS: 1

REF: 2.10. Hot Spots and Mantle Plumes

44. Plate tectonics have affected biological evolution by ____.
- a. causing global climatic change with joining together or breaking apart of large landmasses
 - b. causing more or fewer habitats to develop as continental masses come together or separate
 - c. forming geographic barriers
 - d. forming geographic corridors
 - e. all of these

ANS: E

ANS: T PTS: 1 REF: 2.8. Plate Tectonics: A Unifying Theory

6. Many seemingly unrelated geologic features and events are interrelated by plate tectonics processes.

ANS: T PTS: 1 REF: 2.8. Plate Tectonics: A Unifying Theory

7. Active volcanism on Venus indicates that the planet has a geologically active interior.

ANS: F PTS: 1 REF: Geo-Insight. Tectonics of the Terrestrial Planets

8. Features associated with ancient continental rift zones include andesite volcanoes and strike slip faulting.

ANS: F PTS: 1 REF: 2.9. The Three Types of Plate Boundaries

18. Slab pull and ridge push facilitate the movement of plates.

ANS: T

PTS: 1

REF: 2.12. The Driving Mechanism of Plate Tectonics