Clues in Motion

Use Earth's patterns to explain plate movement and hazards.

ESS.6 "Obtain, evaluate, and communicate information about the theory of plate tectonics. a. Construct an evidence-based explanation of continental drift, basing conclusions on comparisons of coastlines, fossils, ages of rocks, climate..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three different clues that continents were once joined. Circle evidence of plates moving today, then number the two places where the passage compares earthquake or volcanic hazards.

Evidence Across an Ocean

(1) On a globe, the continental shelves of South America and Africa fit more closely than their present shorelines. Matching fossils of the freshwater reptile Mesosaurus occur on both continents, though it could not have crossed a wide ocean. Rock layers of similar ages and compositions also line up across the Atlantic. Ancient glacial scratches in now warm regions of both continents point to ice that once spread across connected land. Together, these clues support continental drift: the continents were once joined. A coastline match alone is weak evidence because erosion and changing sea levels reshape shores.

(2) Earth's crust and the rigid uppermost mantle form the lithosphere, which is broken into moving plates. Beneath it, the softer, slowly flowing asthenosphere is part of the mantle. At a mid-ocean ridge, plates separate, magma cools into new oceanic crust, and iron-bearing minerals record matching magnetic stripes on opposite sides. Those stripes record reversals of Earth's magnetic field and show seafloor spreading. At a convergent boundary, one oceanic plate may sink beneath another, producing earthquakes and a chain of volcanic islands. At a transform boundary, plates slide past along faults, causing earthquakes but usually not volcanoes.

(3) The Aleutian Islands of Alaska formed above a subduction zone, so nearby communities face both strong earthquakes and volcanic eruptions. In contrast, Alabama has no active plate boundary and no active volcanoes, although earthquakes can occur on faults within a plate. Hawaii's volcanoes sit over a hotspot, where hot mantle material rises beneath the moving Pacific Plate, not at a plate boundary. Earthquake risk depends on more than a boundary label: the location of active faults, past quakes, and local ground conditions matter. These patterns help scientists compare hazards without claiming they can predict an exact earthquake date.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why would matching coastlines alone be weak evidence for continental drift? Give two other clues from the passage that strengthen the explanation.

2. How do matching magnetic stripes on opposite sides of a mid-ocean ridge support the claim that plates move apart?

3. Compare the earthquake and volcanic hazards near the Aleutian Islands with those in Alabama. Use each area's tectonic setting to explain the difference.

4. Why can both transform and oceanic convergent boundaries have earthquakes, while a chain of volcanic islands is associated with only one of them?

3 YOUR TURN

Your own words

Scientists find the same ancient freshwater-reptile fossils and matching rock layers of the same age on opposite sides of an ocean basin. They also find matching magnetic stripes on both sides of a ridge in the basin. In four sentences, explain how the basin formed, use two different kinds of evidence to support your explanation, and predict how the basin may change if current plate motion continues.

Clues in Motion

PART 1 · READ AND MARK

Underline three different clues that continents were once joined. Circle evidence of plates moving today, then number the two places where the passage compares earthquake or volcanic hazards. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why would matching coastlines alone be weak evidence for continental drift? Give two other clues from the passage that strengthen the explanation.	**Erosion and changing sea levels reshape shores. Matching Mesosaurus fossils and rock layers of similar ages and compositions provide additional evidence.**
2	How do matching magnetic stripes on opposite sides of a mid-ocean ridge support the claim that plates move apart?	**New crust forms at the ridge and moves outward on both sides, recording matching patterns of magnetic-field reversals.**
3	Compare the earthquake and volcanic hazards near the Aleutian Islands with those in Alabama. Use each area's tectonic setting to explain the difference.	**The Aleutians lie above a subduction zone and face both strong earthquakes and volcanic eruptions. Alabama has no active plate boundary or active volcanoes, but earthquakes can still occur on faults within a plate.**
4	Why can both transform and oceanic convergent boundaries have earthquakes, while a chain of volcanic islands is associated with only one of them?	**Plates sliding past each other at transform faults can cause earthquakes but usually not volcanoes. At an oceanic convergent boundary, one plate sinks beneath another, producing earthquakes and a volcanic island chain.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The two continents were once connected, and the ocean basin formed as their plates moved apart. The shared freshwater-reptile fossils and matching rock layers support this claim because they could have formed on connected land. Matching magnetic stripes on either side of the ridge show that new crust has formed as the seafloor spread. If the plates continue separating, the basin will widen over time.

Accept other passage-supported evidence in question 1, including glacial scratches. For Your Turn, look for a claim about separation, evidence from both the continents and seafloor, and a prediction consistent with continued spreading.