Plates Leave Clues

Trace how plate motion shapes landforms, hazards, and resources.

ESS.2B.4 "Research, analyze, and explain the origin of geologic features and processes that result from plate tectonics, including sea floor spreading, earthquake activity, volcanic activity, mountain building, and location of natural resources."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline descriptions of plate motion and circle the landforms, hazards, and resources each motion helps produce so you can trace causes to effects.

Three Boundaries, Different Clues

1. At Iceland, the Mid-Atlantic Ridge rises above the ocean. The North American and Eurasian plates pull apart along this boundary. Hot mantle rock rises into the gap, melts partly as pressure drops, and feeds eruptions. When lava cools, it forms new oceanic crust, a process called sea floor spreading. Moving away from the ridge, the sea floor is generally older because new rock keeps forming at the center. Pulling and breaking rock also causes shallow earthquakes. Near Iceland's volcanic zones, underground water heats against hot rock. Wells can bring this heat to the surface for buildings and electricity.

2. On the western edge of South America, the oceanic Nazca Plate moves beneath the continental South American Plate. This sinking, called subduction, creates a deep ocean trench offshore. Friction can lock the plates; when they slip, powerful earthquakes shake the coast. As the Nazca Plate sinks, released water helps mantle rock melt. Magma rises, feeding volcanoes in the Andes. Compression also thickens and lifts the continental crust, building mountains. Hot fluids linked to magma can carry dissolved metals into cracks. As the fluids cool, copper minerals may form concentrated deposits that people can mine.

3. Farther north, the Himalayas show a different way to build mountains. The Indian and Eurasian continental plates collide. Neither plate sinks readily because continental crust is relatively buoyant. Instead, rocks crumple and thicken, lifting high peaks, while stored stress produces earthquakes. This collision does not create a long chain of subduction volcanoes like the Andes. Plate boundaries therefore leave different sets of clues: new crust and shallow quakes at a spreading ridge, volcanoes and deep as well as shallow quakes near subduction, or high mountains and quakes at a continental collision. The same processes help explain why geothermal heat and some metal deposits cluster where they do.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why is the sea floor generally older farther from the Mid-Atlantic Ridge?

2. How does the sinking Nazca Plate help produce both Andes volcanoes and copper deposits?

3. How do the Andes and Himalayas form mountains in different ways, and why does only one have a long chain of subduction volcanoes?

4. Why might a company seek geothermal energy near Iceland's volcanic zones but copper deposits in parts of the Andes?

3 YOUR TURN

Your own words

A research team finds young volcanic islands above a boundary where one oceanic plate sinks beneath another. In four sentences, predict two geologic hazards and one useful resource, explain each using plate motion, and name one observation that could test a prediction.

ANSWER KEY

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HIGH SCHOOL · ESS.2B.4

PART 1 · READ AND MARK

Underline descriptions of plate motion and circle the landforms, hazards, and resources each motion helps produce so you can trace causes to effects. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why is the sea floor generally older farther from the Mid-Atlantic Ridge?	**The plates pull apart, and lava forms new crust at the ridge. Older crust moves away as more new crust forms.**
2	How does the sinking Nazca Plate help produce both Andes volcanoes and copper deposits?	**Water released from the sinking plate helps mantle rock melt. Rising magma feeds volcanoes, while hot fluids linked to magma can deposit copper minerals in cracks.**
3	How do the Andes and Himalayas form mountains in different ways, and why does only one have a long chain of subduction volcanoes?	**At the Andes, an oceanic plate sinks beneath a continent while compression thickens and lifts the crust. In the Himalayas, two continental plates collide and crumple; neither readily sinks to produce a chain of subduction volcanoes.**
4	Why might a company seek geothermal energy near Iceland's volcanic zones but copper deposits in parts of the Andes?	**Hot rock near Iceland's volcanic zones heats underground water that wells can use for energy. In the Andes, hot fluids linked to magma can leave concentrated copper minerals.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Where one oceanic plate sinks beneath another, locked plates could slip and cause strong earthquakes. Water released by the sinking plate could help mantle rock melt, feeding volcanoes that build islands. Hot rock near those volcanoes could heat groundwater, making geothermal energy a possible resource. Researchers could test the volcanic prediction by checking for young volcanic rock along the island chain.

Accept other well-supported resources or observations if the student explains the link to subduction. The open response should predict two hazards, identify one resource, and give a testable observation in four sentences.