Rock Age Trails

Use crust ages to evaluate plate tectonic movement.

HS-ESS1-5 "Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each statement that describes an age pattern, and circle each word or phrase that names a plate process, so you can connect rock-age evidence to crust movement.

A Moving Record of Earth's Crust

1. Earth's outer rocky layer is broken into plates that include continental crust and oceanic crust. At a mid-ocean ridge, hot material rises, cools, and forms new basaltic oceanic crust. The seafloor then moves away from the ridge on both sides as plates spread. Because crust begins at the ridge and travels outward, rock samples collected near a ridge are generally youngest. Samples from greater distances are older. This age pattern is evidence of seafloor spreading, not evidence that every ocean basin formed at the same time. Older oceanic crust can eventually be recycled where one plate sinks beneath another.

2. Continents preserve a different, longer record because continental crust is less commonly recycled than oceanic crust. In North America, very old rocks occur in and around the Canadian Shield, an ancient continental core. Moving away from that core, many regions contain younger crust that was added during collisions, volcanic activity, and other past plate interactions. This broad pattern does not mean every rock becomes steadily younger in every direction. Local faults, intrusions, erosion, and later deformation can complicate a map. Still, radiometric dates across large areas show that the central ancient core is older than much of the surrounding continental crust.

3. Rock ages are evidence only when they are connected to a process. Suppose scientists sample a line across an ocean basin and find 2-million-year-old basalt near a ridge, 18-million-year-old basalt farther away, and 47-million-year-old basalt near a trench. The ordered ages fit crust forming at the ridge and moving outward over time. A different explanation, such as random volcanic eruptions at each site, would not predict this regular distance-age relationship. Scientists evaluate plate tectonics by asking whether one model explains multiple observations, including rock ages, locations, and features such as ridges, trenches, and zones of earthquakes.

2 ANSWER WITH EVIDENCE

Use the passage

1. Use the process at a mid-ocean ridge to explain why oceanic rock samples farther from the ridge are usually older.

2. How does crust recycling help explain why oceanic crust does not continue getting older forever?

3. Describe the broad age pattern of North American continental crust and identify the plate-history explanation for it.

4. Which observation better supports seafloor spreading: oceanic rocks with the same age at all distances from a ridge, or rocks that become older with distance from a ridge? Explain.

3 YOUR TURN

Your own words

A continent has 2.7-billion-year-old granitic rocks in its central Highlands, 1.4-billion-year-old rocks to the east and west, and 300-million-year-old rocks near its outer edges. In exactly 3 sentences, explain how past plate interactions could produce this pattern and state one reason the pattern might not be perfectly regular everywhere.

ANSWER KEY

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HIGH SCHOOL · HS-ESS1-5

PART 1 · READ AND MARK

Underline each statement that describes an age pattern, and circle each word or phrase that names a plate process, so you can connect rock-age evidence to crust movement. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Use the process at a mid-ocean ridge to explain why oceanic rock samples farther from the ridge are usually older.	**New oceanic crust forms at the ridge, then spreads outward. Crust farther away formed earlier and has traveled longer, so it is older.**
2	How does crust recycling help explain why oceanic crust does not continue getting older forever?	**At subduction zones, old oceanic crust sinks and is recycled, so it is removed instead of remaining at the surface indefinitely.**
3	Describe the broad age pattern of North American continental crust and identify the plate-history explanation for it.	**The Canadian Shield and nearby central core contain very old crust, while much surrounding crust is younger. Past collisions, volcanism, and other plate interactions added younger crust farther from the core.**
4	Which observation better supports seafloor spreading: oceanic rocks with the same age at all distances from a ridge, or rocks that become older with distance from a ridge? Explain.	**Rocks that become older with distance from a ridge better support seafloor spreading because new crust forms at the ridge and moves outward over time.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The central Highlands likely contain an ancient continental core. The younger rocks toward both edges could have been added later by plate collisions, volcanism, or other plate interactions. This interpretation fits the broad age pattern, although local deformation or intrusions could make individual ages less regular.

Accept explanations that connect increasing ocean-crust age away from a ridge to new crust formation and spreading. For continental crust, accept an ancient central core with younger crust added through past plate interactions, while recognizing that local geologic events can complicate the pattern.