Crust Age Clues

Use rock ages and plate motion to reconstruct crustal history.

ES.ESS1.5 "Evaluate patterns in 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 the ages at equal distances on opposite sides of the ridge, circle their motion directions, and number two passage sentences that help explain why old oceanic crust can disappear while old continental crust remains.

A Survey Across the Seafloor

1. At a mid-ocean ridge, molten rock rises and cools into new basalt. Scientists date minerals in basalt to estimate when that section of oceanic crust formed. Satellites also track how points on plates move today. These measurements do not record ancient motion directly, so scientists compare them with rock ages to test whether a proposed history fits.

2. Imagine a survey across an ocean basin with a ridge near its center and a trench beside a continent to the west. The table reports ages of dated igneous rocks and present-day plate motion at five sites. Distances are measured from the ridge. A matching pair of sites lies on opposite sides of it.

ROCK AGES AND CURRENT PLATE MOTION

Site	Rock	Age (million years)	Current plate motion
Ridge axis	Basalt	Less than 1	Plates move apart
300 km west of ridge	Basalt	15	West, 3 cm/year
300 km east of ridge	Basalt	15	East, 3 cm/year
1,800 km west of ridge, near trench	Basalt	75	West, 3 cm/year
Continent west of trench	Granite	950	East, 1 cm/year

3. At a trench, oceanic lithosphere can sink into the mantle, removing seafloor. Less dense continental crust is much less likely to sink. Granite on land may thus preserve a far older formation age than basalt on a nearby seafloor. Today's plate speeds cannot tell scientists exactly how fast plates moved millions of years ago.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the ages and current motions of the two sites 300 km from the ridge support the idea that crust formed at the ridge and moved apart?

2. Use the three basalt ages west of or at the ridge to explain what happened to oceanic crust as it moved west.

3. Near the trench, do the current motions suggest that the oceanic and continental plates are moving together or apart? How does this help explain where old seafloor can go?

4. The sampled continental granite is 950 million years old, while the oldest sampled basalt is 75 million years old. How does plate tectonics help explain this difference?

3 YOUR TURN

Your own words

At a different, former ridge, basalt 200 km east of the ridge is 10 million years old, and basalt 800 km east is 40 million years old. GPS now shows the eastern plate moving west, toward the former ridge. In four or five sentences, evaluate whether the ages and current motion support a history of unchanging plate motion, suggest a possible change, and name evidence that could test your idea.

ANSWER KEY

Crust Age Clues

HIGH SCHOOL · ES.ESS1.5

PART 1 · READ AND MARK

Underline the ages at equal distances on opposite sides of the ridge, circle their motion directions, and number two passage sentences that help explain why old oceanic crust can disappear while old continental crust remains. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the ages and current motions of the two sites 300 km from the ridge support the idea that crust formed at the ridge and moved apart?	**Both basalts are 15 million years old, and their plates now move in opposite directions away from the ridge. That pattern supports formation at the ridge followed by movement apart.**
2	Use the three basalt ages west of or at the ridge to explain what happened to oceanic crust as it moved west.	**Basalt is less than 1 million years old at the ridge, 15 million years old 300 km west, and 75 million years old near the trench. Crust farther west formed earlier and has moved away from the ridge.**
3	Near the trench, do the current motions suggest that the oceanic and continental plates are moving together or apart? How does this help explain where old seafloor can go?	**They are moving together: the oceanic plate moves west and the continental plate moves east. At the trench, oceanic lithosphere can sink into the mantle, removing old seafloor.**
4	The sampled continental granite is 950 million years old, while the oldest sampled basalt is 75 million years old. How does plate tectonics help explain this difference?	**Oceanic crust forms at ridges and can later sink at trenches. Continental crust is less likely to sink, so granite can remain exposed much longer.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The older basalt is farther east, a pattern consistent with crust moving east away from the former ridge when it formed. GPS now shows the eastern plate moving west, so an unchanging eastward-motion history does not fit both kinds of evidence. The plate may have changed direction after the basalt formed. Ages from more sites and motion measurements across the former ridge could test that idea.

Accept explanations that connect increasing basalt age with distance from the ridge and distinguish past movement inferred from rocks from motion measured today. For Part 3, a change in direction is a possible explanation, not a proven event.