# Plates Leave Clues

Use landforms and earthquakes to explain plate motion.

**ESS.6.b** "Construct an explanation, based on evidence, of tectonic plate movement, types of plate boundaries, and how boundary type relates to specific tectonic features, including mountain ranges, earthquakes, volcanism, volcanic islands, hotspots..."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline phrases that describe plate motion, circle the features that result, and give matching numbers to at least three motion-and-feature pairs.

### What the Surface Reveals

1. GPS stations on opposite sides of Iceland drift apart by a few centimeters each year. Iceland sits on the Mid-Atlantic Ridge, where two plates pull away from each other. Hot mantle rock rises into the gap. As pressure drops, some of that rock melts. Magma cools into new ocean crust, building a mid-ocean ridge, and some reaches the surface as lava. Small earthquakes occur as the stretched crust cracks. Iceland also lies above a hotspot, a place where unusually hot mantle rises beneath a plate. That extra supply of magma helps raise part of the ridge above sea level as a volcanic island.

2. Near the Mariana Islands, the Pacific Plate sinks beneath the oceanic Philippine Sea Plate along a deep trench. As the descending plate releases water, nearby mantle rock melts. Rising magma feeds a curved chain of volcanic islands, while sudden slips where the plates meet cause strong earthquakes. Farther west, India and Eurasia meet in a different way: two continental masses collide. Because continental crust resists sinking deeply into the mantle, it crumples and thickens, raising the Himalayas. Earthquakes shake both regions, but the Mariana Islands have active volcanoes while the Himalayas do not. The kind of crust involved matters.

3. Along California's San Andreas Fault, two plates slide horizontally past each other. Rocks may lock for years, then lurch, producing earthquakes. This transform boundary does not normally make a ridge or a volcanic arc because it neither opens a gap nor forces one plate under another. Away from plate boundaries, the Hawaiian Islands tell another motion story. As the Pacific Plate moves over a relatively fixed hotspot, volcanoes form one after another. The youngest active volcanoes lie near the hotspot; older islands farther away record where the plate used to be. Together, earthquake patterns, volcano locations, and measured plate motion help reveal what plates are doing.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. How do the GPS measurements and small earthquakes near Iceland support an explanation for the growth of a mid-ocean ridge?

2. Both the Mariana Islands and the Himalayas have earthquakes. Why does one region also have volcanic islands while the other has high mountains?

3. Why can the San Andreas Fault produce earthquakes without producing the volcanic arc found near the Mariana Islands?

4. Volcanic islands form near both the Mariana Islands and Hawaii. What evidence in the passage helps you tell their plate processes apart?

## 3 YOUR TURN

Your own words

At a newly surveyed ocean-floor fracture, markers on opposite sides shift sideways, earthquakes cluster along the fracture, and rock ages do not form a young central strip. In four or five sentences, identify the most likely boundary type, explain two observations using evidence from the passage, and contrast this site with a boundary that makes new crust.

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## PART 1 · READ AND MARK

Underline phrases that describe plate motion, circle the features that result, and give matching numbers to at least three motion-and-feature pairs. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | How do the GPS measurements and small earthquakes near Iceland support an explanation for the growth of a mid-ocean ridge? | **GPS stations show the plates moving apart. The stretched crust cracks, causing small earthquakes, while magma rises into the gap and cools into new crust at the ridge.** |
| 2 | Both the Mariana Islands and the Himalayas have earthquakes. Why does one region also have volcanic islands while the other has high mountains? | **Near the Mariana Islands, one oceanic plate sinks beneath another, leading to melting and volcanic islands. At the Himalayas, colliding continental crust crumples and thickens into mountains rather than sinking deeply.** |
| 3 | Why can the San Andreas Fault produce earthquakes without producing the volcanic arc found near the Mariana Islands? | **Plates slide past each other at the San Andreas Fault, where locked rocks can suddenly slip. Unlike the Mariana boundary, neither plate sinks and triggers melting that feeds a volcanic arc.** |
| 4 | Volcanic islands form near both the Mariana Islands and Hawaii. What evidence in the passage helps you tell their plate processes apart? | **The Mariana Islands lie beside a trench where one oceanic plate sinks beneath another. Hawaii is away from plate boundaries, and its islands grow older farther from the hotspot as the Pacific Plate moves.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

This ocean-floor fracture is most likely a transform boundary. The sideways shift of markers shows that the plates slide past each other, as they do along California's San Andreas Fault. Rocks can lock and then slip, which explains the clustered earthquakes. A divergent boundary like the one at Iceland makes new crust at a ridge, with the youngest rock near its center. Because this site has no young central strip, spreading is a poorer explanation.

Accept explanations that connect the sideways motion and clustered earthquakes to a transform boundary. The contrast should explain why the missing young central strip makes a divergent boundary less likely.