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Warm-Up | Characteristics of the Seafloor

Lesson Question

What is the process of seafloor spreading?

Lesson Goals

Describe the process of seafloor spreading.

Describe evidence that supports seafloor spreading.

Explain what occurs at deep-ocean trenches.

Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

C mid-ocean ridge

A subduction zone

D deep-ocean trench

B seafloor spreading

A. a long area where one tectonic plate sinks beneath another

B. the process by which ocean crust spreads apart along each side of a mid-ocean ridge

C. an area in the ocean that has an upwelling of molten material associated with seafloor spreading

D. a deep canyon formed in the ocean at a subduction zone

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Continental Drift

In the early 1900s, Alfred Wegener wrote a book about the origins of the continents.

- Claimed that continents were one huge landmass called Pangaea
- Proposed that continents broke up due to continental drift

Plate Tectonics

Plate tectonics explains the formation, movement, and subduction of Earth's plates.

- Earth's lithosphere is made of sections called plates.
- Plates move constantly but slowly.
- Plates interact with one another at boundaries.
- Plate interaction creates landforms and causes geologic events.

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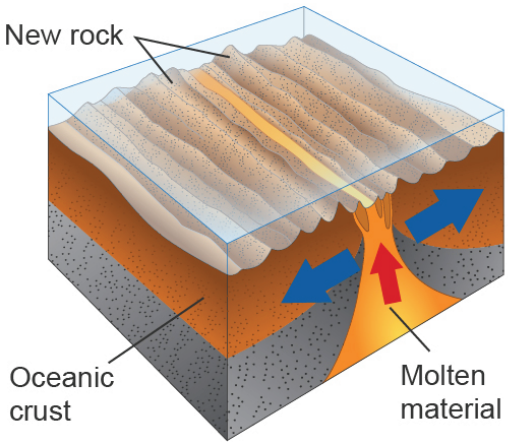
Slide 2

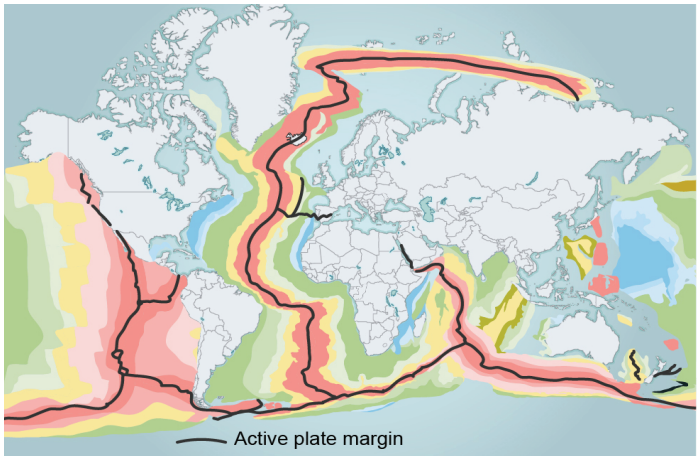
Seafloor Spreading

American geologist Harry Hess proposed the idea of **seafloor spreading**, which states that:

- the seafloor spreads along [mid-ocean ridges].
  - This process creates new ocean floor.
  - It also moves [continents].



Age of the Seafloor



- The land masses are white and gray in the map.
- The areas with color are actually the floor of Earth's [oceans].
- The black jagged lines represent the [mid-ocean] ridges.
- The colors represent the age of Earth's crust, with [red] being the youngest and [blue] being the oldest.

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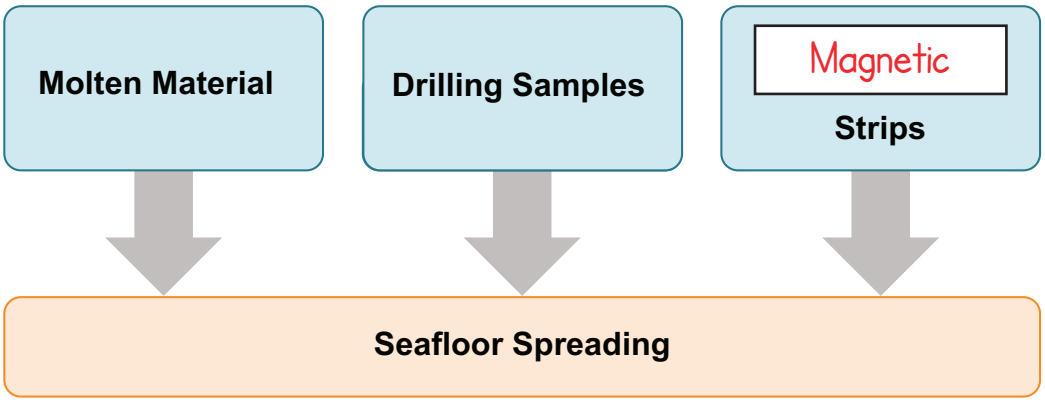
Steps of Seafloor Spreading

1. Crack forms in [oceanic] crust.
2. [Molten] rock rises up through crust.
3. New material pushes [older] rock away from ridge.
4. Molten rock [solidifies] at center of ridge.

Slide 5

Evidence for Seafloor Spreading



Molten Material

Scientists discovered that molten material comes from the mid-ocean [ridges].

- [Pillow-shaped] rocks form.
- Molten material makes new [crust].

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Drilling Samples

In 1968, the *Glomar Challenger* collected drilling samples from the [ocean] floor.

- Rocks closer to the center of mid-ocean ridges are always [younger] than those that are farther away.

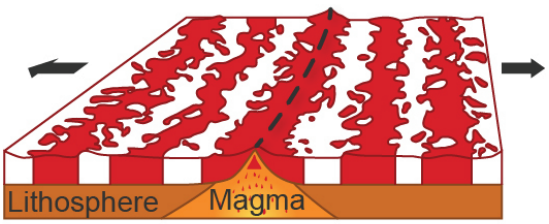
This evidence supported Hess's idea of seafloor spreading.

Slide 7

Magnetic Stripes in Ocean Rock

Rocks that make up the [seafloor] occur in a pattern of magnetized stripes.

- Stripes that have iron oriented [north] alternate with stripes that have iron oriented [south].
- This pattern is found on [both] sides of the ridge.



Normal magnetic polarity

Reversed magnetic polarity

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Slide 10

Deep-Ocean Trenches

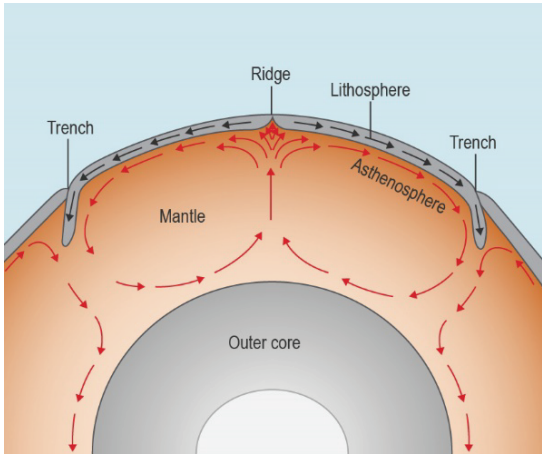
Although the [seafloor] is spreading, it does not continue to get wider and wider.

- **Deep-ocean trenches** occur at [subduction] **zones**.
- [Denser] plate slides under lighter plate.
- Crust material becomes [molten] rock.

Subduction and Seafloor Spreading in Action

Seafloor spreading and subduction work together.

- [Magma] rises.
- The [crust] forms and moves away.
- The crust sinks under [lighter] plate.
- The [ocean] floor changes.



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Summary | Characteristics of the Seafloor

Lesson Question

What is the process of seafloor spreading?

Answer

(Sample answer) The seafloor spreads through the solidification of the new molten rocks that rises up through the cracks in the oceanic crust and push the old rocks away from the ridge. The old rock sinks down into the mantle, where it melts and eventually forms new molten rock.

Slide 2

Review: Key Concepts

Seafloor spreading occurs at mid-ocean ridges, which form along cracks in oceanic crust.

Step 1	Step 2	Step 3	Step 4
• A crack forms in [oceanic] crust.	• Molten rock rises up through crust.	• New material pushes older rock away from ridge.	• Molten rock [solidifies] at center of ridge.

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Summary | Characteristics of the Seafloor

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Review: Key Concepts

Seafloor spreading and subduction are part of the process of plate tectonics.

Seafloor Spreading

- Occurs at mid-ocean ridges
- Creates new crust when magma rises and cools to form rock
- Pushes older crust away from ridge

Subduction

- Occurs at deep-ocean trenches
- Causes old, dense crust to sink under lighter crust
- Destroys older crust when it melts in the mantle

Use this space to write any questions or thoughts about this lesson.

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