Chapter 17 Plate Tectonics

17.2 Seafloor Spreading

In the mid 1900’s what was the ocean floor thought to have looked like in comparison to the continents?
FLAT

Help From Technology
What 2 advances changed that thinking?
ECHO SOUNDING METHODS LIKE SONAR
MAGNETOMETER

Sequence the steps in the use of sonar to map the ocean floor.
• sound waves travel through the water
• regular pulses of sound sent out from a device aboard a ship
• the time it takes waves to travel from and to the receiver on the boat is used to calculate distance
• sound waves reflected off ocean floor

1. REGULAR PULSES OF SOUND SENT OUT FROM A DEVICE ABOARD A SHIP
2. SOUND WAVES TRAVEL THROUGH THE WATER
3. SOUND WAVES REFLECTED OFF OCEAN FLOOR
4. THE TIME IT TAKES WAVES TO TRAVEL FROM AND TO THE RECEIVER ON THE BOAT IS USED TO CALCULATE DISTANCE

Ocean Floor Topography
With this new technology what features were found on the ocean floor? Describe these two features.
UNDERWATER MOUNTAIN CHAINS—CALLED OCEAN RIDGES
DEEP-SEA TRENCHES

What questions arose with these new findings?
WHAT FORMED THE UNDERWATER MOUNTAIN RIDGE?
WHAT IS THE SOURCE OF VOLCANOES ASSOCIATED WITH THESE MTS?
WHAT FORCES MADE THE TRENCHES SO DEEP?

Ocean Rocks and Sediments
Two discoveries from looking at Ocean Rocks
1. AGES OF SEAFLOOR ROCKS VARY IN AGE IN A PREDICATLE PATTERN: YOUNG NEAR RIDGE AND OLD NEAR TRENCHES

2. THICKNESS OF SEAFLOOR SEDIMENT IS MUCH LESS THAN EXPECTED. CONTINENTS HAVE MUCH MORE SEDIMENT THAN OCEANS. THICKNESS OF SEDIMENT INCREASES WITH DISTANCE FROM AN OCEAN RIDGE.
Magnetism

What is Paleomagnetism?

STUDY OF EARTH'S MAGNETIC RECORD.

Magnetic Reversal?

A CHANGE IN EARTH'S MAGNETIC FIELD.

Magnetic Symmetry

MATCHING MAGNETIC PATTERN ON EITHER SIDE OF OCEAN RIDGE

Seafloor Spreading

What did Harry Hess propose that brought more credibility to Alfred Wegener’s theory of continental drift?

THE THEORY OF SEAFLOOR SPREADING—NEW OCEAN CRUST IS FORMED AT OCEAN RIDGES AND DESTROYED AT DEEP-SEA TRENCHES.
- HOTTER LESS DENSE MAGMA IS FORCED TOARDS THE CRUST ALONG AN OCEAN RIDGE AND FILLS THE GAP.
- MAGMA HARDENS ADDING NEW OCEAN FLOOR.
- THIS PROCESS CONTINUES

New crust is formed where? OCEAN RIDGES

Then where is it destroyed? DEEP-SEA TRENCHES

Make an events chain concept map to show the sequence of steps involved in seafloor spreading using the following:

- magma pushed into ocean ridge
- plate move outward from ridge
- ocean ridge continues to spread
- crust eventually destroyed in trenches
- new crust formed
- magma forms

Magma forms

MAGMA PUSHED INTO OCEAN RIDGE

NEW CRUST IS FORMED

Plate moves outward from ridge

Ocean ridge continues to spread

CRUST IS EVENTUALLY DESTROYED IN THE TRENCHES
1. How do ocean ridges and deep-sea trenches support the theory of seafloor spreading?
   The theory of seafloor spreading states that ocean ridges are places where new ocean crust is formed; trenches are places where it is destroyed.

2. Explain how ocean-floor rocks and sediments are evidence of seafloor spreading.
   Both sediment thickness and the ages of ocean-floor rocks increase with distance from the ridge. These data are consistent with new crust forming at ridges and being destroyed at trenches.

3. Compare and contrast normal magnetic polarity and reversed magnetic polarity.
   Both are orientations of Earth's magnetic field. Normal fields have the same polarity as today's field. Reversed fields have the opposite polarity as today's field.

4. Refer to figure 17-11. Why are the magnetic bands in the eastern Pacific Ocean so far apart compared to the magnetic bands along the Mid-Atlantic Ridge?
   Magnetic bands in the eastern Pacific Ocean are farther apart than bands along the Mid-Atlantic Ridge because the rates of spreading in the Pacific Ocean are faster than those in the Atlantic Ocean.