Notes # _______ - Sea Floor Spreading

Mid Ocean Ridge - underwater chain of mountains that extends into all the Earth’s oceans. In some places, the ridge is above water, (Iceland), but mostly it is under hundreds of meters of water. Some areas have a steep sided valley called a rift valley that splits the tops of the mid ocean ridge.

After years of studying mid ocean ridges, a scientist named Harry Hess came up with the idea of sea floor spreading. In sea floor spreading, the sea floor spread apart along both sides of the mid ocean ridge adding new crust to the middle of the ridge and pushing old crust away. As a result, the ocean floors move like conveyor belts, carrying the continents along with them.

Along the ridge, molten material (magma) rises to the surface and erupts. At the same time, older crust is pushed away on either side of the ridge. As the molten material (magma) cools, it hardens into rock at the center of the ridge.

Evidence of Sea Floor Spreading
1. Rock shapes in the mid ocean ridge
2. Magnetic striping/banding
3. Rock samples from Drilling

1. Rock shapes at the mid ocean ridge - Scientists in a submersible discovered strange rocks shaped like pillows or squeezed-out toothpaste in the central valley of mid-ocean ridges. These rock formations only form when magma erupts underwater and hardens very quickly.
2. Magnetic striping/banding - One of Earth’s most important features is its magnetic field. This magnetic field is what causes the needle on a compass to point north. Earth’s magnetic poles sometimes reverse (on average ~4-5 times every million years) but it is not easily predicted. When magma erupts from the rift valley, the iron in the rocks lines up with the magnetic field at the time. This creates a striped pattern from the center of the ridge moving out that is the same on both sides.
3. **Rock samples from drilling** - Scientists collected rock samples by drilling into the ocean floor and calculated the age of the rocks in the samples. The scientists found that the youngest rocks were at the center of the ridge, and the rocks got older as you moved away from the ridge.

**Subduction at the Trenches**

Even though the sea floor is constantly spreading, the Earth is not getting bigger. Sea floor spreading is actually pushing the sea floor into deep sea trenches. At deep sea trenches, the ocean floor sinks back down into the mantle and is melted into magma. New ocean crust is hot, but as it moves away from the mid-ocean ridge it cools and becomes less dense. This older, denser rock sinks beneath the less dense continental crust.

Subduction and sea floor spreading are changing the size and shape of the oceans. The Mid Atlantic Ridge is spreading the Atlantic Ocean at a rate of about 1 inch per year. There are only a few small trenches in the Atlantic Ocean, so the Atlantic is spreading faster than it is being subducted. This means that the Atlantic Ocean is growing. In the Pacific Ocean, the East Pacific Rise is spreading at a rate of about 6 inches per year, but the Pacific Ocean is surrounded by deep sea trenches. This means that more ocean floor is being subducted than is being produced by sea floor spreading and the Pacific Ocean is shrinking.