

UNIT 4: Plate Tectonics and Earth's Interior

LAB 4-3: SEA-FLOOR SPREADING

INTRODUCTION: **Sea-floor spreading** is the hypothesis that the sea floor moves sideways away from the crest of a mid-ocean ridge. The two sides of the ridge are moving in opposite directions leaving a rift that is the site of submarine volcanic eruptions. Molten rock from a magma chamber only 1 or 2 kilometers below the central rift valley and stretching along the ridge feeds up into the spreading rift. The magma fills in the crack between the separating crustal plates. It is estimated that 20 volcanic eruptions occur each year along Earth's mid-ocean ridges and that every year 2.5 square kilometers of new sea floor is formed by this process. With a crustal thickness of 1 or 2 kilometers, this amounts to about 4 cubic kilometers of new ocean crust formed each year.

OBJECTIVE: Using ocean depth data, you will construct an ocean bottom profile. Using the profile, maps of the ocean floor and of Earth's tectonic plates, you will identify features of the ocean bottom in regions of diverging plate boundaries.

VOCABULARY:

sea-floor spreading:

seamount:

mid-ocean ridge:

continental shelf:

rift valley:

PROCEDURE A: Construct an ocean bottom profile on the graph titled "North Atlantic Ocean Bottom Profile" using the ocean depth data provided.

1. Using an appropriate scale, label the vertical axis depth in kilometers.
2. Label the following ocean floor features: Mid-Atlantic Ridge, Rift Valley, continental shelf, deep ocean floor and seamounts.
3. Referring to the "Tectonic Plates" map in the Appendix, draw arrows representing the directions in which the sea floor is moving.

PROCEDURE B: Complete the following procedures on the "Age of the Atlantic Sea Floor" map provided. The profile from Procedure A is along line AB.

1. Label the Mid-Atlantic Ridge.
2. Color the region of youngest rocks on the map. Use red pencil.
3. Referring to the "Tectonic Plates" map in the Appendix and your ocean bottom profile, draw arrows on either side of the Mid-Atlantic Ridge indicating the direction in which the sea floor is moving.

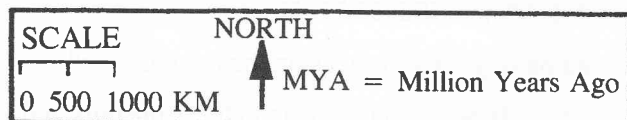
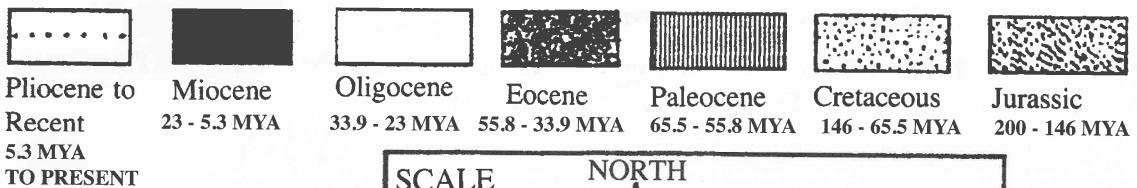
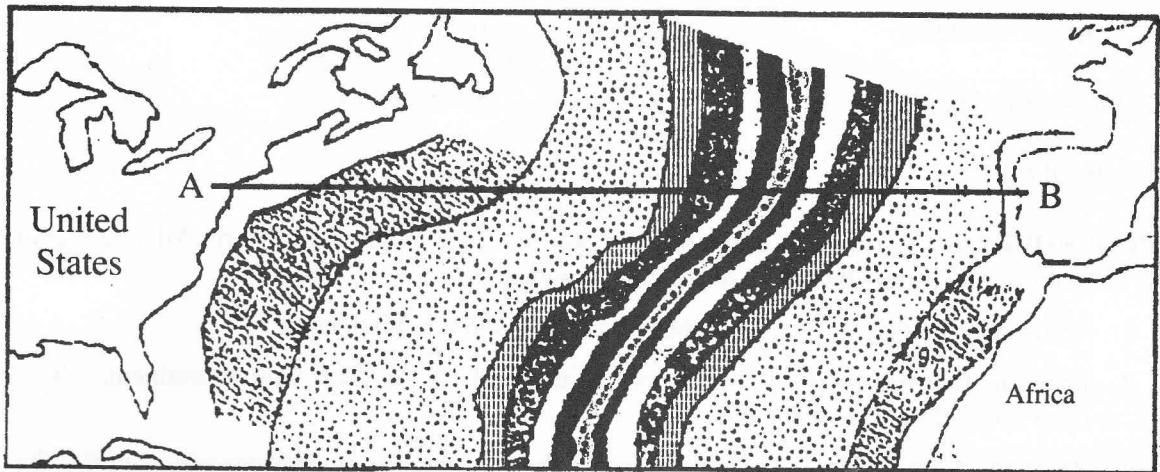
DATA CHART: NORTH ATLANTIC OCEAN BOTTOM PROFILE

DISTANCE (KM)	DEPTH (KM)
0	0
120	0.2
200	2.7
400	3.7
490	3.7
620	4.6
680	1.8
720	4.6
2000	4.6
2500	4.0
2900	2.7
3000	1.8
3090	4.0
3100	2.4
3200	2.9

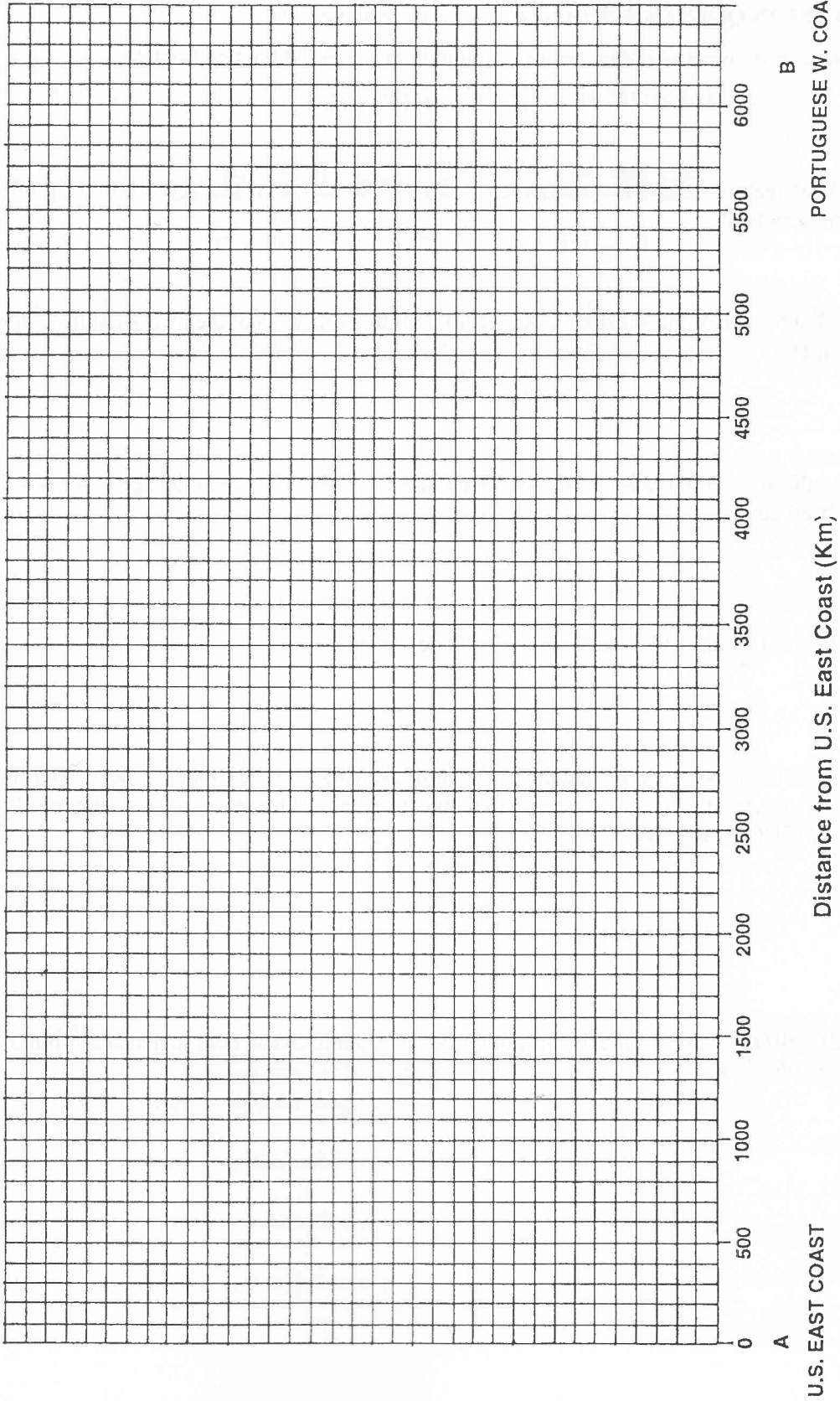
DISTANCE (KM)	DEPTH (KM)
3500	3.5
3600	3.7
3650	3.7
4025	4.0
4050	2.7
4100	+0.5
4125	2.2
4500	4.6
5000	5.0
5300	4.4
5800	3.7
6000	2.7
6075	0.2
6100	0
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Depths are at distances from the east coast of the United States. Data has been simplified for student use.

AGE OF THE ATLANTIC SEA FLOOR



NORTH ATLANTIC OCEAN BOTTOM PROFILE



DISCUSSION QUESTIONS: (*Answer in Complete Sentences*)

1. What prominent sea floor feature is found in the central Atlantic Ocean?
2. What feature is found at a distance of 4,100 kilometers on the ocean bottom profile you constructed?
3. What motion of the sea floor is responsible for the formation of the Mid-Atlantic Ridge's rift valley?
4. As distance from the Mid-Atlantic Ridge increases what change in the age of the sea floor is observed?
5. How old are the oldest rocks of the Atlantic sea floor?
6. The rate of plate movement along portions of the Mid-Atlantic Ridge has been determined to be 3 cm/yr. At this rate how long will it take the Atlantic Ocean to widen another one kilometer? (SHOW ALL WORK.)

CONCLUSION: Describe the features of the North Atlantic Ocean bottom that are forming due to sea floor spreading.