

NAME: _____ PERIOD: _____ DATE: _____

LAB PARTNERS: _____ LAB # 21

THE SPREADING SEAFLOOR

CLAIM: The seafloor is spreading at ocean ridges.

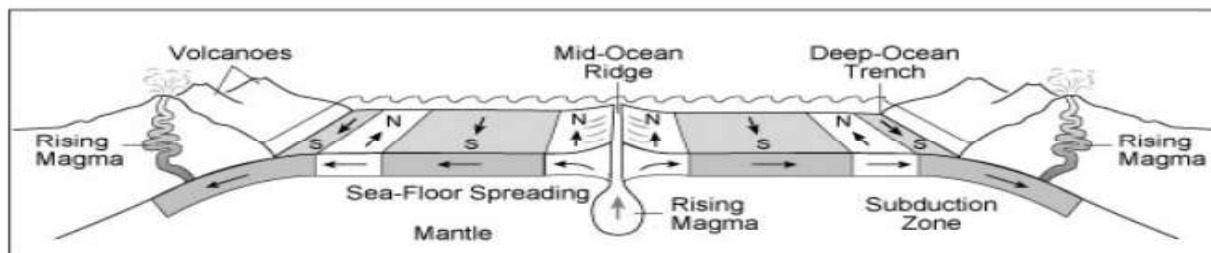
After completing this lab, you will be able to state **EVIDENCE** and **REASONING** to support this claim.

SEP'S: Throughout this lab, the following SEP's will be touched upon:

1. Asking questions
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking

PHENOMENA:

1. Seafloor spreading images from NASA
<https://visibleearth.nasa.gov/images/87189/seafloor-features-are-revealed-by-the-gravity-field/87189t>
2. Sea floor spreading/magnetic reversals
<https://www.youtube.com/watch?v=pHWceRySDb8> (0:24)
3. You Tube: Silfra Fissure
<https://www.youtube.com/watch?v=U3eT0qmPJbw> (3:02)
4. Look at the 2 diagrams, below.



Age (millions of years)	170	160	140	120	100	80	60	40	20	TODAY	0	20	40	60	80	100	120	140	160	170
Magnetic polarity	N	N	S	N	S	S	N	S	N	N	N	S	N	S	S	N	S	N	N	N

List 3-5 questions that you have after viewing these 2 diagrams:

QUESTIONS:

1. _____
2. _____
3. _____
4. _____
5. _____

INTRODUCTION

As molten rock cools and solidifies, the magnetic minerals in them are magnetized to the direction of Earth's magnetic field. They retain their magnetism, thus serving as permanent magnetic memories of the direction of the Earth's magnetic field in the place and the time they solidified.

It has been discovered that Earth's magnetic field has 2 states: it can point either toward the North Pole, as it is today ("normal polarity"), or toward the South Pole during periods of reversal of magnetic polarity ("reversed polarity").

A research vessel made crossings of the Mid-Atlantic Ridge, sampling rocks to determine their ages, and measuring the direction of the magnetic field captured in rock on the ocean floor. In this investigation, you will be using data to study the rate of seafloor spreading occurring at the ridge. You will also be creating a model to represent the spreading of the seafloor.

PART I: Model of sea floor spreading

On a piece of paper, measure and cutout a strip that is 12cm wide and 30cm long (see Figure 1). Cut 3 slits, about 8cm in length. One slit should be in the center and the other 2 should be 10cm from each end. Label the slits “A” and “B” at either end.

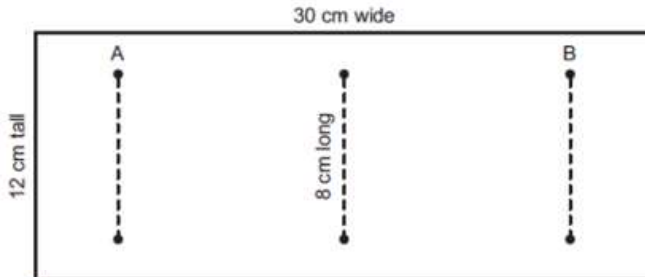


Figure 1.

1. See “Templates for plate strips” on page 125 and color areas labeled 1, 3, 5 and 7 in **BLUE**
2. Color in the areas labeled 2, 4 and 6 in **GREEN** (on the “Plate Strips”)
3. Cut out the plate strips
4. Place the plate strips back to back (with colored sides facing inward and with number 1 at the top) and tape the end as shown (at the end nearest #7)
5. Put the 2 plate strips up through the bottom of the center slit (see figure 2), keeping the taped edge at the bottom
6. Pull the “North American Plate” strip down through slit “A” and the “Eurasian Plate” strip through slit “B”
7. Push the strips up from below until you can see numbers 3, 4 and 5 on top of the base.

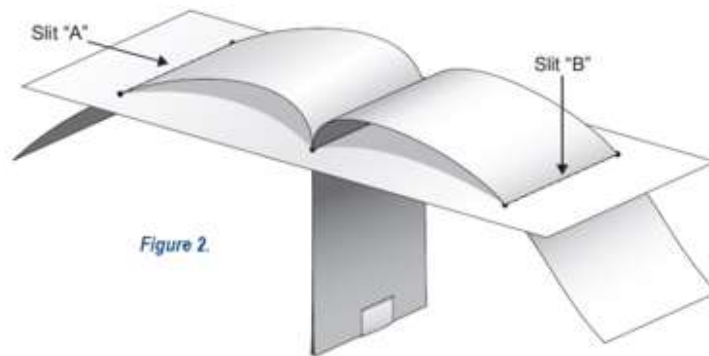


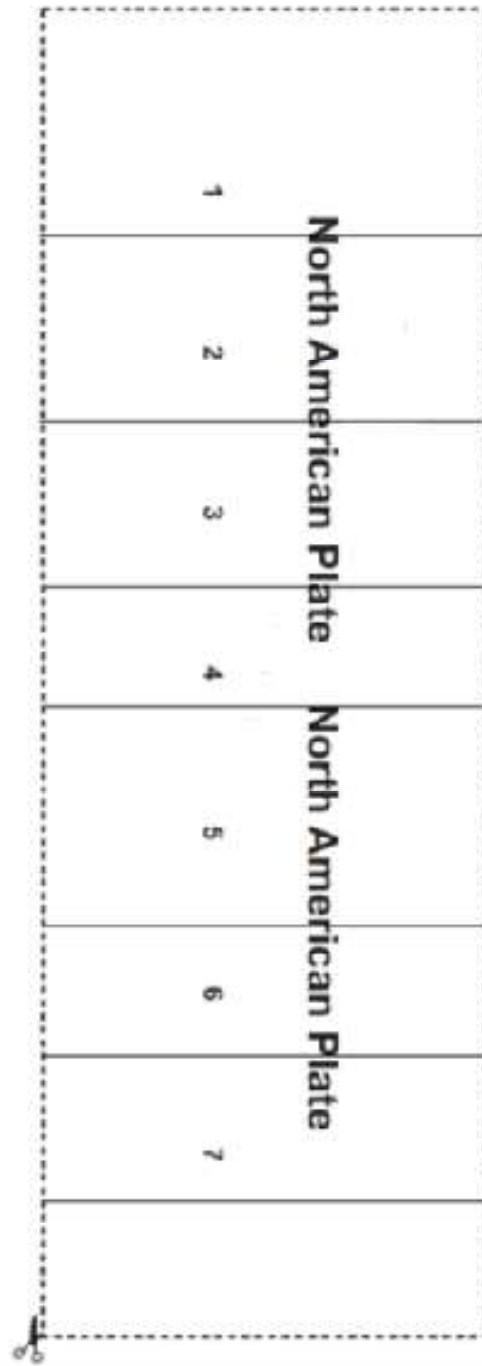
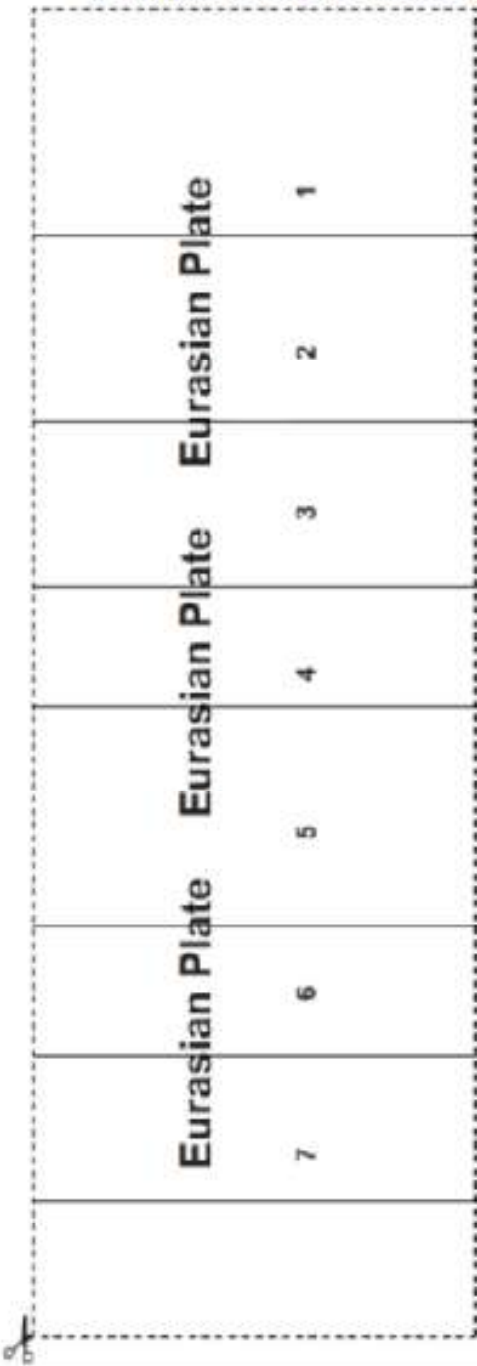
Figure 2.

QUESTIONS::

1. As you push the paper strips through the base, what process are you modelling?
2. What process is occurring at slits “A” and “B” as you pull the paper strips through the base?

Use this
page for
Part IV

Templates for plate strips



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PAGE**

PART II: Rate of seafloor spreading

1. Figure I shows the stations (A-F) where samples of oceanic crust were collected by a research vessel. Using the map scale, record in the data table, the **distances (km)** of stations A-F FROM THE CENTER OF THE RIDGE. Hint: Using a straight edge will help you determine the distance.
2. Using Figure 2, calculate and record the **ages of the rocks (millions of years)** at stations A-F. For example, at a distance of 20 kms, the rock would be approximately 1.6 million years old.
3. Calculate the **rate of movement in KILOMETERS PER YEAR**. This will involve some conversions as outlined, below:

Example:

If the distance from the ridge is 25km...

Using figure 2 gives us an age of 2 million years.

The rate of movement in km/yr would be determined by dividing the distance by the age:

$$25/2,000,000=.0000125 \text{ km/yr}$$

4. After you have calculated the rates for all six locations (A-F), calculate the AVERAGE rate of movement by adding the 6 "Rate of Movement" values and dividing by 6.

Station	A	B	C	D	E	F
Distance from Ridge (km)						
Age (Millions of years)						
Rate of Movement (km/yr)						
Average Movement (km/yr)						

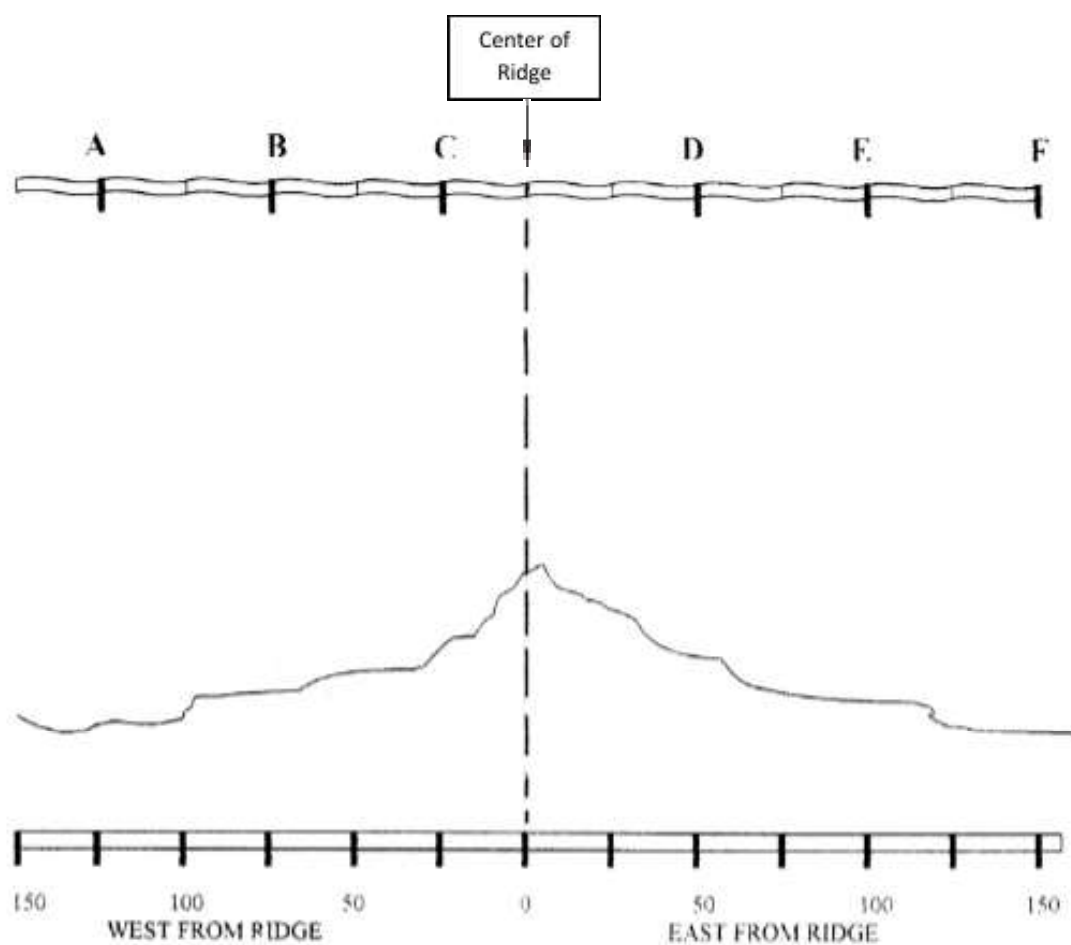
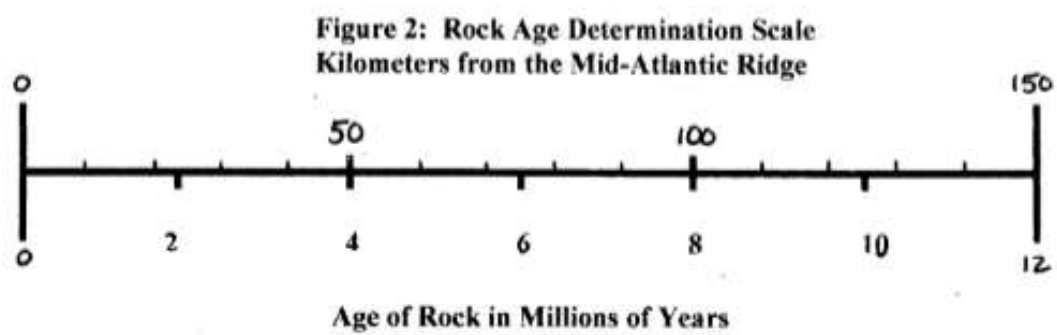


FIGURE 1: SCALE OF KILOMETERS



PART III: Graphing the data



On the grid below, use the data from Part II to design a graph that represents the relationship between the “distance from the ridge” vs. the “age of the seafloor”.

QUESTIONS:

3. Based on the graph you created, **describe the relationship** between the distance from the ridge and the age of the seafloor.

4. What **KIND** of relationship is this?

PART IV: Illustrate what you've learned

Now that you have completed parts I-III, you should have an understanding of the processes involved in seafloor spreading.

As a lab group, create a drawing that shows the process of sea floor spreading and magnetic reversals. Your drawing should be labeled, include descriptions, be colorful and neat. Make sure your names are on the drawing. (There is a page in this lab for your drawing)

LABORATORY QUESTIONS:

5. Describe the age of the rocks found near the center of the oceanic ridge compared to those found farther away from the center.
6. Explain why the rocks are not all the same age on the ocean bottom.
7. Is crust created or destroyed at the oceanic ridges?
8. If Earth's size remains constant and crust is created at ridges, what happens to the crust at the ocean trenches?
9. Would the rocks in the middle of the Mid-Atlantic ridge today show normal or reversed polarity?
10. If the rocks 100 kilometers west of the Mid-Atlantic ridge show reversal of polarity, what type of polarity would they show 100 kilometers east of the ridge?
11. Imagine that you could move a compass over the sea floor from South America to the Mid-Atlantic Ridge and then to Africa. Explain what would happen to the compass needle during this route?
12. If the distance from both South America and Africa, to the center of the Mid-Atlantic ridge, is 2400 kilometers, using the "average rate of movement" calculated in this exercise, determine how long ago South America and Africa were joined together. **SHOW ALL WORK!**

Now that you have completed this lab, go back to the original **CLAIM** that stated:

CLAIM: The seafloor is spreading at ocean ridges.

List **EVIDENCE** to support this claim and describe your **REASONING** as to whether or not this is an accurate claim?

EVIDENCE:

REASONING: