

Web Problem : Plate Tectonics

The Age of the Seafloor. The Marine Geology and Geophysics section of the National Geophysical Data Center features spectacular images showing the topography and age of the seafloor:

www.ngdc.noaa.gov/mgg/image/crustalimages.html. Use the *Crustal Age Image with Plates* to answer the following questions: •

1. Where are the oldest crustal rocks located in the Atlantic Ocean?
 2. What is the approximate age of these Atlantic Ocean rocks (in millions of years), and to which time period does this correspond (see a Geologic Time Scale)?
 3. Where are the oldest crustal rocks located in the Pacific Ocean?
 4. What is the approximate age of these Pacific Ocean rocks (in millions of years), and to which time period does this correspond (see a Geologic Time Scale)?
 5. What is the age of the youngest oceanic crust?
 6. Describe where we find most of the youngest oceanic crust.
 7. Explain the relationship between the youngest oceanic crust and the plate boundaries running through the Atlantic, Indian, and eastern Pacific oceans.
 8. What are the ages of the Atlantic oceanic crust along the coasts of Greenland and northern Europe (north Atlantic)?
 9. What are the ages of the Atlantic oceanic crust along the coasts of the United States and Africa (central Atlantic)?
 10. What are the ages of the Atlantic oceanic crust along the coasts of Argentina and southern Africa (south Atlantic)?
- Based on Answers to Questions 8, 9, and 10, answer Questions 11, 12, and 13.
11. Which part of the Atlantic Ocean opened up first?
 12. Which part of the Atlantic Ocean opened up second?
 13. Which part of the Atlantic Ocean opened up last?

Please note that the Pacific Ocean is rather complicated . You can compare the age of the seafloor map with a tectonics plate map for further investigations of these mysteries!

Plate Tectonics and Sediment Accumulation on the Seafloor.

Visit www.ngdc.noaa.gov/mgg/sedthick/sedthick.html and click on "Version 2" to see the new map of the total thickness of sediment on the ocean floors. Use this map to answer the following:

14. Where is the sediment the thickest, near the continents or in the deep ocean? Why?

15. If you compare the trend of the ocean ridges (Refer back to Problem #7) with the sediment thickness map, you will see that the ocean ridges have the thinnest sediment cover of anywhere in the oceans. Explain whether this observation is consistent with the theory of plate tectonics.

Consult the Tectonic Map inside the front cover of the lab manual (or in your textbook or online), you will see that the Nazca Plate is subducting under the western edge of South America (refer to a diagram of a subducting plate boundary, Ex: Fig. 17.5B in lab manual). The Andes Mountains run along the western edge of South America, just east of the subduction zone. Meanwhile, the east side of South America is a trailing continental margin, which was once a divergent- plate boundary but now lies well within the South American plate.

16. Using what you know about plate tectonics, propose an explanation (hypothesis) for why so little sediment is present on the subducting Nazca Plate whereas it is so thick on the Atlantic side.

The PaleoMap Project features a host of maps and animations showing how the Earth's tectonic plates have moved over the past 1100 million years. Click on the link to go straight to the animations: www.scotese.com/newpage13.htm.

*Modified from Web Extras for Laboratory Manual for Physical Geology by Jones and Jones (McGraw-Hill).

EARTHQUAKES

***<http://earthquake.usgs.gov/>**

Earthquakes provide clues to interpret the Earth's interior, however, most people are interested in what happens on the Earth's surface when an earthquake occurs.

1. What is an earthquake?

Today's Date: _____

Click on the *world map* to answer the following questions:

2. How many earthquakes took place today?
3. What do the different color symbols represent?
4. What are the smallest size magnitude earthquakes shown on the map?
5. What is the location of the largest earthquake that occurred today?

At a depth of?

6. What is/are the most significant earthquake(s) to occur in the past 30 days?
(List location and magnitude)

Click on the *USA map*:

7. Which part of the country has the most earthquakes?
8. Where was the largest earthquake on the map, and what was its magnitude?
9. Was there an earthquake in North Carolina? If so, what was its magnitude?

Past Earthquake Records:

10. What is the depth range for a shallow earthquake?
11. What is the depth range for an intermediate earthquake?
12. What is the depth range of a deep earthquake?
13. Around which ocean are most intermediate and deep earthquakes found?

14. What is the geologic significance of the March 1964 Alaskan Earthquake? Describe the results?

15. A magnitude 9.0 earthquake struck near Honshu, Japan in March 2011, causing the devastating tsunami and disabling nuclear reactors at a power station. Describe the results.

16. Geologically speaking, what do these two earthquakes have in common?

17. Based on your knowledge of plate tectonics, propose an explanation for these earthquake data. ---
Why do deep earthquakes occur only along deep-sea trenches in a pattern where they start shallow at the trench and then become progressively deeper moving in only one direction away from the trench? In all other places on Earth, the foci of earthquakes tend to be less than 35 km deep.

18. Determining the epicenter and Richter magnitude of an earthquake:

www.sciencecourseware.org/VirtualEarthquake/

**Print 'Certificate of Completion' – Attach to lab.*