

Name: \_\_\_\_\_

**Introduction to Oceanography 112 - M. Yasuda**  
Date: October 1, 2009  
**Assignment 6**

**Reading – Week 4 Mapping**

1. Chapter 5 All

**Vocabulary list**

- |                         |                             |  |
|-------------------------|-----------------------------|--|
| 1. Hydrogenous sediment | 11. Evaporate               | 21. Sediment accumulation rate           |
| 2. Biogenous sediment   | 12. Lithification           | 22. Calcium carbonate compensation depth |
| 3. Terrigenous sediment | 13. Carbonate ooze          | 23. Earth history                        |
| 4. Cosmogenous sediment | 14. Chalk                   | 24. Deep sea drilling                    |
| 5. Calcareous sediments | 15. Limestone               | 25. Pleistocene glaciations              |
| 6. Siliceous sediments  | 16. Microtektite            | 26. Oxygen isotopes                      |
| 7. Calcium carbonate    | 17. Red clay                | 27. Neritic                              |
| 8. Opal                 | 18. Sedimentation rate      | 28. Pelagic                              |
| 9. Chemical precipitate | 19. Biological productivity |  |
| 10. Manganese nodule    | 20. Sediment preservation   |  |

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**Websites related to lecture**

**Sonar animation**

Earthguide

[http://earthguide.ucsd.edu/eoc/teachers/t\\_tectonics/p\\_sonar.html](http://earthguide.ucsd.edu/eoc/teachers/t_tectonics/p_sonar.html)

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**GOALS**

**Shape of the Earth and Mapping**

1. Be able to find a location on the earth by latitude and longitude
2. Be able to identify significant features of the ocean floor – by map, image or written description
3. Know the average depths of the ocean, mid-ocean ridges and continental shelf edge
4. Know how to use the principle of sonar to measure bathymetry AND be able to estimate depth from a cross-section of two-way travel time data
5. Be able to describe general ways that shoreline position changes over time – including causes, rates of change, and degree of change
6. Be able to cite ways in which the volume of seawater in the world oceans can change
7. Be able to identify modern vs. historical methods of determining location

**Marine sediments**

1. Know the four major types of marine sediments and their general distribution in the oceans
2. Be able to identify the two common materials used by organisms to make their shells
3. Be able to explain the significance of the CCD
4. Be able to describe how sediment thickness varies with age of seafloor, distance from coasts, and occurrence below the CCD
5. Know how marine sediments are collected
6. Be able to identify how marine sediments are used to reconstruct the glacial history of the earth
7. Be able to identify why the sediment record may not accurately reflect the living assemblage of organisms
8. Be able to identify the rock type that underlies marine sediments
9. Be able to describe what would happen to the CCD in a more CO<sub>2</sub>-rich ocean.

## ACTIVITIES

### A. Redo the multiple-choice questions that you missed on the midterm.

1. Write out the entire new answer on your answer sheet using a different colored ink.
2. Turn in just that page next week. If you want to mark up a photocopied version of that page, that is acceptable.

Each question will be worth  $\frac{1}{2}$  of its original value.

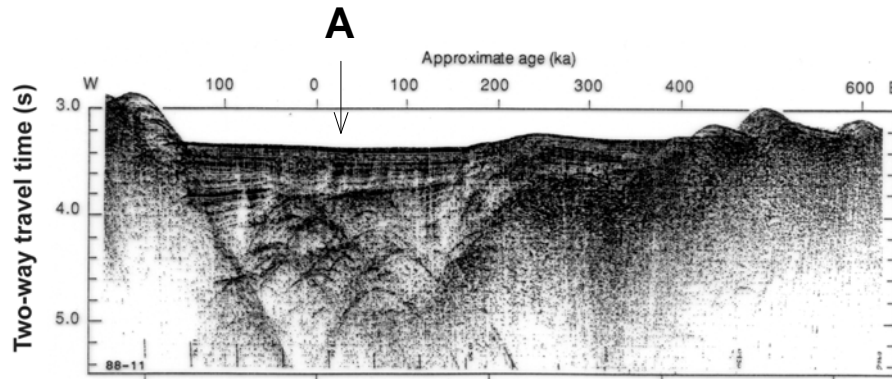
While you can take shortcuts in doing this, it will help you study for the final if you work on recognizing the problem with your first answer.

Do not do question #56. I didn't mark it incorrect or count that question because the question was scrambled in word-processing.

### B. Continental margins and other oceanic features

1. What is the depth of the lowest part of the continental shelf (the shelf break)?  
a. 4,000 mbsl    b. 2,700 mbsl    c. 150 mbsl
2. What kind of crust lies below the continental shelf?  
a. Continental    b. Oceanic
3. The continental shelf is wider along:  
a. Active continental margins    b. Passive continental margins
4. The world's largest rivers tend to exit oceans on this side of continents:  
a. Active    b. Passive
5. Submarine canyons that cut across continental shelves are scoured and cut by:  
a. Turbidites    b. Running water    c. Ice flow
6. The abyssal plain is smoother than seafloor close to the midocean ridges because of:  
a. Erosion    b. Plate motion    c. A light sediment cover
7. The edges of most continents are:  
a. At the shoreline    b. At the outer edge of the continental shelf
8. Continents are:  
a. Above sea level    b. Made up of continental rock
9. An atoll is:  
a. An oceanic island  
b. A submerged flat-topped volcano  
c. A volcanic island topped with a ring-shaped coral reef  
d. A hotspot volcano
10. All volcanic landforms that sit on the ocean floor sink over time.  
a. True    b. False
11. All the statements below are false. What is false about each statement?  
a. Shells of foraminifers are common in the Peru-Chile Trench.  
b. Thicker terrigenous sediments are found off the coast of Peru rather than Brazil.  
c. If you drop a pearl into seawater at 6,000 meters depth, it will dissolve.  
d. The CCD marks a major change in the composition of seawater.  
e. Hydrothermal vents occur in subduction zones at trenches.  
f. Hawaii and Iceland sit on unusual hotspots that are at divergent plate boundaries (margins).

**C. Calculate the depth of the seafloor under Point “A” using principles of sonar.**



1. Write down the general equation that relates two-way travel time to depth. Make sure to write down a **complete equation** in formal notation as we discussed in class.
2. What is the two-way travel time for a ship-based sound wave that has bounced off seafloor under Point “A”?
3. Calculate the depth to seafloor. **Show all your calculations, include all units and draw a box around the final answer.** This will be the format required on the midterm and final.
4. Where is sea level relative to Point A on your diagram? Explain your answer.
5. Do you think there is a trench under Point A? Explain your answer.

**D. Sediments**

1. What are the four major types of marine sediments?
2.
  - a. Which of the four major types of marine sediments make up the thickest marine sediments?
  - b. How thick are the thickest deposits?
  - c. Where in the world are they located?
  - d. Which kind of continental margins are rimmed with the thickest sediments and why?
3. Layers of marine sediment blanket the seafloor. Where is the oldest sedimentary strata located, close to the seafloor or buried next to the underlying continental or oceanic crust?
4. Where do you expect to find the thickest biogenous sediments – on younger or older oceanic crust. Explain your thinking.
5. If you look along the equator in the eastern part of the Pacific, sediments are a little thicker than to the north or south. This area is far from land and well beyond any continental shelf. Which of the four major sediment types dominates this area in the eastern equatorial Pacific?
6.
  - a. Where do the sediments in red clays originate?
  - b. In which of the four major marine sediments types do they belong?
  - c. Red clays accumulate at less than 1 mm/1000 years while terrigenous sediments accumulate at 4-20 cm/1000 years on some continental slopes. Why are red clays dominant in the centers of the north and south Pacific and Atlantic rather than closer to their point of origin on land? Explain.

7.
  - a. In which of the four major marine sediment types do calcareous and siliceous oozes belong?
  - b. What kinds of organisms make up calcareous oozes?
  - c. What kinds of organisms make up siliceous oozes?
  - d. Where do these organisms typically live?
  
8. You go to a place in the Western Pacific where the bathymetry is 6,000 mbsl and the crust is 140 million years old. The uppermost layer of sediment is dominated by red clay. You core through the underlying pile of marine sediments and find calcareous (carbonate) sediments containing foraminifera below.

Develop a hypothesis to explain how this vertical layering could have developed.

- a. Make a drawing to show the relative vertical layering of sediments. Start with underlying basalt.
- b. Explain how this layering developed. The answer to this one isn't in the book. It requires application of several concepts – including plate tectonics.