

Name: _____

Introduction to Oceanography 112 - M. Yasuda

Date: September 3, 2009

Due: September 17, 2009

Week 2

Reading - Earth structure and plate tectonics - Chapter 3: All

Vocabulary list

- | | |
|------------------------------|---|
| 1. Crust, mantle and core | 15. Gravitational compression |
| 2. Planetary differentiation | 16. Seafloor spreading |
| 3. Density stratification | 17. Midocean ridges |
| 4. Buoyancy | 18. Transform faults |
| 5. Isostatic equilibrium | 19. Fracture zones |
| 6. Lithosphere | 20. Subduction and subduction zone |
| 7. Asthenosphere | 21. Trench |
| 8. Cross-section | 22. Island arc |
| 9. Aerial view | 23. Volcanic arc |
| 10. Topography | 24. Accretionary prism |
| 11. Bathymetry | 25. Divergent, convergent and transform plate margins |
| 12. Geotherm | 26. Active and passive continental margins. |
| 13. Convection | |
| 14. Radioactive decay | |

Interesting websites

1. Google Earth

<http://earth.google.com/>

See the entire Earth and oceans. Look for where you live.

2. National Geophysical Data Center

<http://www.ngdc.noaa.gov/mgg/global/global.html>

Bathymetric maps of the globe. See the hidden shapes of the seafloor.

This week's activities due at start of class in two weeks – September 17, 2009.

- Includes alternative activities since there will be no class next week.
- We will do some of these activities in class today. The remainder is homework.
- Type and draw your answer on a separate sheet of paper. Essay answers must be typed and double-spaced so I have space to comment.

1. There is something that is false about each of these statements. Identify the false element(s).

- The universe began with a supernova called the Big Bang 14 billion years ago
- Images taken with the Hubble telescope can let us see the current state of galaxies located near the outer rim of the Universe
- Many nebula, such as the Milky Way, are areas of space that contain slightly higher than background levels (the near vacuum) of dust and gas from which stars such as the Sun develop.
- Elements heavier than iron are produced by 1) fusion that takes place within a star and 2) at the end of a star's life when it explodes.
- None of the atoms in your body existed before our Sun.
- The planets are much younger than our Sun.

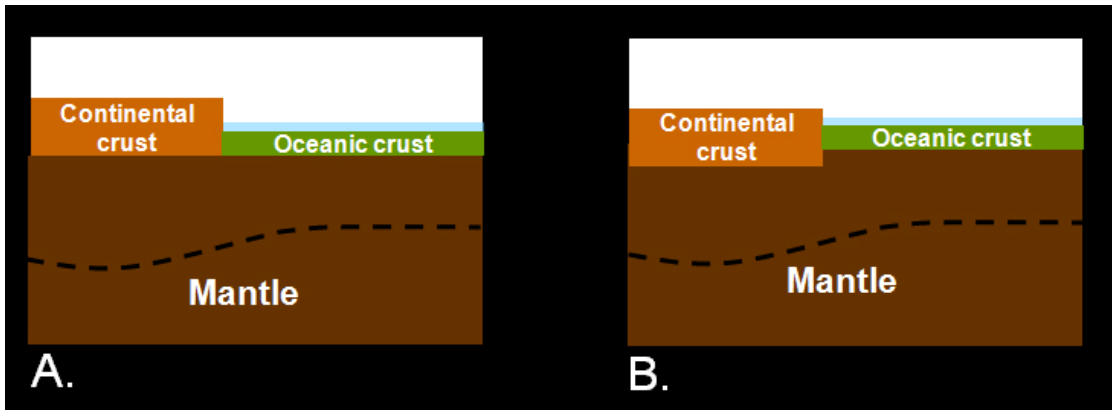
- g. Stars come and go, recycling the materials in the universe unlike the Sun.
- h. Individual atoms of gas assemble in space to form solid ices and minerals by a process called accretion.
- i. Planets form as smaller solids are attracted to them by magnetism.
- j. After the Earth heated up internally, it underwent planetary differentiation that cause the Moon to form.
- k. The Earth developed its magnetic field before differentiation occurred.
- l. The gases that exist in the atmosphere today, including water vapor and oxygen, were mostly released from the Earth's interior by outgassing from volcanic vents. These gases have been accumulating since the Earth formed.
- m. Water collected and accumulated in the oceans once the Earth heated up enough to produce rain.
- n. Life on Earth started on land.
- o. The oceans have existed for the last 65 million years.
- p. The Moon is full of impact craters while the Earth is not because the Moon preferentially attracts asteroids.
- q. Life on Earth exists by about 3.5 billion years ago. Since then, evidence suggests that life has existed continuously on Earth. This in turn suggests that the Earth's surface temperature has varied greatly over time relative to other planets.
- r. Nearly three-quarters of the Earth's volume is made up of water.
- s. The low spots on Earth and underlain by the same kind of rock that we find on land.
- t. Both the Pacific and Atlantic oceans are now growing new seafloor.
- u. Both the Pacific and Atlantic oceans are now growing larger in area.
- v. Solids float in fluids when the density of the solid is greater than that of the fluid.

2. Make a schematic diagram showing the layers of the Earth

By composition

By response to physical stress

3. The Earth's surface

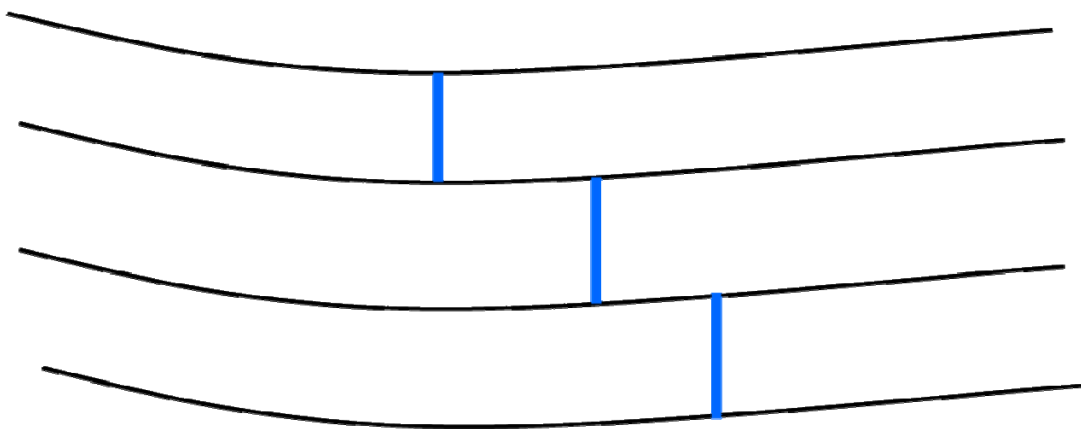


a. How are the crust and mantle situated - more like A or B? Explain why.

b. What does the dashed line represent?

4. Mark the following items on this schematic drawing of the area around a midocean ridge. This is an areal view.

- Midocean ridge segments
- Direction of motion
- Fracture zones
- Transform faults



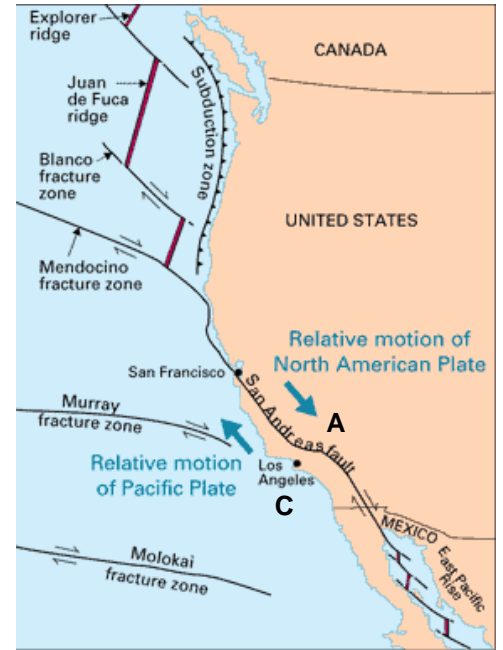
5. Draw a cross-section of a midocean ridge zone and show all key associated features.

6. Draw a cross-section of a subduction zone and show all key associated features.

7. San Andreas Fault

The area around the San Andreas Fault is shown on the diagram to the right

- Does the San Andreas Fault sit:
 - At the edge of two tectonic plates
 - On the very edge of a continent
 - Within the interior of a plate
- What kind of plate boundary is marked by the San Andreas Fault?
 - Convergent
 - Divergent
 - Transform
- Is Sacramento on the same plate as San Diego?
- In which direction is the plate under Point **A** ACTUALLY moving according to <http://cddis.nasa.gov/926/noamtect.html>?
 - To the southwest
 - To the southeast
 - To the northwest
 - To the South
- In which direction is the plate under Point **B** ACTUALLY moving according to <http://cddis.nasa.gov/926/noamtect.html>?
 - To the southwest
 - To the southeast
 - To the northwest
 - To the south



- Are the big blue arrows (also shown on Fig. 3.25 of your textbook) showing the **actual** direction of plate motion? Explain your answer.
- Mark the **two** separate pieces of midocean ridge that sit at each end of the San Andreas Fault transform fault with a colored pencil. (Even though the San Andreas transform fault does not sit in the middle of the ocean, it is configured like the one we discussed in class – in between two offset segments of midocean ridge.)
- Los Angeles is moving towards San Francisco at approximately 5 cm/year. Explain where you expect Los Angeles will be located relative to San Francisco in 20 million years. Show your calculation and include any sketches that may be helpful.