

Last Name _____ First Name _____ Student ID# _____

Oceanography 201, Spring 2002

Exam #1

Please make sure to mark your answers clearly on the scan-tron. If they are not marked clearly, the computer will grade them wrong. **Only use a #2 pencil.** Good luck!

Multiple Choice: 1 Point each. Make sure to read all the answers before you choose one.

1. The fact that the Earth is round was first discovered around
 - (a) 200 BC
 - (b) 200 AD
 - (c) 1500 AD
 - (d) 1500 BC

2. The continental rise is:
 - (a) A type of trench found at high latitude
 - (b) A ridge created by the formation of new crust
 - (c) A wedge of sediment at the base of the continental slope
 - (d) An uplifted sedimentary basin

3. The Hawaiian-Emperor seamount chain is an example of:
 - (a) A subduction zone
 - (b) A mid-ocean ridge
 - (c) A volcanic arc
 - (d) A hot-spot trace

4. The Earth, from the center outward, is composed of the following layers:
 - (a) Inner core, outer core, mantle, crust
 - (b) Inner core, outer core, mesosphere, lithosphere
 - (c) Core, mantle, asthenosphere, crust
 - (d) Core, mantle oceanic crust, continental crust
 - (e) Core, mantle, asthenosphere, troposphere

5. Free Oxygen in the Earth's atmosphere has accumulated mainly through:
 - (a) Photodissociation of water and loss of hydrogen to outer space
 - (b) Change in sea level
 - (c) Formation of the earth's core
 - (d) Photosynthesis and burial of organic carbon
 - (e) Nucleosynthesis in stars

6. Continents are built by:
 - (a) Andestitic volcanism at subduction zones
 - (b) Basaltic volcanism at mid ocean ridges
 - (c) Accretion of terranes onto the margins of existing continental masses
 - (d) Outgassing of volatiles from the earth's interior
 - (e) Both a and c

7. We know that the outer core of the earth is liquid in part because:

- (a) No earthquakes occur there
- (b) The plates move
- (c) Seismic "s" waves do not propagate through it
- (d) The deep sea drilling project drilled there
- (e) The increased pressure melts the rock into a liquid

8. Which of the following is not found on Loihi Seamount?

- (a) Bacterial mats.
- (b) Low temperature hydrothermal deposits
- (c) An abundance of diverse hydrothermal biota

9. The principal of isostasy states that

- (a) The earth's surface is dominated by two levels: the continents and the oceans
- (b) The lithosphere is in gravitational equilibrium through a buoyancy mechanism, with compensation occurring in the asthenosphere
- (c) Crust is produced by differentiation from the mantle, by upwelling and solidification of molten rock
- (d) If the earth were perfectly smooth, it would be covered by nearly 3000m of ocean water
- (e) As you move north along the Hawaiian island chain, the island get smaller until they are below the water level

10. Evidence that the earth has two kinds of crust comes from

- (a) Seismology
- (b) The hypsometric curve
- (c) The moon
- (d) Both a and b
- (e) All of the above

11. In 1966, Matthews & Vine presented evidence, which finally convinced geologists that sea-floor spreading is real. This evidence involved:

- (a) Earthquake patterns at deep-sea trenches
- (b) Patterns of coral reef growth and development
- (c) Direct sampling of ocean floor crustal rocks
- (d) Magnetic patterns measured at oceanic ridges
- (e) Gravity measurements taken at sea

12. The main proponent of the theory of continental drift was:

- (a) John Tuzo-Wilson
- (b) Harry Hess
- (c) Alfred Wegener
- (d) James Cook
- (e) Alex Malahoff

13. The rock type associated with mid ocean ridges is

- (a) Marble
- (b) Andesite
- (c) Granite
- (d) Basalt

14. The major forces driving the plates in the theory of plate tectonics are:
- (a) Inertia and mass balance
 - (b) Convection currents and centrifugal force
 - (c) Slab pull and convection currents
 - (d) Refraction and isostasy
 - (e) Diagenesis and blue shift.
15. The San Andreas Fault, in California is an example of a:
- (a) Spreading center
 - (b) Passive margin
 - (c) Back arc basin
 - (d) Good spot to buy real estate
 - (e) Transform fault
16. After the earth formed, the distribution of matter changed with:
- (a) Andesite going to the mantle and basalt to the core
 - (b) Denser material going to the core and lighter material to the surface
 - (c) Nickel and iron remaining in the crust, and silica and basalt sinking.
 - (d) Oxygen sinking into the mantle, to be released later through vents.
17. The most active volcano on Earth is:
- (a) Kavachi
 - (b) Mount St. Helens
 - (c) Mauna Loa
 - (d) Mount Pinatubo
 - (e) Kilauea
18. Polynesians first settled Fiji and other western Pacific islands around
- (a) 20,000 yrs ago
 - (b) 10,000 yrs ago
 - (c) 1300-1100 BC
 - (d) 600-900 A.D.
19. The Wadati-Benioff Zone:
- (a) Is the layer between the lithosphere and asthenosphere
 - (b) Is the "shadow area" where p waves do not appear after an earthquake
 - (c) Is the "shadow area" where s waves do not appear after an earthquake
 - (d) Is the area where a subducting lithospheric plate enters the asthenosphere
 - (e) Is the zone of seismic and volcanic activity that encircles the Atlantic Ocean.
20. Nebulae are:
- (a) Siliceous organisms that settle to the ocean floor to form siliceous ooze
 - (b) The first forms of life to appear on earth, and can be found in fossils in Northern Canada
 - (c) Clouds of dust and gas
 - (d) Found in the ring of meteors between Earth and Mars
 - (e) Formed during Supernovas.

21. Nuclear Fusion:
- (a) Occurs when a nuclear bomb is detonated
 - (b) Occurs when 2 H atoms form a He atom
 - (c) Occurs at hydrothermal vents
 - (d) Occurs only at very low temperatures and requires the addition of liquid nitrogen.
 - (e) Occurs in the outer core
22. The following particle sizes are in order of smallest to largest
- (a) Boulder, pebble, cobble, clay
 - (b) Clay, sand, granule, cobble
 - (c) Clay, granule, sand, silt
 - (d) Pebble, cobble, silt, clay
 - (e) None of the above
23. Terrigenous material can get to the ocean by
- (a) Rivers
 - (b) Wind
 - (c) Glaciers
 - (d) Turbidity currents
 - (e) All of the above
24. Cosmogenic sediments:
- (a) Represent a very small proportion of marine sediments
 - (b) Are from outer space
 - (c) Are usually small fragments of meteorites or spherules
 - (d) Are found mostly in the Pacific Ocean
 - (e) A, B, and C
25. Most atolls in the Pacific are believed to have formed by
- (a) Nuclear testing
 - (b) Coral growth on banks built up by sediments
 - (c) Coral growth on subsiding volcanic foundations
 - (d) Global Thermal Subsidence.
26. A terminal moraine is:
- (a) A moraine that cannot grow anymore because it has reached the ocean.
 - (b) A really bad headache.
 - (c) A ridge of unsorted glacial till deposited by a glacier at the line of its farthest advance.
 - (d) A permanent magnetization acquired by igneous rocks as they cool.
 - (e) A broad, flat region of muddy or sandy sediment.
27. Earthquakes associated with the descending plate at a convergent plate margins can typically occur at depths:
- (a) Of 7-10 km
 - (b) Of 70-100 km
 - (c) Of 70 to more than 300 km
 - (d) 7000 km

28. A typical depth for deep-sea abyssal plains is approximately:

- (a) 10 km
- (b) 5000 m
- (c) 5000 ft
- (d) 100 km
- (e) 1000 m

29. Turbidity currents lead to the formation of:

- (a) graded deposits
- (b) submarine canyons
- (c) sediment fans
- (d) all of these

30. In which of the following do earthquakes not generally occur?

- (a) Wadati-Benioff zones
- (b) Mid ocean ridges
- (c) fracture zones
- (d) transform faults

31. The transition between a continental shelf and slope is known as the:

- (a) continental rise
- (b) bank
- (c) shelf break
- (d) abyssal plain

32. The density of oceanic crust material is approximately:

- (a) 4.5 g/cm^3
- (b) 2.9 g/cm^3
- (c) 12.9 g/cm^3
- (d) 2.7 g/cm^3

33. The Curie point is:

- (a) The place where Marie Curie discovered radioactivity
- (b) The temperature at which basalt freezes during the formation of oceanic crust
- (c) The temperature below which the orientation of magnetic minerals in rocks is fixed.
- (d) The direction to which magnetic minerals in rocks point
- (e) The temperature at which magma begins to circulate in convection cells in the mantle

34. The largest volcanic edifice in the world is:

- (a) Mount St Helens
- (b) Mount Pinatubo
- (c) Fujiyama
- (d) Mauna Loa

True and False Questions. 1 Point Each mark A=True OR B=False

35. Scientific theories are always subject to challenge and may be overturned.

36 Yellowstone is an example of a hot spot.

37. Lava exits from Kilauea volcano vents at temperatures exceeding 2000 °F
38. The bend in the Hawaii-Emperor seamount chain is due to a reversal of the magnetic field of the earth, which occurred 20 million years ago.
39. Erosion from continents is a significant source of sediment in the oceans.
40. The CCD is defined as the depth at which coral cannot live because of lack of nutrients and light.
41. Pelagic deposits accumulate approximately 5-10x faster than sediments near large river mouths.
42. Turbidity currents help carve submarine canyons and take sediment from the continental shelf to the deep sea floor.
43. The Pacific plate moves at approximately 8-10 cm/yr
44. The age of the earth, the moon, and meteorites is the same
45. Early Polynesian navigators were able to navigate accurately by excellent observation of stars, waves, winds, and current patterns and did not use magnetic compasses.
46. CaCO₃ tends to dissolve much slower than silica in the ocean.
47. Explosive volcanism is associated with Pacific type continental margins.
48. The island of Oahu was once a guyot.
49. Solar luminosity has increased over the last 4 billion years.
50. The lithosphere is usually described as "plastic"
51. Atlantic type continental margins are lithospheric plate boundaries .
52. The oldest rocks on the seafloor are much older than the oldest rocks from the continents.
53. Continental crust has a different mineral composition than oceanic crust.
54. The Pacific Ocean is deeper (on average) than the Atlantic Ocean..
55. Coccolithophores are small animals that are made of CaCO₃.
56. Sediments are much thicker in the Atlantic Ocean than in the Pacific Ocean.
57. Turbidity currents are a kind of landslide.
58. Hawaii is an example of Island Arc Volcanism.
59. The Molokai Fracture zone is the line dividing West Molokai Volcano from East Molokai Volcano

60. Radioactivity in the deep Earth is one potential source of the heat that drives mantle plumes.

Fill in the blanks (1 point for each blank).

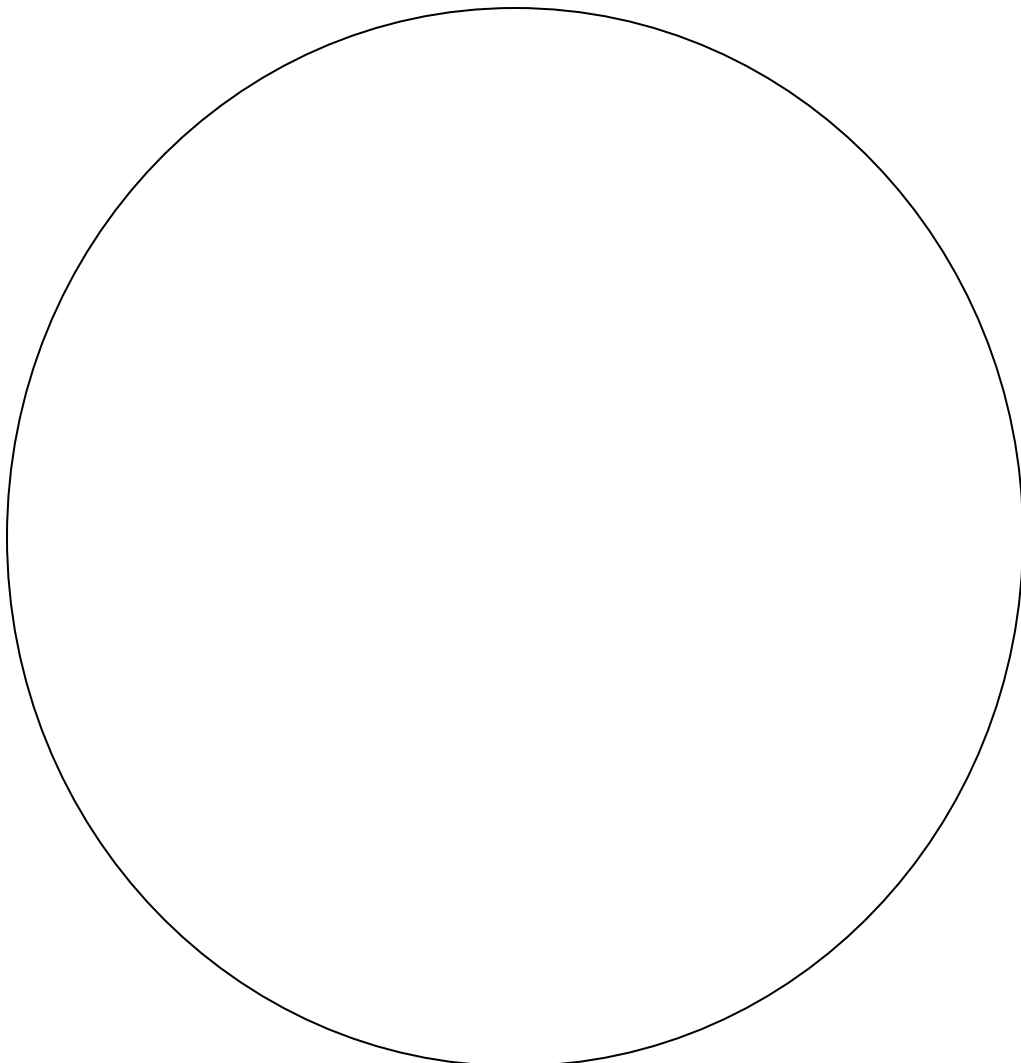
The three causes of global sea level change are _____,
_____ and _____

Essay Questions. Please answer in the spaces provided. Be concise.

Draw a cross section of the earth. Name the layers as described by their physical and chemical properties.

Please be very clear. (5 points).

Bonus: If an earthquake were to occur at the north pole, show how the p and s waves would travel through the earth (3 points).



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Draw a typical convergent plate boundary between continental and oceanic crust. Label the major parts, show direction of movement provide the name a specific geographical location on earth where the boundary you sketched occurs (7).

60. Radioactivity in the deep Earth is one potential source of the heat that drives mantle plumes.

Fill in the blanks (1 point for each blank).

The three causes of global sea level change are _____, _____ and _____

Essay Questions. Please answer in the spaces provided. Be concise.

Draw a diagram in the space below of a passive continental margin formed as a result of continental breakup. Be sure to clearly identify the major features, where and at what depth they occur (5pts).

Bonus: Provide an approximate age sequence for the formation of such a margin in the North Atlantic Ocean (3pts)

Alternate question: Briefly explain how the super-continent cycle is responsible for the opening and closing of the Northern and Southern Atlantic Ocean."

The answer should mention some of the following: formation of a rift under continental crust, lateral movement of the now separated continents, depression of the newly-created seafloor as heat is dissipated over time, formation of a trench on one side of the ocean basin (due to lithospheric stress), enclosure of the basin...

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Sketch a divergent plate boundary. Label the major parts, show directions of movement and provide the name a specific geographical location on earth where the boundary you sketched occurs (7).