

Last Name _____ First Name _____ Student ID# _____

Oceanography 201, Fall 2000 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. 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

2. In 1966, Matthews & Vine presented evidence which finally convinced geologists that seafloor 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

3. 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

4. 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

5. The rock type associated with mid ocean ridges is:

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

6. 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

7. Most atolls of 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

8. 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

9. 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

10. 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 AD

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

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

12. 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

13. The largest volcanic edifice in the world is:

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

14. Earthquakes associated with the descending plate at a convergent plate margins can occur as deep as:

- (a) 7-10 km
- (b) 70-100 km
- (c) 300-700 km
- (d) 7000 km

15. Terrigenous material can get to the ocean by:

- (a) Rivers
- (b) Wind
- (c) Glaciers
- (d) Turbidity currents
- (e) All of the above

16. 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

17. 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

18. Turbidity currents lead to the formation of:

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

19. The fact that the Earth is round was first discovered around:

- (a) 200 BC
- (b) 200 AD
- (c) 1500 AD
- (d) 1500 BC

20. The principle 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

21. The density of oceanic crust material is approximately:

- (a) 4.5 g/cm³
- (b) 2.9 g/ cm³
- (c) 12.9 g/ cm³
- (d) 2.7 g/cm³

22. 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
23. 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
24. In which of the following do earthquakes not generally occur?
- (a) Wadati-Benioff zones
 - (b) Mid ocean ridges
 - (c) fracture zones
 - (d) transform faults
25. 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
26. 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
27. 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
28. The element gold is/was formed:
- (a) In the center of the Earth
 - (b) During fusion in our Sun
 - (c) During Super Novae explosions
 - (d) during the "Big Bang"
 - (e) All of the above

29. 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
30. Cosmogenic sediments:
- (a) Form tektites and microtektites
 - (b) Are from outer space
 - (c) Are abundant in the sedimentary record at the triassic-jurassic boundary
 - (d) Are found mostly in the Pacific Ocean
 - (e) A, B, and C
31. Which of the following statements most accurately reflects current scientific thinking?
- (a) The size of the universe is static.
 - (b) The Universe is expanding
 - (c) The Universe is contracting
32. 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
33. 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
34. 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

True and False Questions: 1 Point Each. (mark A=True and B=False)

35. The Pacific Ocean is deeper (on average) than the Atlantic Ocean.
36. The island of Oahu was once a guyot.
37. The oldest rocks on the seafloor are much older than the oldest rocks from the continents.
38. Explosive volcanism is associated with Pacific type continental margins.
39. Coccolithophores are small animals that are made of CaCO_3

40. Yellowstone is an example of a hot spot.
41. The CCD is defined as the depth at which coral cannot live because of lack of nutrients and light.
42. Turbidity currents are a kind of landslide.
43. Early Polynesian navigators were able to navigate accurately by excellent observation of stars, waves, winds, and current patterns and did not use magnetic compasses.
44. Solar luminosity has increased over the last 4 billion years.
45. Radioactivity in the deep Earth is one potential source of the heat that drives mantle plumes.
46. Sediments are much thicker in the Atlantic Ocean than in the Pacific Ocean.
47. 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.
48. CaCO_3 tends to dissolve much slower than silica in the ocean.
49. Atlantic type continental margins are lithospheric plate boundaries.
50. Hawaii is an example of Island Arc Volcanism.
51. The lithosphere is usually described as "plastic".
52. Scientific theories are always subject to challenge and may be overturned.
53. Continental crust has a different mineral composition than oceanic crust.
54. Pelagic deposits accumulate approximately 5-10X faster than terrigenous sediments.
55. The age of the earth, the moon, and meteorites is approximately the same.
56. The Molokai Fracture zone is the line dividing West Molokai Volcano from East Molokai Volcano.
57. Turbidity currents help carve submarine canyons and take sediment from the continental shelf to the deep sea floor.
58. Lava exits from Kilauea volcano vents at temperatures exceeding 2000 °F.
59. The Pacific plate moves at approximately 8-9 cm/yr.
60. Erosion from continents is a significant source of sediment in the oceans.

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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.

1. 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: Briefly explain how the Super-Continent cycle is responsible for the opening and closing of the Northern and Southern Atlantic Ocean. (3pts)

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