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## OCEANOGRAPHY 201

Spring 2004

Exam #1

### I) Multiple Choice: Pick the best answer. (1 pt each)

- 1) The fact that the average thickness of sediment on the ocean floor is only ~600 m implies that:  
a) the earth is expanding      b) the ocean floor is relatively young  
c) the earth is heating up  
d) sediments are being consumed as they are being produced
- 2) Earthquakes associated with the descending plate at a convergent plate margin can occur as deep as:  
a) 5 km                              b) 50 km                              c) 500 km                              d) 5000 km
- 3) A typical depth for deep-sea abyssal plains is approximately:  
a) 10 km                              b) 5000 m                              c) 5000 ft                              d) 100 km
- 4) The Hawaiian islands formed as the Pacific Plate passed over a:  
a) hot spot      b: transform fault                              c: spreading center  
d: fracture zone                              e) convection current
- 5) The determination of longitude requires an accurate knowledge of:  
a) latitude      b) water depth                              c) time                              d) ship speed
- 6) The age of the universe is estimated to be:  
a) 4.5 billion yrs                              b) 15 billion yrs  
c) 15 million yrs                              d) 250 million yrs
- 7) A seismograph mounted in a submarine would not be able to detect:  
a) P-waves      b) earthquakes                              c) S-waves      d) electromagnetic waves
- 8) Which of the following rock types is found in convergent plate margin volcanoes?  
a) basalt                              b) andesite                              c) marble                              d) dolomite
- 9) Turbidity currents lead to the formation of:  
a) graded deposits                              b) submarine canyons  
c) sediment fans                              d) all of these

- 10) In which of the following do earthquakes not generally occur?  
a) Wadati-Benioff zones      b) mid ocean ridges  
c) fracture zones              d) transform faults
- 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) 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
- 13) Which of the following does not involve the creation or destruction of oceanic crust:  
a) a mid ocean ridge  
b) a transform fault  
c) a subduction zone
- 14) The Pacific plate is moving in a NW direction at about:  
a) 0.5 cm/yr      b) 2-3 cm/yr      c) 8-10 cm/yr      d) 20 cm/yr
- 15) After the earth formed, material is thought to have shifted with:  
a) andesite going to the mantle and basalt to the surface  
b) nickel and iron going largely into the atmosphere  
c) gases being permanently stored in the lower mantle  
d) denser material going to the core and lighter material to the surface
- 16) Hawaiian volcanoes typically have:  
a) only summit eruptions of basaltic lava  
b) only flank (or rift zone) eruptions of basaltic lava  
c) only explosive rift zone eruptions of andesitic lavas  
d) both summit and rift eruptions of basalt
- 17) Coral reefs are:  
a) found only in the Pacific Ocean  
b) formed by the accumulation of foraminifera  
c) found between approximately 30° north and south of the equator  
d) found as deep as 300 meters below the surface
- 18) Which of the following would not be found at the surface of the sediments below 4500 m water depth in the oceans?  
a) red clay                      b) siliceous ooze  
c) ferromanganese nodules      d) calcareous ooze
- 19) A guyot is:  
a) an abyssal hill rising above 2000 m from the seafloor  
b) a flat-top drowned volcanic edifice  
c) a sedimentary feature typical of the Atlantic ocean  
d) volcanic feature formed in a back-arc basin

- 20) The planets Saturn, Jupiter and Uranus are composed primarily of:  
a) rocks and metals in a molten state                      b) hydrogen and helium  
c) ices of water, ammonia, and other volatiles  
d) none of the above
- 21) The scientific method involves:  
a) formulating hypotheses                      b) making predictions  
c) asking questions                              d) making observations  
e) all of the above
- 22) The Hawaiian-Emperor seamount chain is approximately how old?  
a) 700 million year old                      b) 70 million years old  
c) 7000 years old                              d) 250 million years old  
e) we really do not know
- 23) We can learn about the Earth's past cycles of global climate change from:  
a) current and future measurements of atmospheric CO<sub>2</sub>  
b) the Earth's magnetic field  
c) sediment cores retrieved from the seafloor  
d) the Earth's gravitational field                      e) all of the above
- 24) Scientists can estimate the distance the Earth is from a star by using:  
a) a plasmon meter                      b) gravity measurements  
c) paleomagnetism                      d) radioactive decay                      e) parallax
- 25) The density of continental crust is:  
a) greater than the density of oceanic crust  
b) about 2.7 g/cm<sup>3</sup>  
c) about the same as that of upper mantle material  
d) about 16 g/cm<sup>3</sup>
- 26) The bulk of free oxygen in the Earth's atmosphere was produced primarily by:  
a) change in sea level  
b) photosynthesis and burial of organic carbon  
c) photodissociation of water and loss of hydrogen to outer space  
d) nucleosynthesis in the stars  
e) formation of the Earth's core
- 27) The Wadati-Benioff Zone is:  
a) a "shadow" area where no P or S waves are detected after an earthquake  
b) an area where a subducting lithospheric plate enters the asthenosphere and characterized by strong shallow- to deep-focus earthquakes  
c) where two plates are being pulled apart and new oceanic lithosphere is being created  
d) the boundary between the crust and mantle, marked by an increase in S-wave velocity  
e) both (b) and (d)

- 28) Calcareous sediments found on the ocean floor consist of remains of:
- a) foraminifera and radiolaria
  - b. radiolaria and diatoms
  - c) foraminifera and coccolithophore
  - d) coccolithophores and diatoms
  - e) both (b) and (c)

The following terms are for questions 29 and 30:

- a) no earthquakes, no volcanism, thin crust, thick sediment
  - b) shallow to deep earthquakes, andesitic volcanism, older crust, thick sediment
  - c) shallow earthquakes, andesitic volcanism, young crust, thick sediment
  - d) shallow to deep earthquakes, basaltic volcanism, older crust, thin sediment
  - e) shallow earthquakes, basaltic volcanism, young crust, sediment absent to thin
- 29) Which of the above terms consistently describe a subduction zone?
- 30) Which of the above terms consistently describe the mid-ocean ridge, a zone of seafloor spreading?
- 31) Alfred Wegener was the principal proponent of the theory of
- a) the Big Bang
  - b) formation of atolls
  - c) mantle plumes
  - d) continental drift
  - e) plate tectonics
- 32) The fact that wavelengths of sound or light change as objects approach or recede is known as:
- a) the Kirchoff effect
  - b) the Doppler effect
  - c) the Shirrell effect
  - d) the Newton effect
  - e) the Einstein effect
- 33) The reaction  $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{CH}_2\text{O} + \text{O}_2$  represents:
- a) photodissociation
  - b) respiration and decay
  - c) chemical weathering
  - d) photosynthesis
  - e) formation of petroleum
- 34) Reversals of the Earth's magnetic field:
- a) are important in understanding longitude
  - b) were the basis for Arthur Holmes' concepts of thermal convection cells
  - c) cause the Earth to turn on its axis
  - d) are recorded in seafloor rocks in bands parallel to spreading centers
  - e) never occur
- 35) The region where plates move past each other is called a:
- a) fracture zone
  - b) spreading center
  - c) guyot
  - d) transform fault
  - e) abyssal hill
- 36) The core of the Earth is made of
- a) Hydrogen and oxygen
  - b) Calcium and magnesium silicates
  - c) Iron and nickel
  - d) Olivine and pyroxene
  - e) Magnesium and Sodium

- 37) The two dominant types of sediment in the deep sea are:  
a) glacial sediments and hydrothermal vent deposits  
b) hydrogenous material and sand  
c) terrigenous silt and manganese nodules  
d) biogenic ooze and abyssal clay  
e) clay and ferro-manganese nodules
- 38) The leading theory for the origin of the Earth's Moon is:  
a) formation in the same manner as Earth, by accretion  
b) condensation from the Solar nebula  
c) impact by a large planetesimal, about the size of Mars, which spun off the Moon  
d) gravitational capture of a large planetesimal  
e) fission due to rapid rotation
- 39) The oceanic crust is composed mainly of:  
a) andesite      b) sediments      c) granite      d) basalt      e) calcium carbonate
- 40) The carbonate compensation depth or CCD is:  
a) the depth at which calcium carbonate dissolves in the oceans  
b) the depth at which the rate of delivery of calcium carbonate is equal to the rate at which it dissolves  
c) the depth below which siliceous ooze begins to dissolve  
d) the depth below which you only find hydrogenous deposits
- 41) Large volumes of ocean sediments are transported from the continental shelves to the deep ocean floor by:  
a) rivers                      b) seafloor spreading                      c) tidal currents  
d) storm surges              e) turbidity currents
- 42) The Curie Point is:  
a) the temperature at which glaciers begin to flow to the ocean  
b) the latitude at which corals cease to grow  
c) the temperature below which magnetic mineral signatures are frozen in rocks  
d) the time when radioactive decay reaches half its original value  
e) the depth below which  $\text{CaCO}_3$  dissolves faster than it accumulates
- 43) Planktonic animals whose silica-rich shells may be found on the ocean floor are called:  
a) diatoms                      b) radiolaria                      c) foraminifera  
d) coccolithophores      e) phosphorites
- 44) Which of the following supports the hypothesis of seafloor spreading?  
a) absence of sediment along the mid-ocean ridge  
b) evidence of earthquakes and volcanism along the mid-ocean ridge axis  
c) age of oceanic crust increases with distance from the mid-ocean ridge axis  
d) elevated topography of mid-ocean ridges  
e) all of the above

- 45) Continents are built by:  
 a) outgassing of volatiles from the Earth's interior  
 b) andesitic volcanism at subduction zones  
 c) basaltic volcanism at mid-ocean ridges  
 d) accretion of exotic terranes onto their margins  
 e) both (b) and (d)
- 46) Polynesian and other traditional Pacific Islander navigators did not use which of the following to help find their way between islands?  
 a) center reference system    b) wave patterns in the ocean    c) rising stars  
 d) presence of homing birds    e) home reference system
- 47) The largest single volcanic mountain on Earth is:  
 a) Mt. Everest    b) Konahuanui    c) Mt. Kilimanjaro  
 d) Mauna Kea    e) Mauna Loa
- 48) The Earth's oceans and atmosphere are considered secondary in origin. This means that:  
 a. they formed by outgassing of the Earth's interior  
 b. they formed by the interaction of living things with their environment  
 c. the cold planetesimals, which aggregated to form the Earth, could have lost its primary atmosphere  
 d. they formed by the reaction between an earlier atmosphere and crustal rocks  
 e. all of the above

**II) True/False questions: mark A for true, and B for false (1 point each)**

- 49) Oceanic crust has a density of  $5.5 \text{ g/cm}^3$
- 50) Hypatia, the last librarian of Alexandria, was killed by a mob of angry Greeks.
- 51) The hot spots under the big island of Hawaii is currently moving in a southeasterly direction.
- 52) Based on the supercontinent cycle reconstructions made by Scotese, continents are predicted to break up into multiple small islands over the next 150 to 250 M years.
- 53) Darwin was the first to propose a plausible explanation for the various stages of coral reefs.
- 54) Continental shelf sediments accumulated primarily during the last glacial period.
- 55) Wegener's theory of continental drift was readily accepted by his peers.
- 56) Loihi Volcano is about 20 M years old.
- 57) Captain James Cook was one of the first seafarers to have the capability to determine longitude accurately.

- 58) Longitude determinations made with time uncertainties on the order of a few seconds are off by miles or more.
- 59) Beach erosion in Hawaii has been successfully handled in Hawaii by armoring seashores.
- 60) Sediment coverage increases with increasing distance from the mid ocean ridge system.

**III) Short essay. If your handwriting is poor, please print, because the grader will not give you credit if he/she cannot read your handwriting.**

- 61) Draw a cross section of a divergence zone, label all the relevant features, indicate relative directions of motion and provide an example (name) of a location on Earth where such a feature is found. (8pts).

- 62) Describe the general basis of Polynesian (Pacific Islander) navigation and indicate the various aids that these people used to find their way between islands (7 pts)