

NAME _____ Lab TA _____ Section _____

UID#: _____

Introduction to Oceanography, ESS15
FINAL EXAM, Winter 2007

EXAM #18735

Instructions

1. PRINT your name and lab TA's name on BOTH the cover sheet of this exam and on the SCANTRON form. Put your student ID # on the SCANTRON, and put the exam number from the top right corner of this page in the "Special Code" blanks as well. (*You will receive a 3-point deduction for incorrect UID's or exam codes.*)
2. You will have until 2:30pm to answer the exam's 82 questions.
3. You must turn in the exam, the SCANTRON form and show proper ID at the end of the exam period. Exams will not be accepted without ID.
4. Scores and final grades will be posted online next week.

Oceanography ESS15, Lecture Exam #2

1. The average depth of the ocean is roughly [Hint: 1 km ~ 0.6 miles]
 - a) 350 feet
 - b) 2.5 miles**
 - c) 120 miles
 - d) 4100 miles

2. The present population sizes of most commercial fish species are well known by fisheries managers.
 - a) True.
 - b) False.**

3. Typical surface currents in the Gulf Stream travel at roughly 1 m/sec. At this rate, which value most closely approximates how long will it take waters off of Miami to travel 7000 km to the British Isles? [Hint: You can assume that there are roughly 4000 seconds/hour and 25 hours/day.]
 - a) 2 days
 - b) 2 weeks
 - c) 2 months**
 - d) 2 years

4. Deep water waves result when the water depth is greater than roughly half the wave length. In the open ocean, which of the following is always a deep water wave?
 - a) Wind waves**
 - b) Tsunamis
 - c) Tides

5. Human activities that typically contribute to shoreline erosion include
 - a) building of dams across rivers carrying sediment to the shore.
 - b) construction of seawalls and breakwaters.
 - c) building artificial groins and jetties.
 - d) all of the above.**

6. The amount of gas that seawater can hold in solution is greater
 - a) in colder water**
 - b) in warmer water
 - c) in saltier water
 - d) under less pressure

7. Which of the following has the largest total biomass?
 - a) Herring and anchovies
 - b) Diatoms and coccolithophores**
 - c) Tuna and finfish
 - d) Cod and haddock

8. The west side of South America is an active tectonic margin. The east side is a tectonically passive margin. On which side of South America are the continental margins narrower?
- The east side
 - The west side**
 - The continental margins are of similar size on either side of South America
 - There are no well-defined continental margins on either side of South America.
9. The tidal cycle commences 50 minutes later each day because
- of the motion of the Moon around the Earth**
 - of the ellipticity of the Earth's orbit around the sun
 - friction between the tides and the continents
10. Fishery scientists argue that _____ are needed to maintain sustainable fisheries.
- marine no-take reserves
 - global efforts to reduce total fishing intensity
 - changes in the way consumers view sea food
 - All of the above.**
11. Roughly ____ percent of all known species have gone extinct.
- 10
 - 33
 - 66
 - 99**
12. Which of the following is **not** believed to be a possible cause of ice ages?
- Reversals of the Earth's magnetic field**
 - Earth's orbital parameters
 - Atmospheric composition
 - Locations of the continents
13. A typical depth of the photic zone is 100 m. A length of 100m is closest to that of
- A yardstick
 - The depth of a typical swimming pool
 - The length of a football field**
 - The distance from UCLA to the Santa Monica Pier
14. Many cephalopods, such as the octopus, have the ability to rapidly change
- internal body temperature.
 - overall body mass.
 - into autotrophs.
 - body color.**

15. Waves striking a depositional coast at an angle will generate:
- a) Sea stacks
 - b) Submarine canyons
 - c) **Longshore currents**
 - d) Estuaries
16. The carbonate compensation depth (CCD) is
- a) **the depth below which new carbonate deposits cannot form**
 - b) the depth below which no more carbonate can be dissolved in seawater
 - c) the depth at which respiration reaches a maximum
 - d) the depth at which carbonates come into isostatic balance
17. Select where the densest deep waters form
- a) In the Arctic Ocean
 - b) In the Gulf of Alaska
 - c) In the Mediterranean Sea
 - d) **Around Antarctica**
18. Which tectonic plate do the Hawaiian Islands reside upon?
- a) the North American Plate
 - b) the South American Plate
 - c) the Gorda Plate
 - d) **the Pacific Plate**
19. The equatorial region of the Earth directly facing the moon experiences a high tide. On the other side of the planet (local longitude + 180°), one will find a
- a) low tide.
 - b) **high tide.**
 - c) tide that cannot be accurately predicted.
20. You are at a seafood restaurant with your Euro-Sugar Daddy, Philippe De La Poisson. You can order anything on the menu. Which entrée is the best choice in terms of maintaining healthy ocean fisheries and ecosystems?
- a) **grilled halibut**
 - b) pepper-crusting mako shark fillet
 - c) pan-seared bluefin tuna steak
 - d) baked orange roughy
21. An explanation of the cause and effect of a natural phenomenon that has been repeatedly confirmed by later experiments:
- a) observation
 - b) hypothesis
 - c) **theory**

22. After graduating from UCLA, you take a job in Vancouver, British Columbia (at ~49 degrees North latitude). In this strangely foreign land, the prevailing winds typically blow from
- East to West
 - West to East**
 - No obvious direction
23. Radiometric dating techniques show that the Earth is about
- 4.6 million years old.
 - 46 million years old.
 - 4.6 billion years old.**
 - 46 billion years old.
24. Bycatch typically makes up about _____ of the total commercial harvest.
- 0.3%
 - 3%
 - 30%**
 - 300%
25. The speed of a wave can be calculated as its _____ divided by its _____.
- waveperiod ... frequency
 - waveperiod ... steepness
 - wavelength ... wave height
 - wavelength ... waveperiod**
26. Longshore sediment transport is controlled mainly by
- The direction and speed of ocean gyre currents
 - Wave activity at the beach**
 - Man-made barriers like groins and jetties
27. Orange roughy live in cold, deep waters and can take up to 25 years to reach sexual maturity. This means that they
- constantly end up as bycatch.
 - are caught by blast fishermen.
 - can be easily harvested to commercial extinction.**
 - taste better than fish that live life in such a rush.
28. Seawater, which is salty, freezes at _____ freshwater.
- a lower temperature than**
 - the *same* temperature as
 - a *higher* temperature than
29. Oceanic surface currents are
- driven by winds in the atmosphere.**
 - driven by Coriolis effects at the equator.
 - driven by density differences.

30. Which of these areas generally has the highest primary productivity?
- a) **The surface ocean near continental margins.**
 - b) The surface ocean in the subtropical gyres.
 - c) The open ocean below the photic zone.
31. According to Seafood Watch, which is the better choice?
- a) Trawl caught shrimp
 - b) **Trap caught shrimp**
 - c) Neither, as shrimp are commercially extinct
32. In an open water wave, the depth at which the wave motion becomes negligible is
- a) Usually well below the ocean bottom.
 - b) **About 1/2 the wavelength of the wave.**
 - c) About 25 times the wavelength of the wave.
33. According to the scientific method, scientific theories
- a) **must be experimentally tested and verified.**
 - b) must be agreed upon by the leading authorities in the field.
 - c) must be consistent with previous, universally accepted scientific concepts.
 - d) are accepted as absolute fact until proven otherwise.
34. Open ocean swell with the greatest propagation velocity
- a) **have the longest wavelengths.**
 - b) occur in shallowest water.
 - c) are driven by spring tides.
35. In the northern hemisphere, planetary rotation causes moving objects to deflect _____.
- a) to their left
 - b) **to their right**
 - c) upwards, often leading to precipitation
36. The heat capacity of water is
- a) Similar to that of crustal rock
 - b) **greater than that of oceanic crust**
 - c) less than that of continental crust
37. Which geographic region has the **lowest** typical bioproductivity:
- a) Continental margins
 - b) **Centers of ocean gyres**
 - c) Equatorial divergences
 - d) High-latitude and polar oceans

38. Fishing efforts in the 2nd half of the 20th century have “fished down the food web.” This means
- a) we have chosen to catch a variety of fish at all different trophic levels such that no one level becomes overly depleted.
 - b) we have caught the majority of the lower trophic level fish, like anchovies.
 - c) **we have fished out the majority of the large, higher trophic level creatures, so that we now must harvest the lower trophic level fishes.**
39. Narrow currents flowing across the surf zone out toward the open ocean are called
- a) Longshore currents
 - b) **Rip currents**
 - c) Surf flow
 - d) Tidal bores
40. The maximum sustainable yield is best defined as the:
- a) annual harvest that will act to balance out natural mortality and predation.
 - b) **largest catch that a given stock can recover from.**
 - c) largest catch that will cover the minimum cost of fishing.
 - d) maximum fishing effort allowed after overfishing occurs.
41. Deep water formation occurs in the North Atlantic but not the North Pacific. From this information, infer in which ocean basin the salinity of surface waters is higher.
- a) **North Atlantic**
 - b) North Pacific
 - c) The salinity is the same everywhere
 - d) The formation of deep water masses is unaffected by salinity
42. With distance away from a mid-ocean ridge, one would expect to measure
- a) Younger oceanic crust.
 - b) **Thickening sea floor sedimentary deposits.**
 - c) Increasing volcanic activity.
43. The fetch is _____ in a region of wind wave generation.
- a) the length of time the wind blows
 - b) **the distance over which the wind blows**
 - c) the speed of the wind
44. The moon revolves around the Earth once every 29.5 days, which leads to a daily tidal period of close to 24 hours and 50 minutes. If the moon revolved around the Earth once every 6 days, the tidal period would be closest to
- a) 6 hours
 - b) 14 hours
 - c) **28 hours**
 - d) 56 hours

45. Geologically young, semi-enclosed bodies containing a mix of fresh water and seawater are called
- a) Passive margins
 - b) Sea stacks
 - c) River deltas
 - d) **Estuaries**
46. Coastal upwellings lead to high bioproductivity because upwellings
- a) raise up deep sea phytoplankton.
 - b) typically occur during fair weather, when bioproductivity is high.
 - c) **bring up deep waters that are rich in dissolved nutrients.**
47. Circulation of deep water in the ocean is predominantly driven by
- a) **Density differences**
 - b) Tides and wind waves
 - c) Winds blowing across the ocean
 - d) Heating at mid-ocean ridges and hotspots
48. Which of the following organisms spend only part of their life cycle as a member of the plankton community?
- a) Plankton
 - b) **Meroplankton**
 - c) Phytoplankton
 - d) Holoplankton
49. In general, the largest fully-developed seas on Earth are found
- a) in the equatorial Pacific.
 - b) in the Arctic Ocean.
 - c) in the Mediterranean.
 - d) **in the waters surrounding Antarctica.**
50. Winter beaches:
- a) Contain finer sediment than summer beaches due to higher average tides during winter.
 - b) Are wider than summer beaches due to low-energy waves during winter
 - c) **Are narrower than summer beaches due to the action of high-energy waves during the winter.**
51. Fishing technique with the lowest expected percentage of bycatch:
- a) **trolling**
 - b) purse seine netting
 - c) gill netting
 - d) blast fishing

52. Intensification of oceanic gyre currents occurs along their _____ boundary.
- a) Northern
 - b) Southern
 - c) Eastern
 - d) **Western**
53. Studies have shown that sharks
- a) do not get common cancers
 - b) **are susceptible to cancers**
 - c) cannot get cancer, but are very susceptible to emphysema
54. The longest wavelength oceanic waves are
- a) shallow water wind waves.
 - b) **tides.**
 - c) tsunamis.
 - d) open ocean wind waves.
55. The shorelines of the world are considered to be
- a) geologically stable zones separating land and sea.
 - b) **a dynamic environment affected by both long-term and short-term cycles.**
 - c) that part of the marine environment most resistant to change.
56. Organisms that produce their own food are called:
- a) consumers
 - b) **autotrophs**
 - c) heterotrophs
 - d) secondary producers
57. Sea level has
- a) not changed measurably over the last ~18,000 years
 - b) **increased by over 100 m over the last ~18,000 years**
 - c) decreased by over 100 m over the last ~18,000 years
58. In high-latitude oceans, when does the primary productivity reach at its yearly peak?
- a) Winter
 - b) **Spring**
 - c) Summer
 - d) Fall
59. The term “bycatch” refers to
- a) krill and other shellfish.
 - b) **non-targeted species that are caught along with commercial species.**
 - c) species harvested for industrial purposes.
 - d) species caught as part of traditional fisheries.

60. Depositional coasts are more likely to be found
- along a tectonically passive margin**
 - along a tectonically active margin
 - below the continental rise
 - upstream of the continental foothills
61. Female giant Pacific octopuses
- Mate once and then lay around 60,000 eggs**
 - Mate up to 60 times, laying close to 1000 eggs each time
 - May mate up to 60,000 times in their lives, each time laying a single egg
62. Calcareous seafloor sediments can be used to estimate past climate conditions because
- calcium carbonate rich plankton shells only dissolve in warm water.
 - calcium carbonate plankton shells record variations in oceanic oxygen isotope ratios.**
 - Biogenous sedimentation ceases during ice ages.
63. A typical wavelength for a tsunami is 200 km. Therefore, tsunamis are
- Shallow water waves**
 - Tidal waves
 - Deep water waves
64. The large-scale circulation of the Earth's atmosphere
- is driven by the Coriolis effect.
 - primarily redistributes solar heat from the oceans to the continents.
 - primarily redistributes solar heat between the equator and the poles.**
65. Carbon dioxide is
- Consumed in photosynthesis occurring in the photic zone
 - Produced by photosynthesis occurring in the photic zone**
 - Consumed by bacterial decomposition of organic matter
 - A and B
66. You wake up one day and find yourself in a room of primary consumers. You are definitely a primary producer. How do you feel to be in a room with primary consumers?
- Nervous about getting eaten.**
 - Cocky that you are about to have a great meal.
 - You feel basically uninterested in this crowd.

67. Because of much greater bioproductivity levels, the _____ typically has a relatively _____ photic zone.
- a) **coastal ocean....shallow**
 - b) open ocean shallow
 - c) coastal ocean....deep
 - d) abyssal plain....deep
68. Scientists currently believe that all marine mammals evolved from
- a) cephalopods
 - b) copepods
 - c) cartilagenous fishes
 - d) **land-dwelling mammals**
69. Tsunami waves can efficiently transport _____ across an ocean basin.
- a) heat
 - b) deep water
 - c) surface water
 - d) **energy**
70. Large baleen whales were harvested until they all nearly reached commercial extinction in the mid-1980s. Since then the majority of the large baleen whale populations
- a) have rebounded strongly.
 - b) have rebounded to near pre-fishing levels.
 - c) **have rebounded slightly, but may still be heading towards biological extinction.**
71. The following is true about cephalopod blood:
- a) Iron-based and red when oxygenated
 - b) **Copper-based and blue when oxygenated**
 - c) Iron-based and blue when oxygenated
 - d) Copper-based and red when oxygenated
72. Autotrophs
- a) Are animal consumers that feed on other organisms
 - b) Decompose organics into simple inorganic nutrient compounds necessary for photosynthesis
 - c) **Manufacture food from inorganic nutrients and sunlight**
73. If we grid the North Atlantic ocean into 50 km by 50 km boxes, what percentage have not been fished in historical times?
- a) **0%**
 - b) 20%
 - c) 40%
 - d) 80%

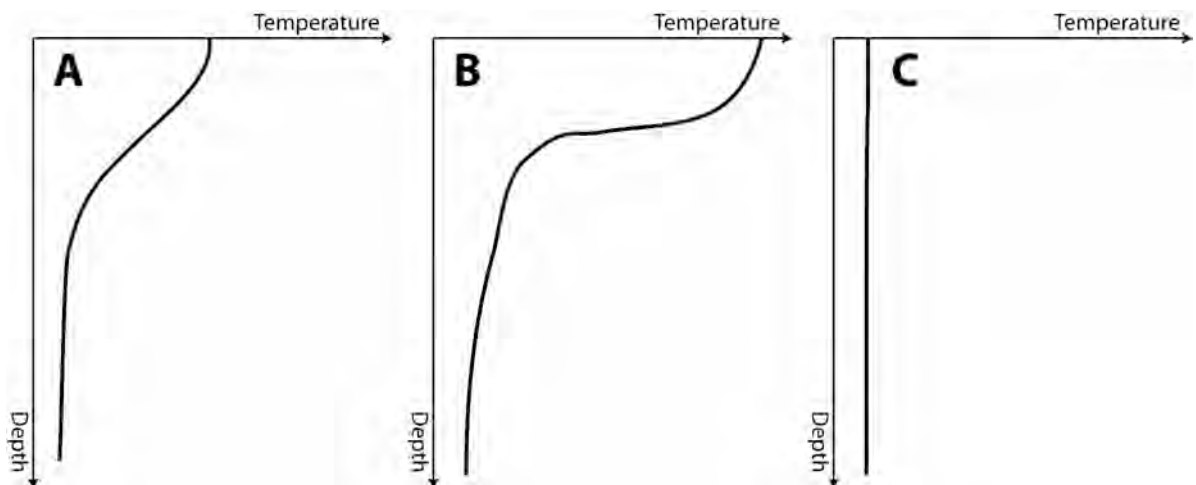
74. Yellowfin tuna, called “ahi” in restaurants, can be found on the Seafood Watch card’s yellow Caution list. It is listed there because
- a) they are commercially extinct.
 - b) they are often caught using techniques that produce large quantities of bycatch.**
 - c) they are biologically extinct.
 - d) Other types of tuna taste better.
75. In order to accurately model future changes in climate, we need to
- a) determine how climate has varied in the past
 - b) understand how the atmosphere and ocean transport heat around the planet
 - c) know how greenhouses gasses, such as carbon dioxide, exchange between the ocean and atmosphere.
 - d) All of the above choices.**
76. Where are you most likely to find biogenous sediments?
- a) An estuary
 - b) The continental shelf
 - c) The continental rise
 - d) The abyssal plain**
77. [**3 Point Problem**] In the space below sketch the cross-section of an open ocean deep water wave, making sure to label the crest, trough and wavelength. [1 point each; 3 points total]

78. In the photograph below, what kind of breaking wave is shown in the bottle?
- a) Surging breaker
 - b) Plunging breaker**
 - c) Breaking breaker
 - d) Spilling breaker



MATCHING. The schematics below show typical temperature vs. depth plots for different times of the year in a midlatitude, temperate ocean. Match each of the following to the appropriate schematic.

- 79. Summer B
- 80. Winter C
- 81. Weakest thermocline C



82. [**4 point problem**] In the space below sketch out a map view of the relative locations of the sun, moon, and Earth during a *neap* tide, making sure to label each body. [2 points] Indicate the locations of high lunar tides on the Earth by writing “LH.” [1 point] Also, indicate the locations of the high solar tides on Earth by writing “SH.” [1 point]