

Society and the Sea, Fall 2008

Final Exam, Thursday Dec. 11, 2008

(Closed Book, closed notes, answer all questions-no penalty for guessing)

USE RED SCANTRON #F-1712-PAR-L

1. The pH of seawater is normally:

- a) 7 b) 10 c) 8 d) 6

2. Benjamin Franklin mapped the Gulf Stream:

- a) for purely scientific purposes, b) to develop new trade routes for the colonies, c) to speed mail ship transits, d) to locate new fishing grounds

3. The approximate latitude, longitude of San Diego, California

- a) 43N, 117E b) 33N, 117W c) 33S, 117E d) 43N, 93W

4. Continental crust rocks have a composition resembling:

- a) granite, b) basalt, c) sandstone, d) limestone

5. Average depth of the entire world ocean:

- a) 2800km b) 3800 km c) 4200 km d) 1000km

6. At what temperature does freshwater have a maximum density?

- a) 0 C, b) 10 C, c) 4 C, d) 1 C

7. Which of the following best describes the Pacific Ocean?

- a) Mountain building dominates its margins b) shallowest ocean basin c) has very few islands d) receives discharges of the largest rivers

8. The unique structure of the water molecule causes it to behave as

- a) a polar molecule b) an ion c) a conservative property d) an acid e) a magnet

9. The Polynesians:

- a) constructed elaborate double-hulled vessels, b) used the sun, stars, and cloud patterns for navigation, c) created stick charts for navigation, d) all of the above

10. Order of the major constituents of sea salts in the ocean from the greatest to least abundant in percent by weight:

- a) sodium, chloride, sulfate, magnesium b) chloride, sodium, sulfate, magnesium c) sodium, sulfate, magnesium, chloride d) sodium, chloride, magnesium, sulfate e) chloride, magnesium, sodium, sulfate

11. The atmospheric structure starting from earth and proceeding upward is:

- a) Troposphere, Stratosphere, Tropopause, Stratopause, Mesosphere b) Stratosphere, Stratopause, Troposphere, Tropopause, Mesosphere c) Troposphere, Tropopause, Stratosphere, Stratopause, Mesosphere d) Mesosphere, tropopause, troposphere, stratosphere, stratopause

12) What is the most effective at causing an ozone hole?

- a) carbon dioxide b) methane c) global warming d) CFCs e) DDT

13) The sun primarily radiates:

- a) infrared energy b) ultraviolet energy c) visible-light energy d) none of the above

14) On a non-rotating Earth, wind at the surface would flow:

- a) from the equator to the poles b) east to west c) from the poles to the equator d) west to east

15) What is NOT characteristic of a low-pressure system:

a) rising air **b) convergence high up in the atmosphere** c) clouds d)convergence near the surface

16. X mass of Uranium can produce _____. times more energy than X mass of coal

a) one million **b) ten billion** c) ten d) 100 trillion

17. The Gulf of California is a marginal basin characterized as

a) a long, narrow marginal sea surrounded by a continent b) a basin formed by island arcs c) a basin lying between two continents d) it is not a marginal basin

18. Which is NOT characteristic of an El Nino event:

a)Warmer than usual waters in the Eastern Pacific Ocean b)reduction in fish catches off Peru **c) a build up of the prevailing westerly winds (Trade Winds) on the eastern side of the Pacific Ocean** d) brings lots of rain to Southern California

19. Today, what is the most common scientific way to measure salinity:

a) taste it and you can determine the salinity **b) measure the conductivity of the seawater** c) dry the sample and weigh the left over salt d) compare the sea water to freshwater by weighing both

20. One of the following is a Western Boundary Current:

a)Monsoon Current **b)Gulf Stream** c)California Current d)Peru Current

21. What percentage of total incoming light energy remains at 10 meters depth in ocean?

a) 1% **b)20%** c)50% d)60 % e) 100%

22. Western boundary currents are:

a) wide (>1000km) and shallow (500m) **b) narrow (< 100km) and deep (1000m)** c) narrow (< 100km) and shallow (500m) d) wide (>1000km) and deep (1000m)

23. The Gulf Eddy has diurnal tides. There was a high tide at 9:00 AM today. When will the Gulf Eddy have its next high tide?

a) 12:00 noon b) 9:25pm today **c) 9:50 AM tomorrow** d) 3:00pm Today

24. A food web is a:

a) complex group of food chains b) relationship between a single predator and its prey c) a net used by Indians for fishing in estuaries d) group of shallow-water benthic animals

25-27) Use these characteristics to describe the three areas:

a) Relatively large number of species

b)Relatively Few Species

c)small biomass

d)large biomass

e)low nutrients

f)high nutrients

25) Subpolar Gyre Area:

A) a,c,e B)b,c,f D) a,d,e **D) b,d,f**

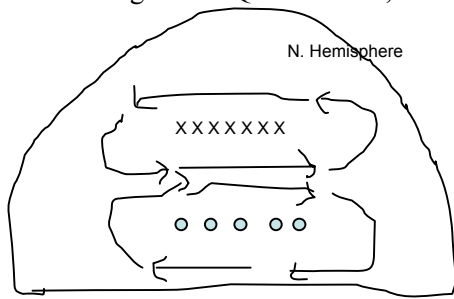
26) Subtropical Gyre Area:

A)a,c,e B)a,d,f C)b,d,e D)b,d,f

27) Equatorial Area:

A)a,d,f B)a,c,e C)b,d,f D)a,c,f

Use this Figure for Questions 28, 29



28. This Gyre experiences convergence in the middle:

- a) **Subtropical Gyre** B) Subpolar Gyre

29. Upwelling would occur here:

- A) ooooo B) **XXXXX** c) near the equator

30. Amphidromic Point:

- a) **Location of very little tide change** b) location of very large tide change c) Location that always experiences a low tide d) location that always experiences a high tide e) location that experiences mixed tides

31. Which region would have the lowest abundance and concentration of phytoplankton:

- a) At the equator b) near a coast c) **in the middle of the subtropical gyre** d) polar regions during its summer

32. Benthic organisms:

- a) **live on the bottom of the ocean** b) live at the surface of the ocean c) swim large distances throughout the ocean d) are ones that have gone extinct

33. Seasons are caused by

- a) periodic brightening of the sun b) variation of the distance between the earth and the sun c) revolution of the earth about its axis d) **changes in the inclination of the earth's axis of rotation**

34. Fossils are useful in determining the age of sediment deposits because they

- a) **provide relative ages** b) provide absolute ages c) occur in all rocks d) are easily recognized

35. Which of the following does NOT suggest Plate Tectonic Theory as true:

- a) similar fossils and geological formations that are found on land that was once connected b) Symmetry of the magnetic anomalies in the ocean about a Mid Ocean Ridge c) Earthquakes along the Ring of Fire d) **Continental crust is denser than oceanic crust**

36. The amount of heat needed to change the temperature of one gram of water by one degree Celsius is called a

- a) British Thermal Unit b) **calorie** c) specific heat d) latent heat

37. Estuarine circulation is characterized by

- a) one way flow of water at all depths b) flow of surface water landward, subsurface water seaward c) **flow of surface water seaward, subsurface flows landward** d) rotary flows of water at all depths

38. At the end of the last glacial stage (about 18,000 years ago) sea level stood:

- a) At the base of the continental rise b) At the base of the continental slope c) **At the edge of the continental shelf** d) At its present level

39. Sardines, Herring, and anchovies are NOT

- a) **filter feeders** b) primarily in upwelling areas, c) actively swimming predators d) fast growing

40. Which of the following deposits would you expect to find in the deep ocean?

- a) **mud** b) gravel c) sand d) boulders

41. Which of the following are NOT members of holoplankton?

- a) foraminifera b) copepods c) **fish eggs** d) pteropods

42. Development can improve the quality of life without depleting natural resources or causing environmental problems for ourselves and future generations. This is the theme of the concept of
a) economic development b) the commons c) **sustainable development** d) biodiversity
43. Zooplankton are:
a) plankton that are only found in a zoo b) **small animals** c) large plants like kelp d) small plants
44. Red tides are produced by
a) rare alignments of the sun, earth, and moon b) large waves from the distant earthquakes c) **dense accumulations of phytoplankton** d) spawning tides
45. Since the effects of the ozone hole were first studied, production by algae and bacteria living in the lower ice layer has
a) increased b) **decreased** c) stayed the same d) fluctuated
46. The kelp forest community is affected by
a) pollution b) fishing c) climate d) **all of the above**
47. Wide, shallow embayments that are typically separated from the coastal ocean by offshore barrier islands are called
a) fjords b) coastal-plain estuaries c) **lagoons** d) tectonic estuaries
48. Anaerobic organisms
a) **require no oxygen in any form** b) break down nitrates or sulfates to obtain oxygen c) common in most ocean waters d) form a major part of the marine food chains
49. Sand is commonly lost from beaches through
a) Trapping in coastal lagoons b) Transport down submarine canyons c) Blown away by winter storms d) **all of the above**
50. Nannoplankton are distinguished by their
a) ability to photosynthesize b) **small size** c) ability to chemosynthesize d) respiration
51. Subpolar Gyres are
a) areas of high nutrients b) divergent areas c) highly productive d) **All of the above**
52. Foraminifera are
a) **one-celled carbonate shelled animals** b) one celled, carbonate shelled plants c) Major frame builders for coral reefs d) grow only in sunlight and warm waters
53. The 200 nautical mile area within which coastal states can regulate ocean resource exploration and exploitation is called the
a) mare liberum b) territorial sea c) Law of the Sea d) **Exclusive Economic Zone**
54. A tidal day is equal to
a) 23 hours, 50 minutes b) 24 hours c) 24 hours 10 minutes d) **24 hours 50 minutes**
55. Which of the following are fast swimmers, effective predators, have well-developed eyes, can be extremely large, migrate vertically, and are among the most common animals in the ocean?
a) sharks b) tuna c) **squid** d) whales
56. Coastal waters near large rivers exhibit
a) high evaporation b) **low salinity** c) high salinity d) low temperature
57. Which of these is FALSE, regarding waves:
a) Water particles move in circular motion as the wave form passes through the water
b) the strength of the swell is increased as the fetch of the wind is increased
c) **waves are bodies of water pushed across the surface of a lake or sea by the wind**

d) Due to refraction, waves tend to arrive at the shore head on; that is the wave front or wave crest parallels or nearly parallels the shoreline

58. What is brackish water?

- a) super saline water
- b) water more saline than freshwater but not as saline as seawater
- c) polluted water
- d) water filled with sediment

59. A symbiotic relationship:

- a) one participant benefits and the other is harmed
- b) both participants are harmed
- c) one or both participants benefit and neither is harmed
- d) one participant eventually takes control and drives the other participant to relocate

60. One important difference between life on land and life in the sea is that the sea has more

- a) living space
- b) higher percentage of oxygen
- c) plants
- d) animals
- e) panache

61. As a wave passes in deep water, water parcels move in:

- a) completely closed circular orbits
- b) closed elliptical orbits
- c) almost closed circular orbits
- d) north
- e) to the right in the north

62. Tides are

- a) predictable
- b) a potential source of electrical energy in some areas
- c) produced primarily by the moon
- d) all of the above

63. Which path best characterizes shooting a cannon from San Diego to L.A.?

- a) will be straight, no curve
- b) will slightly curve right
- c) will slightly curve left
- d) would hit Texas

64. The geology of the Andes Mountains in South America:

- a) Continent-Continent Collision
- b) Divergence of two plates creating volcanism
- c) Subduction of Oceanic plate under Continental plate
- d) Hot spot in the middle of Continental Plate

65. Ocean waves break at a depth of up to 1.5 times the wave height. Therefore a 5 meter high wave would cause erosion on the sea floor at a depth of:

- a) 7.5 meters
- b) 8.5 meters
- c) 5 meters
- d) 10 meters

66. Beach sediments are transported laterally by:

- a) offshore winds
- b) tides
- c) longshore currents
- d) onshore currents

67. Mean sea levels are NOT a function of

- a) plate tectonics
- b) ocean basin modification
- c) glaciation
- d) tidal effects

68. At what time would the temperature profile of the ocean's top ten meters be closest to a straight line (near equal temperature from at the surface to ten meters deep)?

- a) midnight
- b) dawn (5am)
- c) noon
- d) dusk (5pm)

69. How were the Great Lakes formed?

- a) plate tectonics and basin formation
- b) retreating ice sheets
- c) No one knows
- d) The great flood

70. Which of these plankton are able to slightly move in water?

- a) diatoms
- b) foraminifera
- c) radiolarian
- d) dinoflagellates

71. Which of these areas would have a food chain with the fewest steps?

- a) upwelling area
- b) coastal area
- c) open sea
- d) They would all have the same

72. Which of these organisms would be considered nekton:

- a) crab
- b) diatoms
- c) swordfish
- d) kelp

73. The San Andreas Fault is a:

- a) Thrust Fault
- b) Transform Fault
- c) Reverse Fault
- d) inactive fault

74. This type of algae lives in coral?

- a) **Zooxanthellae** b) dinoflagellates c) cyanobacteria d) diatoms

75. The order of which an organism dominates a bare rock surface, over time, starting with the first:

- a) small algae, bacteria, mussels, barnacles b) bacteria, small algae, mussels, barnacles
c) **bacteria, small algae, barnacles, mussels** d) small algae, bacteria, barnacles, mussels

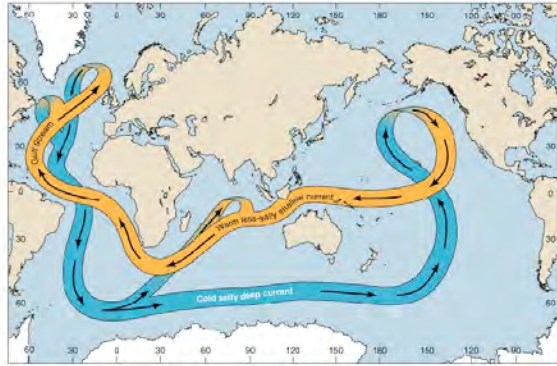
76. Animals that live in buried sediment:

- a) epifauna b) **infauna** c) nekton b) all of the above

77. Which of these feeding strategies constitutes the main biomass of the ocean at 2000 meters deep:

- a) Herbivores b) Omnivores c) **Carnivores**

78-81. This is a simplified diagram of the ocean circulation (Global Conveyor Belt)



78. Based on this diagram, which water mass would have more oxygen

- a) **Deep Atlantic Ocean Water** b) Deep Pacific Ocean water c) Deep water near Antarctica

79. Which water mass would have the highest amount of nutrients

- a) Deep Atlantic Ocean Water b) **Deep Pacific Ocean Water** c) Atlantic Ocean Surface water

80. Where would you find the highest amount of CFCs (do not decay, were put into atmosphere in the ~1950s)?

- a) **bottom water in the North Atlantic** b) bottom water in the north Pacific c) Both would have same amount

81. Which of these does the diagram above not portray, but is actually very important in global ocean circulation?

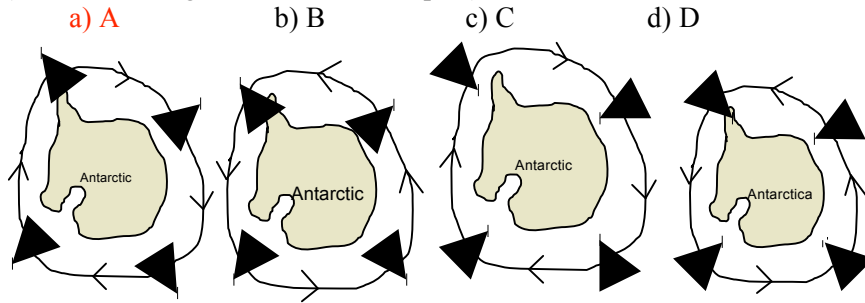
- a) Input of deep water into Atlantic from the highly saline Mediterranean Sea b) Downwelling of water near Antarctica to create the Antarctic Bottom Water c) The important influence of the Southern Ocean (Antarctic Circumpolar Current) d) **all of the above**



82. Rank the following areas (above) from greatest surface salinity to least surface salinity

- a) B C A b) A C B c) B A C d) **C B A**

83. Which diagram best represents the circumpolar current and upwelling around Antarctica?
(The solid triangles are Ekman transport)



84. Which of these animals does NOT migrate?

a) gray whale b) salmon c) North Atlantic eels d) All of them migrate and they do so to take advantage of seasonally abundant foods and/or spawn

85. Which planet is NOT considered terrestrial in nature?

a) Earth b) Mars c) Saturn d) Mercury

86. What are krill?

a) tiny phytoplankton b) very small shrimp c) large nekton d) edible bacteria

87. The largest marine mammals are

a) specialized for filter feeding b) active predators c) specialized to live on the bottom d) restricted to coastal ocean waters

88. What is the approximate occurrence of an El Nino?

a) every 10-20 years b) every 1-2 years c) every 30 years d) every 3-8 years

89. Compared to continental crust, oceanic crust tends to be:

a) older, thinner, and less dense b) younger, thicker, and more dense c) younger, thinner, and more dense d) older, thinner, and more dense

90. Earth's surface is approximately ___% water

a) 19 b) 71 c) 85 d) 56

91. What is the approximate population of humans on Earth?

a) 800 million b) 6.7 billion c) 11 billion d) 2 billion

92. Deep-ocean waters return to the surface

a) in 500 to 2,000 years b) seasonally c) once in a million years d) less than 20 years

93. Many deep dwelling fish are this color because this color does not penetrate very deep in the open ocean:

a) yellow b) blue c) green d) red

94. The direction of the Trade Winds:

a) from east, moving west b) from west, moving eastward c) moving poleward d) moving equatorward

TRUE (A) / FALSE (B)

95. Open ocean food webs are short and simple while upwelling areas off a coast have food webs that are long and complicated F, the exact opposite

96. The exchange of water between the Atlantic Ocean and the Mediterranean Sea is an example of Estuarine Circulation. (Think of the Medit. as a river going into the Atlantic Ocean. Will the dynamics be the same as a river going into the ocean?) F, this is anti-estuarine circulation

97. Ekman transport in the Southern Hemisphere is 90 degrees to the right of the wind direction F, to the left

98. Mixed tides have two unequal high and two unequal low tides T
99. Reefs are characteristic of high latitudes F
100. Normally, wind blows from the sea to land during the night and from the land to the sea during the day F
101. Diatoms are more efficient at using up nutrients than dinoflagellates T
102. The troposphere gets colder as elevation increases T
103. Deep water in the North Pacific has more oxygen than deep water in the North Atlantic F
104. Cyanobacteria play an important role as nitrogen fixers in the ocean. It is also hypothesized that this organism changed Earth's atmosphere from carbon dioxide and methane rich to oxygen rich. T
105. The oldest oceanic crust in the Atlantic Ocean is found furthest away from land near the Mid-Ocean Ridge F
106. The stratosphere gets warmer as elevation increases T
107. Heavy monsoon rains fall on India and Southeast Asia during the winter F, summer
108. The Jet Stream makes flying from New York to LA faster and enables planes to use less fuel F
109. The ozone is located in the stratosphere T
110. Hurricanes have high pressure F
111. The thermocline is a zone in the ocean in which temperature changes very fast with depth T
112. Manganese nodules are examples of hydrogenous sediment T
113. Condensation (water vapor turning into liquid water) gives off energy (exothermic) T
114. The dominant wavelength that Earth radiates is visible. F, it is infrared (heat)
115. Continental crust is magnesium and iron rich, while the oceanic crust is silica rich F, the opposite
116. The Pacific Ocean margin is a passive margin F
117. Sodium and aluminum have the same residence time in the ocean F, sodium has much longer residence time
118. Both foraminifera and diatoms are made up of calcium carbonate F, diatoms are made up of silica
119. The freezing point of water decreases with increasing salinity T
120. The greatest tidal ranges occur during Spring Tides T
121. The Coriolis Force is zero at the equator T
122. San Diego experiences mixed tides T
123. Dissolved-oxygen concentrations and nutrient concentrations have very similar profiles versus depth F, they have the exact opposite
124. Waves in a swell are smoother, longer, and less frequent than waves in a sea T
125. Diurnal tides have one high tide and one low tide per day T