

**OCN 201 Fall 2002 Exam 2**  
**Section 1**

**True/False**

*Indicate whether the sentence or statement is true or false.*

1. Because of the dissolved salt in seawater its freezing point is higher than that of pure water
2. Marcellus's principle states that "regardless of how the salinity may vary from place to place the ratios between the amounts of the major ions in the waters of the open ocean are nearly constant"
3. Large numbers of organisms are found around hydrothermal vents that do not have hydrogen sulphide in them
4. There are no hydrothermal vents in the Arctic Ocean
5. All of the nitrate in the ocean comes from rivers
6. Most organic matter is decomposed at the bottom of the ocean
7. Tritium is a chemical that can be used to trace the physical movement of water in the oceans
8. The maximum density of seawater occurs at approximately 4°C
9. Red light is absorbed most readily in the ocean
10. Outgoing radiation from the Earth is longwave
11. Dry air is more dense than humid air
12. Low pressure zones in the atmosphere occur where air is ascending
13. During La Nina the surface of the western Pacific is higher than the eastern Pacific
14. During El Nino conditions atmospheric pressure is lower in Tahiti than in Darwin
15. The speed of a shallow water wave is related to its period
16. Wave packets travel at the same speed as individual waves
17. The crest of a tsunami always arrives first
18. The effect of the Sun on the generation of tides is about 45% of that of the Moon
19. Tides have wavelengths of up to 12,000 miles
20. There are two neap tides every 28 days
21. Carbon dioxide is the only Greenhouse Gas
22. Atmospheric carbon dioxide levels are currently higher than they have been during the last 160,000 years
23. The most significant contributor to future global sea level rise is thermal expansion of surface ocean water
24. The Hadley cell is an atmospheric circulation cell that moves air between the Equator and 30°N
25. When wind blows over cold ocean water it is more likely to produce rain than when it blows over warm water

## Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

26. In sea water major ions constitute what percentage of the total?:
  - a. 100%
  - b. 99.4%
  - c. 90%
  - d. 50%
  - e. 10%
27. How much salt is dissolved in a kilogram of typical seawater
  - a. 1gram
  - b. 15 gram
  - c. 35 gram
  - d. 1000 gram
  - e. 0.1 gram
28. Conservative ions are:
  - a. those whose proportions remain constant relative to each other in all oceans
  - b. those whose proportions vary relative to each other in all oceans.
  - c. those ions whose concentration is less than 1 mmol
  - d. those ions whose concentration is greater than 1 mmol
  - e. those ions that vote republican
29. Most of the chemicals in seawater come from
  - a. hydrothermal vents
  - b. rivers
  - c. rain
  - d. phytoplankton
30. Hydrothermal fluids do not boil at 380 °C at the bottom of the ocean because
  - a. Pressure has raised the boiling point
  - b. Sea water doesn't boil
  - c. There are too many chemicals dissolved in the sea water
  - d. The particles prevent boiling
31. The chemosynthetic based communities at hydrothermal vent sites get their energy ultimately from:
  - a. Sulphide
  - b. Sunlight
  - c. Warmth of the water
  - d. Radioactive decay
  - e. Twinkie bars
32. Which of the following chemicals is most likely to be the limiting nutrient in the surface waters of the ocean?
  - a. calcium
  - b. silicon
  - c. phosphorous
  - d. carbon
  - e. cadmium
33. The 1% light level in the open ocean (say just north of Hawaii) is somewhere around
  - a. 1 m

- b. 60 m
  - c. 120 m
  - d. 200 m
34. Most of the tritium entered the surface ocean
- a. during the second world war
  - b. in 1952
  - c. in 1964
  - d. in 1981
35. If you cool seawater its density
- a. increases
  - b. decreases
  - c. stays the same
36. The pycnocline is the depth in the ocean where
- a. the temperature changes rapidly
  - b. the salinity changes rapidly
  - c. the density changes rapidly
  - d. sharks hang out waiting for surfers
37. The maximum energy of light coming into the surface ocean is in the following part of the spectrum
- a. violet-indigo
  - b. blue-green
  - c. yellow-orange
  - d. red-infrared
38. The mass of one square inch of the atmosphere at the Earth's surface is approximately
- a. 5 pounds
  - b. 1 pound
  - c. 15 pounds
  - d. 25 pounds
  - e. 10 pounds
39. The wavelength of the radiation entering and leaving the Earth are
- a. the same
  - b. incoming is short, outgoing is long
  - c. incoming is long, outgoing is short
  - d. none of the above
40. Effective transport in the Ekman layer in the northern hemisphere relative to the wind is
- a. 20° to the left
  - b. 90° to the left
  - c. 15° to the right
  - d. 45° to the right
  - e. directly ahead
41. Western boundary currents are:
- a. faster than eastern boundary currents
  - b. warmer than eastern boundary currents
  - c. all of the above
  - d. none of the above
42. Southern oscillation is:
- a. a variation in the upwelling along the equator
  - b. a subsurface wave that travels along the thermocline

- c. a variation in the pressure gradient between Tahiti and Darwin
  - d. a new dance
43. During the 1982/83 El Nino the weather conditions in Australia were:
- a. drought
  - b. heavy rainfall
  - c. hurricanes
  - d. unaffected
44. The period of a wave is:
- a. the distance between its crests
  - b. the time it takes succeeding crests to pass a fixed point
  - c. the number of waves that pass a fixed point each second
  - d. the distance from the crest to the trough of a wave
45. When wave trains propagate away from a storm they lose what percentage of their height each day?
- a. 10%
  - b. 50%
  - c. 30%
  - d. 22%
46. Neap tides occur when:
- a. the moon is new
  - b. the moon is full
  - c. the sun and moon are aligned
  - d. Jupiter is aligned with Mars
  - e. none of the above
47. The tides in Hawaii are:
- a. diurnal
  - b. semi-diurnal
  - c. mixed
48. Recent atmospheric CO<sub>2</sub> levels started to increase around
- a. 1700
  - b. 1780
  - c. 1850
  - d. 1935
49. Relative to the atmosphere how much carbon dioxide is dissolved in the oceans:
- a. the same amount
  - b. one tenth
  - c. 70 times as much
  - d. 1000 times as much
50. During an ice age sea level
- a. goes up
  - b. goes down
  - c. stays the same
51. The Vostock ice core was drilled by French and Soviet scientists in
- a. France
  - b. Greenland
  - c. Siberia
  - d. Antarctica
  - e. Alaska

52. The atmospheric pressure at the top of Mauna Kea is approximately
- 1000 mb
  - 829 mb
  - 562 mb
  - 213 mb
53. If a wind wave has a period of 8 seconds its velocity in meters per second in deep water would be approximately:
- 8
  - 12
  - 24
  - 210
54. How long would it take to replace all the water in the oceans with river water?
- 36,000 years
  - 8 million years
  - 1000 years
  - 1 million years
  - 100 million years
55. Major ions in sea water have residence times:
- greater than 1 million years
  - greater than 1,000 years
  - less than 1million years
  - more than 100 million years

### **Completion**

*Complete each sentence or statement.*

56. The mixing time of the oceans is approximately \_\_\_\_\_ years
57. The three factors that determine the development of a "full sea" are \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_

### **Essay (If necessary use the next page to continue your answer)**

58. Name 5 of the 6 major ions in seawater.
59. Name four chemicals that are needed by all oceanic plants and two that are needed by some organisms that build skeletons
60. Draw a picture and name the principal currents in the North Pacific gyre



