## Fall 2003 exam 2 section 2

**True/False**
*Indicate whether the sentence or statement is true=A or false=B.*

____ 1. Short residence time elements are uniformly distributed in the oceans

____ 2. The hydrothermal vent sites at Loihi have lots of animals around them.

____ 3. Nitrate, phosphate, carbon and calcium are required nutrients

____ 4. Tritium (3H) was produced during the atmospheric testing of nuclear weapons

____ 5. The density of seawater is determined by temperature and salinity

____ 6. Thermohaline circulation is the process whereby surface seawater becomes denser at high latitudes and sinks to form new deep water

____ 7. Outgoing radiation from the Earth is longwave

____ 8. Dry air is more dense than humid air

____ 9. Deserts are found at the latitudes where air masses are rising

____ 10. Low pressure zones in the atmosphere occur where air is ascending

____ 11. Surface currents are driven by atmospheric processes

____ 12. During La Nina the surface of the western Pacific is higher than the eastern Pacific

____ 13. Wave packets travel at the same speed as individual waves

____ 14. Wind waves are deep water waves

____ 15. The crest of a tsunami always arrives first

____ 16. Tsunami are shallow water waves

____ 17. The Sun has more effect on the tides than the moon

____ 18. The highest tides occur in the spring

____ 19. Carbon dioxide is the only Greenhouse Gas

____ 20. Atmospheric carbon dioxide levels are currently lower than they have been during the last 160,000 years

____ 21. Evidence from ice cores suggests that $CO_2$ levels in the atmosphere just before the industrial revolution were much higher than today

____ 22. There is about 100 times more carbon dioxide in fossil fuels than in the atmosphere

____ 23. Long wavelength waves travel more slowly than short ones

____ 24. The speed of a shallow water wave is related to its period

____ 25. Waves can refract around island chains

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

____ 26. How much salt is dissolved in a kilogram of typical seawater
a. 1gram
b. 15 grams
c. 35 grams
d. 0.1 gram

____ 27. In sea water major ions constitute what percentage of the total?:
a. 100%
b. 99.4%
c. 90%
d. 50%
e. 10%

____ 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. How much of the Earth's surface water is in the oceans?
a. 10%
b. 97%
c. 99%
d. 73%

____ 31. Chimneys form at hydrothermal vent sites because
a. iron sulphide precipitates
b. the surrounding seawater is oxidising
c. the surrounding seawater is cold
d. all of the above

____ 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. If you cool seawater its density
a. increases

b. decreases
c. stays the same

____ 34. The thermohaline circulation is
a. the process that moves deep water from the Atlantic to the Pacific Ocean
b. the process by which organisms remove chemicals in surface waters and remobilise them in deep water
c. the process which brings hydrothermal fluids to the sea floor
d. a new transport system at San Francisco airport

____ 35. The thermocline is the part of the ocean where
a. the density changes rapidly
b. salinity changes rapidly
c. the temperature changes rapidly
d. you are most likely to find Elvis

____ 36. Of the total water in the ocean the deep zone accounts for about
a. 1%
b. 18%
c. 80%
d. 99.4%

____ 37. The heat capacity of a substance is the amount of heat needed to raise its temperature by
a. 1˚C
b. 10˚C
c. 15˚C
d. 100˚C

____ 38. The SOFAR layer in the ocean is a region
a. with maximum sound speed
b. with minimum sound speed
c. where submarines can hide from SONAR
d. where sound waves refract away from

____ 39. 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

____ 40. At the equator the Earth is rotating eastward at approximately:
a. 100 mph
b. 10,000 mph
c. 1,000 mph
d. 1,500 mph

____ 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. Currents flow around the boundary of the gyres because of
a. geostrophic balance

b. Coriolis force
c. trade winds
d. Ekman spiral

____ 43. The southern oscillation is:
a. the change in direction of Coriolis force at the equator
b. the change in pressure differential between Darwin and Tahiti
c. the change in the thermocline depth between El Nino and La Nina
d. A popular dance from Brazil

____ 44. During the 1982/83 El Nino the weather conditions in Australia were:
a. drought
b. heavy rainfall
c. hurricanes
d. unaffected

____ 45. During El Nino the layer of warm water at the surface ocean in the Western Pacific is
a. thicker than normal
b. thinner than normal
c. stays the same

____ 46. When a deep water wave approaches the shore which of the following is true:
a. its velocity remains constant
b. its period remains constant
c. its wavelength remains constant
d. all of the above

____ 47. The period of a typical Tsunami is:
a. 30 seconds
b. 2 minutes
c. 15 minutes
d. 35 minutes

____ 48. The tides in Hawaii are:
a. diurnal
b. semi-diurnal
c. mixed

____ 49. Compared to the size of the atmospheric reservoir of carbon dioxide the fossil fuel reservoir is approximately:
a. 13.5-times
b. 25.7-times
c. 100-times
d. 140-times
e. 10-tiimes

____ 50. Data from ice-cores shows that when carbon dioxide levels in the atmosphere went down, average planetary temperatures:
a. stayed the same
b. went up
c. went down

____ 51. If a wind wave has a period of 12 seconds its velocity in meters per second in deep water would be approximately:

a. 8
b. 12
c. 18
d. 36

____ 52. Spring tides occur when:
a. the moon is one quarter
b. the Sun and Moon are aligned with the Earth
c. Jupiter is aligned with Mars
d. none of the above

____ 53. 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%

____ 54. 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

**Completion**
*Complete each sentence or statement.*

55. Major ions are well mixed in the ocean because they have a _____ residence time.

56. Name two ways in which large storms can lose the energy which feed their growth
_____ and _____

57. Three mechanisms by which heat can be transferred are: _____, _____ and _____.

**Essay**

58. (5 points) During hydrothermal vent circulation, name two chemicals that are removed or changed into another form in seawater and name three chemicals that are added to sea water

59. (5 points) Draw a picture that shows what happens to 100 units of primary production in the ocean. Label the amounts of material at each depth in the ocean and sediments

60. (5 points) Name 5 of the 6 major ions in seawater.