

Name (print, last name first): _____

Social Security No.: _____ -- _____ -- _____

OCEANOGRAPHY 201

Fall 1998 Exam #2

Answer 1-60 on the computer-scan sheet (1 point each). Use a dark (#2) pencil only, and make marks neatly within the circles. If you change an answer, erase completely. Also, be sure your ID number is coded correctly.

PART I: true/false (1 point each = 25 points)

Mark 9a) for “true” and (b) for “false”

- 1) Short residence time elements are uniformly distributed in the oceans
- 2) Blue light is absorbed most rapidly in the ocean.
- 3) Gyres in the Southern hemisphere are anticlockwise.
- 4) Hydrothermal vents always have large numbers of animals around them
- 5) Carbon dioxide is the only Greenhouse gas.
- 6) At hydrothermal vents that do not have hydrogen sulphide in them, large numbers of organisms are found.
- 7) Tritium (^3H) was produced during the atmospheric testing of nuclear weapons.
- 8) Outgoing heat from the surface of the Earth is short wave radiation.
- 9) The sun has more effect on the tides than the moon.
- 10) Salinity is used to determine the density of sea water.
- 11) Hydrothermal vents are found only at mid-ocean ridges
- 12) Because of the dissolved salt in seawater its freezing point is higher than that of pure water
- 13) There is more carbon dioxide in the oceans than in the atmosphere.
- 14) The concentration of Nitrate (NO_3) in the deep water of the Pacific Ocean is less than that in the deep water of the Atlantic Ocean.
- 15) Light penetration in the middle of the N. Pacific gyre is likely to be much greater than near the coast.

- 16) Wave trains travel at the same speed as individual waves.
- 17) Spring tides occur when the Sun and the Moon are in line with each other
- 18) Warm moist air is heavier than cold dry air
- 19) In the southern hemisphere Coriolis effect turns motion to the left.
- 20) Waves can refract around island chains.
- 21) Tsunami are deep water waves.
- 22) Surface currents are driven by thermohaline processes.
- 23) The velocity of a deep water wave can be calculated from its period
- 24) Salinities in the open ocean can vary from 32-39.
- 25) Most deep water is formed in the North Pacific.

PART 2: Multiple Choice (1 point each = 35 points)

- 26) How much salt is dissolved in a kilogram of typical seawater?
a) 1 gram b) 15 grams c) 35 grams d) 1,000 grams e) 0.1 gram
- 27) When sea water passes through a hydrothermal system
a) Anhydrite (CaSO_4) is precipitated
b) Magnesium (Mg) is removed by reaction with the rock.
c) Sulphate is reduced to sulphide.
d) All of the above.
- 28) The mixing time of the oceans is:
a) 36,000 yr.
b) 1,000 yr.
c) 1 million yr.
d) 3,600 yr.
- 29) If the period of a wave is 12 seconds what is its approximate velocity in metres/second?
a) 4 b)8 c)18 d) 24

- 30) Major ions constitute:
- a) 100% of all ions in s/w
 - b) 99.4%
 - c) 90%
 - d) 50%
 - e) 10%
- 32) Constructive interference is when:
- a) Two waves' crests overlap
 - b) A wave crest and a wave trough overlap
 - c) Someone corrects your pronunciation from the back of the room
- 33) Chemosynthetic animal communities at hydrothermal vent sites get their energy from a)
- Sunlight b) Pressure c) Warm water d) Sulphide c) Twinkie Bars
- 34) Major ions in sea water have residence times:
- a) greater than 1 million years
 - b) less than 1,000 years
 - c) less than 1million years
 - d) more than 100 million years.
- 35) Of the total water in the ocean the deep zone accounts for about
- a) 1% b) 18% c) 80% d) 99.4%
- 36) 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) a) and c)
- 37) 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
- 38) The concentration of chloride (Cl) in sea water is approx:
- a)0.5M b) 0.05M c) 5 mmol d) 5 μ mol, e) 5 nmol
- 39) The average atmospheric pressure on hte surface of the Earth is (in pounds per square inch)
- a) 1 b) 5 c) 15 d) 25 e) 1000
- 40) Most of the chemicals in seawater come from
- a) Hydrothermal vents
 - b) Rivers
 - c) Rain
 - d) Phytoplankton

- 41) Hydrothermal fluids do not boil at 380°C at the bottom of the ocean because
- a) Pressure has raised the boiling point
 - b) The salt in the sea water has raised its boiling point
 - c) the presence of bacteria in the water
 - d) The particles prevent boiling
- 42) If a 100 units of organic matter are produced in the upper waters of the ocean on average how many units of this organic matter will fall through the water column reach the sea bed and be preserved in the sediments:
- a) 1-3 b) 90 c) 9 d) 0
- 43) The “Chimneys” at hydrothermal vent sites are formed from:
- a) Magnesium
 - b) lava
 - c) iron, zinc and copper sulphides
 - d) the remains of organisms.
- 44) The speed of sound in the ocean is about
- a) 100 m/sec
 - b) 1000 m/sec
 - c) 1500 m/sec
 - d) 3000 m/sec
 - e) none of the above
- 45) Nutrients are removed from the surface waters of the ocean down to the point where the light level is:
- a) 50% b) 10% c) 5% d) 1%
- 46) Western boundary currents are:
- a) weaker than eastern boundary currents
 - b) colder than eastern boundary currents
 - c) slower than eastern boundary currents
 - d) all of the above
 - e) none of the above
- 47) When wind blows over warm ocean water it is:
- a) more likely to produce rain
 - b) less likely to produce rain
- 48) 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

- 49) Sound travels a long way in the SOFAR channel because
- a) the speed of sound is highest in this layer
 - b) the speed of sound is lowest in this layer
 - c) Whales communicate in this layer
 - d) It is the depth of the 1% light level
- 50) The atmospheric cell between the equator and 30°N is called:
- a) the Ferrel cell
 - b) the Hadley cell
 - c) the inter-tropical convergence zone
 - d) the Coriolis zone
- 51) The Earth loses its heat by:
- a) Convection b) Conduction c) Radiation d) none of the above e) all of the above
- 52) 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) The latest dance in Argentina
- 53) 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
- 54) 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
- 55) Each day high tide is approximately:
- a) 1 hour later b) 1 hour earlier c) 2 hours later d) exactly the same time
- 56) During El Nino the layer of warm water at the surface ocean in the Western Pacific is
- a) is thicker than normal
 - b) is thinner than normal
 - c) stays the same

57) A wave behaves as a shallow water wave when the depth of the ocean is equal to or less than:
a) one wavelength
b) 1/2 wavelength
c) 1/20 wavelength
d) 1/23 wavelength

58) In 1998 the atmospheric carbon dioxide level is approximately:
a) 280 ppmv b) 315 ppmv c) 365 ppmv d) 560 ppmv

59) In the Pacific Ocean Tsunami travel at approximately:
a) 13 mph b) 45 mph c) 150 mph d) 450 mph e) 3,700 mph

60) The period of a typical Tsunami is:
a) 30 seconds b) 2 minutes c) 15 minutes d) 35 minutes

Part 3: SHORT Essay (5 points each)

61) Name 5 of the 6 major ions in seawater.

62) Name the principal currents in the North Pacific gyre (1 point/current +1 bonus for all correct)

63) El Niño events can have devastating effects on the fisheries off Peru.
Name two El Niño-related changes in the water column that can lead to the decline of the fisheries (2 points):

Name two atmospheric changes that help create these conditions (2 points):

Name one additional negative effect of El Niño (besides impact on fisheries) (1 point):