OCN 201, Chemistry & Physics Section A

23-March-2018

Name:_____ **ID:**_____

Answer the True/False and Multiple Choice questions on the scantron sheet. Answer the remaining questions on this exam handout. Turn in both the scantron and exam at the end of class. This exam has 59 questions, for a total of 75 points.

True/False Questions

1. (1 point) Salinity is a measure of the dissolved organic solids in water.
   A. True B. False

2. (1 point) Nitrate, phosphate, carbon and calcium are required nutrients.
   A. True B. False

3. (1 point) Because of the dissolved salt in seawater it's freezing point is lower than that of pure water.
   A. True B. False

4. (1 point) More solar radiation per m^2 reaches the poles than tropics.
   A. True B. False

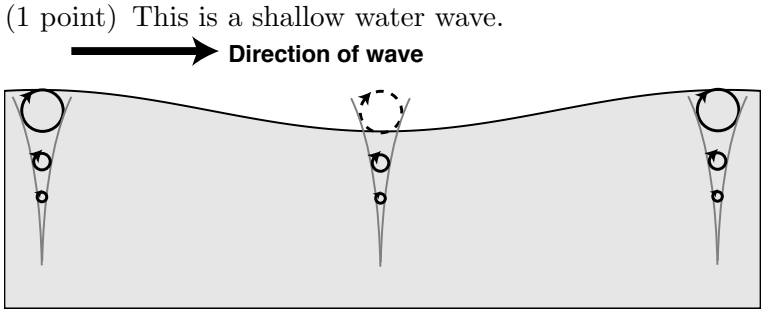
5. (1 point) Salinity is used in determining the density of sea water.
   A. True B. False

6. (1 point) Short residence time elements are uniformly distributed in the oceans.
   A. True B. False

7. (1 point) Deep water waves with a long wavelength travel more slowly than short ones.
   A. True B. False

8. (1 point) The following statement is true or false: "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" .
   A. True B. False

9. (1 point) This is a shallow water wave.



   A. True B. False

10. (1 point) Tsunami are deep water waves.
    A. True B. False

11. (1 point) The Sun has more effect on the tides than the moon.
    A. True B. False

12. (1 point) Carbon dioxide is one of several greenhouse gases.
    A. True B. False

13. (1 point) Atmospheric carbon dioxide levels are currently higher than they have been during the last 400,000 years.
    A. True B. False

14. (1 point) The speed of light is slower in water than in air.
    A. True B. False

15. (1 point) During La Nina the surface of the Western Pacific is higher than the Eastern Pacific.
    A. True B. False

16. (1 point) The ocean's surface circulation is driven primarily by density differences.
    A. True B. False

17. (1 point) Sound travels as a wave of compression.
    A. True B. False

18. (1 point) Outgoing radiation from the Earth is shortwave.
    A. True B. False

19. (1 point) Seiches are propagating waves in lakes or harbors.
    A. True B. False

20. (1 point) The concentration of Silicate in the deep water of the Pacific Ocean is greater than that in the deep water of the Atlantic Ocean.
    A. True B. False

Multiple Choice Questions

21. (1 point) In the video clip with the aircraft carrier we watch in class was there (over 90% of you voted to have this question on the exam)
    A. a helicopter in the air.
    B. two helicopters in the air.
    C. a helicopter on the flight deck.
    D. no helicopter.

22. (1 point) If you cool seawater its density
    A. remains the same.
    B. increases.
    C. decreases.

23. (1 point) High salinity (e.g. in the Mediterranean Sea) is due to:
    A. Fish sweating.
    B. Precipitation exceeding evaporation.
    C. Evaporation exceeding precipitation.
    D. Precipitation equals evaporation.
    E. Both B & C.

24. (1 point) In sea water major ions constitute what percentage of the total dissolved ions?
    A. 100%
    B. 99.8%
    C. 90%
    D. 50%
    E. 10%

25. (1 point) The thermocline is defined as the part of the ocean where
    A. the density changes rapidly.
    B. salinity changes rapidly.
    C. the temperature changes rapidly.
    D. the speed of sound increases rapidly.

26. (1 point) In water the speed of sound
    A. increases with decreasing temperature.
    B. increases with increasing pressure.
    C. all of the above.
    D. none of the above.

27. (1 point) Why did human eyes evolve with high sensitivity to 400-700 nm (visible) light, rather than UV or IR?
    A. There is more energy in the 400-700 nm band
    B. Infrared is invisible
    C. Ultraviolet causes sunburns
    D. Water absorbs sunlight

28. (1 point) The colour of light that is absorbed least in the ocean is
    A. violet
    B. blue
    C. green
    D. red

29. (1 point) Without any greenhouse gases in the Earth's atmosphere the global average temperature would be:
    A. -50°C
    B. -20°C
    C. 0°C
    D. 15°C
    E. 30°C

30. (1 point) Based on your knowledge of Coriolis and Ekman transport, how do you think coastal upwelling works on the west coast of the US?
    A. Southerly wind (poleward) pushes water offshore allowing deep water to surface near the coast.
    B. Northerly wind (equatorward) pushes water offshore allowing deep water to surface near the coast.
    C. Southerly wind (poleward) pulls water towards the coast.
    D. Offshore wind directly pushes water offshore.

31. (1 point) One Sverdrup equals _____ cubic meters/second:
    A. 1.
    B. 1 thousand.
    C. 1 million.
    D. 1 billion.

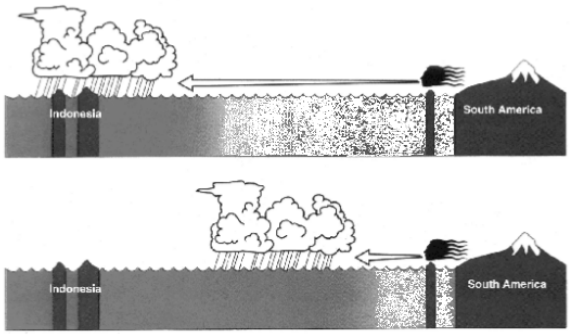
32. (1 point) Which is the safest reaction to a tsunami alert?
    A. Get to higher ground or above the 3rd floor of a concrete building
    B. Wait to see if it's a big one
    C. Check out the new tide pools
    D. Buy a beer and settle in to watch the show
    E. Swim parallel to shore

33. (1 point) Photosynthesis can only occur near the surface, where there is light. Therefore biologically active nutrients will be
    A. Depleted with depth.
    B. Depleted at the surface.
    C. Unchanged with depth.

34. (1 point) The dominant restoring force with a Tsunami wave is:
    A. Surface tension
    B. Coriolis
    C. Gravity
    D. Geostrophic balance

35. (1 point) Which process does **not** create CO_2?
    A. Photosynthesis
    B. Respiration
    C. Combustion
    D. Sprinting 100m

36. (1 point) Which of the following best describes the figure:



    A. Top is El Nino, bottom is normal
    B. Top is normal, bottom is El Nino
    C. Top is normal, bottom is La Nina
    D. Top is La Nina, bottom is normal

37. (1 point) The wave speed of a shallow water wave in the ocean depends on
    A. Coriolis
    B. wavelength
    C. period
    D. water depth
    E. the amount of water it is transporting

38. (1 point) The anthropogenic CO_2 currently ends up distributed
    A. 100% in the atmosphere
    B. 100% in the ocean
    C. 90% in the atmosphere, and 10% in ocean
    D. 90% in the atmosphere, and 10% in terrestrial biomass
    E. 50% in the atmosphere, 25% in ocean and 25% in terrestrial biomass

39. (1 point) Western boundary currents are:
    A. slower than eastern boundary currents.
    B. colder than eastern boundary currents.
    C. all of the above.
    D. none of the above.

40. (1 point) If a shallow wave wave is propagating in 100m water depth, its speed is
    A. 10 m/s
    B. 15 m/s
    C. 30 m/s
    D. 150 m/s
    E. 300 m/s

41. (1 point) Why is the ocean salty?
    A. Material from volcanos.
    B. Material from hydrothermal vents.
    C. Material from rivers.
    D. All of the above.
    E. None of the above.

42. (1 point) 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. During April, May.
    E. None of the above

43. (1 point) The anthropogenic CO_2 currently ends up distributed
    A. 100% in the atmosphere
    B. 100% in the ocean
    C. 90% in the atmosphere, and 10% in ocean
    D. 90% in the atmosphere, and 10% in terrestrial biomass
    E. 50% in the atmosphere, 25% in ocean and 25% in terrestrial biomass

44. (1 point) The polarized nature of a water molecule means water
    A. is a good natural solvent
    B. is a bad solvent
    C. is a liquid
    D. has a freezing point of 0°C

45. (1 point) The composition of dry air is:
    A. 78% O_2, 21% N_2
    B. 78% N_2, 21% O_2
    C. 78% N_2, 21% CO_2
    D. 78%N_2, 21% Ar
    E. mainly water vapor

46. (1 point) During an ice age sea level:
    A. goes up.
    B. goes down.
    C. stays the same.

47. (1 point) Ekman transport in the northern hemisphere relative to the wind is
    A. to the left.
    B. directly against.
    C. to the right.
    D. directly ahead.

48. (1 point) With surface wind waves, refraction is responsible for
    A. the waves with longer period arriving first.
    B. waves bouncing off seawalls.
    C. shallow water waves becoming more parallel to the shore as they approach.
    D. the waves with shorter period arriving first.

49. (1 point) The sound channel 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.

50. (1 point) An object's color result from the wavelength of light associated with that color:
    A. being scattered
    B. being absorbed
    C. not being absorbed

51. (1 point) If caught in a rip current you should
    A. Loose all hope and drown
    B. Wait and see if a cute lifeguard will rescue you
    C. Swim across it (parallel to shore)
    D. Swim against it (straight into shore)

52. (1 point) Which of these statements is true.
    A. The polar regions are most sensitive to climate change because they are so dry.
    B. The polar regions are most sensitive to climate change because they are so humid.
    C. The tropics are most sensitive to climate change because they are so dry.
    D. The tropics are most sensitive to climate change because they are so humid.

53. (1 point) Deep water is colder than surface water at most latitudes because:
    A. The deep water cools because there is no sunlight
    B. Hydrothermal vents cool deep water
    C. Water sinks then cools
    D. It gets cold at the surface then sinks
    E. All of the above

54. (1 point) A high pressure system in the Northern Hemisphere will have
    A. rising air which draws surface air in, the surface winds spiral to the left.
    B. rising air which draws surface air in, the surface winds spiral to the right.
    C. sinking air which pushes surface air out, the surface winds spiral to the left.
    D. sinking air which pushes surface air out, the surface winds spiral to the right.

Fill in the Blanks

55. (2 points) Excess heat is transported from the tropics to the poles by the

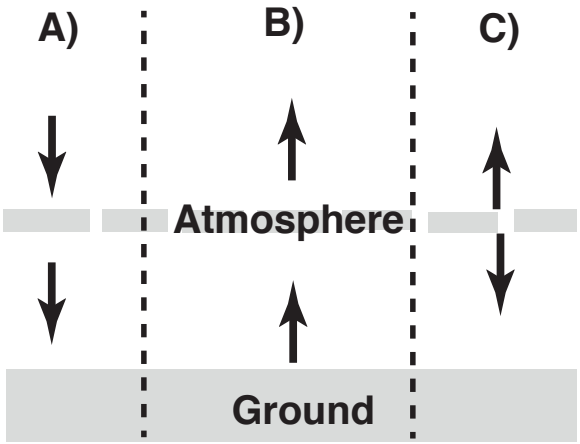
    _____ and _____.

56. (2 points) Major boundary currents include Agulhas, Canary, California, Benguela, Brazil, East Australian, Gulf stream, Kuroshio, Peru, West Australian. In the North Pacific subtropical gyre, the western boundary current is _____ and the eastern boundary current is _____.

Longer answer

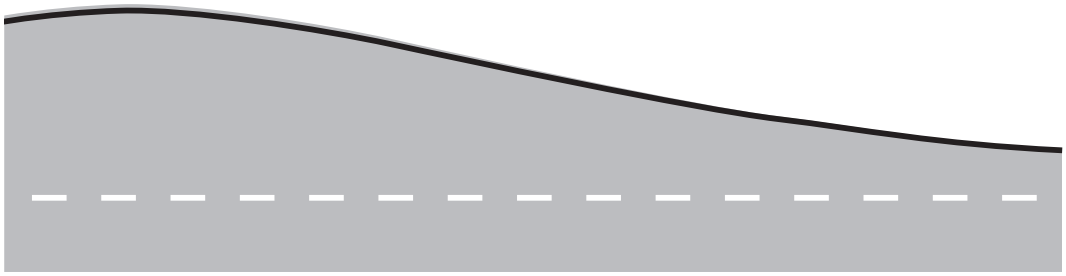
57. (5 points) Name 5 of the 6 major ions in seawater?

58. (6 points) For each column (A, B, C) in the figure below answer the following two questions (i.e., 6 answers required).
    (a) Is the radiation longwave or shortwave?
    (b) Is the heat source Sun, Moon, Earth, or Atmosphere.

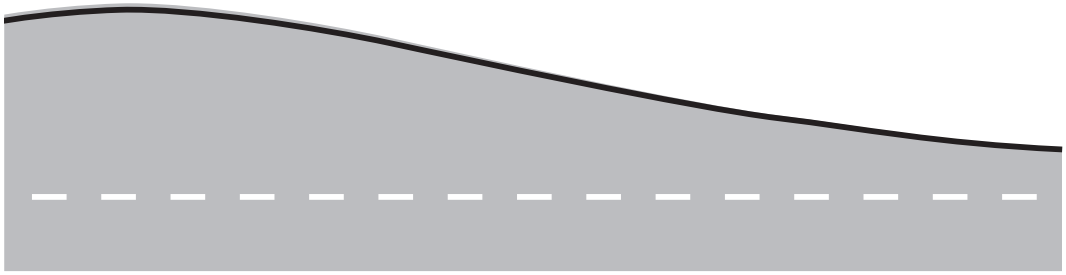


	A	**B**	**C**
Wavelength			
Source			

59. (a) (2 points) On dashed line in the figure below mark the region of high pressure and low pressure with a H and L, respectively.



(b) (2 points) Draw the direction of motion without rotation: towards the left (←), towards the right (→), into the page (⊗), or out of the page (⊙).



(c) (2 points) Draw the direction of motion in the Northern Hemisphere under the geostrophic balance: towards the left (←), towards the right (→), into the page (⊗), or out of the page (⊙).