Water Quality C - Water Quality C - University of Michigan Div C - 02-20-2021

This test consists of 72 questions and you will have 50 minutes to complete it.

The Tiebreakers for this test will be:
#21
#22
#29
#36
#40
#47
#61
#62
#65
#71

If you experience technical difficulties during the test:
Immediately contact the event supervisor through the classroom feature on Scilympiad, stating clearly what issue you are having.
If your work is not saving/submitting, take screenshots of your answers on Scilympiad and submit them to this google form (https://docs.google.com/forms/d/19cRQLafN7EARRS7tZHC-8HOCt4B1F-4fYOSliON1kro/e
Try to stay within your allotted 50 minutes.

1. (2.00 pts) In the water cycle, where are the two places the water goes once the precipitation reaches the ground?

Expected Answer: A river or other body of water, Infiltrate the ground (groundwater)- 1pt for each correct location

2. (3.00 pts) List three factors that affect infiltration.

Expected Answer: Precipitation, Base Flow, Soil Characteristics (soil absorbency), Soil Saturation, Land Cover (parking lots, storm drains, vegetation), Slope of the Land, Evapotranspiration- 1pt for each answer from this list

3. (1.00 pts)
In the potable water treatment process, the first steps are coagulation and flocculation. Positively charged chemicals are added to water to neutralize the negative charge of particles in the water. What is the name of the metal hydroxides produced when the positively charged chemicals bind with the particles?

Expected Answer: Floc

4. (1.00 pts) How do impervious surfaces such as road and parking lots affect watersheds?

Expected Answer: They increase the speed and amount of runoff flowing into surface waters. They cause turbidity, erosion, and harm wildlife habitats.

5. (1.00 pts) A larger predator: prey mass ratio (PPMR) results in

- A) Longer food chains
- B) Shorter food chains
- C) Inconsistency in dietary data
- D) Overfishing

6. (2.00 pts) Describe two different ways to help stop the spread of garbage patches.

Expected Answer: Reducing the consumption of plastic, Supporting organizations that work to eradicate plastic in the ocean, Spreading awareness of garbage patches and microplastics in the ocean, Notifying authorities when witnessing plastic management violations, Participating in ocean “clean-up” days, etc.

7. (1.00 pts) Which of the following is a possible depth where a long-spined black sea urchin could live at in a coral reef?

- A) 0.5 meters
- B) 5 meters
- C) 20 meters
- D) 25 meters

8. (2.00 pts) Why does the Humphead Wrasse have a very slow breeding rate?

Expected Answer: Individuals reach sexual maturity at around 5 to 7 years. They are protogynous hermaphrodites, some individuals can become males at 9 years old.

9. (1.00 pts) What is the common name of the following organism?

Expected Answer: Snapper

10. (1.00 pts) What is the most common food these organisms from #9 eat in the **spring**?

Expected Answer: Crabs

11. (1.00 pts) What is the most common food these organisms from #9 eat in the **winter**?

Expected Answer: Stomatopods

12. (1.00 pts) Identify the following organism by its common name.

Expected Answer: Nassau Grouper

13. (1.00 pts) In what months does this organism from #12 spawn in?

(Mark **ALL** correct answers)

- [x] A) January
- [ ] B) March
- [ ] C) April
- [ ] D) May
- [ ] E) August
- [x] F) December

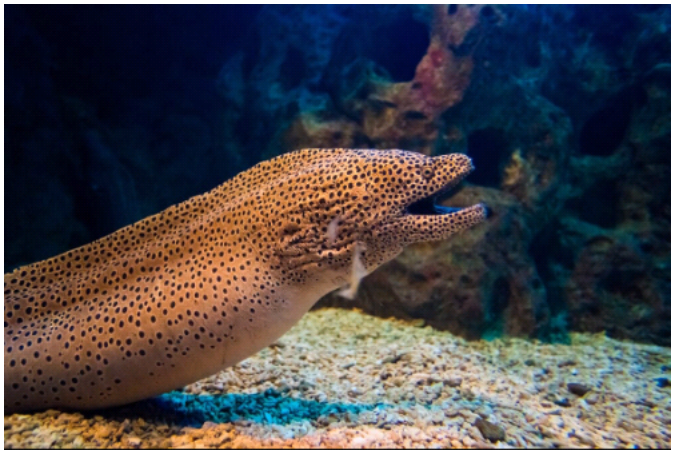
14. (1.00 pts) Adults of the organism from #12 only eat fish.

- (●) True
- ( ) False

15. (1.00 pts) The juveniles of this species below live rather solitary lives.

- (●) True
- ( ) False

16. (1.00 pts) What is the common name of this species?

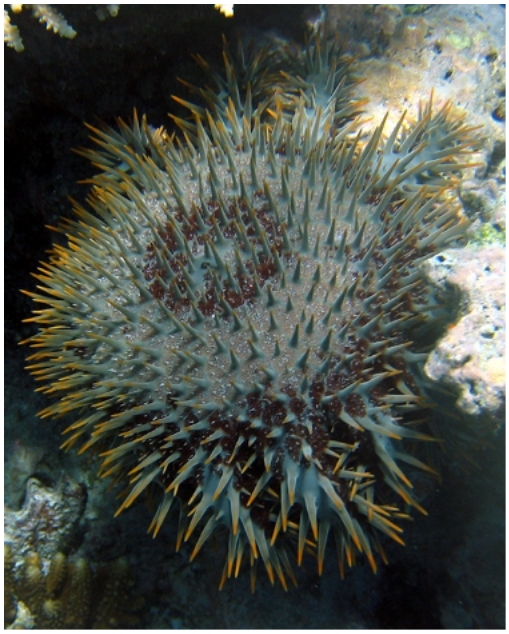


Expected Answer: Moray eel

17. (1.00 pts) In regards to the species from question #16, describe the feeding behavior.

Expected Answer: Carnivorous predators that feed primarily on smaller fish, crabs, and octopuses.

18. (1.00 pts) What is the common name of this species?



Expected Answer: Crown of thorns starfish

19. (1.00 pts) What is the primary sink for phosphorus in the ocean?

Expected Answer: Sediment

20. (1.00 pts) Why is phosphorus limiting in marine ecosystems?

Expected Answer: Phosphorus absorbs sediments.

21. (2.00 pts)
Suppose you obtain 200mg of dried residue from a 400mL sample. Calculate the number of total solids per liter that are in this sample. Units are mg. Show all work for full credit.

Expected Answer: 200mg/0.4L = 500mg

22. (3.00 pts)
A Secchi disk is dropped into a turbid body of water at a depth of 5ft. In meters, approximately how deep will photosynthesis be able to occur. Explain your answer.

Expected Answer: Accept answers from 3.048m-4.572m. Light is present 2-3x the depth of the Secchi disk. Photosynthesis can only occur when light is present.

23. (4.00 pts) List and describe two different methods for measuring the turbidity of water.

Expected Answer: 1. Secchi Disk- a disk that is lowered into water until the point where it is no longer visible. The depth at which the disk is not visible is called the Secchi depth. 2. Nephelometer- most accurate method. Also known as a turbidity meter. This method uses a light and photo detector to measure light scatter. Uses units of NTU (nephelometric turbidity units) or FTU (formazin turbidity units). 1pt for each correct method, 1 pt for each accurate description

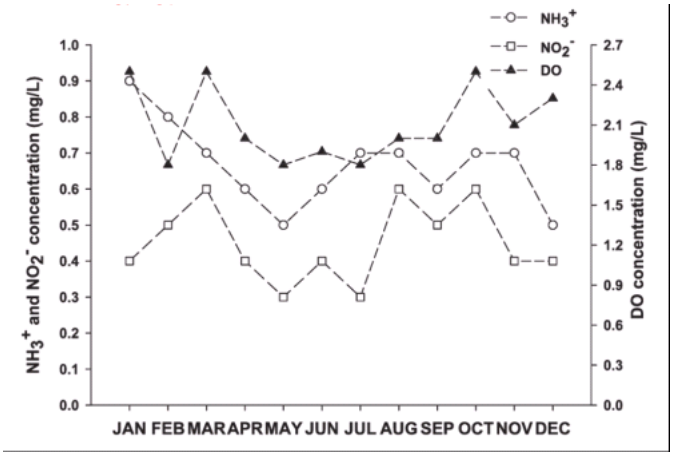
24. (1.00 pts) What happens to the amount of phosphate ions when phosphorus is removed from sewage?

Expected Answer: The amount of W ions is lowered.

25. (1.00 pts) What is the term that describes the condition of water with dissolved oxygen levels lower than 1mg/L?

Expected Answer: Hypoxic

26. (2.00 pts) According to the graph below, is the DO concentration in February considered anoxic? Explain.



Expected Answer: No, it is not anoxic because there are still some traces of DO/DO.

27. (1.00 pts) The sodium chloride content in the ocean is 5%.

- ○ True
- ◉ False

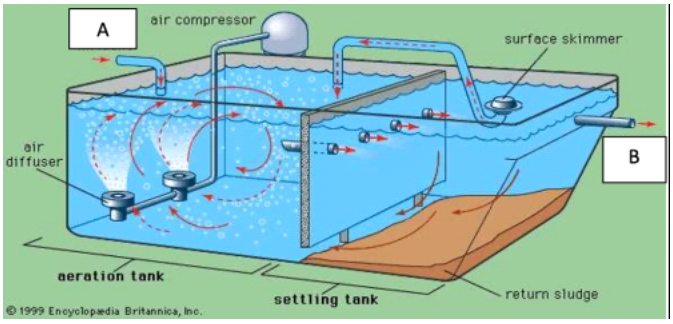
28. (1.00 pts) Are aeration and disinfection a part of the secondary or primary treatment process?

- ○ A) Primary
- ◉ B) Secondary

29. (1.00 pts) In wastewater treatment, what is the name of the "tank" that is filled with a bed of stones where settled sewage is sprayed on top of?

Expected Answer: Trickling Filter

30. (2.00 pts) The photo below is a diagram of a prefabricated package plant for the aeration treatment of small sewage flows. Label A and B.



Expected Answer: A is influent and B is effluent

31. (1.00 pts) The process of Nitrification-Dentrification involves the conversion of ammonia nitrogen into nitrites by macroorganisms.

○ True ◉ False

32. (2.00 pts) Where does primary sludge come from?

Expected Answer: Chemical precipitation, sedimentation, and other primary processes.

33. (3.00 pts) List three places where autotrophs can get inorganic nutrients from to later convert them into organic compounds.

Expected Answer: Air, water, soil

34. (1.00 pts) Interspecific competition occurs between members of the same species.

○ True ◉ False

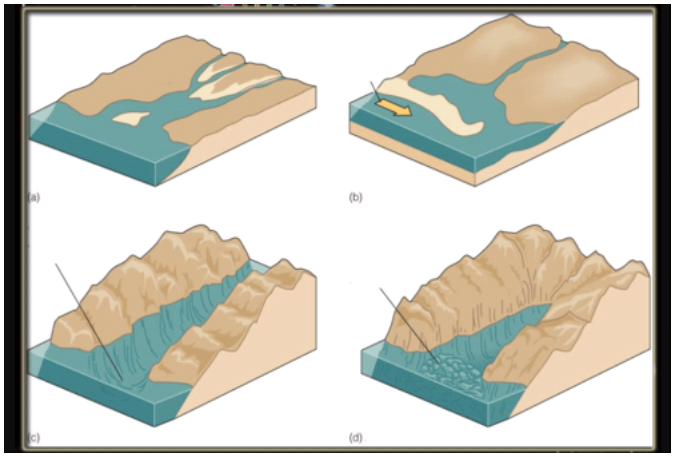
35. (1.00 pts) Combined sewage overflows is the greatest source of viral and bacterial contamination in estuaries.

◉ True ○ False

36. (2.00 pts) Fjord and salt-wedge estuaries are classified differently based on their _____.

Expected Answer: Salt distribution or water circulation

37. (4.00 pts) Name the 4 types of estuaries shown in the photo below.



Expected Answer: a. coastal plain estuary b. bar-built estuary c. tectonic estuary d. fjord

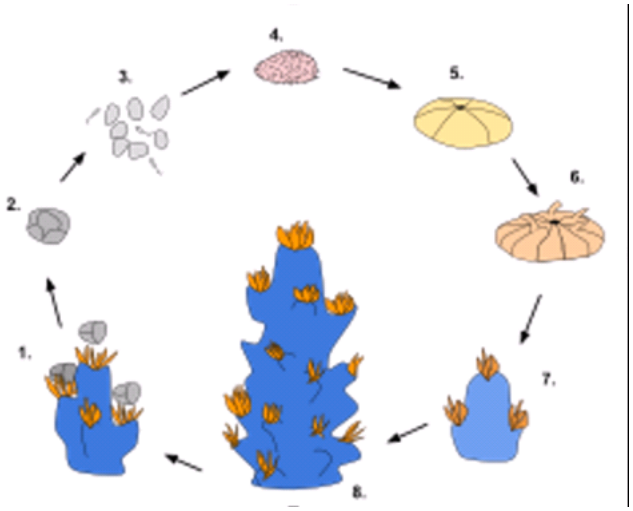
38. (1.00 pts) Anaerobic bacteria and fungi are present in anaerobic sludge digesters.

- (●) True
- ( ) False

39. (2.00 pts) What is wrong with the coral in the following image and why?

Expected Answer: The coral is bleached and it is caused by changes in temperature, light, or nutrients.

40. (2.00 pts) The following photo shows the life cycle of corals by sexual reproduction. Explain what is happening at #1.



Expected Answer: Colonies are releasing gametes in clusters

41. (2.00 pts) In the same diagram from question #40, explain what is happening at step 6.

Expected Answer: Embryos metamorphose into juvenile polyps

42. (1.00 pts) What is the common name of the species shown below?

Expected Answer: Sea sponge

43. (1.00 pts) What does the overabundance of the species from question #42 indicate?

Expected Answer: Bioerosion

44. (2.00 pts) Is the species from question #42 more abundant in tropical or temperate waters? Why?

Expected Answer: Temperate because their predators are more abundant in tropical waters

45. (1.00 pts) What organism uses its three pairs of claws to remove parasites and fungi from fish?

Expected Answer: Banded coral shrimp

46. (1.00 pts) The species from question #45 lives above the intertidal zone.

○ True ◉ False

47. (1.00 pts) How many larval stages does the species from question #45 have?

Expected Answer: 9

48. (1.00 pts) Do dissolved oxygen levels in a body of water increase or decrease overnight?

○ A) Increase
◉ B) Decrease

49. (1.00 pts) The species that are known to live for around 30 years and are protogynous hermaphrodites are called _____.

Expected Answer: Humphead Wrasse

50. (1.00 pts) The addition of additional nitrogen and phosphorus to aquatic systems will

- (●) A) Increase algae and decrease O2.
- ( ) B) Increase O2 and decrease algae
- ( ) C) Increase the number of fish
- ( ) D) Decrease productivity

51. (1.00 pts) Generally, daily pH cycles peak

- ( ) A) In the morning
- ( ) B) In the evening
- ( ) C) At Noon
- (●) D) At night

52. (1.00 pts) Which holds the most dissolved oxygen?

- ( ) A) Water at 50°C
- (●) B) Water at 0°C
- ( ) C) Water at 10.0°C
- ( ) D) Water at 7°C

53. (1.00 pts) The best pH sampling procedure is to collect the water sample a

- ( ) A) At the surface of the riverbank
- ( ) B) Just above the bottom of the river
- (●) C) Away from the riverbank and below the surface
- ( ) D) It does not matter where you collect the sample

54. (1.00 pts) Which of the following is decreased by the breakdown of organic waste?

- ( ) A) Salinity
- ( ) B) Total Suspended Solids
- ( ) C) Acidity
- (●) D) Dissolved Oxygen

55. (3.00 pts) List three other names for estuaries.

Expected Answer: Lagoons, Inlets, Sloughs, Bays

56. (1.00 pts) What trophic level contains secondary consumers?

Expected Answer: Third trophic level

57. (2.00 pts) Explain why linear food chains are rare in nature.

Expected Answer: Because the same food source may be part of several interwoven food chains and many organisms have several food sources.

58. (2.00 pts) Describe what is happening in the photo below.

Expected Answer: Harmful Algal Bloom (HAB)

59. (2.00 pts) Describe the domino effect in a food web.

Expected Answer: A chain of disruptive events can occur when one ecosystem component changes, ex: climate change.

60. (1.00 pts) Which type(s) of organisms make up the first trophic level in a food web?

- A) Producers
- B) Autotrophs
- C) Primary Consumers
- D) A and B

61. (1.00 pts) What cells contain toxins which are used for catching prey?

- A) Nematocysts
- B) Mesoglea
- C) Coenosarcs
- D) Theca

62. (1.00 pts) What is the highest point of a reef?

Expected Answer: Algal ridge

63. (1.00 pts) The name of the chemical that is often used to stun live fish and can potentially kill coral reefs is _____.

cyanide

64. (1.00 pts) Estuaries usually have lower levels of phosphorus compared to freshwater systems.

- True
- False

65. (1.00 pts) Algae can affect the pH of a body of water.

- True
- False

66. (1.00 pts) Water is sampled from some unknown location. The salinity was measured to be 20 ppt. What type of water is this sample taken from?

Expected Answer: Brackish water

67. (1.00 pts) From the question above, what is an example of body of water that this type of water could be taken from?

Expected Answer: Any estuary

68. (1.00 pts) Which of the following is caused by an excess amount of phosphates in water?

- A) High oxygen
- B) Cloudy water
- C) Overpopulation
- D) Domino effect

69. (1.00 pts) Which of the following regions would you expect to have the highest biomass productivity?

- A) Coral reefs
- B) Oceans
- C) Salts and marshes
- D) They all have equal biomass productivity

70. (1.00 pts) Which statement about wastewater treatment processes is correct?

- A) Aeration is used in the removal of dissolved iron when present with small amounts of manganese.
- B) Sedimentation is the process used for the separation of solids.
- C) Filtration is used to remove particles from the water.
- D) All of the above

71. (1.00 pts) What is the name for stable manmade chemicals that have properties which allow them to repel both water and oil?

Expected Answer: PFAS (Perfluoroalkyl substances)

72. (1.00 pts) List one common type of freshwater harmful algal bloom.

Expected Answer: Cyanobacteria (blue green algae), Golden algae

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