

Name: _____ Date: _____

1. Adding dissolved compounds such as salt to water _____ the boiling point and _____ the freezing point.
 - A) increases; increases
 - B) increases; decreases
 - C) decrease; increases
 - D) decreases; decreases

2. The high specific heat of water
 - A) means large amounts of heat are needed to change the temperature of water.
 - B) requires significant heat energy to make the transition from solid to liquid.
 - C) requires significant heat energy to make the transition from liquid to gas.
 - D) makes it difficult to increase the temperature of liquid water above 100°C.

3. Which is NOT an adaptation that exploits the density of water?
 - A) a gas-filled swim bladder
 - B) droplets of oil on algae
 - C) long, filamentous appendages
 - D) high percentages of fat

4. The low density of ice
 - A) makes it ineffective at insulating water from the cold.
 - B) allows aquatic plants to survive the winter.
 - C) is due to the high viscosity of water.
 - D) prevents it from moving in water.

5. Water's polar nature
 - A) explains its high density.
 - B) makes it a good solvent.
 - C) causes it to freeze at 0°C.
 - D) limits the amount of dissolved nutrients it can hold.

6. At what temperature does water reach its maximum density?
 - A) 32°C
 - B) 0°C
 - C) 4°C
 - D) -12°C
 - E) 100°C

7. The limit to the amount of minerals water can hold is called
- A) the dissolution limit.
 - B) the solvent point.
 - C) deposition.
 - D) saturation.
8. Which is the most basic?
- A) human blood
 - B) acid rain
 - C) carbonated beverages
 - D) pure water
9. Which causes acid rain?
- A) CO₂
 - B) SO₂
 - C) HCO₃
 - D) NaOH
10. Aquatic organisms have developed streamlined shapes to adapt to the
- A) density of water.
 - B) viscosity of water.
 - C) polar nature of water.
 - D) basic nature of water.
11. Which part of an organism is less dense than water?
- A) bone
 - B) protein
 - C) muscle
 - D) fat
12. A liquid with low pH would have
- A) high OH⁻ concentration.
 - B) low NO₂ concentration.
 - C) low CaCO₃ concentration.
 - D) high H⁺ concentration.

13. Which of the nutrients listed below is NOT required by all organisms?
- A) nitrogen
 - B) phosphorus
 - C) potassium
 - D) sulfur
 - E) silicon
14. Limestone deposits are due to
- A) the low pH of ocean water.
 - B) the solubility of calcium carbonate.
 - C) the polar nature of water.
 - D) acid deposition.
15. You are studying a small stream and find that its pH is 4.5. What does this tell you about the stream, and what might be the cause?
16. What is unusual about the physical properties of water?
17. Why is liquid water important for the formation of life on Earth?
18. How does a low pH harm aquatic environments?
19. Solutes
- A) are membranes through which nutrients pass into cells.
 - B) reduce the acidity of water.
 - C) are particles that can pass through cell membranes.
 - D) are substances dissolved in water.
20. A freshwater fish with a high concentration of dissolved nutrients will
- A) have high osmotic pressure.
 - B) have low osmotic pressure.
 - C) be hyposmotic.
 - D) actively secrete solutes.

21. Hyperosmotic conditions
- A) cause low osmotic pressure.
 - B) occur in freshwater organisms.
 - C) cause active secretion in gills.
 - D) occur in arid landlocked lakes.
22. Why is it important for organisms to osmoregulate?
- A) Organisms cannot survive in hyposmotic conditions.
 - B) Active transport requires large amounts of energy.
 - C) An imbalance in solutes disrupts cell functions.
 - D) High osmotic pressure can burst cell walls.
23. The use of salt on roads in winter has led to
- A) adaptation of roadside plants to increased salt levels.
 - B) decreased survival of freshwater organisms in nearby ponds.
 - C) hyperosmotic conditions.
 - D) increased acid deposition.
24. Mangroves grow on salt-laden coastal mudflats that are inundated daily by high tides. Which of the following is NOT used by the plant to address the problem of water acquisition and elimination of excess salts?
- A) growing only when salt content of the coastal mudflats are at the season lowest levels
 - B) maintaining high concentrations of organic solutes in their roots
 - C) excluding salts from their roots by active transport
 - D) actively excreting salt from glands on the surfaces of their leaves
25. Ammonia is a by-product of
- A) digesting proteins.
 - B) absorbing excess salts.
 - C) excreting urea.
 - D) active uptake in gills.
26. How does the permeable nature of cells affect evolution in aquatic animals?
27. Why do sharks retain urea rather than excrete it? How does this influence their fitness?
28. Explain why freshwater fish do not need to drink water.

29. Which of the following is NOT a part of carbon equilibrium in water?
- A) bicarbonate
 - B) ammonia
 - C) hydrogen ions
 - D) carbonic acid
30. Why are both carbon dioxide and oxygen limited in aquatic environments?
- A) They are not very soluble in water.
 - B) They change to different chemical forms in water.
 - C) They cannot diffuse across cell membranes.
 - D) They are rare in the atmosphere and therefore limited in water.
31. How does the concentration of bicarbonate in water compare to the concentration of carbon dioxide in the air?
- A) one-tenth
 - B) about the same
 - C) twice as much
 - D) about 30 times more
 - E) over 100 times more
32. How does water in a bog differ from water in other locations?
- A) More bicarbonate and more carbon dioxide are available.
 - B) More bicarbonate and less carbon dioxide are available.
 - C) Less bicarbonate and more carbon dioxide are available.
 - D) Less bicarbonate and less carbon dioxide are available.
33. Which does NOT limit the ability of aquatic plants to photosynthesize?
- A) slow diffusion of carbon dioxide in water
 - B) boundary layers
 - C) the size of bicarbonate molecules
 - D) high levels of carbonic acid
34. The dissolved oxygen levels in water did NOT require adaptation for
- A) whales.
 - B) sharks.
 - C) squid.
 - D) zooplankton.

35. Which is used to increase oxygen extraction?
- A) hydrogen ions
 - B) boundary layers
 - C) countercurrent circulation
 - D) concurrent circulation
36. Anaerobic conditions
- A) decrease photosynthesis.
 - B) are due to increased pH.
 - C) decrease the diffusion of oxygen.
 - D) are more common in deep water than in the shallows.
37. Which is a byproduct of anaerobic respiration?
- A) CO₂
 - B) H₂CO₃
 - C) H₂S
 - D) HCl
38. Which is NOT an adaptation to low-oxygen aquatic environments?
- A) increased hemoglobin
 - B) breathing air
 - C) increased metabolic activity
 - D) symbiotic relationship with algae
39. In which location would you expect to find the highest levels of dissolved oxygen?
- A) deep ocean water
 - B) a freshwater bog
 - C) a landlocked lake
 - D) a fast, shallow river
40. Explain why there are relatively few plant species in mangrove forests.
41. What are some ways to prevent an aquarium from becoming anoxic?

42. Why is it surprising that some organisms are able to live at temperatures above 75°C?
- A) High temperatures decrease the efficiency of glycoproteins.
 - B) High temperatures denature proteins.
 - C) High temperatures evaporate water in cells.
 - D) High temperatures increase the permeability of cell membranes.
43. What enables thermophilic bacteria to withstand very high temperatures?
- A) high glycerol concentrations that protect cell membranes
 - B) low concentrations of isozymes that change form at high temperatures
 - C) cell materials that reduce heat transfer
 - D) high proportions of particular amino acids that form strong bonds
44. The rate of biological processes increases two to four times for each _____ increase in temperature
- A) 12°C
 - B) 10°C
 - C) 8°C
 - D) 5°C
45. What prevents ice formation in blood and tissues of marine animals?
- A) an increased concentration of glycerol
 - B) an increased concentration of oxygen
 - C) a decreased concentration of salt
 - D) a decreased concentration of trimethylamine oxide
46. Organisms that survive in varied temperatures adapt to changes by using
- A) supercooling.
 - B) hyperosmotic molecules.
 - C) countercurrent circulation.
 - D) isozymes.
47. Suppose organisms in a lake are limited by oxygen. How might the lake's ability to support organisms change if the temperature increased by 10°C, assuming that all the organisms were still within their thermal optima?
- A) It could support about twice as many organisms.
 - B) It could support about half as many organisms.
 - C) It could support about the same number of organisms.
 - D) More information is required to determine whether it would change.

48. Glycoproteins coat ice crystals that begin to form in blood and prevent freezing in a process called
- antifreeze accumulation.
 - supercooling.
 - isozymal coating.
 - osmoregulation.

49. What concept does the graph illustrate? Explain why it is important.

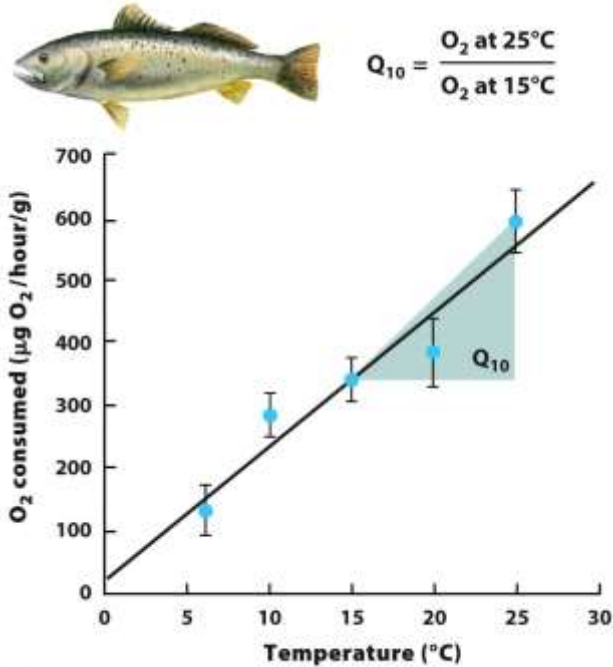


Figure 2.18
Ecology: The Economy of Nature, Seventh Edition
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50. What unique low-temperature challenge are marine organisms likely to encounter?
51. Explain why thermal pollution is relatively rare in oceans.
52. Explain how osmotic regulation might make marine organisms better at surviving low temperatures than freshwater organisms.

53. What percentage of a normal distribution is within one standard deviation of the mean?
- A) 34%
 - B) 50%
 - C) 68%
 - D) 76%
 - E) 95%
54. Nine ponds are sampled, and the mean salt concentration is 121 ppm, with a sample variance of 25 ppm. What is the standard deviation of the sample?
- A) 0.6
 - B) 2.2
 - C) 3
 - D) 5
 - E) 11
55. Samples of ocean water are taken from 25 locations, and the mean salt concentration is 36 ppt, with a sample variance of 1 ppt. What is the standard error of the sample?
- A) 0.2
 - B) 0.5
 - C) 1
 - D) 1.2
 - E) 5
56. What do a large standard deviation and small standard error tell you about the data from several samples?
57. The primary cause of coral bleaching is
- A) decreased water temperature.
 - B) increased water temperature.
 - C) decreased salt concentrations.
 - D) increased water pH.
 - E) decreased water pH.
58. Coral bleaching
- A) occurs when coral exoskeletons begin to break down.
 - B) is due to a lack of dissolved nutrients from the surrounding water.
 - C) is a temporary process that is usually reversed within days.
 - D) occurs when algae are expelled from coral.

59. Explain how increased atmospheric carbon dioxide can affect the ability of coral to build their exoskeletons.
60. Explain how acid precipitation indirectly impacts trees.
61. You are studying a river estuary system. Explain why a prolonged summer drought in the river's watershed might have a potential impact on species living in the estuary.
62. The thermal optimum for an organism results from
- A) the environment in which the organism is found.
 - B) the genetic makeup of the organism.
 - C) the niche of the organism.
 - D) the thermal properties of water.
63. Organisms that can withstand high environmental temperatures without having their proteins denatured are termed
- A) endothermic.
 - B) exothermic.
 - C) thermophilic.
 - D) homeothermic.
64. Fish obtain oxygen from the water through their gills using
- A) countercurrent circulation.
 - B) concurrent circulation.
 - C) unidirectional circulation.
 - D) recurrent circulation.
65. Spotted salamanders lay eggs in gelatinous masses on twigs partially submerged in small ponds or vernal pools. Associated with the eggs, scientists have found a species of alga living in a mutualistic relationship with the developing eggs. What benefit does the salamander receive from this relationship?
- A) The salamander eggs are better camouflaged.
 - B) The salamander embryos receive an increased oxygen supply.
 - C) The salamander embryos receive an increased carbon dioxide supply.
 - D) The salamander embryos receive an increased nitrogen supply.

66. The region of unstirred air or water surrounding the leaf surfaces of a terrestrial or aquatic plant is called the
- A) photosynthetic active region.
 - B) diffusion layer.
 - C) boundary layer.
 - D) transpiration zone.
67. A smallmouth bass swimming in colder water of a springtime lake would likely expend _____ energy than when swimming in warmer water of the same lake during the summer (all things being equal).
- A) less
 - B) more
 - C) the same
 - D) There is no way to determine.
68. The intricately designed shells of the algae known as diatoms are made up of which minor nutrient?
- A) magnesium
 - B) calcium
 - C) iron
 - D) silica
69. Explain from a physiological perspective why it would be advantageous for a temperate freshwater fish species to produce isoenzymes.

Answer Key

1. B
2. A
3. C
4. B
5. B
6. C
7. D
8. A
9. B
10. B
11. D
12. D
13. E
14. B
- 15.
- 16.
- 17.
- 18.
19. D
20. A
21. B
22. C
23. B
24. A
25. A
- 26.
- 27.
- 28.
29. B
30. A
31. E
32. C
33. D
34. A
35. C
36. D
37. C
38. C
39. D
- 40.
- 41.
42. B
43. D
44. B

- 45. A
- 46. D
- 47. B
- 48. B
- 49.
- 50.
- 51.
- 52.
- 53. C
- 54. D
- 55. A
- 56.
- 57. B
- 58. D
- 59.
- 60.
- 61.
- 62. B
- 63. C
- 64. A
- 65. B
- 66. C
- 67. B
- 68. D
- 69.