ESTUARY SUBJECT REVIEW

Fill-in-the-Blank

1. An __________ is a partially enclosed body of water and its adjacent habitats where saltwater from the ocean mixes with freshwater from rivers or streams.

2. Waters whose salt content is between that of freshwater and that of seawater are called __________.

3. Of the 32 largest cities in the world, 22 are located on __________.

WORD BANK

stenohaline  nurseries  highest
euryhaline  pollutants  mixing
energy  habitat  salt wedge
euryhaline  fish  slightly stratified
pneumatophores  ecosystem services  vertically-mixed
propagules  ice age  storms
anaerobic  decreases  peat
zoa  lagoons  red mangrove
megalope  sediment  flooded
anthropogenic  earthquakes  salinity
storms  fjords  wrack
winter ice  tidal creeks  nutrient
anoxic  pannes  pathogens
glaciers  sediment  eutrophication
high tides  lagoons  nutrient
bar built  mudflats  sediments
barrier  nutrients  conversion
delta  watershed  pollution
tectonic  SWMP  biomagnification
smaller  polluted  sediments
unique  buffers  combined sewage
geology  coastal elevation  invasives
estuary  coastal plain  NERRS
brackish  halophytes  increases
estuaries  smooth cordgrass  dissolved oxygen
salinity  mangrove  photosynthesis
variable  prop roots  organic matter
tides  salinity  turbidity
two  dense  pH
freshwater  tidal range  chlorophyll
isohalines
4. In the ocean the concentration of salts, or __________, averages about 35 parts per thousand.

5. The salinity of estuarine water is __________ from one day to the next.

6. __________ are a major influence on many estuaries.

7. Most areas of the earth experience __________ high and low tides each day.

8. Tides at broad mudflats might appear to be __________ than tides at the end of a long, narrow inlet.

9. Every estuary is __________.

10. Estuaries are typically classified based on how saltwater and freshwater mix in the estuary and on their __________.

11. Estuaries formed by rivers or streams entering massive lakes are called __________ estuaries.

12. Estuaries are often called __________ of the sea.

13. Estuaries filter out __________ from rivers and streams before they flow into the oceans.

14. Estuaries provide critical __________ for many birds, fish, amphibians, insects, and other wildlife.

15. Estuaries provide habitat for more than 75 percent of the __________ harvested in the United States.

16. __________ are fundamental life support processes upon which all organisms depend. [two words]

17. __________ is a spongy matrix of live roots, decomposing organic material, and soil that helps filter pollutants out of the water.
18. One reason that estuaries are so productive is that the water filtering through them brings in __________ from the surrounding watershed.

19. The entire land area that drains into a particular body of water, like a lake, river or estuary is called a drainage basin or __________.

20. Estuaries are some of the most fertile ecosystems on earth, yet they may also be one of the most __________.

21. Estuaries and their surrounding wetlands act as _______ that stabilize shorelines and protect coastal areas from floods, storm surges, and excessive erosion.

22. The _______ determines the rate of freshwater that flows into an estuary from rivers and streams. [two words]

23. ________ estuaries are formed when rising sea levels flood existing river valleys. [two words]

24. ________ estuaries are characterized by barrier beaches or islands that form parallel to the coastline and separate the estuary from the ocean. [two words]

25. ________ beaches and islands are formed by the accumulation of sand or sediments deposited by ocean waves.

26. A ________ is characterized by large flat fan-shaped deposits of sediment at the mouth of a river.

27. ________ estuaries are formed when the earth’s tectonic plates run into or fold-up underneath each other.

28. ________ are steep-walled river valleys created by advancing glaciers that later became flooded with seawater as the glaciers retreated.

29. Most coastal plain estuaries in North America were formed at the end of the last__________. [two words]
30. A protected area of calm water between the coast and a barrier island is called a __________.

31. Bar-built estuaries and deltas both have large deposits of __________.

32. The first stage in the formation of a tectonic estuary typically occurs during __________.

33. __________ tend to have a moderately high input of freshwater, but very little inflow of seawater.

34. When a sill prevents deep waters in an estuary from mixing with deep waters of the sea, poor water exchange causes __________ (low oxygen) water to build up on the bottom of the estuary.

35. Estuaries with a sill are found in areas that were once covered with __________.

36. __________ create saltwater currents that move seawater into estuaries. [two words]

37. The daily mixing of freshwater and saltwater in estuaries leads to variable and dynamic chemical conditions, especially __________.

38. Because freshwater flowing into the estuary is less __________ than water from the ocean, it often floats on top of the heavier seawater.

39. The difference between the average low tide and the average high tide is the __________. [two words]

40. __________ are areas in water that have equal salt concentrations.

41. The shape of the isohalines indicates the amount of __________ that is occurring, and may provide clues about the estuary's geology.
42. ________ estuaries occur when a rapidly-flowing river discharges into the ocean where tidal currents are weak. [two words]

43. In ________ estuaries, saltwater and freshwater mix at all depths. [two words]

44. A ________ estuary occurs when river flow is low and tidally generated currents are moderate to strong. [two words]

45. Freshwater estuaries are driven by ________.

46. Salt marshes are a mosaic of snaking channels called ________.

47. Salt ________ are shallow depressions that contain very high concentrations of salt.

48. Burrowing organisms such as clams, mussels, oysters, fiddler crabs, sand shrimp, and blood worms are typical of ________.

49. Salt marshes are covered with salt-tolerant plants called ________.

50. ________ is one of the main components of peat and dominates the low marsh all the way up to the estuary’s edge. [two words]

51. ________ trees grow at tropical and subtropical latitudes, and can grow in anoxic soils where slow moving waters allow fine sediments to accumulate.

52. Many mangals can be recognized by their dense tangle of ________ that make the trees appear to be standing on stilts above the water. [two words]

53. The ________ colonizes the seaward side of mangals. [two words]

54. The zones where white mangrove and buttonwood trees grow are almost never ________.
55. Plants and animals living in estuaries must be able to respond quickly to drastic changes in __________.

56. Plants and animals that can tolerate only slight changes in salinity are called __________.

57. Plants and animals that can tolerate a wide range of salinities are called __________.

58. It requires a lot of __________ to adapt to constantly changing salinities.

59. Many species of mangrove trees have aerial roots called __________ that take up oxygen from the air for the roots.

60. Mangrove seeds that begin growing while still attached to the parent plant are called __________.

61. During low tides, oysters close up their shells, stop feeding, and switch to __________ respiration.

62. Blue crab larvae called __________ require water with a salinity over 30 ppt for optimal development.

63. As they develop, blue crabs eventually return to the estuary as young crabs called __________.

64. __________ disturbances are caused by humans.

65. Large __________ are especially destructive to estuaries.

66. A common natural disturbance to estuaries in non-tropical regions is __________. [two words]

67. A natural disturbance in salt marshes caused by the burial of vegetation by rafts of dead floating plant material, is called __________.

68. The greatest human-caused threat to estuaries is their large-scale __________.
69. __________ is probably the most important threat to water quality in estuaries.

70. __________ is a process through which toxic substances can accumulate in the tissues of organisms that consume these substances.

71. Some toxic substances become attached to __________ that flow down rivers and get deposited in estuaries.

72. __________ is a type of pollution in which excess nutrients stimulate an explosive growth of algae which depletes the water of oxygen when the algae die and are eaten by bacteria.

73. __________ pollution is the single largest pollution problem affecting coastal waters of the United States.

74. __________ are disease-causing organisms.

75. In most estuaries, the largest contributor of bacteria and viruses is probably __________. [three words]

76. __________ are plants and animals that have found their way into areas outside their normal range.

77. Non-native species are often introduced to estuaries in the __________ water of ships.

78. __________ is a partnership program between NOAA and U.S. coastal states that protects more than one million acres of estuarine land and water.

79. The health of every National Estuary Reserve is continuously monitored by the __________.

80. As water temperature increases, the amount of oxygen that can dissolve in the water __________.

81. In estuaries, salinity levels are generally __________ near
the mouth of a river where the ocean water enters.
82. The amount of oxygen that can dissolve in water ________ as salinity decreases.

83. The amount of ________ in an estuary’s waters is the major factor that determines the type and abundance of organisms that can live there. [two words]

84. Oxygen enters the water through two natural processes: diffusion from the atmosphere, and ________.

85. Bacteria, fungi, and other decomposer organisms reduce DO levels in estuaries because they consume oxygen while breaking down _________. [two words]

86. ________ is related to the amount of sediment and other solids suspended in water.

87. The chemical components in seawater resist large changes to ________.

88. Scientists can determine the density of phytoplankton and the amount of primary productivity by measuring ________.
Across
6. As water temperature increases, the amount of oxygen that can dissolve in the water ________.
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42. A __________ estuary occurs when river flow is low and tidally generated currents are moderate to strong.
45. Freshwater estuaries are driven by __________.
49. ________ substances are chemicals and metals that can causing serious illness or death. They may be poisonous, carcinogenic (cancer-causing) or harmful in other ways to living things. Pesticides, automobile fluids like antifreeze, oil or grease, and metals such as mercury or lead have all been found to pollute estuaries. These substances can enter an estuary through industrial discharges, yard runoff, streets, agricultural lands, and storm drains.

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