Ecology

Modified True/False
Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.

_T_ 1. The number of species in an area is a measure of biodiversity. _______________________

_F_ 2. A species that is brought to a place where it never lived is considered a(n) native species. __exotic_________

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

___ 3. Nitrogen is released to the abiotic parts of the biosphere from the processes of death and _____.
   a. decay by bacteria  c. runoff
   b. infiltration of groundwater  d. lightning in storm clouds

___ 4. Carbon dioxide in the atmosphere enters the biotic parts of the biosphere through _____.
   a. burning of forests  c. combustion of fossil fuels
   b. photosynthesis  d. all of these

___ 5. Some birds are known as honey guides because they may be followed by humans to wild beehives. When the humans take honey from the hives, the birds are able to feast on the honey and bees, too. This type of relationship can best be described as _____.
   a. parasitism  c. mutualism
   b. commensalism  d. symbiosis

___ 6. Cougars are predators that often eat weakened or diseased animals. This is a description of the _____ of cougars.
   a. habitat  c. niche
   b. community  d. none of these

___ 7. An ecologist who studies how several species in an area interact among each other and with the abiotic parts of the environment is interested in the biological organization level called a(n) _______.
   a. organism  c. community
   b. population  d. ecosystem

___ 8. An ecologist who studies how several species in an area interact is interested in the biological organization called a(n) _______.
   a. organism  c. community
   b. population  d. ecosystem
9. Referring to Figure 2-1, suppose 10 000 units of energy are available at the level of the grasses. What is the total number of energy units lost by the time energy reaches the coyote?
   a. 90 units
   b. 990 units
   c. 9900 units
   d. 9990 units

10. Referring to Figure 2-1, as matter and energy move from grasses to coyotes, the amount of available energy
   a. increases
   b. decreases
   c. decreases then increases
   d. increases or decreases but population size remains the same

11. Referring to Figure 2-1, the relationship between cats and mice could best be described as _____.
   a. predator-prey
   b. scavenger-carrion
   c. parasite-host
   d. consumer-producer

12. Referring to Figure 2-1, the coyotes would be considered _____.
   a. herbivores
   b. third-order consumers
   c. second-order consumers
   d. decomposers

13. Referring to Figure 2-1, energy flows from _____.
   a. coyotes to grasses
   b. cats to mice
   c. mice to cats
   d. coyotes to cats
14. In the energy pyramid shown in Figure 2-7, which level has the smallest number of organisms?

Figure 2-7

a. fox  

b. birds  

c. grasshoppers  

d. grass

15. Which organism shown in the pyramid shown in Figure 2-7 receives the highest percentage of energy from the sun?

a. fox  

b. birds  

c. grasshoppers  

d. grass

16. The flea shown in Figure 2-12 is involved in which type of symbiosis?

Figure 2-12

a. mutualism  

b. commensalism  

c. parasitism  

d. predatorism

17. The stable ecosystem that develops due to succession _____.

a. is called a niche  

b. is always a forest  

c. is called a climax community  

d. never changes
18. In Figure 3-3, where will you be most likely to find the greatest diversity?
   a. A  
   b. B  
   c. C  
   d. D

19. In Figure 3-3, which section would have a lack of organisms due to an overabundance of resources?
   a. A  
   b. B  
   c. C  
   d. D

20. In Figure 3-3, which section would account for a lower number of organisms near the bottom of a pond due to a short supply of oxygen and sunlight?
   a. A  
   b. B  
   c. C  
   d. D

21. Exponential growth of a population is represented by \( \frac{dN}{dt} = \)
   a. \( rN/K \)  
   b. \( rN \)  
   c. \( rN (K-N)/K \)  
   d. \( rN (K+N) \)
22. Look at the graph in Figure 3-6. What does this graph tell us about this species of plant?
   a. too much sunlight can hurt them
   b. they thrive in a lot of sun
   c. heat is damaging to them
   d. they need plenty of water

23. Look at the graph in Figure 3-6. Approximately how many hours of sunlight should these plants receive each day in order to make them grow at their optimum level?
   a. 4
   b. 12
   c. 16
   d. 20

24. What would be the best time of the year to plant the organism described in Figure 3-6?
   a. winter
   b. spring
   c. summer
   d. fall

25. The effect of movement of people between counties has _____ effect on total world population.
   a. a damaging
   b. little
   c. a great
   d. no

26. Organisms that employ a strategy of slow reproduction usually require an environment that ______.
   a. is stable
   b. fluctuates from year to year
   c. has cold days
   d. has 24-hour growing periods
27. A population that grows until it reaches its carrying capacity usually has the shape of an _____.
   a. I                     c. S
   b. J                     d. M

28. Density-independent factors are limiting factors whose effects are _____.
   a. confined to the habitat of the population
   b. determined by the degree of competition for resources
   c. not influenced by population densities
   d. determined by the difference between birthrate and population density

29. For a particular species, the carrying capacity is the maximum number of individual organisms that _____.
   a. the species could reach in a given time period if all the offspring survive and reproduce
   b. could be supported by a given environment indefinitely
   c. are in their post-reproductive years
   d. could be supported by any environment over a period of one year

30. Unrestricted populations of organisms experience _____.
   a. exponential growth                     c. fertility
   b. linear growth                           d. biotic growth

31. The major threat to biodiversity is _____.
   a. habitat fragmentation                   c. habitat degradation
   b. habitat loss                            d. exotic species
32. The major focus of conservation biology is _____.
   a. to prevent cruelty to animals
   b. to keep animals in zoos for people to see
   c. protect species from extinction
   d. stop hunting

33. Acid rain changes the pH of soil, killing some trees. This is an example of _____.
   a. habitat fragmentation
   b. global warming problems
   c. habitat degradation
   d. exotic species

Table 5-1 shows the population sizes for 5 different species in four different areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Species U</th>
<th>Species V</th>
<th>Species W</th>
<th>Species X</th>
<th>Species Y</th>
<th>Species Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>6</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>3</td>
<td>11</td>
<td>1</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 5-1**

34. From Table 5-1, which species has the highest average population size?
   a. Species W
   b. Species X
   c. Species Y
   d. Species Z

35. If the four areas in Table 5-1 were the only places in the world to find these organisms, which species most likely faces the greatest chance of extinction?
   a. Species U
   b. Species X
   c. Species Y
   d. Species Z

36. Which area in Table 5-1 has the greatest biodiversity?
   a. Area A
   b. Area B
   c. Area C
   d. Area D
37. If all four areas in Table 5-1 had identical climate and geology, which one would probably have the smallest area?

- Area A
- Area B
- Area C
- Area D

38. Carnivorous birds that fed on organisms exposed to this chemical produced fragile eggs. The chemical is

- CFC
- DNA
- DDT
- Nitrogen oxide

39. Which country has the fewest species of mammals?

- Canada
- United States
- Mexico

40. If the communities in Figure 5-4 were put in order of least to most biological diversity, they would be

- ABCD
- CADB
- BDAC
- DBCA

Figure 5-4
41. Desert iguanas remain in their burrows when soil surface temperatures cool below 39°C. Why don’t they venture out in cool weather?

a. They move sluggishly and risk being caught by a warm-blooded predator.
b. They will die within minutes if their body temperature drops below 39°C.
c. Their prey are also inactive when temperatures are cooler.
d. Their hearing is impaired at low temperatures because sound travels more slowly.

42. What happened to species B in the graph shown in Figure 5-6?

a. it increased in biodiversity
b. it decreased in population slightly
c. it became carnivorous
d. it became extinct

43. What effect did the loss of species B have on species A and D in Figure 5-6?

a. it caused the populations of A and D to decrease
b. it caused the populations of A and D to increase
c. it caused the populations of A and D to become extinct
d. it had no effect on the populations of A and D

44. Suggest what happened to species E in Figure 5-6.

a. it became extinct
b. it replaced species B in its niche
c. it stopped eating species B
d. it started eating species A
45. An individual giant red velvet mite emerges from its burrow in the sands of the Mojave Desert only once each year. What important functions does the mite perform during such
   a. bathing and drinking  
   b. finding nesting material  
   c. feeding and mating  
   d. all of the above

46. The Mojave Desert sits at about 35° N. latitude. It is a desert because there is little rainfall, but it is also very hot. Why so hot?
   a. Due to the tilt of the earth, there is more solar radiation striking 30-35° than other latitudes.
   b. There is a broad band of thinner atmosphere at this latitude (N and S) so that more radiation can penetrate to the ground.
   c. In a year there are more hours of daylight at this latitude compared with others.
   d. Sinking cold, dry air (originally from the equator) heats up as it falls and slams into the earth at around 30-35° N and S latitudes.
   e. a & c

47. In which of the following biomes would you expect the greatest above-ground biomass?
   a. Rain forest
   b. Boreal forest
   c. Grassland
   d. Tundra
   e. a & b

48. Which of the following ecological regions has the slowest transit time for carbon?
   a. Tropical rain forest
   b. Littoral zone
   c. Bog
   d. Oligotrophic lake

49. The term (K-N)/K of the logistic growth equation...
   a. Is only relevant for r-selected organisms
   b. Is only relevant for K-selected organisms
   c. Is a density-independent factor
   d. Does not take into account the size of the population
   e. None of the above

50. The age distribution for a population of an r-selected organism would be...
   a. Pyramidal
   b. Rectangular
   c. An inverse pyramid
   d. Bimodal
51. The fact that you find giant Anolis lizards on islands of the Lesser Antilles (in the Caribbean) is an example of...
   a. siderosis
   b. adaptive radiation
   c. mimicry
   d. allelic dysentery

52. Since there is so much nitrogen available in the atmosphere (70% of air is N2), this element tends not to be a critical or limiting nutrient for plants.
   a. true
   b. false

53. If large carnivores in an ecosystem are killed off, the number of primary producers in the area may also decrease dramatically, even though the carnivores don't eat the primary producers. How do you explain this effect?
   a. It is the result of a trophic inversion.
   b. The death of the carnivores leads to increased decomposition which pollutes the primary producers.
   c. The carnivores are most likely keeping the herbivore population in check.
   d. Angular stratification of the grazer biome is rectified when the carnivores are killed.

54. Toxins in the food chain are magnified as you go to higher and higher trophic levels. This is because...
   a. Higher tropic levels are mostly filled with many less-complex organisms so there are more individuals eating the toxins.
   b. Most of the toxins released into the environment are consumed only by animals high on the food chain.
   c. Many toxins are not cleared from tissues, so each animal that eats another retains a relatively small percentage of the carbon, nitrogen, etc but 100% of the toxins.
   d. Organisms higher on the food chain are larger, so the toxins are easier to see.

55. Which of the following is the largest single factor in species loss?
   a. chemical pollution
   b. thermal pollution
   c. habitat loss
   d. introduced species

56. All of the energy generated through photosynthesis in an ecosystem – respiration by both heterotrophs and autotrophs is:
   a. Gross Primary Productivity (GPP)
   b. Net Ecosystem Productivity (NEP)
   c. Net Primary Productivity (NPP)

57. In the Sonoran Desert, the lesser long-nosed bat pollinates the saguaro cactus as it feeds from the nectar from the flowers, this is a classic example of
   a. commensalism
   b. mutualism
   c. parasitism
   d. predation
58. At nighttime, desert temperature
   a. stay scorching hot
   b. cool down to a warm and balmy temperature
   c. often cool down to freezing temperatures
   d. vary significantly from desert to desert

59. What is desertification?
   a. a serious world problem when deserts disappear due to increasing rainfall
   b. a rapid increase in the number of desert species over a period of 5-10 years
   c. a rapid decrease in the number of desert species over a period of 5-10 years
   d. a serious world problem when deserts encroach on arable land

60. What characteristics of grasses allow them to thrive in the grassland biome?
   a. they grow from the bottom rather than the top, thus being able to rebound after a fire
   b. they require thick layers of healthy soil to grow
   c. they require constant rainfall
   d. all of the above

61. In their natural state, which of the following factors contribute to the maintenance of the grasslands:
   a. climate, topography, and grazing
   b. climate, topography, and fire
   c. topography, fire, and grazing
   d. climate, fire, and grazing

Completion

Complete each sentence or statement.

62. Organism, population, and community make up the ____Ecosystem_____.

63. Parasitism, commensalism, and mutualism are examples of ____symbiosis_____.

64. In a pond ecosystem, ducks, mosquitoes, pond plants, and frogs are ____biotic______ factors.

65. Both the alga and the fungus are benefited from their relationship in a lichen. This relationship is one of _mutualism_____.

66. Water, carbon, and nitrogen are released back into the atmosphere during ____decomposition_____.

67. Energy that passes through a food chain is lost to the environment as ____heat_______.

68. To explain and show how the amount of living material at each trophic level of a food chain changes, you could use a pyramid of ____biomass_______.

69. In ecological classification, the next smallest level after the biosphere is the ______ecosystem_____.

70. Instead of growing explosively, population growth tends to level off because the population reaches the ____carrying capacity____ of a particular environment.

71. A population of bacteria that doubles its size every 20 minutes exhibits ____exponential____ growth.
72. Which North American desert has the most complex vegetation of any desert on Earth?

Sonoran

81. Joshua trees live only in the _____Mojave___ desert.

73. Saguaro and other columnar cacti are indicator species of the __Sonoran__ desert.

Match the given biome to the plant life that it can support.

74. Tundra  G  a. evergreen trees
75. Taiga     A  b. cacti
76. Temperate Deciduous Forest E  c. shrubs
77. Tropical Rain Forest   F  d. grasses
78. Chaparral  C  e. broadleaf trees
79. Desert        B  f. orchids
80. Grassland     D  g. lichen

Label which biomes the following pairs of temperature and precipitation graphs belong to.

81. Grassland

82. Desert
83. Define and list abiotic factors in an ecosystem.

abiotic factors – any nonliving components of an ecosystem: soil, minerals and other chemicals, pH, weather, climate, water, light, moisture, most limiting factors (4 points, at least 3 factors)

84. What is the most common limiting factor in a desert environment?

Water (1 point)

85. Name the four North American Deserts.

Chihuahuan Desert, Great Basin Desert, Mojave Desert, Sonoran Desert

86. List three common greenhouse gases, and explain the difference between global warming and the greenhouse effect.

Carbon dioxide, Methane, water vapor, nitrous oxide, ozone, CFCs; greenhouse effect = The process in which greenhouse gases in the atmosphere trap heat from the sun and keep Earth warm. The greenhouse effect is necessary for life on Earth, but too many gases in the atmosphere could make our planet's temperatures rise too high. global warming = an increase in the average temperature of the earth's atmosphere (especially a sustained increase that causes climatic changes). (5 points, 3 for gases, 2 for difference between the two)

Short Answer

87. Label the energy available at each trophic level for figure 1: Bottom – 10,000, 1,000, 100, 10 on top

88. What type of pyramid might figure 2 be? Pyramid of numbers (spindle-shape)

*Sometimes the pyramid of numbers doesn't look like a pyramid at all. This could happen if the producer is a large plant such as a tree, or if one of the animals is very small. Remember, though, that whatever the situation, the producer still goes at the bottom of the pyramid.

89. In a grassland biome, what food chain might this pyramid represent? Bottom- grass (P=producer). Any omnivore/herbivore (PC Primary consumer), carnivore (SC=secondary consumer), decomposer/carnivore {TC = Tertiary consumer) (4points, 1 each level)
90. What is the name of the following cycle, and in what step of this cycle is necessary for plants to receive the nutrients from this cycle? **Nitrogen cycle, Nitrogen fixation (2 points)**

**Tiebreakers:** these will be used to determine who wins in the case of a tie.

91. List three or more adaptations in desert organisms and their functions.

- large surface area for cooling – ex. rabbit ears; waxy surface to contain water;
- large water retaining trunks, stocks, humps, or holding areas to have a water supply in case of drought;
- needles as opposed to leaves to conserve water;
- spines and poisons for protection;
- nocturnal to conserve water and energy, so as not to overheat;
- CAM photosynthesis to conserve water (6 points, Any three or other appropriate answer)

92. List three or more adaptations in grassland organisms and their functions.

- Some animals, such as bison, have broad, flat-topped teeth and digestive systems especially adapted to feed on grasses.
- Many prairie animals have front legs and paws that allow them to burrow into the ground, where they are protected from predators.
- Many prairie animals are adapted for nocturnal life; that is, they are active at night, which helps conceal their presence from predators.
- The color of many prairie animals blends in with the plant life, which also helps them hide from predators.
- The colorful blossoms attract insects to pollinate them.
- Extensive root systems for some shrubs can get water from far down in the Earth. Different species' roots get most of their water and nutrients from different levels in the soil.
- Three examples of animal adaptation are first giraffes because their necks are adapted to feed from the tall trees instead of feeding from the smaller trees where all the other animals feed. (6 points, any three or other appropriate answer)

93. List three common greenhouse gases, and explain the difference between global warming and the greenhouse effect.

- Carbon dioxide, Methane, water vapor, nitrous oxide, ozone, CFCs;
- greenhouse effect = The process in which greenhouse gases in the atmosphere trap heat from the sun and keep Earth warm. The greenhouse effect is necessary for life on Earth, but too many gases in the atmosphere could make our planet's temperatures rise too high.
- global warming = an increase in the average temperature of the earth's atmosphere (especially a sustained increase that causes climatic changes).

(5 points, 3 for gases, 2 for difference between the two)