## Biodiversity and Population Size

Name: $\qquad$ Date: $\qquad$
4. Which occurs within self-sustaining ecosystems?
A. Consumers produce most of the oxygen.
B. Consumers eventually outnumber producers.
C. Energy is created and destroyed.
D. Organisms interact with their environment.
5. Which represents a community?
A. all the Paramecium candatum in a pond
B. the abiotic factors in Lake Michigan
C. all the interacting populations in a forest
D. the concentration of minerals in soil
6. In an ecosystem, the ultimate source of all energy is
A. photosynthesis
B. oxygen
C. fermentation
D. sunlight
7. A sudden increase in the number of producers in an ecosystem would first affect the population of
A. carnivores
B. herbivores
C. saprophytes
D. decomposers
8. When populations of different species occupy the same area at the same time, these populations form a
A. community
B. phylum
C. biome
D. succession
9. Which term describes all the individuals of any one species present in a particular environment?
A. a community
B. an ecosystem
C. a biosphere
D. a population
10. Which condition is not necessary for an ecosystem to be self-sustaining?
A. a greater number of consumers than producers
B. the presence of decomposers
C. the presence of autotrophic organisms
D. a constant energy source
11. A natural community interacting with its abiotic environment is a description of
A. a population
B. an organ system
C. an organism
D. an ecosystem
12. A population could best be represented by all of the
A. acorn barnacles on a rock
B. different species of fish in a bay
C. animals found along a sandy beach
D. organisms in a pond
13. The timber wolves, rabbits, and vegetation in a particular region of northern New York together constitute part of a
A. population
B. community
C. genus
D. species
14. All the plants and animals interacting in a given area make up a
A. community
B. population
C. biosphere
D. species
15. An island in a river in New York State has a population of mice. In 1 year, the population density changed from 12 mice per 25 square meters to 20 mice per 25 square meters.

Which factor most likely caused the change in the population density of mice on the island?
A. a decrease in the amount of precipitation
B. migration of snakes to the island
C. competition among mice for food
D. a decrease in the island's owl population
16. The climax flora on this island would most likely be
A. lichens and mosses
B. snakes and owls
C. beech and maple trees
D. insects and mice
17. Which term best describes the interactions between the physical and living factors shown in the diagram?

A. a biosphere
B. an ecosystem
C. a community
D. a biome
18. In an ecosystem, the calcium compounds found in rocks are best described as
A. inorganic and abiotic
B. inorganic and biotic
C. organic and abiotic
D. organic and biotic
19. Which is an example of an ecosystem?
A. a population of monarch butterflies
B. the interdependent biotic and abiotic components of a pond
C. all the abiotic factors found in a field
D. all the mammals that live in the Atlantic Ocean
20. The drawing shown represents some organisms in Africa. All the organisms in the drawing make up an ecological unit known as a

A. species
B. biome
C. population
D. community
21. The graph shown represents the population growth curves of two different species of aquatic organisms, $A$ and $B$. What is a valid prediction based on this graph?

A. Species $A$ will not be present in the water during the winter months.
B. Species $A$ will eliminate species $B$ from the water after 1 year.
C. Species $B$ will attain maximum population size each autumn due to a decrease in water temperature.
D. Species $B$ will decrease in population size approximately 1 month after a decrease in the population size of species $A$.
22. Which organisms constitute a population?
A. all the grey squirrels in a certain wooded area
B. all the mammals in a certain wooded area
C. all the autotrophs in an ecosystem
D. all the decomposers in an ecosystem
23. Which group represents a population?
A. all the vertebrates living in New York State
B. all the Homo sapiens living in New York State
C. all the plant and animal species found in New York State
D. all the flowering plants found in New York State
24. All of Earth's water, land, and atmosphere within which life exists is known as
A. a population
B. a community
C. a biome
D. the biosphere
25. The chart lists four groups of factors relating to an ecosystem.

| Group A | Group B | Group C | Group D |
| :--- | :--- | :--- | :--- |
| Sunlight | Sunlight | Sunlight | Sunlight |
| Green plants | Climate | Green Plants | Rainfall |
| Rainfall | Rainfall | Rainfall | Consumers |
| Consumers | Minerals | Producers | Producers |
| Oxygen | Gases | Carbon Dioxide | Water |

Which group contains only abiotic factors?
A. $A$
B. $B$
C. $C$
D. $D$
26. The wrasse, a small marine fish, periodically cleans harmful parasites from the mouth and body of the moray eel. The moray, in turn, protects the wrasse from larger predators and provides it with a constant supply of food. This is an example of the type of relationship known as
A. mutualism
B. parasitism
C. commensalism
D. saprophytism
27. In New York State, bluebirds and sparrows inhabit nearly the same ecological niche. In many areas, bluebirds are being replaced by the sparrows as a result of
A. symbiosis
B. competition
C. mutualism
D. equilibrium
28. Cattails in freshwater swamps in New York State are being replaced by purple loosestrife plants. The two species have very similar environmental requirements. This observation best illustrates
A. variation within a species
B. competition between species
C. isolation of species populations
D. random recombination
29. The relationship between athlete's foot fungus and humans is known as
A. synthesis
B. mutualism
C. parasitism
D. commensalism
30. Some hydras have green algae living symbiotically inside their bodies. The algae produce food for the hydra and receive carbon dioxide and shelter from the animal. What type of relationship exists between the two organisms?
A. parasitism
B. commensalism
C. mutualism
D. saprophytism
31. An organism that obtains its food at the expense of another living organism is known as a
A. host
B. saprophyte
C. parasite
D. scavenger
32. Which term includes the other three?
A. symbiosis
B. mutualism
C. parasitism
D. commensalism
33. Both species of organisms in a lichen benefit from a symbiotic association called
A. commensalism
B. mutualism
C. saprophytism
D. parasitism
34. When two different species temporarily occupy the same niche, they are
A. in a symbiotic relationship with one another
B. not affecting one another
C. cooperating with one another
D. competing with one another
35. Which statement describes symbiotic relationships?
A. Different species live in close associations in an ecosystem.
B. Abiotic factors interact in an ecosystem.
C. Saprophytes respond to abiotic changes in an ecosystem.
D. Ecosystem feeding levels show changes in energy.
36. Some small fish attach themselves to the body of a shark without harming it and feed upon its left over food. This relationship between the shark and the fish is an example of
A. commensalism
B. mutualism
C. competition
D. parasitism
37. In a pure culture, Paramecium caudatum grew and flourished. In a mixed culture and P. aurelia, all $P$. caudatum died within 16 days, while the $P$. aurelia survived. This observation illustrates
A. saprophytism
B. gradualism
C. competition
D. evolution
38. The oxpecker, a small African bird, periodically cleans ticks and other pests off the skin of the impala. The impala, in turn, protects the oxpecker from larger predatory birds and provides it with a constant supply of food. This relationship is an example of
A. mutualism
B. parasitism
C. commensalism
D. saprophytism
39. Select the example of symbiosis, chosen from the list below, that is best described by the statement shown.

A parasite benefits at the expense of a host.
A. Barnacles on a whale
B. Nitrogen-fixing bacteria in the nodules of legumes
C. A tapeworm in a dog
D. Protozoa within a termite's digestive system
40. Select the example of symbiosis, chosen from the list below, that is best described by the statement shown.

This relationship is an example of commensalism.
A. Barnacles on a whale
B. Nitrogen-fixing bacteria in the nodules of legumes
C. A tapeworm in a dog
D. Protozoa within a termite's digestive system
41. The graph here shows the population growth curves of Paramecium aurealia and Paramecium caudatum cultures after they were mixed together. One influence that could correctly be drawn from the graph is that Paramecium aurelia and Paramecium caudatum cannot successfully

A. utilize oxygen for anaerobic respiration
B. utilize the same wavelengths of light
C. live in marine environments
D. occupy the same niche
42. The graph here shows the population growth curves of Paramecium aurealia and Paramecium caudatum cultures after they were mixed together. This graph can be used to illustrate the principle of
A. mutualism
B. competition
C. assimilation
D. saprophytism
43. The gypsy moth, Porthetria dispar, is a defoliator (an agent that removes leaves) of both deciduous trees and conifers in New York State. the gypsy moth undergoes a complete metamorphosis from egg to larva to pupa to adult moth. The gypsy moth larvae (caterpillars) cause the greatest amount of damage to trees. The heaviest defoliations occur in oak forests because these trees are highly favored as food plants by all larval stages. The adult moths do not feed; their only function is to reproduce.

The male moth is a fairly strong daytime flier and tends to fly upwind in a zigzag pattern. The female is so heavily laden with eggs that she is unable to fly. Egg laying occurs soon after the moths mate, usually within a day or so after the female reaches the adult stage. Moths die soon after egg laying is completed.

The best means of controlling the gypsy moth in the forests of New York State is through the development and use of biological methods of pest control. The most important of these includes the use of Oooencytrus kuwanae, a tiny wasp that parasitizes the upper layers of eggs in a cluster and is normally effective on about three-fourths of the eggs; Sturmia scutellata, a fly known as the pupal parasite; and Calosoma sycophanta, a ground beetle that preys on both gypsy moth larvae and pupae.

An important natural agent that causes gypsy moth populations to collapse is a viral disease of the larvae. Affected caterpillars are seen hanging from trees. The virus is always present in gypsy moth colonies in a dormant form and becomes activated when outside stress is applied. The viral disease, starvation, stress-induced diseases, and parasitism may cause a population to collapse after a forest has undergone 2 or 3 years of defoliation.

Which is the best method to use in eliminating gypsy moth populations from the Adirondack and Catskill Mountains of New York State?
A. Spray the oak, beech, and maple trees with an insecticide.
B. Apply DDT residues to the trunk of spruce, fir, and pine trees.
C. Introduce a species of ground beetle that preys upon gypsy moth larvae.
D. Apply a phosphate fertilizer to the soil to prevent larval attack against conifer and deciduous root systems.
44. An overpopulation of deer in a certain area will most likely lead to
A. a decrease in the number of predators of the deer
B. an increase in the number of autotrophs available for food
C. a decrease in the incidence of disease
D. an increase in competition between the deer
45. Nitrogen-fixing bacteria live on the roots of leguminous plants in swellings called nodules. The bacteria synthesize nitrogen compounds that are used by the plants, and the plants provide moisture and nutrients for the bacteria. The interaction between the nitrogen-fixing bacteria and the leguminous plants is known as
A. parasitism
B. mutualism
C. saprophytism
D. commensalism
46. The role of an organism within a community is known as its
A. niche
B. habitat
C. biome
D. succession
47. A flea in the fur of a mouse benefits at the mouse's expense. This type of relationship is known as
A. commensalism
B. parasitism
C. saprophytism
D. mutualism
48. In a forest in northern New York State, the most intense competition would most likely occur between white-tailed deer and
A. brown bears
B. humans
C. other white-tailed deer
D. coyotes
49. Select the term that is most closely associated with the following relationship:

Protozoans digest cellulose within the digestive tract of termites. The termites receive nutrients, and the protozoans are provided with a niche.
A. Predation
B. Saprophytism
C. Commensalism
D. Mutualism
50. Select the term that is most closely associated with the following relationship:

Orchids grow on large tropical trees. The orchids depend on the support offered by the trees but do not harm the trees.
A. Predation
B. Parasitism
C. Commensalism
D. Mutualism
51. A group of 100 female water fleas was placed in each of three culture jars of different sizes. The graph shows the average number of offspring produced per female each day in each jar. The information in the graph suggests that

A. water fleas produce more offspring when they are crowded together
B. the ability of a water flea to produce offspring is affected by population density
C. water fleas have fewer offspring when they are thinly populated
D. the reproduction rate of water fleas increases steadily after 20 days
52. The graph shows the changes in two populations of herbivores in a grassy field. A possible reason for these changes is that

A. all of the plant populations in this habitat decreased
B. population $B$ competed more successfully for food than population $A$ did
C. population $A$ produced more offspring than population $B$ did
D. population $A$ consumed the members of population $B$
53. Which organism would most likely have a predator-prey relationship?
A. tapeworm and dog
B. barnacle and whale
C. hawk and mouse
D. rabbit and grass
54. Which factor promotes competition between organisms in an ecosystem?
A. cycling of minerals
B. decomposition of organic matter
C. limited resources
D. presence of saprophytes
55. If two different bird species in the same habitat require the same type of nesting site, both species will most likely
A. interbreed and share the nesting sites
B. compete for the nesting sites
C. change their nesting site requirements
D. use the nests of other bird species
56. Base your answer(s) to the following question(s) on the paragraph and on your knowledge of biology.

Leeches often attach to the tongue of a crocodile and consume the crocodile's blood as food. The Egyptian plover is a bird that flies into the mouth of the crocodile and eats the leeches. The crocodiles do not harm the plovers.

For each relationship identified in the following questions, select the ecological term, chosen from the list below, that identifies that relationship.

## Ecological Terms

(1) Commensalism
(2) Mutualism
(3) Parasitism
(4) Saprophytism
(5) Prey-predator

The relationship between the plover and the crocodile
A. (2)
B. (3)
C. (4)
D. (5)
57. A bird lives in a tree in a forest, where it builds a nest and lays two eggs. The chicks hatch, and the mother feeds the chicks insects she has plucked from the tree bark. This information helps most in determining the bird's
A. niche
B. rate of metabolism
C. biomass
D. migratory pattern
58. Of the following factors, which most directly regulates photosynthetic activity in a marine biome?
A. amount of dissolved oxygen in the water
B. nitrogen content of the water
C. total rainfall over the water
D. amount of dissolved carbon dioxide in the water
59. Which type of biome occupies the largest area of Earth?
A. marine
B. grassland
C. tropical rain forest
D. temperate deciduous forest
60. Base your answer(s) to the following question(s) on the diagram below, which shows the sequence of plant communities that have occupied land that was left barren 300 years ago, and on your knowledge of biology.


In which biome would this sequence of plant communities most likely be found?
A. taiga
B. tundra
C. tropical rain forest
D. temperate deciduous forest
61. Which example shows a relationship between a living thing and a nonliving thing?
A. An insect is food for a salmon.
B. Water carries a rock downstream.
C. A tree removes a gas from the air.
D. A flower makes food for a butterfly.
62. The graph below shows a population of pigeons living in a neighborhood over a ten-year period.


Which of the following statements could account for the change in population seen between years 7 and 8 ?
A. The birth rate of the pigeons increased.
B. The emigration rate of the pigeons decreased.
C. The death rate of the pigeons exceeded the birth rate.
D. The neighborhood reached its carrying capacity for the pigeon population.
63. The graph below shows changes in a caribou population over time.


Based on the graph, which of the following is a possible explanation for the stabilization of the caribou population?
A. an equal number of deaths and births
B. an unequal number of deaths and births
C. an equal number of immigrants and births
D. an unequal number of immigrants and deaths
64. Rabbits introduced into Australia over 100 years ago have become a serious pest to farmers. Rabbit populations increased so much that they displaced many native species of plant eaters. What is the most logical explanation for their increased numbers?
A. Rabbits have a high death rate.
B. There are few effective predators.
C. Additional rabbit species have been introduced.
D. There is an increase in rabbit competitors.
65. Scientists found that, over a period of 200 years, a mountain pond was transformed into a meadow. During that time, several communities of organisms were replaced by different communities. Which of these best explains why new communities were able to replace older communities?
A. The original species became extinct.
B. Species in the older community died from old age.
C. The abiotic characteristics of the habitat changed.
D. Diseases that killed the older organisms disappeared.
66. The graph below shows the birth rate and death rate for a population during the 1900s.


From 1900 to 2000, the population has
A. increased.
B. decreased.
C. stayed the same.
D. increased until 1930, then decreased.
67. If a paleontologist finds fossils of many different species existing in the same area at approximately the same time, the paleontologist can conclude that the ecosystem in this area had a high degree of
A. climatic variation.
B. episodic speciation.
C. biological diversity.
D. geographic isolation.
68. In the longstanding war between coyotes and sheep ranchers in New Mexico, studies show that coyotes kill sheep and the percentage of sheep lost from herds in areas where coyotes have been exterminated is about the same as the percentage lost in areas where coyotes are still present.

What is the most likely explanation for the similarity in the percentage of sheep lost in both areas?
A. Coyotes were protecting sheep.
B. The sheep died from overcrowding.
C. Another predator was killing sheep.
D. Coyotes were preying on sick or weak sheep.
69. The growth rate of a local population is dependent on the birth rate minus the death rate and
$\qquad$ -.
A. the ratio of males to females in the population
B. the lifespan of females beyond the reproductive age
C. the amount of genetic variation that exists in the population
D. the immigration and emigration of individuals to and from the population.
70. The graphs below show the annual number of AIDS deaths in the United States and in South Africa from 1999-2003.


What conclusion is best supported by the data in the graphs?
A. AIDS has been cured in the United States but not in South Africa.
B. AIDS has caused a greater population decline in South Africa than it has in the United States.
C. The number of AIDS deaths in each country is solely responsible for the population growth rate in each country.
D. The population in South Africa has increased regardless of AIDS, whereas the United States population has decreased as a result of AIDS.
71. Use the picture below to answer the following question.


Which of these lists only living parts of this ecosystem?
A. fox, tree, grass
B. sun, stream, cloud
C. cloud, grass, rock
D. stream, cloud, fox
72.


The graph above shows how a white-tailed deer population recovered over a ten-year period after a population crash. Wolves in the same area feed primarily on deer. Which graph shows the most likely change in wolf population for the same ten-year period?
A. Wolf Population

C. Wolf Population

B. Wolf Population



73. Use the pictures below to answer the following question.


Which ecological process is illustrated in this sequence of pictures?
A. migration
B. succession
C. nitrification
D. precipitation
74. A scientist was studying a mammal population. The data table below shows some of her results.

| Mammal Population |  |
| :--- | :---: |
| Segment of Mammal <br> Population | Number of Individuals in <br> Population |
| Adult Males | 49 |
| Adult Females | 52 |
| Juveniles | 104 |

Which graph best represents the information in the table?

## A. Mammal Population


B. Mammal Population

C. Mammal Population

D. Mammal Population

75. Use this graph to answer the question .

Height of Flowers at Different Elevations


A scientist studying a species of flower that grows on the side of a mountain measured the height of many of the flowers at different elevations. His results are shown in the graph. Which statement best describes the pattern of growth for the flowers during this experiment?
A. The flowers' heights are unaffected by elevation.
B. The flowers cannot grow below elevations of 1,000 meters.
C. The flowers grow taller at elevations of around 3,000 meters.
D. The flowers' heights increase with higher elevation.
76. Which statement best describes how birth and death rates compare in a population at carrying capacity?
A. The birth rate is greater than the death rate.
B. The birth rate is less than the death rate.
C. The birth rate is equal to the death rate.
D. The birth rate and the death rate are zero.

Some biology students conducted an experiment on the growth of duckweed. They are writing a laboratory report about their experiment. The introduction, methods, and results sections of their report are shown. They have not yet written the discussion section. Read and study the unfinished laboratory report. Then answer the following question(s).

## Factors Affecting the Growth of Duckweed

## Introduction

Duckweed (Lemna minor) is a very small plant that floats on top of water in ponds, marshes, and puddles. It has green leaf-like structures called thalli. Duckweed can grow very quickly, reproducing through the breaking off of smaller thalli from larger plants.


Although duckweed can grow very rapidly, sometimes it does not. Our investigation was designed to explore the effects of light, nutrients, and available space on the growth of duckweed. We hypothesized that duckweed would grow fastest in high-light and high-nutrient conditions, and that the duckweed population would then use up all the available space.

## Methods

We placed duckweed plants in beakers representing the different conditions. We used an initial population of 10 plants in each beaker. We counted the total number of plants present in each of the beakers each week for 6 weeks. Plants were counted as live only when they were green. White, clear, or brown plants were not counted. When plants were very close together, it was sometimes necessary to make our best estimate of the number of individual plants present.

We used identical small beakers for each test population. Beakers were filled with distilled water (no nutrients-group 1), pond water (low nutrients-group 2), or pond water with a small amount of commercial plant fertilizer (high nutrients-group 3). As evaporation occurred, all beakers were refilled with distilled water. In addition, we used a screen over some high-nutrient beakers (group 4) to create a low-light condition. All beakers were kept under plant lights at room temperature for the entire experiment.

We used a total of 12 beakers in 4 different treatment groups. The table shows our experimental design.

| Group | Nutrients | Light | Number of Beakers |
| :---: | :---: | :---: | :---: |
| group 1 | no nutrients | high light | 3 |
| group 2 | low nutrients | high light | 3 |
| group 3 | high nutrients | high light | 3 |
| group 4 | high nutrients | low light | 3 |

## Results

We recorded the number of live plants in each of the 3 beakers in each group each week. Then we calculated the average number of live plants each week within each treatment group. We graphed these average values in the line graph shown.

77. Based on the information in the graph, which statement best explains whether the duckweed population in group 3 reached its carrying capacity during the 6 weeks of the experiment?
A. After about 3 weeks, the population reached its carrying capacity of about 250 plants.
B. After about 4 weeks, the population reached its carrying capacity of about 225 plants.
C. The population did not reach its carrying capacity because it was still slowly increasing.
D. The population did not reach its carrying capacity because it was declining at the end of the experiment.
78. The diagram below represents the distribution of trees in an area of a forest.


When squirrels move into the area, they gather acorns from the one oak tree in this area and hide them in the ground over a wide area.

Which of the following best represents this same area of the forest 20 years later?
A.

B.

$\mathscr{P}=$ oak
$\triangle=$ pine
$O=$ birch
$\square=$ cedar
$M=$ maple
C.


D.

1.

Answer: C
2.

Answer: C
3.

Answer: $\quad$ C
4.

Answer: D
5.

Answer: C
6.

Answer: D
7.

Answer: B
8.

Answer: A
9.

Answer: D
10.

Answer: A
11.

Answer: D
12.

Answer: A
13.

Answer: B
14.

Answer: A
15.

Answer: D
16.

Answer: C
17.

Answer: B
18.

Answer: A
19.

Answer: B
20.

Answer:
D
21.

Answer: D
22.

Answer: A
23.

Answer: B
24.

Answer: D
25.

Answer: B
26.

Answer: A
27.

Answer: B
28.

Answer:
B
29.

Answer: C
30.

Answer: C
31.

Answer: C
32.

Answer: A
33.

Answer: B
34.

Answer: D
35.

Answer: A
36.

Answer: A
37.

Answer: $\quad$ C
38.

Answer: A
39.

Answer: C
40.

Answer: A
41.

Answer: D
42.

Answer: B
43.

Answer: C
44.

Answer: D
45.

Answer: B
46.

Answer: A
47.

Answer: B
48.

Answer: C
49.

Answer: D
50.

Answer: C
51.

Answer: B
52.

Answer: B
53.

Answer: C
54.

Answer: C
55.

Answer: B
56.

Answer:
A
57.

Answer: A
58.

Answer: D
59.

Answer: A
60.

Answer: D
61.

Answer: C
62.

Answer: C
63.

Answer:
A
64.

Answer: B
65.

Answer: C
66.

Answer: A
67.

Answer: C
68.

Answer: C
69.

Answer:
70.

Answer: B
71.

Answer: A
72.

Answer: B
73.

Answer: B
74.

Answer: C
75.

Answer: C
76.

Answer: C
77.

Answer: A
78.

Answer: D

