

# CHAPTER 4--BIODIVERSITY AND EVOLUTION

Student: \_\_\_\_\_

1. How many humans are injured or killed each year by sharks?
  - A. 5-15
  - B. 20-35
  - C. 40-55
  - D. 60-75
  - E. 135-150
2. How many sharks are killed each year by humans?
  - A. 501
  - B. 150,000
  - C. 1.3-2.7 million
  - D. 22-47 million
  - E. 79-97 million
3. Sharks are an important part of biodiversity for all of the following reasons, *except*
  - A. they remove dead and dying fish
  - B. they could teach us how to not get cancer
  - C. they are an important food source for whales
  - D. they remove dead and dying aquatic mammals
  - E. their immune systems could teach us how to heal without becoming infected
4. Biodiversity includes all of the following components *except*
  - A. functional diversity
  - B. genetic diversity
  - C. intellectual diversity
  - D. ecological diversity
  - E. species diversity
5. The diversity that enables life on earth to adapt and survive environmental changes is called
  - A. functional diversity
  - B. genetic diversity
  - C. intellectual diversity
  - D. ecosystem diversity
  - E. species diversity

6. The variety of processes, including matter cycling and energy flow within ecosystems, which result from species interacting with one another in food webs is called
- A. functional diversity
  - B. genetic diversity
  - C. intellectual diversity
  - D. ecosystem diversity
  - E. species diversity
7. A change in the genetic characteristics of a population from one generation to another is called
- A. emigration
  - B. mutation
  - C. natural selection
  - D. evolution
  - E. genetic drift
8. Some individuals in a population have genetic traits that are favored by environmental conditions because the trait enhance their ability to survive and produce offspring, a process called
- A. natural selection
  - B. adaptability
  - C. genetic drift
  - D. mutation
  - E. scientific theory
9. Mutations are *not* caused by which of the following?
- A. ultraviolet light
  - B. a physical accident to a parent
  - C. radioactivity
  - D. certain chemicals
  - E. X rays
10. For natural selection to occur, an adaptive trait
- A. must be to a physical trait
  - B. must be to a physiological trait
  - C. must be to a psychological trait
  - D. must be to a heritable trait
  - E. must not be to a heritable trait
11. Biological evolution by natural selection is when genes \_\_\_\_, individuals \_\_\_\_, and populations \_\_\_\_.
- A. evolve; mutate; are selected
  - B. are selected; mutate; evolve
  - C. mutate; evolve; are selected
  - D. evolve; are selected; mutate
  - E. mutate; are selected; evolve

12. Which of the following is *not* an adaptation that has made humans so successful?
- A. strong opposable thumbs
  - B. physical strength
  - C. upright walking
  - D. complex brain
  - E. All of these have made us successful.
13. From a scientific point of view, which of the following is *true*?
- A. Evolution leads to survival of the strongest.
  - B. Evolution leads to survival of the most valuable.
  - C. Organisms develop traits because they need them.
  - D. Fitness is a matter of reproductive success.
  - E. Evolution follows a plan of nature.
14. The movement of the continents influences evolution in which of the following ways?
- A. increases the level of carbon dioxide
  - B. changes the earth's climate
  - C. changes the spin of the earth
  - D. decreases soil nutrient richness
  - E. changes magnetic fields and disrupts migration patterns
15. Which of the following is *not true* of the conditions on earth that make life possible?
- A. gravitational mass keeps atmospheric gasses from flying off
  - B. spin of the earth keeps the sun from overheating any one part of the planet
  - C. balance of consumer and producer organisms keeps oxygen levels at correct level
  - D. for last 2 billion years unreliable ozone levels have caused mutations
  - E. distance from the sun keeps temperature in a narrow range
16. Geographic isolation may result from which of the following?
- A. volcanic eruptions
  - B. migrations of subgroups
  - C. mountain ranges
  - D. roads
  - E. all of these
17. Mass extinctions, with 25-95% of species going extinct, have occurred how many times in the history of the earth?
- A. 1 or 2
  - B. 3-5
  - C. 6-8
  - D. 9-12
  - E. 20-23

18. Biodiversity is believed to be the result of the interaction between
- A. geographic isolation and reproductive isolation
  - B. speciation and extinction
  - C. mass extinction and background extinction
  - D. speciation and genetic engineering
  - E. reproductive isolation and extinction
19. Scientists have used genetic engineering to do all of the following, *except*
- A. develop modified crop plants
  - B. develop human clones
  - C. develop new drugs
  - D. develop pest resistant plants and animals
  - E. develop oil eating bacteria
20. The number of different species an ecosystem contains is its
- A. speciation
  - B. species evenness
  - C. species niche
  - D. species richness
  - E. habitat
21. Which of the following is *true*?
- A. The higher the species richness, the lower productivity.
  - B. The higher the species richness, the lower the sustainability.
  - C. The lower the species richness, the more the productivity.
  - D. The lower the species richness, the more the sustainability.
  - E. The higher the species richness, the more the sustainability.
22. The role a species plays in its ecosystem is the
- A. function
  - B. habitat
  - C. ecological niche
  - D. geographical location
  - E. ecological job
23. An ecological niche includes all of the following *except*
- A. the place where the species lives
  - B. how much water the species needs
  - C. how much sunlight the species needs
  - D. how much space the species needs
  - E. temperatures the species can tolerate

24. A species with a broad niche is considered a(n)
- A. endemic species
  - B. endangered species
  - C. specialist species
  - D. native species
  - E. generalist species
25. Which of the following would *not* be considered a generalist species?
- A. humans
  - B. cockroaches
  - C. pandas
  - D. raccoons
  - E. white-tailed deer
26. All of the following would be true of a specialist species, *except*
- A. live in only one habitat
  - B. use only one or a few types of food
  - C. have a narrow range of climactic conditions
  - D. less prone to extinction
  - E. can tolerate only a few environmental conditions
27. Which of the following is another name for a nonnative species?
- A. native
  - B. invasive
  - C. keystone
  - D. indicator
  - E. foundation
28. Which of the following is *not* an example of a cause for the decline of amphibians?
- A. habitat loss
  - B. prolonged rainy periods
  - C. pollution
  - D. increases in UV radiation
  - E. parasites
29. A species in an ecosystem that plays a central role in the health of that ecosystem, and whose removal may cause the collapse of the ecosystem, is called a(n)
- A. foundation species
  - B. indicator species
  - C. native species
  - D. keystone species
  - E. specialist species

30. A species in an ecosystem that shapes communities by creating and enhancing habitats in ways that benefit other species is called
- A. foundation species
  - B. indicator species
  - C. native species
  - D. keystone species
  - E. specialist species
31. Shark species have been around for more than 400 million years.
- True False
32. For every shark that injures a person, humans kill at least 1 million sharks.
- True False
33. More plant species have been identified than any other group of organisms.
- True False
34. Biodiversity is a vital part of the natural capital that sustains all life.
- True False
35. Most of what we know about the earth's history comes from fossils.
- True False
36. The fossils found so far probably represent about 50% of the species that have ever lived.
- True False
37. A huge body of evidence supports the idea of biological evolution through natural selection.
- True False
38. Most mutations occur because of exposure to artificial external agents, such as radiation.
- True False
39. Charles Darwin is the only person who came up with the idea that organisms change over time and are descended from a common ancestor.
- True False
40. Individuals evolve.
- True False

41. Mutations that occur in any cell are passed from generation to generation as a heritable trait.  
True False
42. Mutations are the source of natural selection.  
True False
43. Survival of the fittest refers to those individuals that leave the most offspring.  
True False
44. Species that are successful during one period of time because of selected adaptations may not be successful when environmental conditions change.  
True False
45. Houseflies would probably adapt to an environmental change much more quickly than a human.  
True False
46. According to the theory of evolution, a giraffe evolved a long neck because it needs it.  
True False
47. Long-term climate changes determine where plant and animal species can survive.  
True False
48. The earth has often times been struck by large asteroids, but they have seldom done much to alter evolution.  
True False
49. If the percentage of atmospheric oxygen increased only by about 4% the atmosphere would likely become a giant fireball.  
True False
50. The earth's spinning on its axis prevents one side from being too hot and the other side too cold for water-based life to exist.  
True False
51. Pandemic species are species found only in one area.  
True False

52. In speciation, two species interbreed to form one new species.  
True False
53. Endemic species are particularly vulnerable to extinction.  
True False
54. Humans are playing a decreasing role in the process of extinction.  
True False
55. Estimates indicate the average annual background extinction rate is one to five species for each million species on earth.  
True False
56. In geologic history mass extinctions have been followed by an increase in species diversity.  
True False
57. The golden toad of Costa Rica is now extinct, perhaps one of the first victims of global warming.  
True False
58. Genetic engineering allows scientists to transfer genes between different species that would not interbreed in nature.  
True False
59. Genetic engineering has resulted in antibiotic resistant bacteria.  
True False
60. A tropical rain forest is likely to have high species evenness and low species richness.  
True False
61. Scientists learn about species richness by studying species on mountains.  
True False
62. Under rapidly changing environmental conditions it is better to be a specialist species.  
True False
63. A single Asian cockroach and its offspring can add about 10 million new cockroaches in a year.  
True False



64. All nonnative species are villains.

True False

65. Amphibians are sensitive to changes in the environment and their decline suggests a decline in the environmental health of the earth.

True False

66. Keystone species have a large effect on the types and abundances of other species in an ecosystem.

True False

67. According to an IUCN 2009 study \_\_\_\_\_ percent of the world's open ocean shark species are threatened with extinction.

\_\_\_\_\_

68. As \_\_\_\_\_ species, many sharks play crucial roles in helping to keep their ecosystems functioning.

\_\_\_\_\_

69. \_\_\_\_\_ diversity is the most obvious component of biodiversity.

\_\_\_\_\_

70. The best guess of the total number of species on earth is between \_\_\_\_\_ and \_\_\_\_\_.

\_\_\_\_\_

71. Large regions such as forests and deserts, with distinct climates and species, are called \_\_\_\_\_.

\_\_\_\_\_

72. Among his many accomplishments, Edward O. Wilson is working on Harvard University's \_\_\_\_\_, an online database of the earth's known and name species.

\_\_\_\_\_

73. The world's cumulative body of discovered fossils is called the \_\_\_\_\_.

\_\_\_\_\_

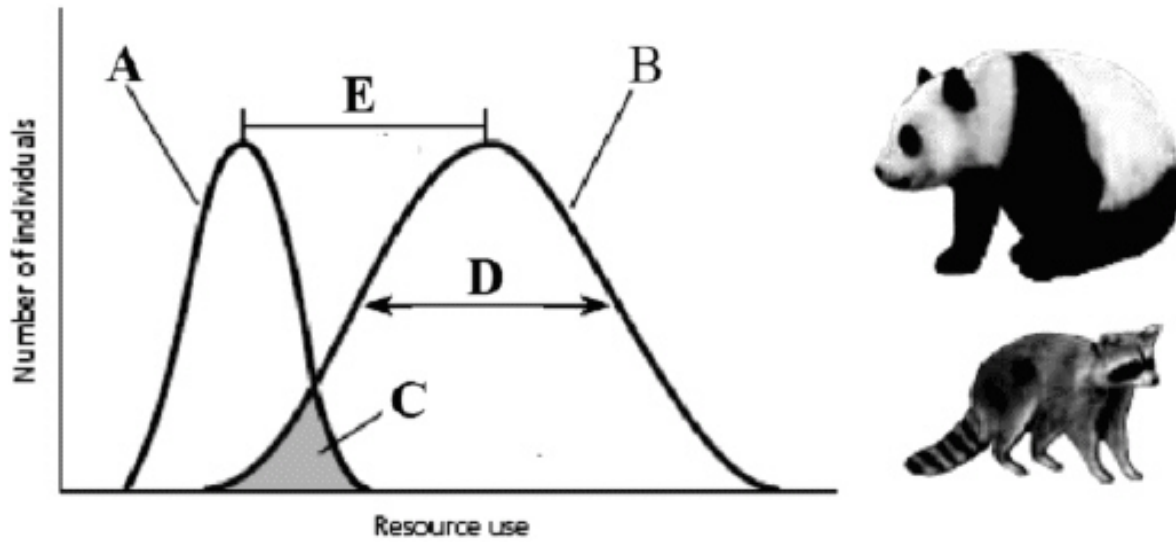
74. Charles Darwin and \_\_\_\_\_ both came up with the concept of natural selection as the mechanism for biological evolution.

\_\_\_\_\_

75. Genetic variation in a population is the result of \_\_\_\_\_.
- \_\_\_\_\_
76. For natural selection to work, a heritable trait must lead to \_\_\_\_\_, which enables individuals with the trait to produce more offspring than others members of the population.
- \_\_\_\_\_
77. Any heritable trait that enables an organism to survive through natural selection and produce more offspring under prevailing environmental conditions is a(n) \_\_\_\_\_.
- \_\_\_\_\_
78. Even if a beneficial heritable trait is present in a population, the population's ability to adapt may be limited by its \_\_\_\_\_.
- \_\_\_\_\_
79. Two-hundred-twenty-five million years ago, one super continent, called \_\_\_\_\_, was home to all terrestrial organisms.
- \_\_\_\_\_
80. New species form when one species splits into two or more different species, a process called \_\_\_\_\_.
- \_\_\_\_\_
81. Species that are only found in one area are called \_\_\_\_\_ and are very vulnerable to extinction.
- \_\_\_\_\_
82. The number of species on the planet at any time is a result of the interaction between the processes of \_\_\_\_\_ and \_\_\_\_\_.
- \_\_\_\_\_
83. A(n) \_\_\_\_\_ is a significant increase in extinction rates above the background level.
- \_\_\_\_\_
84. \_\_\_\_\_ is the alteration of an organism's genetic material, through adding, deleting, or changing segments of its DNA.
- \_\_\_\_\_

85. The species diversity of communities varies with their \_\_\_\_\_.
- \_\_\_\_\_
86. Species that migrate into, or that are deliberately or accidentally introduced into, an ecosystem are called \_\_\_\_\_.
- \_\_\_\_\_
87. A 2005 study found an apparent correlation between \_\_\_\_\_ and the extinction of about two-thirds of 110 known species of harlequin frog in Central and South America.
- \_\_\_\_\_
88. If a species of frog becomes threatened by a change in environmental conditions, the species would be considered a(n) \_\_\_\_\_.
- \_\_\_\_\_
89. The loss of a(n) \_\_\_\_\_ species can lead to population crashes and extinctions of other species in a community that depend on it.
- \_\_\_\_\_
90. \_\_\_\_\_ keystone species feed on and help regulate the populations of other species in an ecosystem.
- \_\_\_\_\_
91. Butterflies, hummingbirds, and bats play a keystone role in some ecosystems by \_\_\_\_\_ plant species.
- \_\_\_\_\_

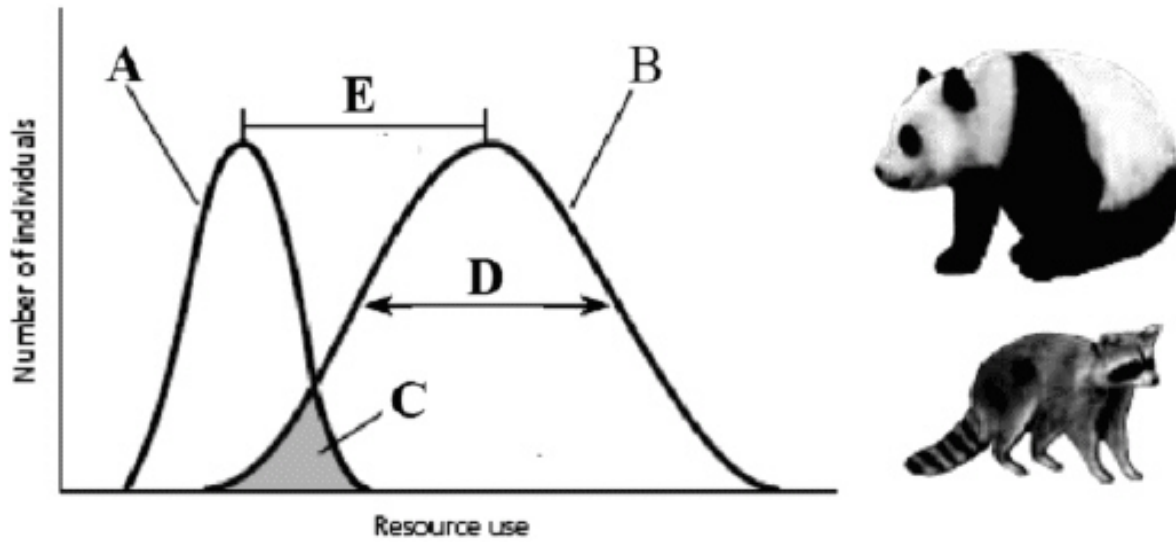
92.



Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

Which of the two animals, the panda or the raccoon, is considered a generalist?

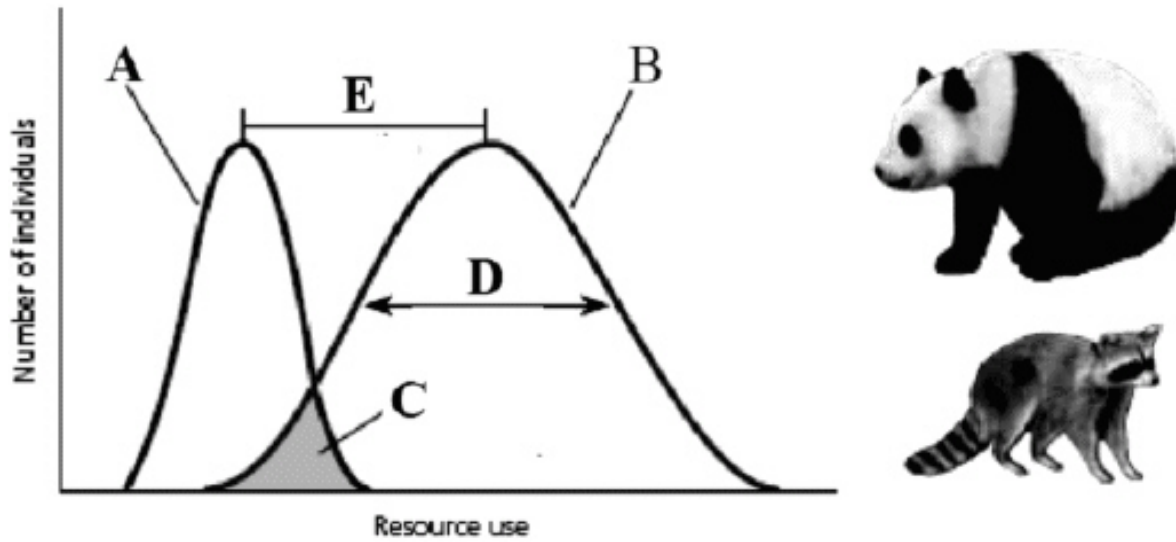
93.



Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

Which graph (A or B) is representative of a generalist species?

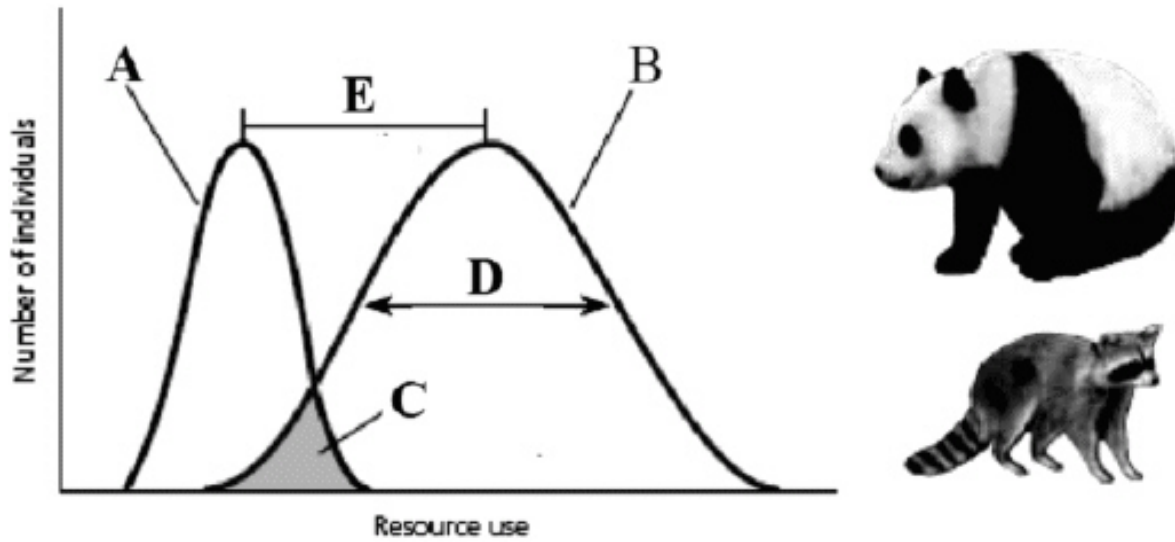
94.



Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

What does the height of the graph represent?

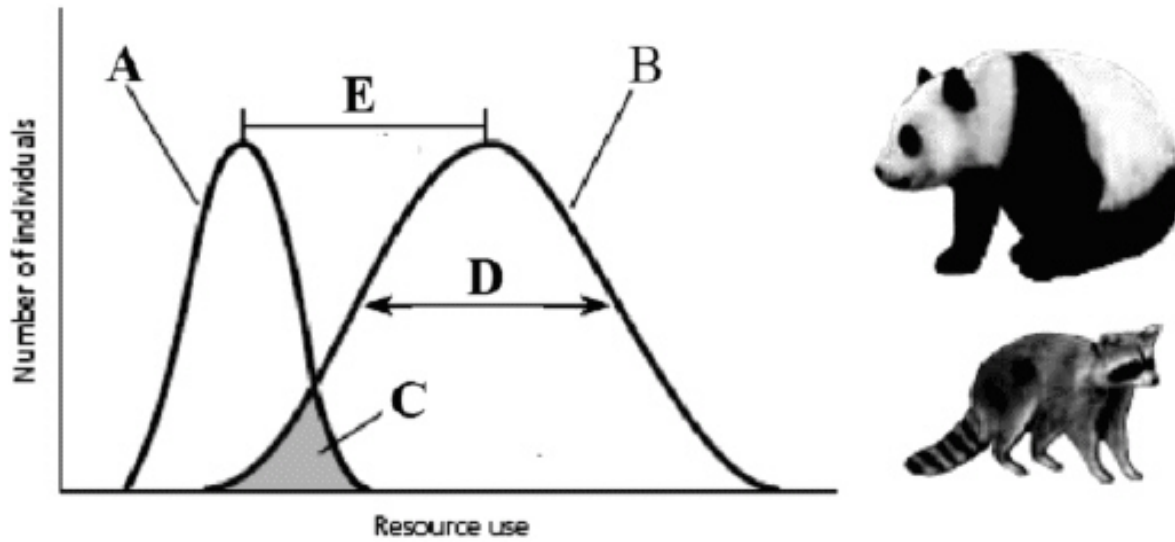
95.



Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

Notice the region lettered C. What does that region represent?

96.

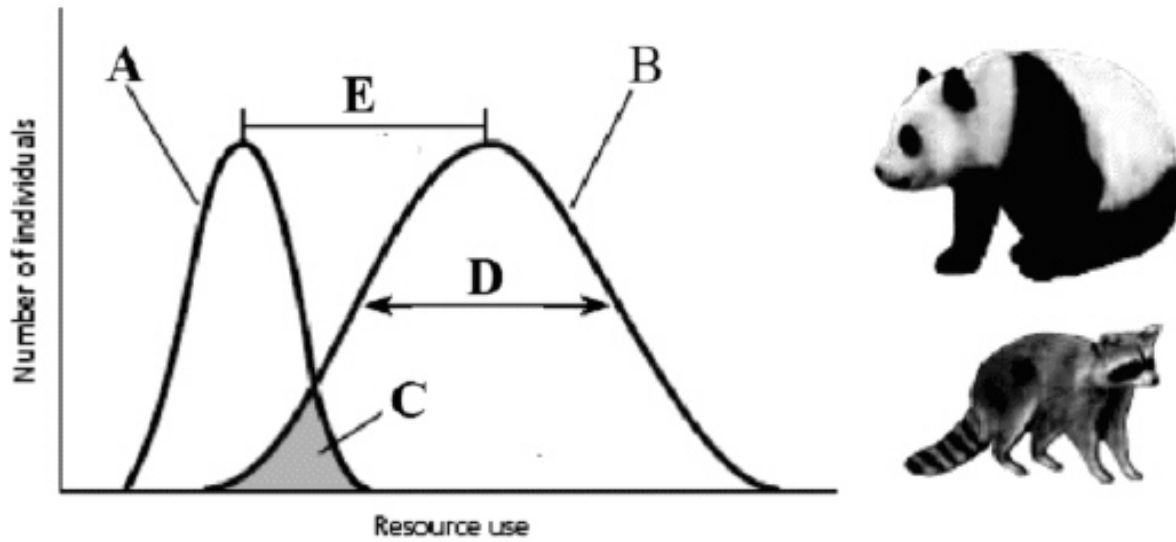


Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

What is the interaction of the two species as a result of the area lettered C?



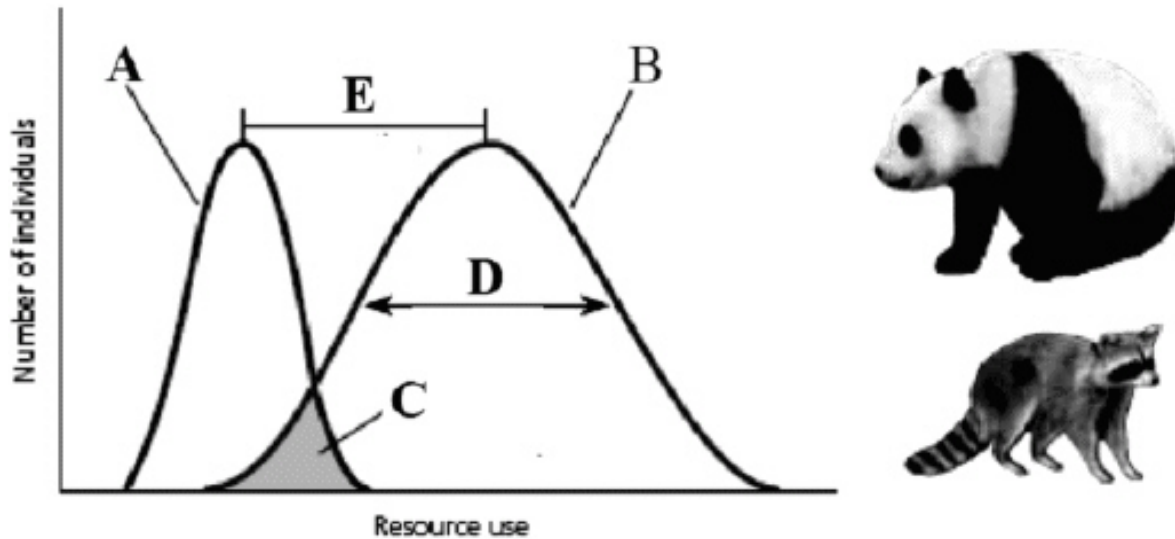
97.



Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

Notice the letter D. It is pointing at a characteristic of this niche. What is this characteristic?

98.



Use the Figure above, which represents the niche of the Panda and the raccoon, to answer the following question(s).

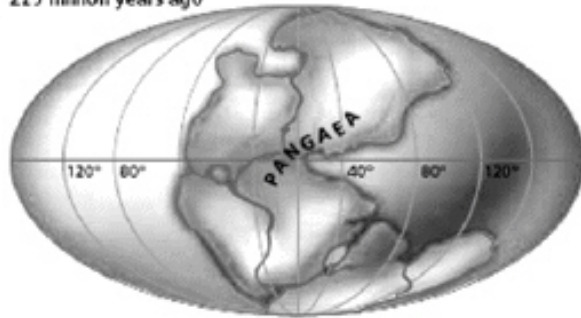
What advantage does the characteristic indicated by letter D bestow upon the animal who occupies this niche as opposed to the animal occupying the other niche?

99. Most people do not understand why it is important for humans to be concerned about biodiversity when there are so many, seemingly more pressing issues. List three reasons why people should be interested in maintaining biodiversity and explain why each reason is important.

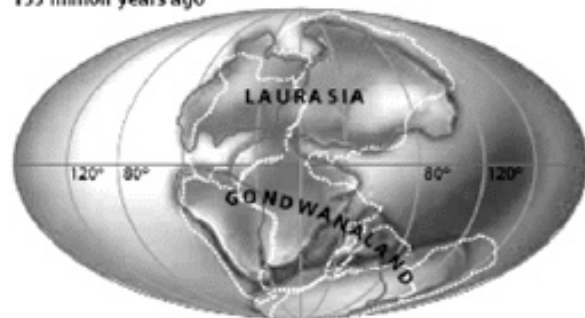
100. Briefly explain how natural selection has worked, and is working to change populations over time.

101. Briefly explain the interaction between mutations, reproductive success, and adaptation or adaptive traits.

102. 225 million years ago



135 million years ago



65 million years ago



Present



After looking at the figure above, explain how the movement of the continents can help explain why some species have the geographic distribution that is observed today.

103. New species arise as the result of two processes, geographic and reproductive isolation. Explain how these processes work together to produce new species.

104.If you were talking to a fisherman on the west coast of the United States, how would you explain to him/her why it is important to release the unharmed sharks he catches in his nets?

## CHAPTER 4--BIODIVERSITY AND EVOLUTION **Key**

1. D
2. E
3. C
4. C
5. B
6. A
7. D
8. A
9. B
10. D
11. E
12. B
13. D
14. B
15. D
16. E
17. C
18. B
19. B
20. D
21. E
22. C
23. A
24. E
25. C
26. D
27. B
28. B
29. D
30. A

31. TRUE
32. TRUE
33. FALSE
34. TRUE
35. TRUE
36. FALSE
37. TRUE
38. FALSE
39. FALSE
40. FALSE
41. FALSE
42. TRUE
43. TRUE
44. TRUE
45. TRUE
46. FALSE
47. TRUE
48. FALSE
49. TRUE
50. TRUE
51. FALSE
52. FALSE
53. TRUE
54. FALSE
55. TRUE
56. TRUE
57. TRUE
58. TRUE
59. FALSE
60. FALSE
61. FALSE
62. FALSE
63. TRUE
64. FALSE

- 65. TRUE
- 66. TRUE
- 67. 32
- 68. keystone
- 69. Species
- 70. 8 million; 100 million
- 71. biomes
- 72. Encyclopedia of Life
- 73. fossil record
- 74. Wallace *or* Alfred Russel Wallace
- 75. mutation
- 76. differential reproduction
- 77. adaptation *or* adaptive trait
- 78. reproductive capacity
- 79. Pangaea
- 80. speciation
- 81. endemic species
- 82. speciation; extinction *or* extinction; speciation
- 83. mass extinction
- 84. Genetic engineering
- 85. geographic location
- 86. nonnative species
- 87. global warming *or* climate change
- 88. indicator species
- 89. keystone
- 90. Top predator
- 91. pollinating
- 92. raccoon
- 93. B
- 94. the number of organisms occupying the niche
- 95. the region of overlap between the two niches
- 96. interspecific competition or competition for resources
- 97. breadth of the niche, broad niche



98. a broad niche allows the organism to be a generalist, to use a variety of resources instead of a small number. The panda is restricted by being a specialist to eating only bamboo, while the raccoon can eat almost anything.

99. (page 84) Biodiversity provides humans with food, energy, fibers, and medicines worth hundreds of billions of dollars per year. Biodiversity helps to preserve the quality of the air and water necessary for humans. Biodiversity helps humans to dispose of wastes and control pests.

100. (pages 85-86) Natural selection works by selecting the population best suited genetically for the current environmental conditions to survive and reproduce. Populations less suited will not provide as many offspring, over time, will be reduced in size or become extinct.

101. (pages 86-87) Mutations are the source of genetic change. Neutral or beneficial mutations may remain in a population even though they have not become prominent. At some point the need may arise, due to changes in the environment, to select a new trait. Mutations have provided a pool of possible alternatives. Natural selection will work on those traits by selecting for the one or ones that provide the best reproductive success.

102. (page 89) Species that arose or were present at the time of the unified continents would have been able to expand broadly. As the continents began to move apart those species would have become isolated from one another, providing for the fragmented distribution that is observed in a group of species such as the marsupials. Their distribution shows larger numbers of species in southern South America and Australia, continents that are currently far apart.

103. (page 91) Geographic isolation occurs when a segment of a population becomes separated from the rest of the population. Over time, this allows for an accumulation of mutations to occur in both populations. If environmental conditions differ between the populations, environmental pressures may select for different sets of mutations. As this selection of difference continues, it may result in the inability of the sub-populations to sexually reproduce. Once the sub-populations are reproductively isolated, they have become separate species.

104. (page 80) Sharks remove sick, injured, and dead organisms from the oceans. They provide a vital top predator role in the ecosystem. They enhance the viability of the fish populations by applying pressure to the populations. They have an immune system that does not allow injuries to become infected. They also do not usually get cancer. Both facts might lead to life-saving insights for humans. Shark populations have steeply declined, as they are killed to remove their fins and/or internal organs. The shark has survived for hundreds of millions of years and should be protected from wanton destruction.