

## Advanced Biology Evolution

Name: \_\_\_\_\_

Date: \_\_\_\_\_

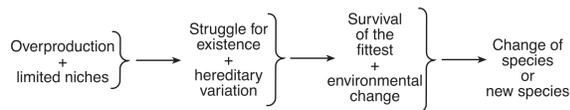
1. According to modern evolutionary theory, genes responsible for new traits that help a species survive in a particular environment will usually
  - A. not change in frequency
  - B. decrease gradually in frequency
  - C. decrease rapidly in frequency
  - D. increase in frequency
  
2. Evidence that best supports the theory of biological evolution was obtained from the
  - A. investigation of environmental niches
  - B. study of fossil records
  - C. comparison of the number of cells in organisms
  - D. analysis of food chains and food webs
  
3. The fossil record of ancient life forms provides scientific evidence of
  - A. direct harvesting
  - B. selective breeding
  - C. gene manipulation
  - D. evolutionary changes
  
4. In 2007, scientists broke open a fossil of a dinosaur bone and found some preserved tissues. Analysis showed that some proteins in these tissues are very similar to proteins found in modern chickens. The conclusion that these dinosaurs are related to modern chickens is based on
  - A. molecular similarities
  - B. natural selection
  - C. similarities in behavior
  - D. the occurrence of mutations
  
5. Which statement is most closely related to the modern theory of evolution?
  - A. Characteristics that are acquired during life are passed to offspring by sexual reproduction.
  - B. Evolution is the result of mutations and recombination, only.
  - C. Organisms best adapted to a changed environment are more likely to reproduce and pass their genes to offspring.
  - D. Asexual reproduction increases the survival of species.

6. The chart below contains a number of characteristics for three different organisms. The characteristics can be used in classifying these organisms.

Characteristics	Organism A	Organism B	Organism C
Number of cells	unicellular	multicellular	unicellular
Type of nutrition	autotrophic	autotrophic	heterotrophic
Nuclear membrane	absent	present	absent
DNA	present	present	present

Which *two* organisms would be expected to have the most similar genetic material? Support your answer using information from the chart.

7. Which concept is best illustrated in the flowchart below?

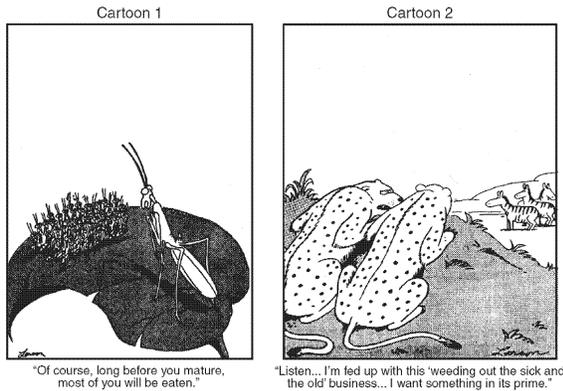


- A. natural selection
- B. genetic manipulation
- C. dynamic equilibrium
- D. material cycles

8. According to the theory of natural selection, why are some individuals more likely than others to survive and reproduce?

- A. Some individuals pass on to their offspring new characteristics they have acquired during their lifetimes.
- B. Some individuals are better adapted to exist in their environment than others are.
- C. Some individuals do not pass on to their offspring new characteristics they have acquired during their lifetimes.
- D. Some individuals tend to produce fewer offspring than others in the same environment.

9. Base your answer to the following question on one of the cartoons, which refer to certain concepts of natural selection, and on your knowledge of biology.



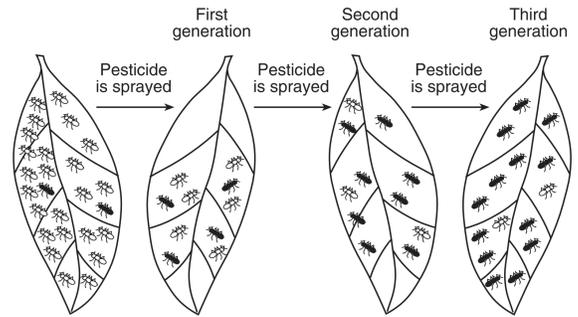
Choose *one* cartoon and write its number in the space below. Identify *one* concept represented in that cartoon, and explain how this concept supports the theory of natural selection. Your answer must:

- identify *one* concept represented in the cartoon you choose
- briefly explain the concept you identified
- explain the relationship between this concept and the process of natural selection

Cartoon Number:

10. A certain chemical destroys bacteria that have thin cell walls. Bacteria with thick cell walls are not affected. Describe how the introduction of this chemical into a culture containing both types of bacteria could be used to illustrate the theory of natural selection.

11. The diagram below shows the effect of spraying a pesticide on a population of insects over three generations.



Which concept is represented in the diagram?

- survival of the fittest
- dynamic equilibrium
- succession
- extinction

12. Which statement is *not* part of the concept of natural selection?

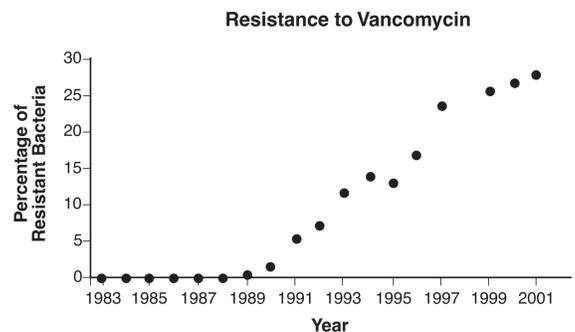
- Individuals that possess the most favorable variations will have the best chance of reproducing.
- Variation occurs among individuals in a population.
- More individuals are produced than will survive.
- Genes of an individual adapt to a changing environment.

13. In an area in Africa, temporary pools form where rivers flow during the rainy months. Some fish have developed the ability to use their ventral fins as “feet” to travel on land from one of these temporary pools to another. Other fish in these pools die when the pools dry up. What can be expected to happen in this area after many years?
- The fish using ventral fins as “feet” will be present in increasing numbers.
  - “Feet” in the form of ventral fins will develop on all fish.
  - The fish using ventral fins as “feet” will develop real feet.
  - All of the varieties of fish will survive and produce many offspring.

14. Buffalo grass is a species of plant found on the grazing prairies of Wyoming. It is a tough grass that has silicates (compounds containing oxygen and silicon) that reinforce its leaves. For hundreds of years, this grass has survived in an adverse environment. Which statement best explains the presence of this grass today?
- There are no variations in this grass species that help it to survive in an adverse environment.
  - Silicates are necessary for photosynthesis.
  - The current species has no mutations.
  - The silicates in the grass have given the species an advantage in its environment.

15. Which characteristic is necessary for natural selection to occur in a species?
- stability
  - variation
  - complex cellular organization
  - a very low mutation rate

16. Base your answer(s) to the following question(s) on the scatter-plot graph below and on your knowledge of biology. The graph shows changes in the percentage of vancomycin-resistant bacteria in a population between the years 1983 and 2001.



Source: [http://evolution.berkeley.edu/evolibrary/article/bergstrom\\_03](http://evolution.berkeley.edu/evolibrary/article/bergstrom_03)

Explain why the percentage of resistant bacteria increased over time.

17. Base your answer(s) to the following question(s) on the information and photographs below and on your knowledge of biology.

In addition to their use for hearing, ears contain many blood vessels that allow heat to escape into the air. Animals that live in warm climates tend to have ears with large areas exposed to the environment. Animals in cold climates have a more compact ear that keeps exposure to the environment to a minimum. The photographs below show a jackrabbit from desert regions of the southwestern United States and a fennec fox from northern Africa with large ears, and a snowshoe hare and an arctic fox with small ears.



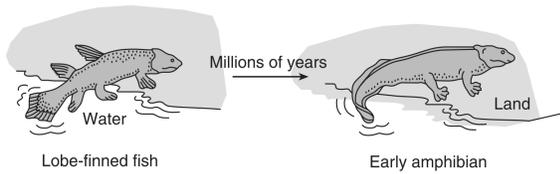
Discuss how differences in ear size in these organisms might have occurred.

Explain how the size of these animals' ears can help the animals survive in their environment.

18. Which statement describes an effect of natural selection on a species?
- A. It favors the survival of certain members of the species and results in a change in the proportion of individuals with highly adaptive traits.
  - B. It provides feedback mechanisms for members of a species and results in a change in the proportion of individuals with homeostatic controls.
  - C. It leads to reproduction with other species, increasing the number of different adaptations.
  - D. It increases competition between populations that occupy different niches, increasing the chance of extinction of the less-adapted species.

19. In a population of birds, the percentage of individuals having a certain gene changes from 20% to 60% over the span of several hundred years. This situation will most likely affect the rate of
- A. biological evolution
  - B. asexual reproduction
  - C. gene mutation
  - D. ecological succession

20. The diagram below represents one possible evolutionary change that could have led lobe-finned fish to develop into the first amphibians. Amphibians are animals that live on land some of their life.



This change from fins on the lobe-finned fish to legs and feet on the early amphibian is most likely due to

- A. a sudden mutation that changed the gills of the lobe-finned fish to lungs
  - B. increased competition between animals that had adapted to living on the land
  - C. the need to move to land because of increased competition for food in the ocean
  - D. variations among offspring, followed by natural selection
21. In order for a species to evolve, it must be able to
- A. consume a large quantity of food
  - B. reproduce successfully
  - C. maintain a constant body temperature
  - D. be domesticated

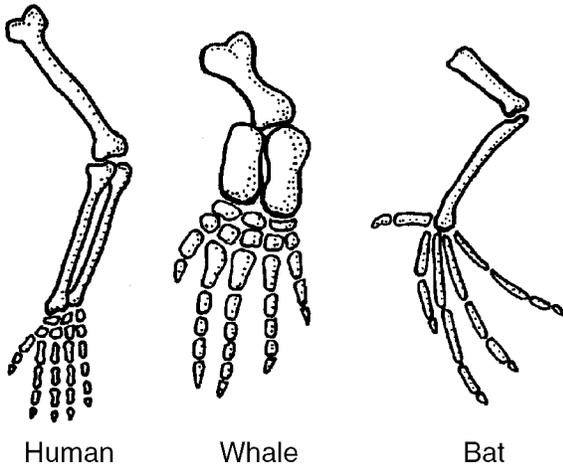
22. Base your answer(s) to the following question(s) on the information below and on your knowledge of biology.

Rabbits eat plants and in turn are eaten by predators such as foxes and wolves. A population of rabbits is found in which a few have a genetic trait that gives them much better than average leg strength.

Predict how the frequency of the trait for above average leg strength would be expected to change in the population over time. Explain your prediction.

23. State what is likely to happen to the rabbits in the population that do *not* have the trait for above average leg strength.
24. It was later discovered that the rabbits born with the trait for above average leg strength also inherited the trait for poor eyesight. Taking into account this new information, explain how your predictions would change. Support your answer.

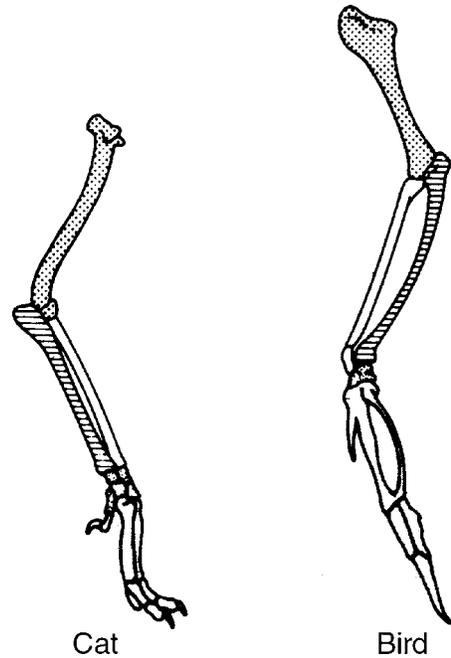
25. The accompanying diagrams show the bones in the forelimbs of three different organisms.



Differences in the bone arrangements support the hypothesis that these organisms

- A. are members of the same species
- B. may have descended from the same ancestor
- C. have adaptations to survive in different environments
- D. all contain the same genetic information

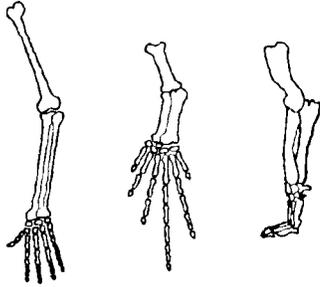
26. The accompanying diagram shows the bones in the forelimbs of two different vertebrate species.



The position and structure of these bones could best be used to make inferences about the

- A. food preferences of these vertebrate species
- B. intelligence of these vertebrate species
- C. history of these vertebrate species
- D. reproductive behavior of these vertebrate species

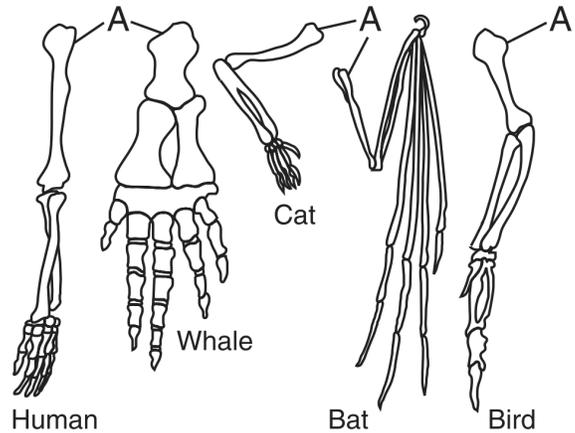
27. The bones in the forelimbs of three mammals are shown below.



For these mammals, the number, position, and shape of the bones most likely indicates that they may have

- A. developed in a common environment
- B. developed from the same earlier species
- C. identical genetic makeup
- D. identical methods of obtaining food

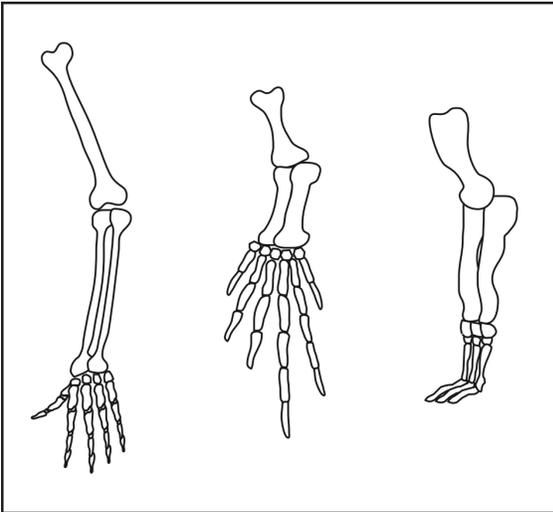
28. Base your answer to the following question on the diagram below and on your knowledge of biology.



The similarities of the bones labeled A provide evidence that

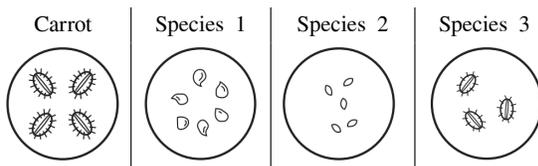
- A. the organisms may have evolved from a common ancestor
  - B. all species have one kind of bone structure
  - C. the cells of the bones contain the same type of mutations
  - D. all structural characteristics are the same in animals
29. The presence of some similar structures in all vertebrates suggests that these vertebrates
- A. all develop at the same rate
  - B. evolved from different animals that appeared on Earth at the same time
  - C. all develop internally and rely on nutrients supplied by the mother
  - D. may have an evolutionary relationship

30. The diagram below represents the bone arrangements in the front limbs of three different species of mammals.



The similarities and differences in these limbs suggest that all three species developed from the same ancestor, but

- A. produced different numbers of offspring  
 B. lived in different time periods  
 C. adapted to different habitats  
 D. migrated to similar habitats
31. The diagrams below represent seeds taken from a carrot plant and seeds taken from plant species 1, 2, and 3.

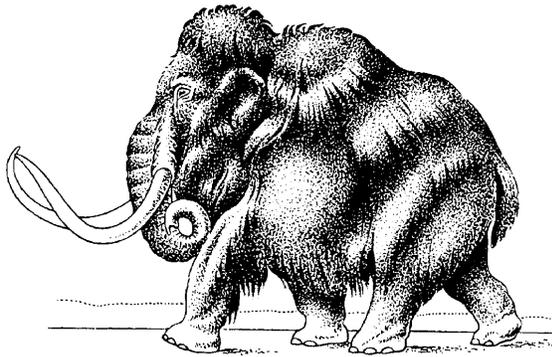


Which species would be expected to be most similar to the carrot? Support your answer.

32. Fish absorb oxygen through the gills, earthworms absorb oxygen through the skin, amoebas take in oxygen through the cell membranes, and cows inhale oxygen through the nasal passages into their lungs. This statement demonstrates that living things

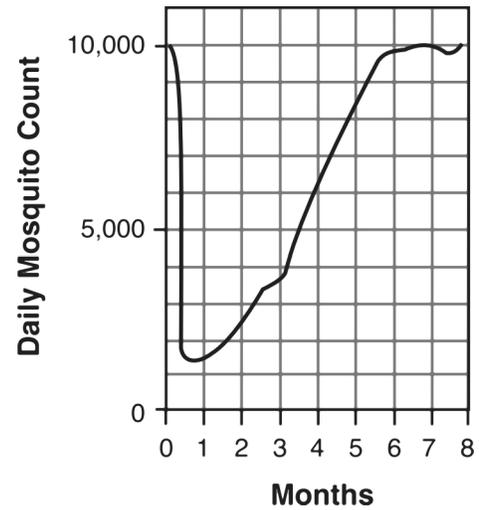
- A. rely on similar or the same processes, but accomplish them in different ways  
 B. rely on different processes and accomplish them in different ways  
 C. rely on different processes, but perform them in the same or related ways  
 D. have no relationship to one another, and are all independent individuals
33. Which statement describing a cause of extinction includes the other three?
- A. Members of the extinct species were unable to compete for food.  
 B. Members of the extinct species were unable to conceal their presence by camouflage.  
 C. Members of the extinct species lacked adaptations essential for survival.  
 D. Members of the extinct species were too slow to escape from predators.

34. The accompanying diagram represents a woolly mammoth, a relative of the modern elephant. Woolly mammoths lived during the Ice Age and eventually became extinct.



State *one* possible reason this species died out.

35. A small village that is heavily infested with mosquitoes was sprayed with an insecticide once a week for several months. Changes in the size of the mosquito population are shown in the graph below.



State *one* way that the population of mosquitoes present 7 months after spraying differs genetically from the population of mosquitoes present before the spraying began.

- |   |  |
|---|--|
| <p>1.<br/>Answer:      D</p> <p>2.<br/>Answer:      B</p> <p>3.<br/>Answer:      D</p> <p>4.<br/>Answer:      A</p> <p>5.<br/>Answer:      C</p> <p>6.<br/>Answer:      A and C would probably have the most similar genetic material. A and C have more of the given characteristics in common than any other pair.</p> <p>7.<br/>Answer:      A</p> <p>8.<br/>Answer:      B</p> <p>9.<br/>Answer:      Cartoon 1<br/>                        • The concept is overproduction.<br/>                        • More organisms are produced than can survive.<br/>                        • The organisms that are best adapted will survive.<br/>                        Cartoon 2<br/>                        • The concept is struggle for survival (or survival of the fittest.)<br/>                        • Those organisms best adapted will survive.<br/>                        • Those that survive will pass these traits on to their offspring.</p> <p>10.<br/>Answer:      Through survival of the fittest, only the thick-walled bacteria would survive. When the chemical is introduced, only the bacteria with thick cell walls survive. The introduction of the chemical causes an environmental change that selectively allows only the thick-walled bacteria to survive.</p> <p>11.<br/>Answer:      A</p> | <p>12.<br/>Answer:      D</p> <p>13.<br/>Answer:      A</p> <p>14.<br/>Answer:      D</p> <p>15.<br/>Answer:      B</p> <p>16.<br/>Answer:      – The resistant bacteria survived, reproduced, and passed on the gene for resistance.<br/>                        – More of the resistant ones survived and reproduced.</p> <p>17.<br/>Answer:      Large ears can help an animal remove excess heat in a warm environment, which helps the animal maintain a stable internal temperature.<br/>                        The small ears in the arctic fox help minimize heat loss in its cold environment.<br/>                        The large ears in the jackrabbit let excess heat escape, helping it stay cool.<br/>                        Large ears would allow animals to hear predators.</p> <p>18.<br/>Answer:      A</p> <p>19.<br/>Answer:      A</p> <p>20.<br/>Answer:      D</p> <p>21.<br/>Answer:      B</p> <p>22.<br/>Answer:      Acceptable responses include, but are not limited to: – The above average leg-strength trait would increase in frequency because the rabbits with the stronger legs would be more likely to get away from predators.</p> |
|---|--|

23.  
Answer: Acceptable responses include, but are not limited to: – The rabbits that do not have the stronger leg-strength trait will start to decrease in number. – They might be eaten by predators.
24.  
Answer: Acceptable responses include, but are not limited to:  
– The frequency of the trait for above average leg strength might actually decrease because the poor eyesight might be more of a disadvantage than the leg strength is an advantage.  
– Now it seems that the frequency will more likely decrease because they will not see well enough to get away.  
– The frequency of the trait for above average leg strength will remain the same because the advantage will be canceled out by a disadvantage.
25.  
Answer: C
26.  
Answer: C
27.  
Answer: B
28.  
Answer: A
29.  
Answer: D
30.  
Answer: C
31.  
Answer: because the seeds are most similar in structure to carrot seeds  
because they look most alike
32.  
Answer: A
33.  
Answer: C
34.  
Answer: The environment changed and the woolly mammoth could no longer adapt. or The number of herbivores increased 10,000 years ago and there was more competition for food. or increase in predators or overhunting by humans

35.  
Answer: Seven months later, there is a higher frequency in the population of the gene for resistance to the insecticide.  
Most of the mosquitoes will have the variation that protects them from the pesticide.  
More have the gene that makes them immune to the effect of the pesticide.  
More mosquitoes have the gene that allows them to survive.