Name_____

Topic Review: Evolution
Living Environment

1. Which statement is most closely related to the modern theory of evolution?
   1) Characteristics that are acquired during life are passed to offspring by sexual reproduction.
   2) Evolution is the result of mutations and recombination, only.
   3) Organisms best adapted to a changed environment are more likely to reproduce and pass their genes to offspring.
   4) Asexual reproduction increases the survival of species.

2. Certain insects resemble the bark of the trees on which they live. Which statement provides a possible biological explanation for this resemblance?
   1) The insects needed camouflage so they developed protective coloration.
   2) Natural selection played a role in the development of this protective coloration.
   3) The lack of mutations resulted in the protective coloration.
   4) The trees caused mutations in the insects that resulted in protective coloration.

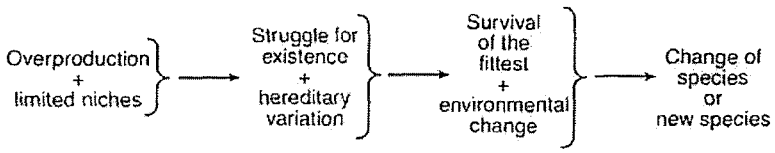
3. Natural selection and its evolutionary consequences provide a scientific explanation for each of the following *except*
   1) the fossil record
   2) protein and DNA similarities between different organisms
   3) similar structures among different organisms
   4) a stable physical environment

4. According to the theory of natural selection, why are some individuals more likely than others to survive and reproduce?
   1) Some individuals pass on to their offspring new characteristics they have acquired during their lifetimes.
   2) Some individuals are better adapted to exist in their environment than others are.
   3) Some individuals do not pass on to their offspring new characteristics they have acquired during their lifetimes.
   4) Some individuals tend to produce fewer offspring than others in the same environment.

5. Even though the environment changes, a population that occupies a given geographic area will most likely continue to be found in this area if the
   1) variations in the population decrease over time
   2) members of the population decrease in number
   3) members of the population exceed the carrying capacity
   4) population passes on those genes that result in favorable adaptations

6. Explain why, in a mammal, a mutation in a gamete may contribute to evolution while a mutation in a body cell will not.

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



1) natural selection 2) genetic manipulation 3) dynamic equilibrium 4) material cycle

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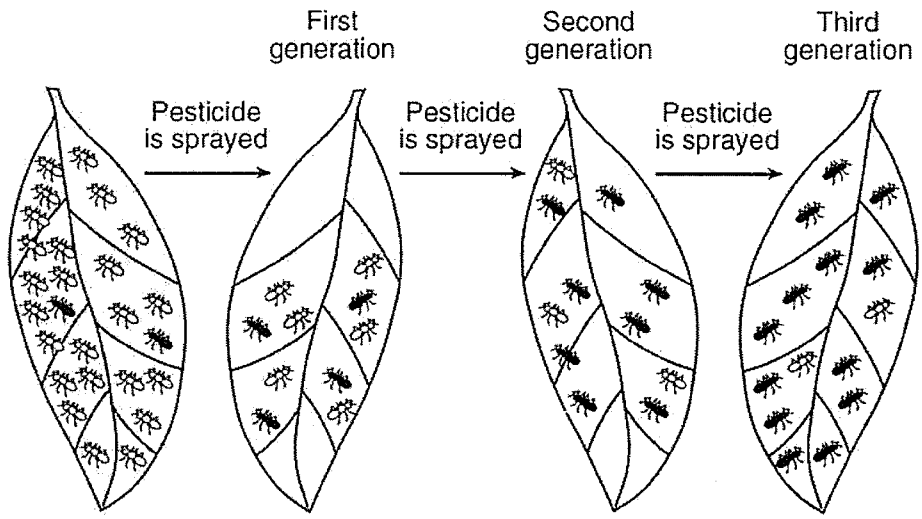
8. When penicillin was first introduced, it was very effective in destroying most of the bacteria that cause gonorrhea. Today, certain varieties of this bacterium are resistant to penicillin. Which statement best explains the appearance of these resistant varieties?
   1) Penicillin stimulated the bacteria to become resistant, and this resistance was passed to the offspring.
   2) Penicillin killed the susceptible bacteria, while naturally resistant varieties survived and reproduced.
   3) Penicillin used today is not as strong as the penicillin used when it was first introduced.
   4) Penicillin stimulated the production of antigens in the resistant bacteria.

9. The concept that new varieties of organisms are still evolving is best supported by the
   1) increasing need for new antibiotics
   2) increasing number of individuals in the human population
   3) decreasing number of new fossils discovered in undisturbed rock layers
   4) decreasing activity of photosynthetic organisms due to warming of the atmosphere

10. Organisms with favorable variations reproduce more successfully than organisms with less favorable variations. This statement best describes the concept of
    1) overproduction
    2) use and disuse
    3) inheritance of acquired characteristics
    4) survival of the fittest

11. Scientists compared fossil remains of a species that lived 5,000 years ago with members of the same species living today. Scientists concluded that this species had changed very little over the entire time period. Which statement best accounts for this lack of change?
    1) The environment changed significantly and those offspring without favorable characteristics died.
    2) The environment changed significantly, but the species had no natural enemies for a long period of time.
    3) The environment did not change significantly and those offspring expressing new characteristics survived their natural enemies.
    4) The environment did not change significantly and those offspring expressing new characteristics did not survive.

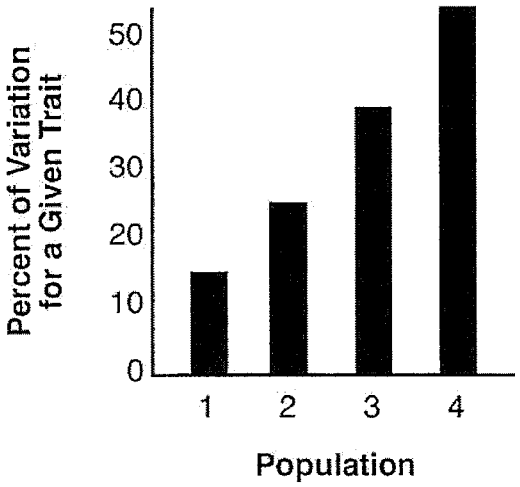
12. The diagram below shows the effect of spraying a pesticide on a population of insects over three generations.



Which concept is represented in the diagram?

1) survival of the fittest
2) dynamic equilibrium
3) succession
4) extinction

13. The graph below shows the percent of variation for a given trait in four different populations of the same species. The populations inhabit similar environments.



In which population will the greatest number of individuals most likely survive if a significant environmental change related to this trait occurs?

1) 1
2) 2
3) 3
4) 4

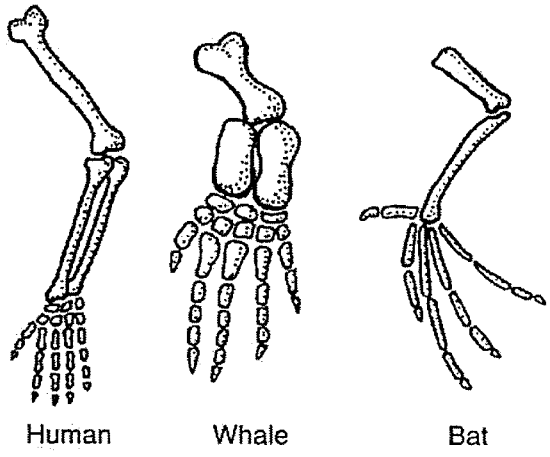
14. Beak structures differ between individuals of one species of bird. These differences most likely indicate

1) the presence of a variety of food sources
2) a reduced rate of reproduction
3) a large supply of one kind of food
4) an abundance of predators

15. When a particular white moth lands on a white birch tree, its color has a high adaptive value. If the birch trees become covered with black soot, the white color of this particular moth in this environment would most likely

1) retain its adaptive value
2) increase in adaptive value
3) change to a more adaptive black color
4) decrease in adaptive value

16. The diagrams below show the bones in the forelimbs of three different organisms.



Differences in the bone arrangements support the hypothesis that these organisms

1) are members of the same species
2) may have descended from the same ancestor
3) have adaptations to survive in different environments
4) all contain the same genetic information

17. A large island in the Pacific Ocean supports isolated populations of two groups of frogs. The following observations of these frogs were recorded by scientists.

(*A*) Are different in color
(*B*) Excrete different products
(*C*) Live in different, isolated habitats
(*D*) Can interbreed and produce fertile offspring

Which observation best supports the inference that these frogs belong to the same species?

1) *A*
2) *B*
3) *C*
4) *D*

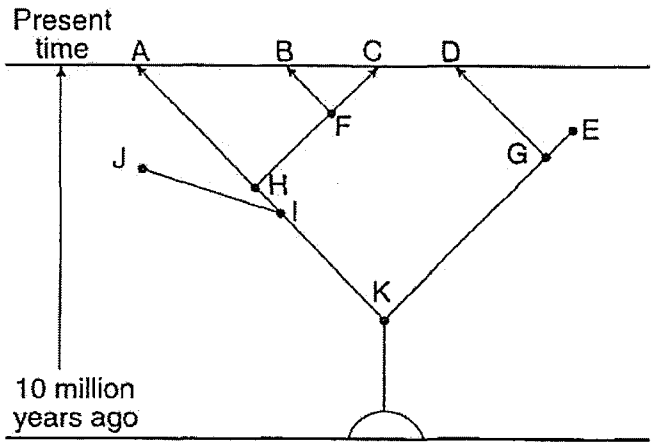
18. What would most likely be the result of two subdivisions of a population remaining geographically isolated from each other for several hundred generations?
    1) Variations in one subdivision would differ from variations in the other subdivision.
    2) Variations in both subdivisions would be identical.
    3) Neither subdivision would show any variations.
    4) Both subdivisions would show variations resulting in similar mating patterns.

19. Species of bacteria can evolve more quickly than species of mammals because bacteria have
    1) less competition
    2) more chromosomes
    3) lower mutation rates
    4) higher rates of reproduction

20. Sheep and pigs have more enzymes in common than sheep and frogs do. This finding may indicate that
    1) none of these animals are related
    2) frogs are not related to pigs
    3) sheep are more closely related to pigs than to frogs
    4) frogs are more closely related to sheep than to pigs

21. When is extinction of a species most likely to occur?
    1) when environmental conditions remain the same and the proportion of individuals within the species that lack adaptive traits increases
    2) when environmental conditions remain the same and the proportion of individuals within the species that possess adaptive traits increases
    3) when environmental conditions change and the adaptive traits of the species favor the survival and reproduction of some of its members
    4) when environmental conditions change and the members of the species lack adaptive traits to survive and reproduce

22. Base your answer to the following question on the diagram below. The diagram shows an interpretation of relationships based on evolutionary theory. The letters represent different species.



The diagram indicates that a common ancestor for species *C* and *E* is species

1) *F* 2) *G* 3) *H* 4) *K*

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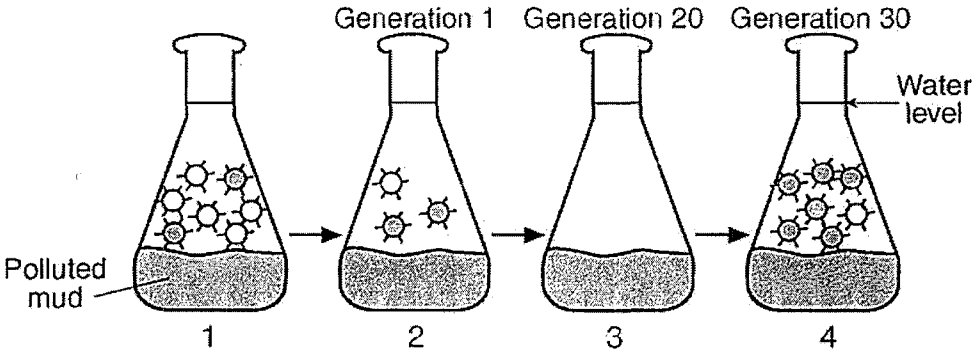
23. An insect pest known as the medfly significantly reduced the orange crop in California. Pesticides were used to control the medfly. Using the concept of natural selection, explain how the continued use of a certain pesticide may become ineffective in controlling this fly. Your answer must include the concepts of:
- variation
- adaptive value of a variation (adaptation)
- survival
- reproduction

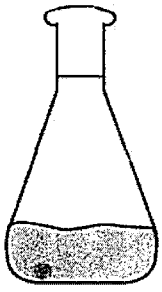
Base your answers to questions 24 and 25 on the information below.

Over the last 30 years, a part of the Hudson River known as Foundry Cove has been the site for many factories that have dumped toxic chemicals into the river. Some of these pollutants have accumulated in the mud at the bottom of the river. The polluted cove water contains many single-celled organisms and simple multicellular animals. Curiously, when the same species from nearby regions with nonpolluted sediments are moved to the polluted cove water, they die.

Scientists hypothesized that the organisms living in the cove have evolved so that they are able to survive in polluted water. To test this hypothesis, biologists tried to duplicate the history of the cove in the laboratory. They took a large number of one species of simple animal from a cove with unpolluted mud and placed them in a flask that contained polluted mud from Foundry Cove (diagram 1). Most of the animals died, but a few survived (diagram 2). The scientists then bred the survivors with each other for several generations producing offspring that were descendants of the survivors. When placed in Foundry Cove, most of these descendants survived. The diagrams below represent the steps in this investigation.



☼ = Pollution-sensitive individuals ☼ = Pollution-resistant individuals



24. On the diagram of the flask above, sketch the animals that would be present in flask 3 after several generations of breeding in the laboratory.

25. Explain how the simple animals of Foundry Cove adapted to the polluted water. Your answer must include an explanation of the role of *three* of the following in this process.

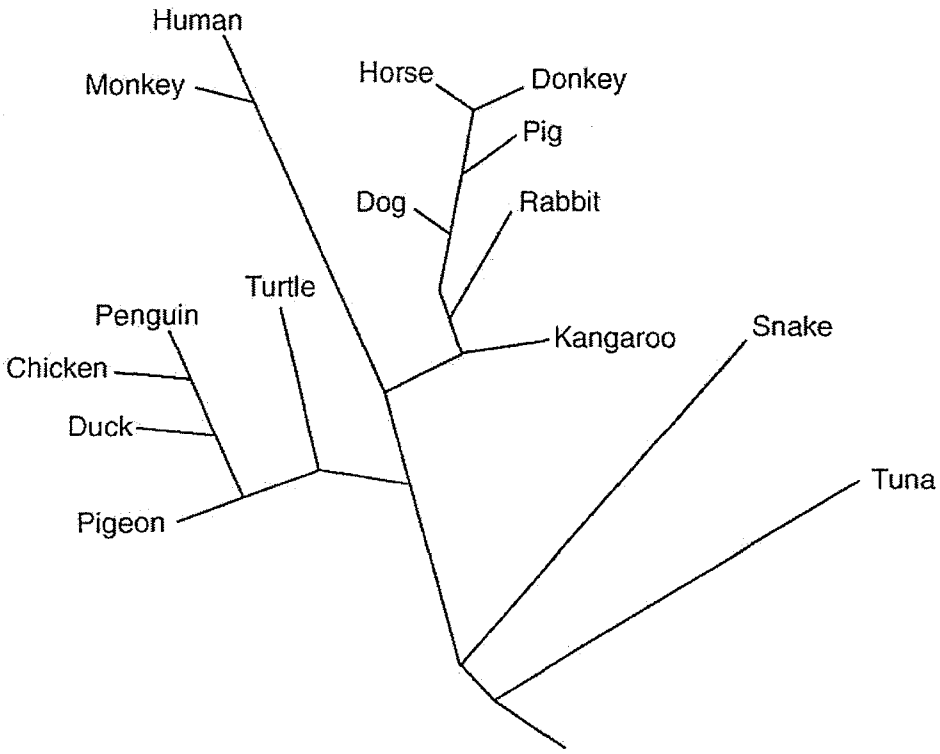
- environment
- genetic variation
- selection
- reproduction
- survival of the fittest

26. A hawk has a genetic trait that gives it much better eyesight than other hawks of the same species in the same area. Explain how this could lead to evolutionary change within this species of hawk over a long period of time. In your answer, be sure to include an explanation of:

a. competition within the hawk population
b. survival of various individuals in the population
c. how the frequency of the better-eyesight trait would be expected to change over time within the population
d. what would most likely happen to the hawks having the better-eyesight trait if they also had unusually weak wing muscles

27. Base your answer to the following question on the information below and on your knowledge of biology.

Based on their analysis of the differences in amino acid sequences of one kind of protein, scientists prepared the evolutionary tree shown below.

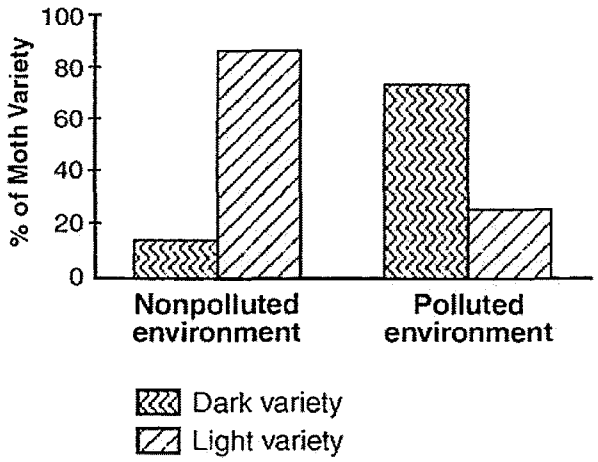


According to this diagram, is the pig more closely related to the dog or the kangaroo? Justify your answer.

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

Color in peppered moths is controlled by genes. A light-colored variety and a dark-colored variety of a peppered moth species exist in nature. The moths often rest on tree trunks, and several different species of birds are predators of this moth.

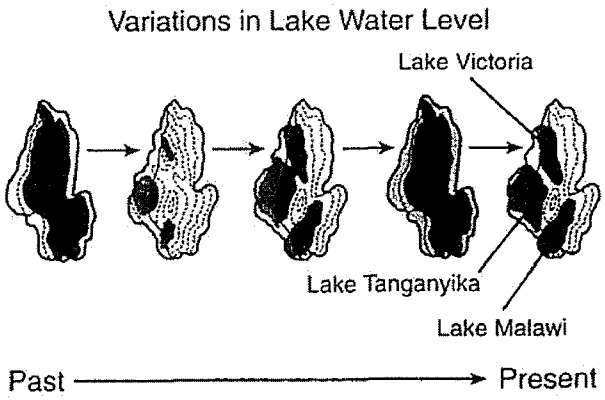
Before industrialization in England, the light-colored variety was much more abundant than the dark-colored variety and evidence indicates that many tree trunks at that time were covered with light-colored lichens. Later, industrialization developed and brought pollution, which killed the lichens, leaving the tree trunks covered with dark-colored soot. The results of a study made in England are shown below.



State *one* possible reason that the light-colored variety was not completely eliminated from the polluted environment.

29. Base your answer to the following question on the information below and on your knowledge of biology.

The three great lakes in Africa (Victoria, Tanganyika, and Malawi) contain a greater number of fish species than any other lakes in the world. Lake Malawi alone has 200 species of cichlid fish. The diversity of cichlid species in these African lakes could have been caused by changes in water level over thousands of years. According to one hypothesis, at one time the three lakes were connected as one large lake and all the cichlids could interbreed. When the water level fell, groups of cichlids were isolated in smaller lakes as shown in the diagram. Over time, the groups of cichlids developed genetic differences. When the water levels rose again, the isolated populations were brought back into contact. Due to significant genetic differences, these populations were unable to interbreed. Variations in water level over thousands of years resulted in today's diversity of cich-lid species.



As the water level of the lakes changed, many species of cichlids survived while others became extinct. State why some species survived while others became extinct.

30. Two cultures, each containing a different species of bacteria, were exposed to the same antibiotic. Explain how, after exposure to this antibiotic, the population of one species of bacteria could increase while the population of the other species of bacteria decreased or was eliminated.