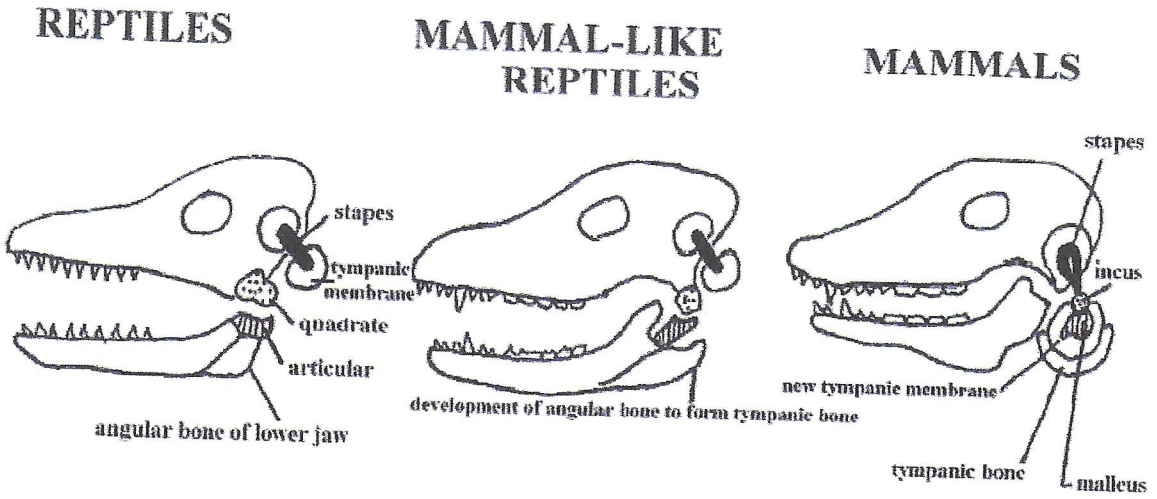
Name: _____ Class: _____ Date: _____ ID: A

Evolution Test Biology 2020 - Chapter 16, 17, 19

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

1. Natural selection acts directly on-
   a. alleles.
   b. genes.
   c. phenotypes.
   d. genotypes.



2. The diagram shows the structures of the ear and the small bones at the hinge of the jaw (articulating jawbones) in fossil skulls. Which statement best summarizes the events of ear bone evolution shown in the diagram?
   a. The articulating jawbones of reptiles evolved from the middle ear bones in mammals.
   b. The middle ear bones in mammals evolved from the articulating jawbones of fossil reptiles.
   c. Lines of both the reptiles and the mammals evolved from a common mammal-like reptile.
   d. Middle ear bones in reptiles are vestigial structures of articulating jawbones in mammals.
3. The two main sources of genetic variation are
   a. genotypes and phenotypes.
   b. gene shuffling and mutations.
   c. single-gene traits and polygenic traits.
   d. directional selection and disruptive selection.
   e. crossing over and natural selection.

4. Antibiotic resistance occurs when an antibiotic has lost its ability to effectively control or kill bacterial growth; in other words, the bacteria are "resistant" and continue to multiply in the presence of therapeutic levels of an antibiotic. Which statement best explains this natural phenomenon in terms of Darwin's theory of natural selection?
   a. The antibiotics caused certain groups of bacteria to suddenly start producing enzymes that destroyed the antibiotic before it could harm the bacteria.
   b. When an antibiotic is used, bacteria that have a natural variation for resistance to the antibiotic have a greater chance of survival than those that are "susceptible."
   c. Although susceptible bacteria are killed or inhibited by an antibiotic, any offspring they produced before they died will be resistant to the antibiotic as will their offspring.
   d. The need to adapt or die caused some bacteria to become resistant to the antibiotic. This acquired resistance was passed on to future bacteria making them resistant.
5. Stable fossil morphology with abrupt changes in the morphology supports the concept of
   a. stasis.
   b. gradualism.
   c. punctuated equillibrium.
   d. immutability.
6. On the Galápagos Islands, Charles Darwin observed
   a. completely unrelated species on each of the islands.
   b. species exactly like those found in South America.
   c. somewhat similar species with traits that suited their particular environment.
   d. species completely unrelated to those found in South America.
7. Genetic drift tends to occur in populations that
   a. are very large.
   b. are small.
   c. are formed from new species.
   d. have unchanging allele frequencies.
8. The length of time required for half of the radioactive atoms in a sample to decay is its
   a. half-life.
   b. relative date.
   c. radioactive date.
   d. period.
9. According to Darwin's theory of natural selection, the individuals that tend to survive are those that have
   a. characteristics their parents acquired by use and disuse.
   b. characteristics that plant and animal breeders value.
   c. the greatest number of offspring.
   d. variations best suited to the environment.

This table shows the amino acid sequences for a fragment of a protein in different organisms.

Species	AA1	AA2	AA3	AA4	AA5	AA6	AA7	AA8	AA9
Eschrichtius robustus	Met	Glu	Glu	Leu	Tyr	Glu	Thr	Leu	Asp
Brassica oleracea	Tyr	Lys	Leu	Leu	Tyr	Asp	Lys	Leu	Met
Manduca sexta	Phe	Asp	Thr	Leu	Glu	Glu	Thr	Leu	Phe
Homo sapien	**Met**	**Asp**	**Glu**	**Leu**	**Tyr**	**Glu**	**Thr**	**Leu**	**Ser**
Saccharomyces cerevisiae	Ser	Asn	Thr	Met	Glu	Leu	Asn	Leu	Asp
Pan troglodytes	Met	Glu	Glu	Leu	Tyr	Glu	Thr	Leu	Ser
Triticum aestivum	Tyr	Asn	Leu	Leu	Tyr	Asp	Met	Leu	Asn

10. Based on commonalities of amino acids in this protein which organism is most closely related to humans?
    a. *Eschrichtius robustus*
    b. *Manduca sexta*
    c. *Pan troglodytes*
    d. *Triticum aestivum*

11. The process by which two species, for example, a flower and a pollinating insect, evolve in response to each other is called
    a. convergent evolution.
    b. adaptive radiation.
    c. coevolution.
    d. punctuated equilibrium.
    e. natural selection

12. What situation might develop in a population having some plants whose flowers open at midday and other plants whose flowers open late in the day?
    a. behavioral isolation
    b. geographic isolation
    c. temporal isolation
    d. mechanical isolation

13. Which choice describes *allelic distribution of a single gene trait* in a population?
    a. a bell shaped curve
    b. a normal curve
    c. $p + q = 1$
    d. $p^2 + 2pq + q^2 = 1$

14. In humans, the pelvis and the femur, or thighbone, are involved in walking. In whales, the pelvis and femur shown in figure 15-2 are

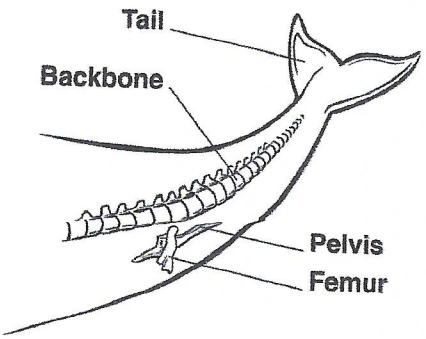


Figure 15–2

    a. examples of fossils.
    b. vestigial structures.
    c. acquired traits.
    d. examples of natural variation.

15. The number of phenotypes produced for a given trait depends upon
    a. the number of genes that control the trait.
    b. which form of the trait is dominant.
    c. the relative frequencies of the various alleles.
    d. whether or not natural selection is at work.

Popples are furry little animals that have fuzzballs on the ends of their tails. The color for the fuzzball is coded for by a single gene with two alleles: blue and pink. The pink fuzzball allele is dominant over the blue fuzzball allele. In a population of 200 popples, 32 have blue fuzzball tails.

16. What is the frequency of the pink allele?
    a. .40
    b. .60
    c. .68
    d. .84

17. How many in the Popple population are carriers for the blue allele (meaning they are heterozygous)?
    a. 24 popples
    b. 96 popples
    c. 48 popples
    d. 16 popples
    e. 54 popples

18. High fitness is a result of
    a. adaptations.
    b. variation.
    c. common descent.
    d. homologies.
    e. working out.

19. When lions prey on a herd of antelope, some antelope are killed and some escape. Which part of Darwin's concept of natural selection might be used to describe this situation?
    a. acquired characteristics
    b. reproductive isolation
    c. survival of the fittest
    d. descent with modification

20. In the past, mass extinctions encouraged the rapid evolution of surviving species
    a. by changing developmental genes.
    b. by making new habitats and niches available to them.
    c. because they killed all organisms that had coevolved.
    d. because they spared all organisms that had evolved convergently.

21. An adaptation is
    a. inhertitable.
    b. able to be acquired during life.
    c. a method of coping with the environment.
    d. guarantees that an organism will survive to reproductive age.
22. A factor that is *necessary* for the formation of a new species is
    a. reproduction at different times.
    b. geographic barriers.
    c. different mating behaviors.
    d. reproductive isolation.
23. The presence of gill slits and tails *in utero* of all vertebrates is an indication of _____.
    a. vestigial structures of non-fish vertebrates.
    b. the superiority of fish
    c. all vertebrates evolving from a common ancestor.
    d. birth defects in all species.
24. Which of the following describes the *phenotypic distributions of a polygenic trait*
    a. a bell shaped curve
    b. a normal curve
    c. $p + q = 1$
    d. $p^2 + 2pq + q^2 = 1$
25. The idea that only famine, disease, and war could prevent the endless growth of human populations was presented by
    a. Darwin.
    b. Lamarck.
    c. Malthus.
    d. Lyell.
26. Which is the first step that occurred in the speciation of the Galápagos finches?
    a. establishment of genetic equilibrium
    b. behavioral isolation
    c. ecological competition
    d. arrival of the founding population
27. Which of the following is a postzygotic reproductive isolating mechanism?
    a. Hybrid stability
    b. Hybrid inviability
    c. Mechanical Isolation
    d. Geographic Isolation
28. Hybrid inviability is
    a. a prezygotic reproductive isolating mechanism.
    b. describing when hybrid zygotes do not form.
    c. describing when hybrids form but are infertile.
    d. describing when hybrids are miscarried (naturally aborted).
29. Urey and Miller subjected water, ammonia, methane, and hydrogen to heating and cooling cycles and jolts of electricity in an attempt to _____.
    a. determine how the dinosaurs became extinct
    b. find out whether the conditions of ancient Earth could have formed complex organic compounds
    c. determine the age of microfossils
    d. find out how ozone forms in the atmosphere

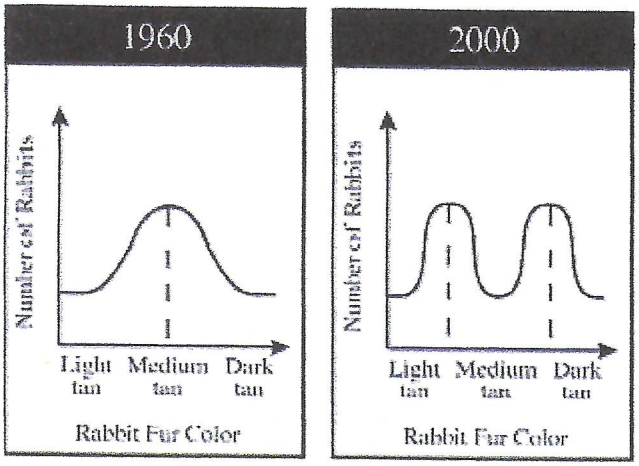


Figure 36

30. The graph in Figure 36 above on the left shows the distribution of fur colors in the rabbit population found in a meadow in 1960. The graph on the right shows the distribution of fur colors in the rabbit population in the same meadow in 2000. What is the most likely reason for the change in the distribution of fur colors shown by the graphs?
    a. Dark tan fur has become dominant over light tan fur.
    b. Darker rabbits have moved into the area.
    c. Change in environment caused medium tan fur to be a disadvantage in this environment.
    d. Medium tan rabbits have the longest life span.

31. In a particular bird species, individuals with average-sized wings survive severe storms more successfully than other birds in the same population with longer or shorter wings. This illustrates -
    a. the founder effect.
    b. stabilizing selection.
    c. disruptive selection.
    d. diversifying selection.

32. Guppies are fresh water tropical fish that are favorites in aquariums because the males are beautifully colored. In the wild, guppies live in streams where they are the favorite snacks of many larger fish. Scientists observed that, in one population, the average size of the guppy decreased over a few years after a new predator was introduced into the pond. What is the selective pressure described in this scenario?
    a. Predator
    b. Prey
    c. Availability of food
    d. Change in climate

33. Brown hair (B) is dominant to blond hair (b). If blond occurs in 36% of the population, what is the frequency of the b allele?
    a. 60%
    b. 40%
    c. 36%
    d. 16%
    e. 48%

Name: _____

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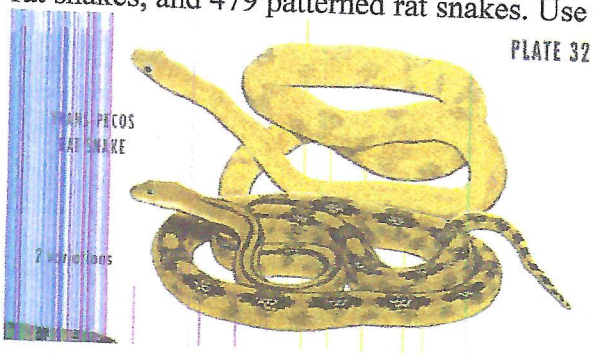
The Trans-Pecos Rat Snake (*Bogertophis subocularis)* has two color patterns, a blonde variety and a variety with dark, H-shaped markings on its dorsum (top of the snake). The allele that codes for the blonde coloration is recessive to the allele coding for the coloration with the dark patterning. Based on data from a field biologist that did a survey and discovered that in the population, there are 330 blonde rat snakes, and 479 patterned rat snakes. Use this information to answer the following questions:



Eastern/Central

Peterson Field Guides
Reptiles and Amphibians

North America

34. What is the frequency of the blonde allele in the population?
    a. .36
    b. .13
    c. .41
    d. .64
    e. .46

35. What is the frequency of heterozygote Trans-Pecos Rate Snake population mentioned above?
    a. .36
    b. .13
    c. .41
    d. .64
    e. .46

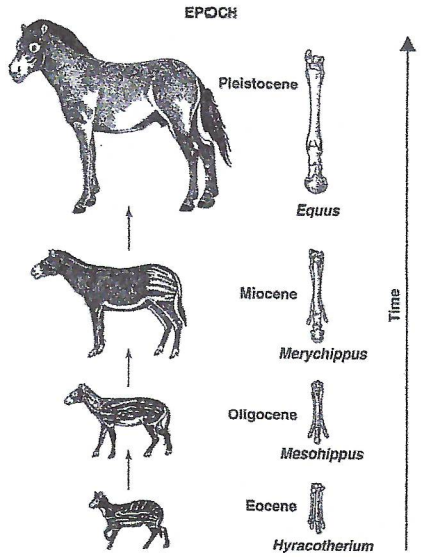


Figure 15–3

36. According to Figure 15-3, how does the number of toes ***through time*** of Mesohippus compare with those of Equus, the modern horse?
    a. Equus has reduced number of toes
    b. Mesohippus has longer toes
    c. Mesohippus has increased number of toes

37. Scientists have never seen the ancient horses shown in Figure 15-3. What do you think was the main type of evidence that scientists used to prepare these diagrams?
    a. DNA
    b. fossils
    c. cave drawings

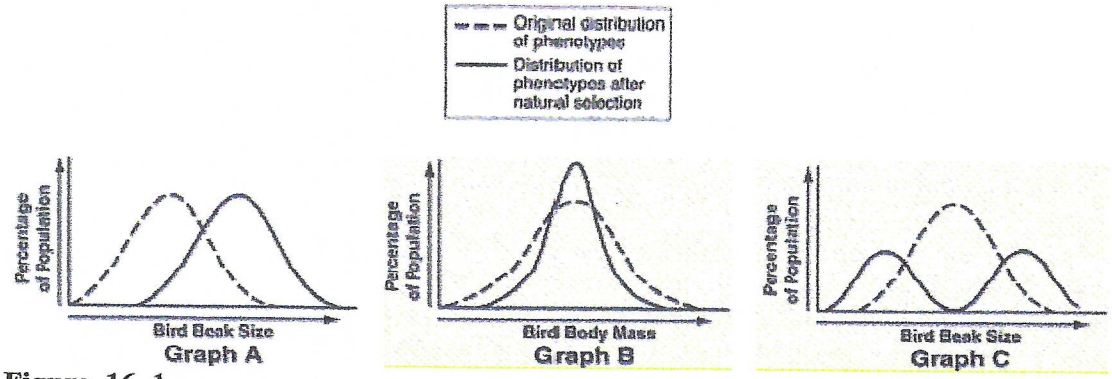


Figure 16–1

38. Which of the three graphs in Figure 16-1 might show a population of birds that specialize in different types of food?

    a. A b. B c. C

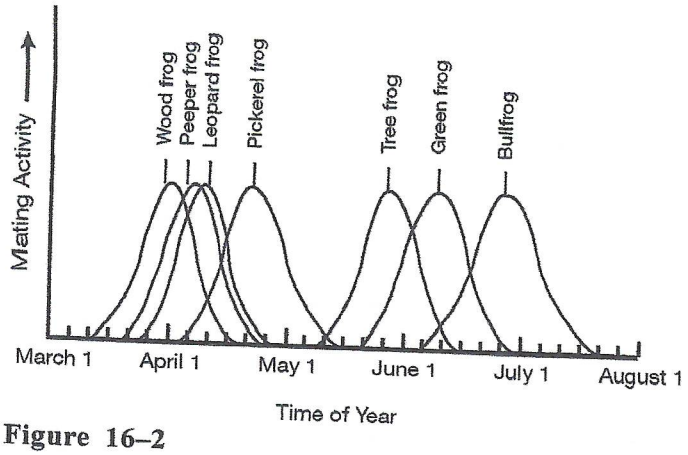


Figure 16–2

39. Peeper frogs and leopard frogs do not interbreed even when they share a habitat. Use the information in Figure 16-2 to determine what reproductive isolating mechanism probably keeps the two species reproductively isolated.
    a. behavioral
    b. temporal
    c. geopraphic
    d. mechanical

40. **BONUS**

(5 points) Five males and five females colonized an earth-like planet and lived there for generations. There was random mating between the colonists and their progeny. All of the individuals had free earlobes, a trait dominant over attached ear lobes.
If two of them were heterozygotes (Aa) for this trait, what are the allelic frequencies of the founding population?