1) The graph below represents the populations of two different species in an ecosystem over a period of several years.

![Population Changes in an Ecosystem](image)

Which statement is a possible explanation for the changes shown?

A) Species A is better adapted to this environment.  
B) Species A is the predator of Species B.  
C) Species B is better adapted to this environment.  
D) Species B is a parasite that has benefited species A.

2) 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.

3) Which statement represents the major concept of the biological theory of evolution?

A) evolution  
B) germination  
C) regeneration of lost structures  
D) transmission of homologous structures

4) Although similar in many respects, two species of organisms exhibit differences that make each well adapted to the environment in which it lives. The process of change that may account for these differences is

A) evolution  
B) geology  
C) regeneration of lost structures  
D) transmission of homologous structures

5) Most species on Earth have changed through time. This change is known as

A) isolation  
B) geology  
C) ecology  
D) evolution

6) Base your answer to the following question on The changes in foot structure in a bird population over many generations are shown in the diagram below.

![Changes in Foot Structure](image)

These changes can best be explained by the concept of

A) evolution  
B) extinction  
C) stable gene frequencies  
D) use and disuse
7) 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.

![Image of evolutionary change from lobe-finned fish to early amphibian]

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

8) Ancestors of the giant panda had rounded paws with five very short toes. Today, the giant panda has a sixth toe, often referred to as a thumb, even though it develops from a wrist bone. This unique thumb is an adaptation that allows the panda to easily hold and eat bamboo shoots. The presence of the giant panda’s thumb is most likely the result of

A) natural selection  
B) selective breeding  
C) asexual reproduction  
D) ecological succession

9) Base your answer to the following question on The diagram below represents four different species of bacteria

![Diagram of four species of bacteria]

Which statement is correct concerning the chances of survival for these species if there is a change in the environment?

A) Species A has the best chance of survival because it has the most genetic diversity.  
B) Species C has the best chance of survival because it has no gene mutations.  
C) Neither species B nor species D will survive because they compete for the same resources.  
D) None of the species will survive because bacteria reproduce asexually.

10) Which concept is best illustrated in the flowchart below?

![Flowchart showing the process of natural selection]

A) natural selection  
B) genetic manipulation  
C) dynamic equilibrium  
D) material cycle
11) The teeth of carnivores are pointed and are good for puncturing and ripping flesh. The teeth of herbivores are flat and are good for grinding and chewing. Which statement best explains these observations?

A) Herbivores have evolved from carnivores.
B) Carnivores have evolved from herbivores.
C) The two types of teeth most likely evolved as a result of natural selection.
D) The two types of teeth most likely evolved as a result of the needs of an organism.

12) 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.

13) Base your answer to the following question on Some of the concepts included in Darwin's theory of natural selection are represented in the diagram below.

![Natural Selection Diagram]

Which concept would be correctly placed in box X?

A) use and disuse
B) variation
C) changes in nucleic acids
D) transmission of acquired traits

14) Which concept includes the other three?

A) competition  
B) survival of the fittest  
C) natural selection  
D) overproduction

15) Organisms with favorable variations reproduce more successfully than organisms with less favorable variations. This statement best describes the concept of

A) overproduction  
B) use and disuse  
C) inheritance of acquired characteristics  
D) survival of the fittest

16) In his studies of birds in the Galapagos Islands, Charles Darwin observed that few bird varieties with similar beak size and shape inhabited a particular area. The limited number of similar varieties was most likely due to

A) competition for the same type of food  
B) competition for a specific concentration of oxygen in the atmosphere  
C) the presence of an excessive number of autotrophs  
D) the presence of a disease that attacks birds with similar beaks

17) Certain insects resemble the twigs of trees. Based on modern evolutionary theory, the most probable explanation for this is that

A) a single gene mutation caused the resemblance  
B) the insects changed because they ate the wood of the trees  
C) genes were transferred from the trees to the insects  
D) natural selections of many variations had occurred

18) Which concept was not included by Darwin in his theory of evolution?

A) overproduction in a population  
B) struggle for existence  
C) genetic basis for variations  
D) survival of the fittest
19) The diagram below represents four different species of wild birds. Each species has feet with different structural adaptations.

Which concept would best explain the development of these adaptations?

A) inheritance of resistance to diseases that affect all these species  
B) inheritance of characteristics acquired after the birds hatched from the egg  
C) natural selection  
D) selective breeding

20) Base your answer to the following question on The diagrams below show the bones in the forelimbs of three different organisms.

Which hypothesis do the differences in the bone arrangements support?

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

21) Which statement would most likely be in agreement with Lamarck's theory of evolution?

A) Black moths have evolved in an area because they were better adapted to the environment and had high rates of survival and reproduction.  
B) Geographic barriers may lead to reproductive isolation and the production of new species.  
C) Giraffes have long necks because their ancestors stretched their necks reaching for food, and this trait was passed on to their offspring.  
D) Most variations in animals and plants are due to random chromosomal and gene mutation.

22) In 1889, August Weismann, a German biologist, conducted an experiment attempting to produce mice without tails. He cut the tails off adult mice and then permitted them to mate. All offspring had long tails. He repeated the experiment many times, always with the same results. This experiment helped to disprove the concept of

A) speciation  
B) extinction  
C) overproduction  
D) competition

23) Geographic and reproductive isolation are most closely associated with

A) speciation  
B) extinction  
C) overproduction  
D) competition

24) The separation of a small group of individuals from the main population is known as

A) chromosomal mutation  
B) fossil formation  
C) geographic isolation  
D) reduction division
25) The American toad breeds earlier in the spring than the Fowler's toad does. Therefore, they do not interbreed, even though they often live in the same habitat. Which conclusion can best be drawn from this information?

A) The two species do not interbreed because of geographic isolation.
B) The two species do not interbreed because of a form of reproductive isolation.
C) Adaptive mutations occurred more often during the evolution of the American toad.
D) Fowler's toad has a higher rate of survival than the American toad does.

26) Over a long period of time the organisms on an island changed so that they could no longer interbreed with the organisms on a neighboring island. This inability to interbreed is known as

A) hybridization
B) reproductive isolation
C) artificial selection
D) survival of the fittest

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

A small community that is heavily infested with mosquitoes was sprayed weekly with the insecticide DDT for several months. Daily counts providing information on mosquito population size are represented in the graph below.

![Graph](image)

What is the most probable reason for the decreased effectiveness of the DDT?

A) DDT caused mutations in
B) DDT was only sprayed once.
C) Mosquitoes resistant to DDT lived and produced offspring.
D) DDT chemically reacted with the DNA of the mosquitoes.

28) Which organism would most likely have new gene combinations?

A) a frog that was produced from a skin cell of a frog
B) a hamster resulting from sexual reproduction
C) a bacterium resulting from asexual reproduction
D) a starfish that grew from part of a starfish

29) When antibiotics were first developed, most infectious diseases could be controlled by them. Today, certain bacteria are resistant to many antibiotics. One possible explanation for this change is that

A) the antibiotics killed most of the bacteria that did not have a genetic variation for resistance
B) the bacteria needed to change in order to produce more antibiotics
C) some of the bacteria learned how to resist the antibiotics
D) antibiotics have become weaker over the years

30) Species of bacteria can evolve more quickly than species of mammals because bacteria have

A) less competition
B) more chromosomes
C) lower mutation rates
D) higher rates of reproduction

31) Which species is most likely to survive changing environmental conditions?

A) a species that has few variations
B) a species that reproduces sexually
C) a species that competes with similar species
D) a species that has a limited life span

32) The embryos of fish, chickens, and pigs have gill slits and a tail. The presence of these features suggests that

A) all these animals can swim
B) pigs developed from chickens
C) these animals may have had a common ancestor
D) gill slits and tails are required for embryonic development

33) Two organisms are closely related and are thought to share a similar evolutionary history. If this assumption is correct, these organisms most likely have

A) no structural differences
B) few biochemical similarities
C) identical chromosome mutations
D) similar embryological development

34) The evolutionary relationship between pigs and humans is supported by observations showing similar stages of prenatal (before birth) development in these organisms. These observations are most closely associated with the field of comparative

A) cytology
B) anatomy
C) biochemistry
D) embryology

35) Sheep and pigs have more enzymes in common than sheep and frogs do. What does this finding indicate?

A) none of these animals are related
B) frogs are not related to pigs
C) sheep are more closely related to pigs than to frogs
D) frogs are more closely related to sheep than to pigs
36) The diagram below shows the evolutionary relationships between several groups of organisms.

Organisms with the greatest biochemical similarities would most likely be found in which pair of genera?

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

37) The sequence of amino acids in the cytochrome c molecule, an enzyme found in mitochondria, is identical in humans and chimpanzees. This fact best supports the concept that

A) simpler organisms synthesized cytochrome c  
B) humans and chimpanzees have similar nutritional requirements  
C) simpler organisms evolved into more complex organisms  
D) humans and chimpanzees have a common ancestor

38) Base your answer to the following question on the chart below and on your knowledge of biology.

<table>
<thead>
<tr>
<th>Species</th>
<th>Sequence of Amino Acids in the Same Part of the Hemoglobin Molecules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>Lys–Glu–His–Iso</td>
</tr>
<tr>
<td>Horse</td>
<td>Arg–Lys–His–Lys</td>
</tr>
<tr>
<td>Gorilla</td>
<td>Lys–Glu–His–Lys</td>
</tr>
<tr>
<td>Chimpanzee</td>
<td>Lys–Glu–His–Iso</td>
</tr>
<tr>
<td>Zebra</td>
<td>Arg–Lys–His–Arg</td>
</tr>
</tbody>
</table>

According to this information, the closest evolutionary relationship most likely exists between the

A) human and the chimpanzee  
B) human and the gorilla  
C) chimpanzee and the gorilla  
D) horse and the zebra

39) Base your answer to the following question on the diagram below that shows some evolutionary pathways. Each letter represents a different species.

The most recent ancestor of organisms D and F is

A) A  B) B  C) C  D) I

40) In the diagram below of undisturbed sedimentary rock strata, in which rock layer are the fossils of more complex animals generally found?

A) A  B) B  C) E  D) D
41) Base your answer to the following question on The diagram below represents undisturbed rock strata in a given region. A representative fossil of an organism is illustrated in each layer.

Which statement best describes a relationship between these representative organisms?

A) Organism A was probably more structurally advanced than organism B and organism C.
B) Organism C probably gave rise to organism A and organism B.
C) All of these organisms probably evolved at the same time.
D) Organism A was probably more primitive than organism B and organism C.

42) Base your answer to the following question on Letters A through F on the graph below represent different species that are related but show different structural, functional, and behavioral adaptations.

One inference that can be drawn from the graph is that

A) speciation occurs only gradually, over long periods of time
B) species E is the ancestor of species F
C) species E resulted from the extinction of species A, B, C, and D
D) speciation may be either gradual or abrupt

43) 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

44) Which pair of structures are homologous?

A) wing of an insect and wing of a bird
B) tentacle of a hydra and flipper of a whale
C) front leg of an insect and bones in the leg of a human
D) bones in the front leg of a dog and bones in the wing of a bat

45) In the diagram below, B, C, and D represent organisms that exist in the present time and show a striking similarity to each other in their bone structure.

In the diagram, letter A most likely represents

A) homologous structures B) a common ancestor
C) an acquired characteristic D) geographic distribution
46) The diagrams below illustrate three homologous structures.

The structural similarities represented in the diagrams are considered supporting evidence for

A) the heterotroph hypothesis  
B) a common ancestry  
C) use and disuse  
D) geographic isolation

47) Base your answer to the following question on the diagram below and on your knowledge of biology. The diagram illustrates one possible scheme of evolution among various groups of organisms.

Which two groups of organisms in the diagram are shown to be most closely related?

A) Porifera and Echinodermata  
B) Chordata and Platyhelminthes 
C) Mollusca and Annelida  
D) Arthropoda and Coelenterata

48) Which term describes appendages that may have different functions, but are similar in structure and are assumed to have the same evolutionary origin?

A) fossils  
B) homozygous 
C) homologous  
D) mutations

49) A certain plant species, found only in one particular stream valley in the world, has a very shallow root system. An earthquake causes the stream to change its course so that the valley in which the plant species lives becomes very dry. As a result, the species dies out completely. The effect of this change on this plant species is known as

A) evolution  
B) extinction 
C) mutation  
D) succession

50) The first life-forms to appear on Earth were most likely

A) complex single-celled organisms  
B) complex multicellular organisms 
C) simple single-celled organisms  
D) simple multicellular organisms

51) The results provided by Stanley Miller's experiments involving a simulated primitive environment, as described in the heterotroph hypothesis, show that in this environment

A) only inorganic molecules can be synthesized  
B) there is little possibility for the synthesis of complex molecules 
C) organic molecules can be synthesized  
D) only complex nucleic acid molecules can be synthesized
52) Base your answer to the following question 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.

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.

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

Two adaptations of the monarch butterfly that aid in its survival are the production of a certain chemical and a distinctive coloration that other animals can easily recognize. When a monarch butterfly is eaten, the presence of the chemical results in a bad taste to the predator.

Although the viceroy butterfly does not contain the chemical that tastes bad to a predator, it does resemble the monarch in size, shape, and coloration. How do the characteristics of the viceroy butterfly aid in its survival?

54) 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
Answer Key
Homework 4B

1) C 42) D
2) C 43) B
3) C 44) D
4) A 45) B
5) D 46) B
6) A 47) C
7) D 48) C
8) A 49) B
9) A 50) C
10) A
11) C
12) B
13) B
14) C
15) D
16) A
17) D
18) C
19) C
20) B
21) C
22) B
23) A
24) C
25) B
26) B
27) C
28) B
29) A
30) D
31) B
32) C
33) D
34) D
35) C
36) C
37) D
38) A
39) B
40) A
41) D

51) C

52) — 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.

53) Example: — Since the viceroy butterfly resembles the monarch, predators that have tasted a monarch butterfly do not eat viceroy butterflies.

54) a. Examples: — The hawk with the better eyesight would compete more successfully. — The hawks with the better eyesight would have a better chance of obtaining food.

b. Examples: — Individuals with the better-eyesight trait would have a better chance to survive.

c. Examples: — The frequency of the better-eyesight trait would increase.

d. Examples: — If the hawks have better eyesight and weak wings, they will not have the same advantage as those with better eyesight and normal wings.