

Name _____ Period _____

Chapter 22: Descent with Modification: A Darwinian View of Life

As you study this chapter, read several paragraphs at a time to catch the flow of ideas and understand the reasoning that is being described. In some places, the text describes a narrative or story regarding the events that led to Darwin's theory of evolution. Therefore, first read the narrative to absorb the big picture and then return to answer the few questions that accompany this material.

Overview

1. Define *evolution* broadly and then give a narrower definition, as discussed in the overview.

Concept 22.1 *The Darwinian revolution challenged the traditional view of a young Earth inhabited by unchanging species*

This section takes a look at the historical setting and influences on Darwin, and it sets the stage for our formal study of evolution.

2. How did each of the following sources view the origin of species?

Aristotle and *Scala Naturae*

The Old Testament

Carolus Linnaeus

3. Explain the role of *fossils in rock strata* as a window to life in earlier times.
4. How would Georges Cuvier have explained the appearance of the record of life shown in the rock strata?
5. James Hutton and Charles Lyell were geologists whose ideas strongly influenced Darwin's thinking. What were the ideas each of them contributed?

James Hutton

Charles Lyell

6. What is the importance of the principle of *uniformitarianism*?

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7. *Jean-Baptiste de Lamarck* proposed a mechanism for how life changes over time. Explain the two principles of his mechanism.

use and disuse

inheritance of acquired characteristics

8. Although Lamarck's mechanism of evolution does not explain the changes in species over time, his thinking has been influential. What is considered to be the great importance of his ideas?

Concept 22.2 Descent with modification by natural selection explains the adaptations of organisms and the unity and diversity of life

9. Charles Darwin proposed that the mechanism of evolution is *natural selection* and that it explains how *adaptations* arise. What are *adaptations*? Give two examples of them.
10. Explain the process of *natural selection*.
11. Let's try to summarize Darwin's observations that drive changes in species over time:

Observation	Cite an Example
1. Variations in traits exist.	
2. These variations (traits) are heritable.	
3. Species overproduce.	
4. There is competition for resources; not all offspring survive.	

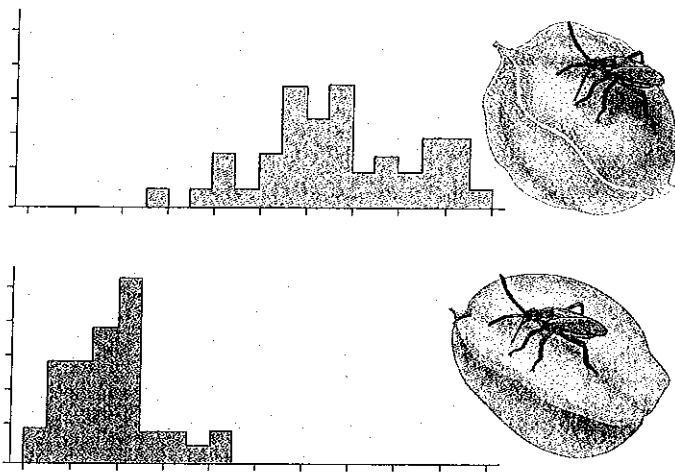
12. From these four observations, what two inferences did Darwin make?
13. It is important to remember that differences in heritable traits can lead to *differential reproductive success*. This means that the individuals who have the necessary traits to promote survival in the current environment will leave the most offspring. How can this *differential reproductive success* affect the match between organisms and their environment?
14. To demonstrate your understanding of this section, complete the following sentences:

_____ do not evolve. _____ evolve.

Now, take out your highlighter and mark the information in the previous box. Hold these ideas firmly in your brain! Finally, if you are ever asked to explain Darwin's theory of evolution by natural selection (a common AP essay question), do *not* pull out the phrase "survival of the fittest." Instead, cite the points made in question 11 and explain the inferences that are drawn from them.

Concept 22.3 Evolution is supported by an overwhelming amount of scientific evidence

15. Use Figure 22.13 in your text to explain how research with soapberry bugs demonstrated observable evolutionary change.



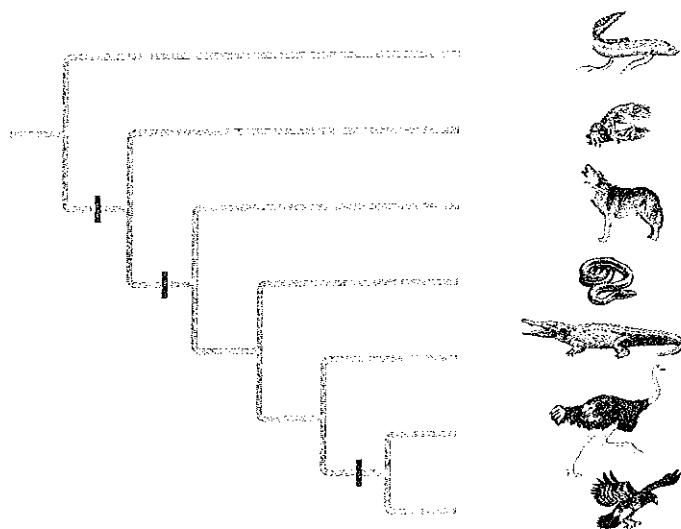
16. *MRSA* is in the news today because it is becoming increasingly more common. What is it?
17. How did it become so dangerous? Explain the evolution of *MRSA*'s resistance to methicillin.
18. Do antibiotics *cause* bacteria to become resistant? Explain your response.
19. Let's make a list of the four evidences for evolution that are described in this concept. Give an example of each.

Evidence for Evolution	Example

20. How does the fossil record give evidence for evolution?
21. What is meant by each of the following terms? Give an example of each.

Term	Explanation/Example
Homologous structures	
Vestigial structures	
Analogous structures (see p. 465)	

22. How do *homologous structures* give evidence for evolution?
23. What is summarized in an *evolutionary tree*?
24. Figure 22.17 in your text shows an evolutionary tree. What is indicated by each branch point in the following figure? Mark each branch point.



25. What is indicated by the hatch marks in Figure 22.17?
26. Use the tree in question 24 to answer this question: Are crocodiles more closely related to lizards or to birds? Explain your response.
27. On the evolutionary tree, label the vertical lines to the right, and annotate the key feature that marks each group.
28. Organisms that are only distantly related can resemble each other. Explain *convergent evolution*, and describe how *analogous structures* can arise.

29. *Convergent evolution* might be summarized like this: *Similar problem, similar solution*. Can you give two examples of convergent evolution?

Study Tip

Homologous structures show evidence of relatedness (whale fin, bat wing).

Analogous structures are similar solutions to similar problems but do *not* indicate close relatedness (bird wing, butterfly wing).

30. What is *biogeography*? How is it affected by *continental drift* and the presence of *endemic species*?

Let's wrap up all of these ideas with a final summary.

ORGANIZE YOUR THOUGHTS

1. Evolution is a change in a species over time.
2. Heritable variations exist within a population.
3. These variations can result in differential reproductive success.
4. Over generations, this can result in changes in the genetic composition of the population.

And remember: Individuals do not evolve! *Populations* evolve.

Test Your Understanding Answers

Now you should be ready to test your knowledge. Place your answers here:

1. _____ 2. _____ 3. _____ 4. _____ 5. _____