

**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 of 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. It is interesting reading and puts Darwin in a historical context, but is not required knowledge for the redesigned AP Biology course. The one thing I recommend that you read from this section is Lamarck's explanation for the mechanism for evolution.

2. Explain Lamarck's theory of inheritance of acquired characteristics. Why was Lamarck wrong?

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

3. 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 adaptations.
4. Explain the process of *natural selection*.

5. 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.	

6. From these four observations, what two **inferences** did Darwin make?

7. 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?

8. To demonstrate your understanding of this section, complete the following sentences:

<b>do not evolve.</b>	<b>evolve.</b>
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Now, take out your highlighter and mark the information in the box above. 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**

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

Evidence for Evolution	Example

13. How does the fossil record give evidence for evolution?

14. 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)	

15. How do *homologous structures* give evidence for evolution?

In the next section of this chapter, pay particular attention to the evolutionary trees, what evidence is used to construct them, and what inferences can be gleaned from them. When we do the BLAST lab, we will be comparing DNA sequences to determine where to place a new, uncategorized fossil on an evolutionary tree.

16. What is summarized in an *evolutionary tree*?

17. 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.

18. What is indicated by the hatch marks in Figure 22.17?

19. Use the tree in question 24 to answer this question: Are crocodiles more closely related to lizards or to birds? Explain your response.

20. Sketch the evolutionary tree in figure 22.17 here (or on the back of this sheet if you need more room) , label the vertical lines to the right, and annotate the key feature that marks each group.

21. Define convergent evolution. How are analogous structures related to convergent evolution?

22. *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).

23. 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 change in 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.**