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

*Adapted and modified from Fred and Theresa Holtzclaw’s AP Biology Reading Guide

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

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

   Aristotle and Scala Naturae

   The Old Testament

   Carolus Linnaeus

   Georges Cuvier

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?

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 adaptations.

10. Explain the process of natural selection.
11. Let’s try to summarize Darwin’s observations that drive changes in species over time:

<table>
<thead>
<tr>
<th>Observation</th>
<th>Cite an Example</th>
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</thead>
<tbody>
<tr>
<td>1. Variations in traits exist.</td>
<td></td>
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<td>2. These variations (traits) are heritable.</td>
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<td>3. Species overproduce.</td>
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<td>4. There is competition for resources; not all offspring survive.</td>
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12. From these four observations, which 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. What can this *differential reproductive success* lead to over time?

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 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 Darwin’s theory explains a wide range of observations**

15. Use Figure 22.12 to explain how John Endler’s work with guppies demonstrated observable evolutionary change.

16. What is the role of 3TC in inhibiting HIV reproduction?

17. Explain the evolution of drug resistance to 3TC.

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.

<table>
<thead>
<tr>
<th>Evidence for Evolution</th>
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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.

<table>
<thead>
<tr>
<th>Term</th>
<th>Example</th>
</tr>
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<tbody>
<tr>
<td>Homologous structures</td>
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<tr>
<td>Vestigial structures</td>
<td></td>
</tr>
<tr>
<td>Analogous structures</td>
<td>(see p. 465)</td>
</tr>
</tbody>
</table>

22. How do homologous structures give evidence for evolution?

23. What is summarized in an evolutionary tree?

24. Organisms that are only distantly related can resemble each other. Explain convergent evolution, and describe how analogous structures can arise.

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