

AP BIOLOGY

BIOLOGY EXPLORATION GUIDE: EVOLUTION #2 SPECIATION, HISTORY OF LIFE, & PHYLOGENETICS

READ:

- Chapter 24, 25, & 26

CAMPBELL BIOLOGY ONLINE TASKS:

- Mastering Biology 24- 26

QUESTIONS FOR YOUR BILL:

CHAPTER 24

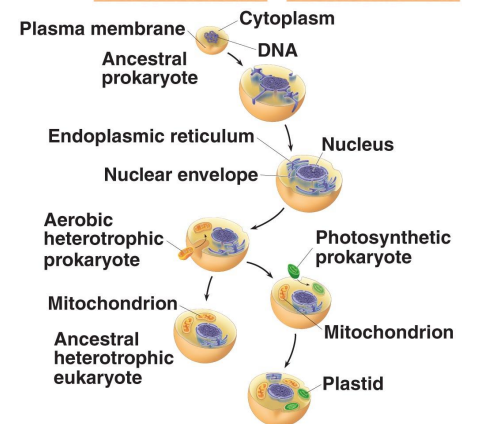
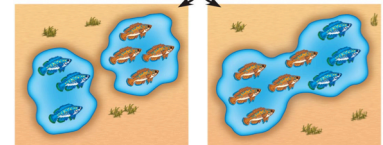
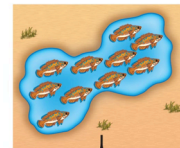
1. Contrast **microevolution** and **macroevolution**.
2. Distinguish between **prezygotic** and **postzygotic** reproductive barriers.
3. Describe FIVE prezygotic reproductive barriers and give an example each.
4. Describe THREE postzygotic reproductive barriers and give an example of each.
5. Summarize key differences between **allopatric** and **sympatric** speciation. Which type of speciation is more common, and why?
6. **Habitat differentiation** is a second process that can lead to sympatric speciation. Describe how habitat differentiation can lead to sympatric speciation.
7. Compare and contrast the two schools of thought about the rate of speciation: **gradualism** (Darwin) and **punctuated equilibrium** (Stephen Jay Gould & Niles Eldridge)



of

Original population

(b)

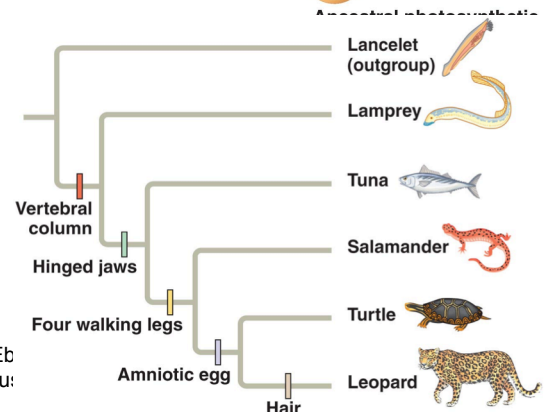


Chapter 25

8. Describe the four stages of the hypothesis for the origin of life on Earth by chemical evolution.
9. Describe the evidence that suggests that RNA was the first genetic material, not DNA. Explain the significance of the discovery of ribozymes.
10. Sketch the process of endosymbiosis and explain the evidence that supports the theory behind the origin of chloroplasts and mitochondria.
11. Describe the key evolutionary adaptations that arose as life colonized land.
12. Define adaptive radiation. Describe, with suitable examples, three circumstances under which adaptive radiation may occur.
13. "A sixth mass extinction may be currently underway." Explain this statement.
14. Explain why island systems are ideal locations for the process of adaptive radiation to take place. Describe other situations that could create ideal conditions for adaptive radiation to occur.
15. Explain the function of *Hox* genes. Describe, with a suitable example, how changes in the number, sequence, or expression of *Hox* genes can lead to major morphological differences between species.
16. Explain why evolutionary change is not goal-directed.

Chapter 26

17. Compare and contrast phylogeny with genealogy. How are these two disciplines similar? How are they different?
18. Explain what Darwin meant when he talked about the common descent of all life, and what the significance is of the branch points on a phylogenetic tree.



19. **Describe** the following pieces of evidence that can be used to construct phylogenetic trees and provide two examples of each:
 - a. Morphological
 - b. Molecular
20. Explain why it is crucial to distinguish between homology and analogy before selecting characters to use in the reconstruction of phylogeny. Describe how homology and analogy can be distinguished from each other.
21. Explain why bird and bat wings are homologous as vertebrate forelimbs but analogous as wings.
22. Identify the criteria that are used in the systematics approach called **cladistics** to create a phylogenetic tree.
23. Define a **clade**.
24. Explain why shared derived characters (synapomorphies) are critically important in establishing a phylogeny and the construction of a cladogram.
25. Describe the relationships between the following pairs of words:
 - a. Monophyletic and polyphyletic
 - b. Paraphyletic and polyphyletic
 - c. Ingroup and outgroup

KEY TERMS: Here is a list of key terms and concepts you will hear about and see during the chapter readings. Get to know them!

<i>Speciation</i>	<i>Reproductive isolation</i>	<i>Temporal isolation</i>	<i>Hybrid breakdown</i>
<i>Species</i>	<i>Prezygotic isolation</i>	<i>Mechanical isolation</i>	<i>Allopatric speciation</i>
<i>Microevolution</i>	<i>Postzygotic isolation</i>	<i>Gametic isolation</i>	<i>Sympatric speciation</i>
<i>Macroevolution</i>	<i>Habitat isolation</i>	<i>Autopolyploid</i>	<i>Gradualism</i>
<i>Adaptive radiation</i>	<i>Behavioral isolation</i>	<i>Allopolyploid</i>	<i>Punctuated equilibrium</i>
<i>Homeotic genes</i>	<i>Hox Genes</i>	<i>Evo-Devo</i>	<i>Outgroup</i>
<i>Phylogeny</i>	<i>Phylogenetics</i>	<i>Clades</i>	<i>Shared derived characters</i>
<i>Taxonomy</i>	<i>Phylogenetic Tree</i>	<i>3 Domain system</i>	<i>Bacteria</i>
<i>Binomial nomenclature</i>	<i>Cladogram</i>	<i>Archaea</i>	<i>Eukarya</i>
<i>Monophyletic</i>	<i>Paraphyletic</i>	<i>Polyphyletic</i>	<i>Ingroup</i>

SUPPLEMENTARY RESOURCES:

Interactives

- Kimball's Biology Pages: [Speciation](#)
- UC Berkeley's Understanding Evolution: [Speciation](#)
- UC Berkeley's Understanding Evolution: [Evo-Devo](#)
- *Nature* article: "[Darwin's Finches Tracked to Reveal Evolution in Action.](#)"
- University of Miami: [Reproductive Isolation](#)
- BBC's GCSE Bitesize Biology: [Natural Selection and Speciation](#)
- TalkOrigins.org: [Examples of Speciation](#)
- Brown University: [Case Histories of Speciation](#)
- UC Berkeley: [Evidence for Speciation](#)
- University of Utah Learn Genetics: [All Living Things are Related](#)
- Kimball's Biology Pages: [Taxonomy and Phylogeny](#)
- UC Berkeley's Understanding Evolution: [The History of Life—Looking at Patterns](#)
- UC Berkeley's Understanding Evolution: [Understanding Phylogenies](#)
- DNA From the Beginning: [Living Things Share Common Genes](#)
- Scitable: [Reading a Phylogenetic Tree—The Meaning of Monophyletic Groups](#)
- McGraw-Hill: [Miller-Urey Experiment Animation](#)
- Massasoit Community College: [Miller-Urey Experiment Explanation](#) (animated)
- BFW Publishers: [Interactive Origins of Life Tutorial](#)
- McGraw-Hill: [Endosymbiosis Animation](#)
- Kimball's Biology Pages: [Endosymbiosis and the Origin of Eukaryotes](#)
- UC-Berkeley: [Endosymbiosis-Lynn Margulis](#)

- Indiana University-Purdue University Indianapolis: [Endosymbiotic Theory](#)
- Sumanas, Inc.: [The Evolution of Organelles](#)
- ExploringOrigins.org (via Boston's Museum of Science): [Ribozymes and The RNA World](#)
- BBC Nature: [The History of Life on Earth](#)
- NOVA / PBS: [A Brief History of Life](#)
- Berkley's Understanding Evolution: [History of Life on Earth](#)
- The University of Utah Learn.Genetics: [The Evolution of The Cell](#)
- ExploringOrigins.org (via Boston's Museum of Science): [A Timeline of Life's Evolution](#)
- UC-Berkeley: [Studying the Origin of Life](#)

Lectures

- Bozeman Biology's ["Abiogenesis"](#) video.
- Bozeman Biology's ["Origin of Life – Scientific Evidence"](#) video.
- Bozeman Biology's ["Endosymbiosis"](#) video.
- Bozeman Biology's ["Speciation and Extinction"](#) video.
- Crash Course Biology's ["History of Life on Earth"](#) video.
- Bozeman Biology's ["Phylogenetics"](#) video.
- Bozeman Biology's ["Cladograms"](#) video.
- Bozeman Biology's ["The Three Domains of Life"](#) video.
- Crash Course: ["Taxonomy"](#)
- Bozeman Biology's ["Speciation"](#) video.
- Crash Course: ["Speciation"](#)

