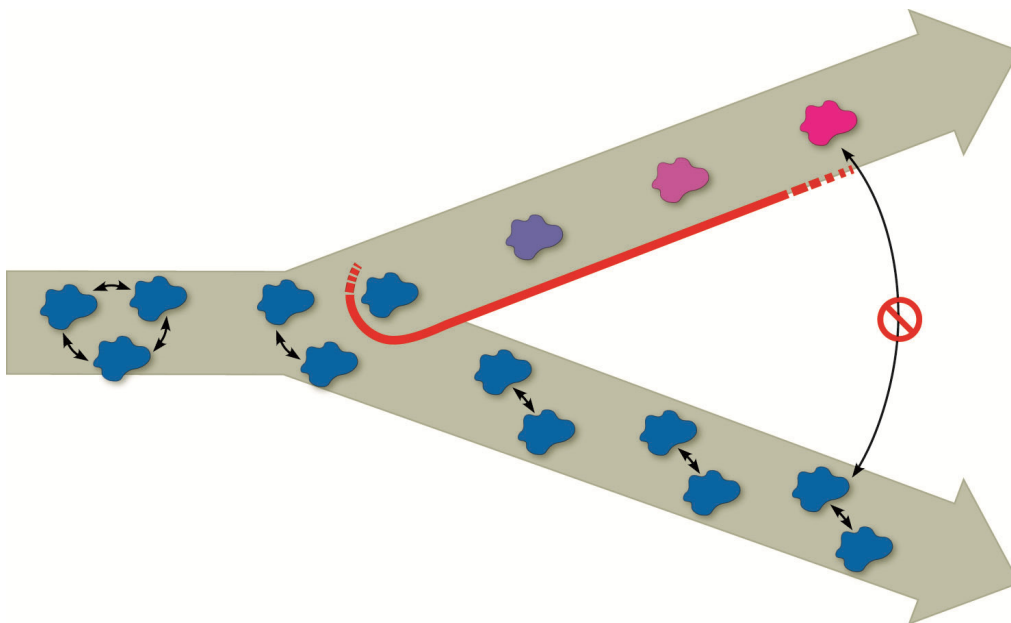


Chapter 24: The Origin of Species

- 24.1** Define the biological species concept, and identify reproductive barriers that could isolate a species' gene pool from that of other species.
- 24.2** Compare and contrast allopatric speciation and sympatric speciation.
- 24.3** Explain what a hybrid zone is, and identify possible outcomes for a hybrid zone over time.
- 24.4** Give examples that show how speciation can occur rapidly or slowly, and can result from changes in few or many genes.

How do new species originate from existing species? The processes by which this happens are described in this chapter. New species arise when two populations diverge from a common ancestor sufficiently to become reproductively isolated. The rate of speciation may vary, and evidence that it has occurred includes the fossil record and genomic data.

Study Tip: Figure 24.1 gives an overview of how speciation can occur. Label and explain the key points in the figure.



Note the double arrow at the end of the figure that you labeled “No interbreeding.” Predict what would happen if interbreeding occurred.

1. What was Darwin's "mystery of mysteries"?
2. Define *speciation*.
3. Distinguish between *microevolution* and *macroevolution*.

Concept 24.1 *The biological species concept emphasizes reproductive isolation*

LO 24.1: *Define the biological species concept, and identify reproductive barriers that could isolate a species' gene pool from that of other species.*

4. Use the biological species concept to define *species*.
5. What is required for the formation of new species?
6. What are *hybrids*?
7. Explain these two types of barriers that maintain *reproductive isolation*.

Prezygotic barriers

Postzygotic barriers

8. The following charts summarize the various ways that *reproductive isolation* is maintained. Explain and give an example of each type of isolating mechanism. Figure 24.3 in your text will help with this task.

Prezygotic Reproductive Barriers	Explanation	Example
Habitat isolation		
Temporal isolation		
Behavioral isolation		

Mechanical isolation		
Gametic isolation		

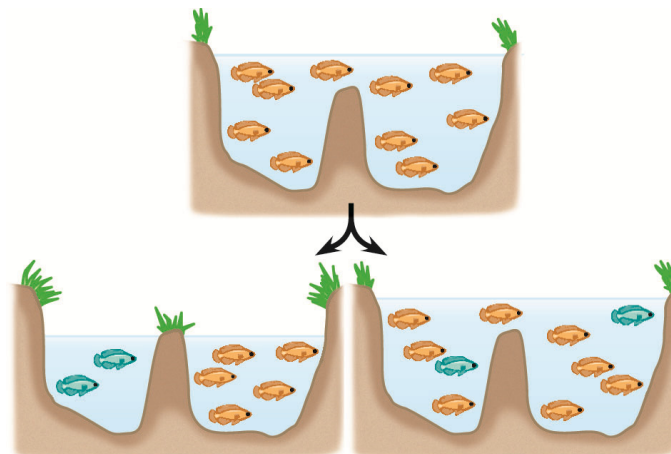
Postzygotic Reproductive Barriers	Explanation	Example
Reduced hybrid viability		
Reduced hybrid fertility		
Hybrid breakdown		

9. What are two limitations of the biological species concept?

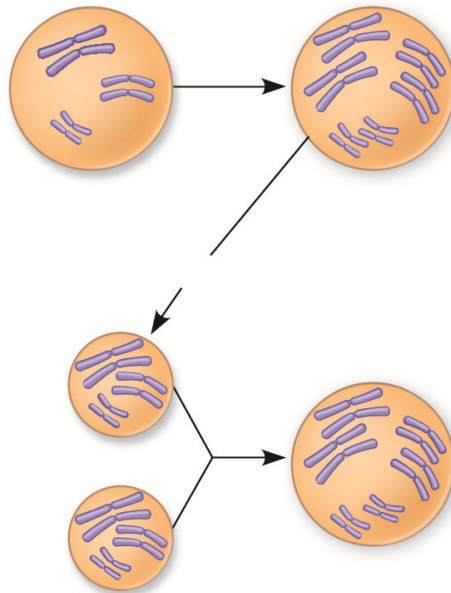
Concept 24.2 *Speciation can take place with or without geographic separation*

LO 24.2: *Compare and contrast allopatric speciation and sympatric speciation.*

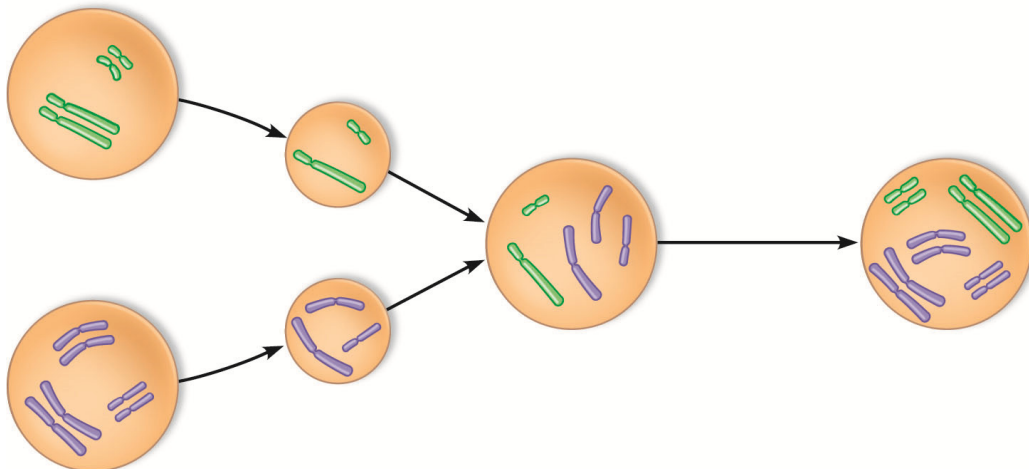
10. Gene flow can be interrupted in two main ways. Explain and give an example of each by labeling and annotating this figure, which shows an ancestral species of fish and then the two modes of speciation.



11. Which type of speciation is caused by a geographic barrier such as the Grand Canyon?
12. *Sympatric speciation* occurs in populations that live in the same geographic area. What are three ways this is possible?
13. Your response to question 12 involves concepts that are not easy to understand at first glance. To begin the process of mastering these ideas, label the following figure and describe the processes that lead to *autopolyploidy*.



14. Now, use this figure to explain *allopolyploid speciation*.



15. It might seem like any type of polyploidism would be rare, and that is true in animals. However, botanists estimate that more than _____ of the plant species alive today were formed by polyploid speciation!
16. Before we leave allopatric and sympatric speciation, explain what happens in *sexual selection*, and how this process can drive sympatric speciation.
17. *Habitat differentiation* can drive either allopatric or sympatric speciation. Explain how sympatric speciation might occur.

Concept 24.3 *Hybrid zones reveal factors that cause reproductive isolation*

LO 24.3: *Explain what a hybrid zone is, and identify possible outcomes for a hybrid zone over time.*

18. What are *hybrid zones*?
19. Refer to Figure 24.15 in your text. It is identical to the figure you labeled and studied in the chapter opening, except now there is some gene flow between the two species. What are three possible outcomes over time for the populations involved in creating a hybrid zone?

Concept 24.4 *Speciation can occur rapidly or slowly and can result from changes in few or many genes*

LO 24.4: *Give examples that show how speciation can occur rapidly or slowly, and can result from changes in few or many genes.*

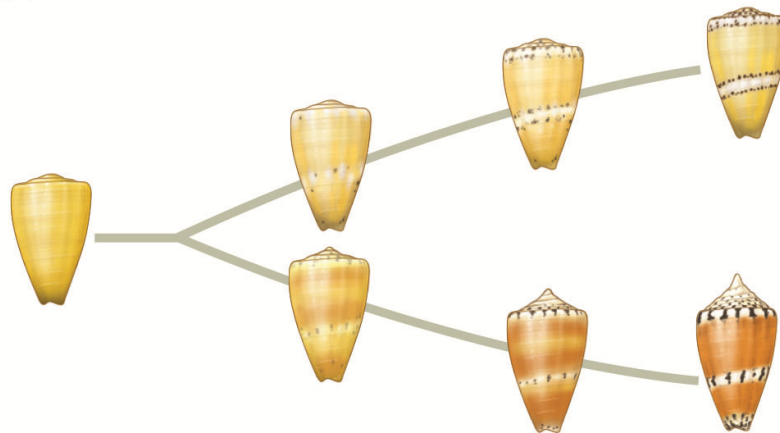
20. Stephen Jay Gould and Niles Eldredge coined the term *punctuated equilibria*. What is meant by a punctuated pattern?

21. Label this figure and then describe how each of the pictures explains a pattern of speciation.

(a)



(b)



22. It seems reasonable that a host of genes might be involved in speciation. Explain how changes in just one gene can lead to speciation.

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

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____