Chapter 5: Evolution of Biodiversity

Summary
This chapter explains evolution and the processes that have created biodiversity on our planet.

While You Read
Earth is home to a tremendous diversity of species

Key Ideas
- The three levels of biodiversity are ecosystem, species and genetic diversity.
- Species richness and species evenness are two different measures of species diversity.

Match These Key Terms
____ 1. Ecosystem diversity
____ 2. Species diversity
____ 3. Genetic diversity
____ 4. Species richness
____ 5. Species evenness
____ 6. Phylogeny

a. The number of species in a given area
b. The variety of ecosystems within a given region
c. The branching patterns of evolutionary relationships
d. The variety of species within a given ecosystem
e. The relative proportion of different species in a given area
f. The variety of genes within a given species

Evolution is the mechanism underlying biodiversity

Key Ideas
- The three ways evolution can occur is by artificial selection, natural selection, and random processes.
- Evolution by random processes can occur by mutations, genetic drift, the bottleneck effect, and the founder effect.

Match these Key Terms
____ 1. Evolution
____ 2. Microevolution
____ 3. Macroevolution
____ 4. Genes
____ 5. Genotype
____ 6. Mutation
____ 7. Recombination
____ 8. Phenotype
____ 9. Evolution by artificial selection
____ 10. Evolution by natural selection

a. A change in the genetic composition of a population over time as a result of humans selecting which individuals breed, typically with a preconceived set of traits in mind
b. Evolution that gives rise to new species, genera, families, classes, or phyla
c. A reduction in the genetic diversity of a population caused by a reduction in its size
d. Traits that improve an individual’s fitness
e. Physical locations on the chromosomes within each cell of an organism
f. A change in a population descended from a small number of colonizing individuals
g. A random change in the genetic code produced by a mistake in the copying process
h. A change in the genetic composition of a population over time
i. A change in the genetic composition of a population over time as a result of the environment determining which individuals are most likely to survive and reproduce
j. Evolution occurring below the species level
11. Fitness  
12. Adaptations  
13. Genetic drift  
14. Bottleneck effect  
15. Founder effect  

Speciation and extinction determine biodiversity  

Key Ideas  
- When a species is geographically isolated from other populations, two distinct species can form.  
- Natural evolution is an extremely slow process.  
- Artificial evolution can be incredibly fast.  

Match These Key Terms  
1. Geographic isolation  
2. Reproductive isolation  
3. Allopatric speciation  
4. Sympatric speciation  
5. Genetic engineering  
6. Genetically modified organisms  

Evolution shapes ecological niches and determines species distributions  

Key Ideas  
- Animals have a set of ideal conditions known as their fundamental niche.  
- As environments change, species can adapt, move, or become extinct.  
- Scientists use the fossil record to study species that lived millions of years ago.  
- There have been five major times when the Earth has experienced mass extinctions.  
- Scientists believe we are in the sixth mass extinction.  

Match These Key Terms  
1. Range of tolerance  
2. Fundamental niche  
3. Realized niche  
4. Distribution  
5. Niche generalist  
6. Niche specialist  
7. Fossils  
8. Mass extinction
Chapter Review

A few questions on evolution have appeared on past AP exams. For the exam, you mostly need to understand the big concepts. It is also important to understand the different levels of biodiversity (ecosystem, species and genetic) and the difference between species evenness and species richness. Also, know that populations can change into two genetically distinct populations by both natural means—such as a river—and also by human creations like cities.

List questions from your initial reading of the chapter

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After You Read

Short Answer

1. Explain in your own words the difference between species evenness and species richness.

2. What are the key ideas of Darwin’s theory of evolution by natural selection?

3. List and describe the four random processes that can cause evolution.

4. Summarize in your own words the example of allopatric speciation from Figure 5.13.

5. What are the factors that determine the pace of evolution?

6. What five factors do scientists contend are causing the sixth mass extinction?