

## Chapter 7: The Evolution of Living Things Summary

- Evolution is the process in which inherited characteristics within a population change over generations, sometimes giving rise to new species. Scientists continue to develop theories to explain how evolution happens.
- Evidence that organisms evolve can be found by comparing living organisms to each other and to the fossil record. Such comparisons provide evidence of common ancestry.
- Scientists think that modern whales evolved from an ancient, land-dwelling mammal ancestor. Fossil organisms that support this hypothesis have been found.
- Evidence of common ancestry among living organisms is provided by comparing DNA and inherited traits. Species that have a common ancestor will have traits and DNA that are more similar to each other than to those of distantly related species.
- Darwin explained that evolution occurs through natural selection. His theory has four parts:
  1. Each species produces more offspring than will survive to reproduce.
  2. Individuals within a population have slightly different traits.
  3. Individuals within a population compete with each other for limited resources.
  4. Individuals that are better equipped to live in an environment are more likely to survive to reproduce.
- Modern genetics helps explain the theory of natural selection.
- Natural selection explains how populations adapt to changes in their environment. A variety of examples of such adaptations can be found.
- Natural selection also explains how one species may evolve into another. Speciation occurs as populations undergo separation, adaptation, and division.

## Chapter 8: The History of Life on Earth Summary

- Fossils are formed most often in sedimentary rock. The age of a fossil can be determined using relative dating and absolute dating.
- The geologic time scale is a timeline that is used by scientists to outline the history of Earth and life on Earth.
- Conditions for life on Earth have changed many times. Rapid changes, such as a meteorite impact, might have caused mass extinctions. But many groups of organisms have adapted to changes such as the movement of tectonic plates.
- The Earth is about 4.6 billion years old. Life formed from nonliving matter long ago.
- Precambrian time includes the formation of the Earth and the appearance of simple organisms.
- The first cells did not need oxygen. Later, photosynthetic cells evolved and released oxygen into the atmosphere.
- There is evidence that *cyanobacteria*, a new kind of prokaryotic organism, appeared more than 3 billion years ago. Cyanobacteria use sunlight to produce their own food. Along with doing other things, this process releases oxygen. The first cyanobacteria began to release oxygen gas into the oceans and air.
- During the Paleozoic era, animals appeared in the oceans and on land, and plants grew on land.
- Dinosaurs dominated the Earth during the Mesozoic era.
- Mammals have dominated the Cenozoic era. This era continues today.
- Humans, apes, and monkeys are primates. Almost all primates have opposable thumbs and binocular vision.
- Hominids, a subgroup of primates, include humans and their humanlike ancestors. The oldest known hominid fossils may be 7 million years old.
- Early hominids included australopithecines and the Homo group found in Africa.
- Early Homo sapiens did not differ very much from present-day humans. Homo sapiens is the only type of hominid living today.

## Evidence of Evolution Study Questions

### Short Answer

1. Describe the four parts of natural selection.
2. Why do the Galápagos finches have different beaks?
3. Describe three possible geological causes of population separation.
4. Compare and contrast the methods of relative and absolute dating.

### Multiple Choice Question Helpers

1. Evidence that whales evolved from mammals that once lived on land include various fossil discoveries, the hip bones in whales, and the fact that whales are mammals (live birth, mammary glands, blow holes, lungs) **The fishlike shape of whales is not evidence of its relation to mammals.**
2. Signs that different species may have a common ancestor include **similar** DNA and **similar** traits.
3. Darwin clearly understood that the process of evolution is slow, the importance of separation and competition. **He didn't understand the role of genetics.**
4. The process of speciation consists of separation, adaptation, and division.
5. Overtime, animals may change behavior or physical appearance in response to changes in the environment is called **adaptation.**
6. **Natural selection** is the process by which organisms that are better adapted to their environment survive and reproduce more successfully than less well adapted organisms.
7. The process by which population slowly change over time is called **evolution.**
8. **Speciation** often begins when a population becomes physically separated. (NEW SPECIES are CREATED)
9. A **trait** is characteristic that can be passed on from parent to offspring.
10. **Selective breeding** is a process farmers use to produce vegetables that will grow in specific climate.
11. **Selection** is when certain gens make organisms more likely to survive and reproduce.
12. Scientists use the geologic time scale to divide the history of the Earth into large divisions called **ERAS.**
13. Primates have opposable thumbs that help them grip and hold things and eyes in the front of the head for 3D vision.

Precambrian Time	Paleozoic	Mesozoic	Cenozoic
Approximately 4 billion years ago to 542.0 million years ago  Scientists think that the early Earth was very different than it is today. The atmosphere was made of gases such as water vapor, carbon dioxide, and nitrogen. Also, the early Earth was a place of great turmoil. Volcanic eruptions, meteorite impacts, and violent storms were common. Intense radiation from the sun bombarded Earth's surface.	542.0 to 251.0 million years ago "Age of Ancient Life"  Plants, fungi, and air-breathing animals slowly colonized land. By the end of the era, forests of giant ferns, club mosses, horsetails, and conifers covered much of the Earth. All major plant groups except for flowering plants appeared during this era. These plants provided food and shelter for animals. Fossils indicate that crawling insects were some of the first animals to live on land. They were followed by large salamander-like animals. Near the end of the Paleozoic era, reptiles and winged insects appeared. The largest mass extinction known took place at the end of the Paleozoic era.	251.0 to 65.5 million years ago "Age of Medieval Life"  The word Mesozoic is from Greek and means "middle life." Scientists think that the surviving reptiles evolved into many different species after the Paleozoic era. Mesozoic era is commonly called the Age of Reptiles. Dinosaurs are the most well known reptiles that evolved during the Mesozoic era. Dinosaurs dominated the Earth for about 150 million years. A great variety of dinosaurs lived on Earth.  The most important plants during the early part of the Mesozoic era were conifers, which formed large forests. Flowering plants appeared later in the Mesozoic era.	65.5 million years ago to Present "Age of Recent Life"  An era of geologic time from the beginning of the Tertiary period to the present. Its name is from Greek and means "new life." -Includes ICE AGES -Many kinds of mammals, birds, insects, and flowering plants appeared.