

Assess Your Understanding

Darwin's Theory

What Was Darwin's Hypothesis?

1a. LIST Make a list of three observations that Darwin made during the *Beagle's* voyage.

b. DESCRIBE An adaptation is a trait that increases an organism's ability to _____ and _____.

c. DEVELOP HYPOTHESES How does artificial selection support Darwin's hypothesis?

got it?

☐ I get it! Now I know that Darwin's hypothesis was _____


☐ I need extra help with _____

Assess Your Understanding

Darwin's Theory

What Is Natural Selection?

2a. **DEFINE** A variation is any (similarity/difference) between individuals of the same species.

b. **ANSWER**  How do life forms change over time?

c. **RELATE CAUSE AND EFFECT** Explain how unfavorable traits can disappear in a species.

got it?

☐ I get it! Now I know that natural selection occurs _____

☐ I need extra help with _____

Key Concept Summaries

Darwin's Theory

What Was Darwin's Hypothesis?

During his five-year voyage around the world, Charles Darwin observed great diversity among living things, often within the same species. A **species** is a group of similar organisms that can mate with each other and produce fertile offspring. Darwin also observed fossils that shared some, but not all, traits with living animals. A **fossil** is the preserved remains or traces of an organism that lived in the past. Darwin observed differences in plants and animals that lived in South America and the Galápagos Islands, which are off the coast of South America. He attributed these differences to examples of adaptation, a trait

that increases an organism's ability to survive and reproduce.

Darwin hypothesized that species gradually change over many generations and become better adapted to new conditions. The gradual change in a species over time is called **evolution**. Charles Darwin's ideas are often referred to as the theory of evolution. A **scientific theory** is a well-tested concept that explains a wide range of observations.

What Is Natural Selection?

In 1858, Darwin and Alfred Russel Wallace proposed the same explanation—natural selection—for how evolution occurs. **Natural selection** is the process by which individuals that are better adapted to their environment are more likely to survive and reproduce more than other members of the same species.

Darwin proposed that, over a long time, natural selection can lead to change. Helpful variations may gradually accumulate in a species, while unfavorable ones may disappear. A variation is any difference between individuals of the same species.

Without variations, all the members of a species would have the same traits and the same chance of surviving and reproducing. Darwin could not explain what caused variations or how they were passed on. Scientists later learned that variations can result from changes in genes and the shuffling of different forms of genes when egg and sperm join. Only traits that are inherited, or controlled by genes, can be acted upon by natural selection. Other factors, such as competition and environmental change can affect an organism's survival.

On a separate sheet of paper, state Darwin's hypothesis in your own words.

Assess Your Understanding

Evidence of Evolution

What Evidence Supports Evolution?

1a. **DEFINE** _____ structures are structurally similar body parts in related species.

b. **CHALLENGE** Insects and birds both have wings. What kinds of evidence might show whether or not insects and birds are closely related? Explain.

got it?

☐ I **get it!** Now I know that the theory of evolution is supported by evidence that includes _____

☐ I need extra help with _____

Key Concept Summary

Evidence of Evolution

What Evidence Supports Evolution?

Since Darwin's time, scientists have found a great deal of evidence that supports the theory of evolution. **Fossils, patterns of early development, similar body structures, and similarities in DNA and protein structures all provide evidence that organisms have changed over time.**

are arranged. Fishes, amphibians, reptiles, birds, and mammals all have an internal skeleton with a backbone. This similarity provides evidence that these animal groups evolved from a common ancestor. Similar structures that related species have inherited from a common ancestor are known as **homologous structures**.

By examining fossils, scientists can infer the structures of ancient organisms. The fossil record provides clues about how and when new species evolved and how organisms are related.

To infer how closely related two or more species are, scientists compare the sequence of nitrogen bases in their DNA. The more similar the DNA sequences, the more closely related the species are. The DNA bases along a gene specify what type of protein will be produced. Therefore, scientists can also compare the order of amino acids in a protein to see how closely related two species are. Evidence from DNA and protein structure has confirmed conclusions about evolutionary relationships among organisms based on fossils, embryos, and body structure.

Scientists also infer evolutionary relationships by comparing the early development of different organisms. Similarities can suggest that species are related and share a common ancestor.

An organism's body structure is its basic body plan, which, in vertebrates, includes how its bones

On a separate sheet of paper, state and briefly explain four kinds of evidence that support the theory of evolution.

Assess Your Understanding

Rate of Change

How Do New Species Form?

got it?

- ☐ I get it! Now I know that new species form when _____

- ☐ I need extra help with _____

What Patterns Describe the Rate of Evolution?

- 1a. **IDENTIFY** The _____ has given scientists information about past life on Earth.
- b. **INFER** Why are fossils of intermediate life forms likely to be rare if the pattern of punctuated equilibrium explains how evolution occurs?

got it?

- ☐ I get it! Now I know that two patterns of evolution are _____

- ☐ I need extra help with _____

Key Concept Summaries

Rate of Change

How Do New Species Form?

Natural selection explains how variations can lead to changes in a species. But how could a new species form? **A new species can form when a group of individuals remains isolated from the rest of its**

species long enough to evolve different traits that prevent reproduction. Natural barriers such as a river, volcano, or mountain range may separate group members.

What Patterns Describe the Rate of Evolution?

The fossil record has provided scientists with a lot of information about past life on Earth. Sometimes new species appear rapidly, at other times they appear as the result of gradual changes. **Scientists have developed two patterns, gradualism and punctuated equilibrium, to describe the rate of evolution.**

Gradualism involves tiny changes in a species that gradually add up to major changes over very long periods of time.

Intermediate forms of organisms in the fossil record show gradual change over time. Scientists call this slow pattern of evolution gradualism. The fossil record also shows a pattern of long periods of little to no change, then rapid change in short periods of time. Scientists call this pattern punctuated equilibrium.

Today most scientists think that evolution can occur gradually at some times and more rapidly at others.

On a separate sheet of paper, name and summarize the two patterns that describe the rate of evolution.