

How can natural and artificial selection influence changes in populations?

Use with textbook pages 44–63.

Mutations

Mutations are changes in the DNA sequence of an organism due to a mistake during cell division or exposure to some environmental factors. Mutations provide genetic variation within a population. Some mutations are beneficial, while others are harmful to the organism and can affect their survival. Other mutations may have no effect on the organism. Mutations in the somatic cells of an organism disappear from the population.

Natural Selection

Natural selection is a process in which traits of a population are selected for by the environment, and members of that population change over time as they reproduce and pass on their traits to their offspring. Natural selection has no direction or purpose. Organisms have **adaptations** (structural, physiological, and behavioural features) that help them survive and reproduce in their specific environment. Organisms that have a **selective advantage** will have a better chance of surviving and reproducing as their environments change.

Speciation and Extinction

Speciation is the formation of new species. Speciation can result when a geographical barrier separates two populations and isolates them from each other. Over time, the two populations can become so different from each other that they can no longer interbreed. This process is an example of **adaptive radiation**, where a common ancestor gives rise to a variety of different species. Environmental conditions can produce selective pressure that will give rise to new species, while eliminating others. **Extinction** occurs when an entire species disappears from our planet.

Mutagens

Mutations are sources of variation in a population. As a result, they can affect natural selection and speciation. Mutations are caused by **mutagens**, which are substances that can physically alter the structure of DNA or chemically react with DNA. Mutagens that cause cancer are called **carcinogens**.

Artificial Selection

Humans choose to breed certain organisms based on the desirable traits that these organisms possess. This process is known as **artificial selection** or selective breeding. In artificial selection, humans do the selecting. Artificial selection can reduce genetic diversity. An example of this is a **monoculture**, where a single crop species is planted over a large area of land.

Adaptations

Use with textbook pages 47-49.

For each situation described, identify whether it illustrates a *structural adaptation*, a *behavioural adaptation*, or a *physiological adaptation*.

1. Dogs pant to cool down their body.

2. Humans shiver when they are cold.

3. A deer sheds its antlers because of a decrease in hormones.

4. Antarctic seals have a thick layer of blubber for extra insulation.

5. Deciduous trees shed their leaves before winter in response to reduced sunlight and cooler temperatures.

6. Polar bears are nomadic, which helps them adjust to changing environmental stressors.

7. The marsh wrens sing with a characteristic fast gurgling and rapid-fire trill.

8. The kit fox, which lives in the desert, has large ears that help dissipate body heat.

9. The red squirrel collects and buries enough nuts to get it through the winter.

10. Cacti in the hot and dry deserts of Osoyoos store water in their thick stems and leaves.
