

1-3 Studying Life

Characteristics of Living Things

No single characteristic is enough to describe a living thing.
Some nonliving things share one or more traits with living things.

Living things share the following characteristics:

- made up of units called cells
- reproduce
- based on a universal genetic code
- grow and develop
- obtain and use materials and energy
- respond to their environment
- maintain a stable internal environment
- change over time

Living things are made up of cells.

A cell is the smallest unit of an organism that can be considered alive.

Living things reproduce.

In sexual reproduction, cells from two different parents unite to form the first cell of the new organism.
In asexual reproduction, a single parent produces offspring that are identical to itself.

Living things grow and develop.

During an organism's development, cells differentiate, which means that the cells look different from one another and perform different functions.

Living things are based on a universal genetic code.

Organisms store the information they need to live, grow, and reproduce in a genetic code in a molecule called DNA.

Living things obtain materials and use energy.

The combination of chemical reactions through which an organism builds up or breaks down materials is called metabolism.

Living things respond to their environment.

A stimulus is a signal to which an organism responds.

Living things maintain a stable internal environment.

Although conditions outside an organism may change, conditions inside an organism tend to remain constant.
This process is called homeostasis.

Taken as a group, living things change over time. Over many generations, groups of organisms typically evolve.

Big Ideas in Biology

Science as a Way of Knowing

Science is not just a list of "facts."

The job of science is to use observations, questions, and experiments to explain the natural world.

Interdependence in Nature

All forms of life on Earth are connected together into a biosphere, which literally means "living planet."

The relationship between organisms and their environment (called ECOLOGY) depends on both the flow of energy and the cycling of matter.

Matter and Energy

Life's most basic requirements are matter that serves as nutrients to build body structure and energy to fuel the processes of life.

Cellular Basis of Life

Organisms are composed of one or more cells, which are the smallest units that can be considered fully alive.

Information and Heredity

Life's processes are directed by information carried in a genetic code that is common, with minor variations, to every organism on Earth.

That information, carried in DNA, is copied and passed from parents to offspring.

Unity and Diversity of Life

All living things are fundamentally alike at the molecular level, even though life takes an almost unbelievable variety of forms.

Evolution

In biology, evolution, or the change in living things through time, explains inherited similarities as well as the diversity of life.

Structure and Function

Structures evolve in ways that make particular functions possible, allowing organisms to adapt to a wide range of environments.

Homeostasis

An organism's ability to maintain a relatively stable internal environment in the face of changing external conditions is vital to its survival.

Science, Technology, and Society

Science seeks to provide useful information, but only a public that truly understands science and how it works can determine how that information should be applied.

Branches of Biology

There are many branches of biology. For example:

- Zoologists study animals.
- Botanists study plants.
- Paleontologists study ancient life.

Some of the levels at which life can be studied include:

- molecules
- cells
- organisms
- populations of a single kind of organism
- communities of different organisms in an area
- the biosphere

Biosphere

The part of Earth that contains all ecosystems



Ecosystem

Community and its nonliving surroundings



Hawk, snake, bison, prairie dog, grass, stream, rocks, air

Community

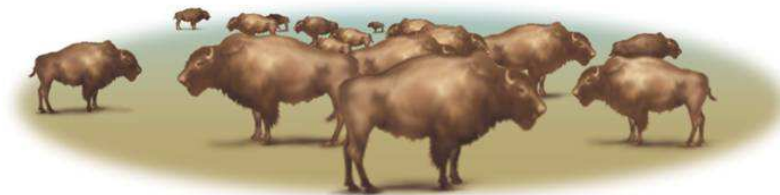
Populations that live together in a defined area



Hawk, snake, bison, prairie dog, grass

Population

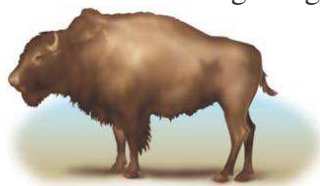
Group of organisms of one type that live in the same area



Bison herd

Organism

Individual living thing



Bison

Groups of Cells

Tissues, organs, and organ systems



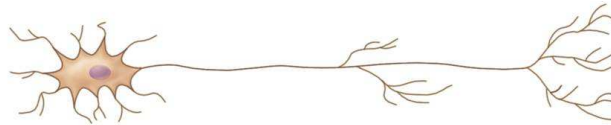
Nervous tissue

Brain

Nervous system

Cells

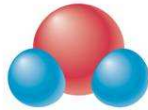
Smallest functional unit of life



Nerve cell

Molecules

Groups of atoms; smallest unit of most chemical compounds



Water



DNA

At all these levels, smaller living systems are found within larger systems.

Biology in Everyday Life

More than any other area of study, biology touches your life every day.

Biology provides information about the food you need and the methods for sustaining the world's food supplies.

Biology describes the conditions of good health and the behaviors and diseases that can harm you.

Biology is used to diagnose and treat medical problems.

Biology identifies environmental factors that might threaten you.

Biology helps you understand what effects the quality of your life.

Biology provides decision makers with useful information and analytical skills needed to predict and effect the future of the planet.