

# Introduction to Biology

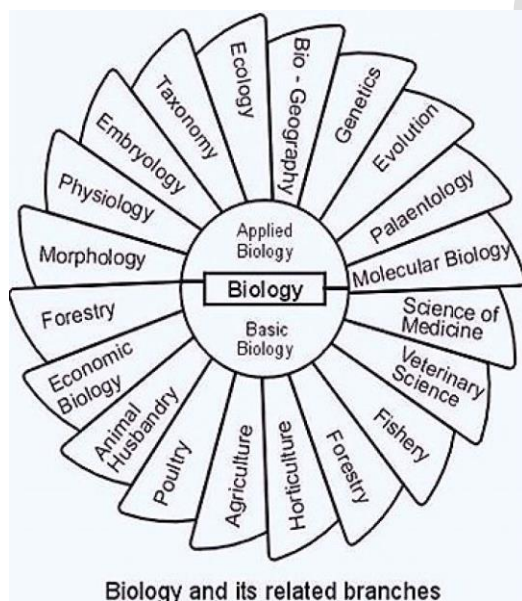
## Table of Contents

What is Biology?  
Branches of Biology  
Properties of Life

## What is Biology?

- The term biology is derived from two Greek words, "*bios*" means life and "*logia*" means discourse or study. In simple terms, biology is the study of living organisms and their interactions with one another and their environments.
- It encompasses the cellular basis of living things, the energy metabolism that underlies the activities of life, and the genetic basis for inheritance in organisms. Biology also includes the study of evolutionary relationships among organisms and the diversity of life on Earth.

## Branches of Biology



- Many sub disciplines and special areas of biology exist, which can be conveniently divided into practical and theoretical categories.
- Types of practical biology include plant breeding, wildlife management, medical science, and crop production.
- Theoretical biology encompasses such disciplines as physiology (the study of the function of living things), biochemistry (the study of the chemistry of organisms), taxonomy (classification), ecology (the study of populations and their interactions with each other and their environments), and microbiology (the study of microscopic organisms).

## **Biology is the science that studies life, but what exactly is life?**

From its earliest beginnings, biology has continuously searching three questions: **What are the shared properties that make something “alive”?** And once we know something is alive, **how do we find meaningful levels of organization in its structure?** And, finally, when faced with the remarkable diversity of life, **how do we organize the different kinds of organisms so that we can better understand them?** As new organisms are discovered every day, biologists continue to seek answers to these and other questions.

### **Properties of Life**

All living organisms share several key characteristics or functions: **order, sensitivity or response to the environment, reproduction, growth and development, regulation, homeostasis, energy processing and evolutionary adaptation.** When viewed together, these seven characteristics serve to define life.

#### **1. Order**

Organisms are highly organized, coordinated structures that consist of one or more cells. Even very simple, single-celled organisms are remarkably complex: inside each cell, atoms make up molecules; these in turn make up cell organelles and other cellular inclusions. In multicellular organisms, similar cells form tissues. Tissues, in turn, collaborate to create organs (body structures with a distinct function). Then, organs work together to form organ systems.



#### **2. Sensitivity or Response to Stimuli**

Organisms respond to diverse stimuli. For example, plants can grow toward a source of light, climb on fences and walls. Even tiny bacteria can move toward or away from chemicals (a process called chemotaxis) or light (phototaxis). Movement toward a stimulus is considered a positive response, while movement away from a stimulus is considered a negative response.



### 3. Reproduction

Single-celled organisms reproduce by first duplicating their DNA, and then dividing it equally as the cell prepares to divide to form two new cells. Multicellular organisms often produce specialized reproductive germline cells that will form new individuals. When reproduction occurs, genes containing DNA are passed along to an organism's offspring. These genes ensure that the offspring will belong to the same species and will have similar characteristics, such as size and shape.

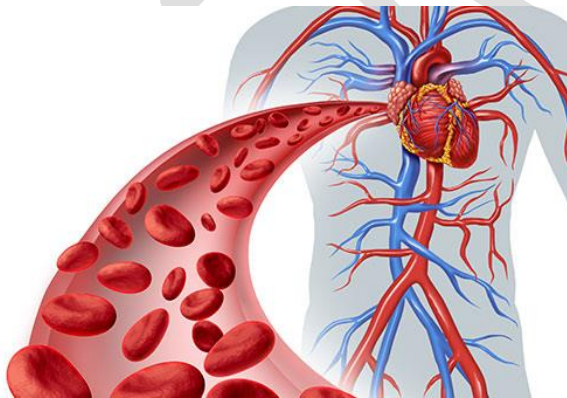


### 4. Growth and Development

All organisms grow and develop following specific instructions coded for by their genes. These genes provide instructions that will direct cellular growth and development, ensuring that a species' young will grow up to exhibit many of the same characteristics as its parents.



### 5. Regulation

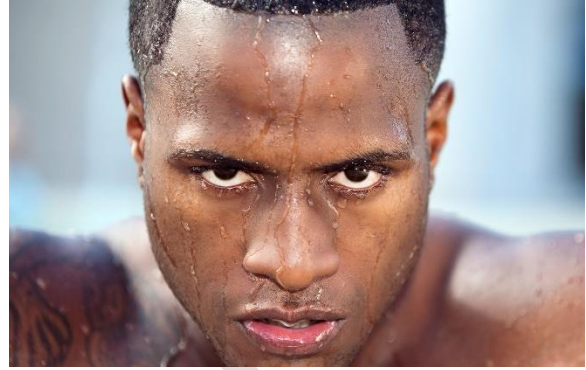


Even the smallest organisms are complex and require multiple regulatory mechanisms to coordinate internal functions, respond to stimuli, and cope with environmental stresses. For example, carrying oxygen throughout the body, removing wastes, delivering nutrients to every cell, and cooling the body are regulated through blood flow in our body.

### 6. Homeostasis

In order to function properly, cells need to have appropriate conditions such as proper temperature, pH, and appropriate concentration of diverse chemicals. These conditions may,

however, change from one moment to the next. Organisms are able to maintain internal conditions within a narrow range almost constantly, despite environmental changes, through homeostasis (literally, “steady state”)—the ability of an organism to maintain constant internal conditions. For example, an organism needs to regulate body temperature through a process known as thermoregulation. Sweating causes the body temperature to lower down.



## 7. Energy Processing

All organisms use a source of energy for their metabolic activities. Some organisms capture energy from the sun and convert it into chemical energy in food; others use chemical energy in molecules they take in as food.



## 8. Evolutionary adaptation



It is the process that species go through in order to become accustomed to an environment. Over many generations, through the process of natural selection, organisms' physical and behavioral features adapt to function better in the face of environmental challenges.

*Somanath Sahoo*