

# WHAT IS BIOLOGY

Biology (bios [life] + logy) is:

- the science of life or living matter in all its forms and phenomena, especially with reference to origin, growth, reproduction, structure and behaviour.
- a science that deals with things that are alive (such as plants and animals)
- Biology is the study of life and living organisms, from one-celled creatures to the most complex living organism of all — the human being. *Biology* includes the study of genes and cells that give living things their special characteristics



In more detail:

“Biology is a science that examines the evolutionary history of living beings, their structures - from one-celled creatures to the most complex living organism - their life-sustaining activities, their behaviors, relationships and interactions both with each other and also with the environment and also their capabilities”.



# BRANCHES OF BIOLOGY

Living beings are divided into two big groups as Plant Kingdom (Regnum Vegetabile) and Animal Kingdom (Regnum Animale). The branch of science examining the Animal Kingdom is called **Zoology** and the branch of science examining the Plant Kingdom is called **Phytology** (Botany).



These two important and big branches of biology are divided into sub-branches to examine the plants and animals in respect to morphology, anatomy, cytology, histology, embryology, ecology, genetics, physiology and systematics. **Common** sub-branches of **Botany** and **Zoology** are as follows:



1. **Morphology (morph [form] + logy)**: Examines the living beings in respect to their structures. It also has some sub-branches:

a) **Cytology (cyto [cell] + logy)**: The science dealing with cells.

Examines the microscopic structures of cells.

b) **Histology (histo [tissue] + ology)**: The science dealing with tissues.

Examines the microscopic structures of tissues.

c) **Anatomy (ana [up] + tome [to cut])**: Macroscopically examines the visible internal and external properties of an organism.



d) **Organography:** The science dealing with organs. Examines the structure of the organs of living beings.

e) **Embryology (embryo + logy):** Examines the embryological developments starting from the formation of a zygote to the formation of an independent living being.



2. **Physiology (physio [nature] 4 logy):** It is the science of the normal function of living things. Examines the activities of vitality and functions of the organs and organ systems.

For example:

- *Metabolism (nutritional) physiology*
- *Growth physiology*
- *Physiology of motion etc.*



- 3. Molecular Biology:** Examines the structure of genes (structures containing the genetic materials) and the biological events occurring under the control of the genes (e.g. metabolic events such as protein synthesis, hormone synthesis etc.) at the molecular level.
- 4. Genetics:** Examines inheritance of genetic characters from generation to generation, the fundamentals of genetics and genetic disorders.





**5. Evolution:** Examines the changes and the origins of these changes that living being has gone through from their simplest form to their current status as individuals and as population.

**6. Systematics (Taxonomy (taxis [arrangement] + nomia [method]):** Deals with the classification of living beings.



7. **Pathology** (patho [suffering - disease] + logy): Examines the diseases and abnormal structures of the organism.
8. **Microbiology** (micro [small] + logy): Examines microscopic living beings like viruses, rickettsia, bacteria and protozoa.
9. **Ecology** (oikos [house] + logy): Examines the relationships of living beings with the environment that they live in.
10. **Sociology** (social + logy): Examines the social lives of living beings.



**11. Paleontology (Archeobiology):** The science of fossils. Examines the living beings that had lived in the geological periods and became extinct with the help of their remnants (fossils).

**12. Teratobiology (Teratology):** Morphologically examines a living being that has formed with a genetic defect; it also examines the reasons of the formation of this defect and the methods of prevention.



**Immunobiology (Immunological Biology):** Examines the ability of an organism to recognize the causes of diseases and to resist them, it also deals with the prevention of the disease.



- **Plant:** Autotrophic living beings made up of one or more cells. They have a cellulosic cell wall.
- **Animal:** They are living beings made up of one or more cells just like plants, however they are heterotrophic organisms. They move actively. Their cells are only surrounded with a cytoplasmic membrane, they lack the cellulosic membrane called cell wall.
- **Species:** A group of living beings that are biologically and morphologically similar to each other, producing fertile offspring when they mate with each other and can pass their genetic characters from generation to generation.

It is also the basic unit in taxonomy.



## COMMON AND TYPICAL CHARACTERS OF LIVING BEINGS

Living beings can be differentiated from non-living beings with the following properties:



**1. Individualism:** All living beings have specific shapes that never change. E.g. when we think about a human, a cat, a bird, a tulip etc., the image (shape) that we conjure up in our minds are distinct and specific.

**2. Structural properties:** Though external appearances of living beings vary from each other, they are similar to each other in respect to their internal structures.

For example:

- All living beings are made up of cells.
- In general, a vital fluid called cytoplasm and a nucleus is present in every cell.
- All living cells are made up of carbohydrates, proteins, lipids, nucleic acids, enzymes and vitamins.



3. **Physiological properties:** Physiological events taking place in living beings are also similar to each other.

- **Anabolism:** Substances taken from outside and assimilated are converted to the substances that are found within the structure of the living beings like carbohydrates, lipids and proteins that have high molecular weights and energies when burned.
- **Catabolism:** Big molecules found in the body (foodstuff) are burned with oxygen and disintegrated into smaller molecules. Vital tasks are performed during this process with the help of the arising energy.





**4. Growth:** Living beings have the ability to grow from the inside. Addition of new tissues to the existing ones can only be accomplished with internal growth. However non-living beings do not grow from the inside, however their sizes might increase due to bulking of additional materials on them.

**5. Irritation:** It is the ability of a living being to react to an internal or external influence. For example: Staying away from danger, the need to eat something when we are hungry, a plant's turning to a light source. If living beings had lacked this ability, then they would have a less of survival.



6. **Reproduction and genetics:** All living beings that have grown to a certain in its life have the ability to produce another similar living being that. This is accomplished by some cells or gonads. Offsprings inherit various characteristics of their parents.
7. **Adaptation:** All living beings adapt to their environments.
8. **Death (Ex):** Living beings that lose the aforementioned characteristics die eventually.

