Biology

It is the science which deals with the study of living beings and their life processes. The term biology was coined by Lamarck and Treviranus (1802). Literally, it contains two Greek words, *bios* and *logos* where bios means life and logos means study. It covers all aspects of study of living beings like occurrence, classification, external form, internal structure, organization, economic importance etc.

The first scientific studies in biology were carried by Aristotle (384–322 BC). Hence, he is known as 'Father of Biology'.

The science biology is divided into three different headings.

1) **Zoology:** The branch of biology which deals with the study of different aspects of animals. Literally, it is derived by Greek words *zoon* and *logos* where zoon means animal and logos means study.
   The first studies of zoology were undertaken by Aristotle. Hence, he is known as 'Father of Zoology' also.
2) **Botany:** The branch of biology which deals with the study of different aspects of plants. Literally, it is derived by Greek word *botane* which means plants.
   The first studies of botany were undertaken by Theophrastus (370–287 BC). Hence, he is known as 'Father of Botany'.
3) **Microbiology:** The branch of biology which deals with the study of different aspects of micro-organisms. Literally, it is derived by Greek words *micros*, *bios* and *logos* where micros means small, bios means life and logos means study.
   The first studies of microbiology were undertaken by Louis Pasteur (1822–1895). Hence, he is known as 'Father of Microbiology'.

Objectives of Botany

1) To know about plant diversity
2) To understand the uses of plant diversity
3) To know about environmental conservation and restoration
4) To understand advance medicine and pharmaceuticals
5) To promote plantation program
6) To enhance educational and recreational experiences

Scope of Botany

The scope of botany is innumerable. It provides the knowledge of medicine, museum work, research work, agriculture, environmental science and conservation.

1) In the field of health and disease: Different types of bacteria and fungi are responsible for causing many diseases. Not only this, some animals act as vectors

for different disease. The control and cure of these diseases are studied by economic biologists.

2) In the field of agriculture: Agriculture is a part of biology. Various types of living organisms are closely associated in a particular environment, eg: Insects pollinate the flowers; bacteria decompose the dead animals and plants to increase the nutritive substances in soil. These are important facts for agricultural science.

3) In the field of Industry: One of the important uses of living beings is as food. Few species belonging to different genus are used in terms of food. Among them, some are cereals, some are grains, some are vegetable, some are spices etc.

4) In the field of scientific research: The living organisms are also used in scientific research. It provides the information about ancestors and descendants. Not only this, it also provides the information about time and region where they found.

Importance of Plants

Plants are very important in the life of living organisms. Without plants the life is almost impossible on the earth. Some of the importances of plant are as follows.

1) It is used as food. The foods are in the form of cereals, pulses, vegetables, fruits, oils etc.
2) It is used as fuel.
3) Some parts of plant are used as medicine.
4) It helps in environmental conservation.
5) It provides timber.
6) It is used as fodder for animals.
7) It is used as ornamental purposes.
8) It is used in textile industries for making different items.

Differences between living and non-living things

Living beings	Non-living things
1. They have definite shapes, size and internal organization.	1. They donot have definite shapes, size and internal organization.
2. They having life in them.	2. They donot have life in them.
3. They are made up of cells.	3. They are made up of chemicals.
4. They show different metabolic activities.	4. They donot show any metabolic activities.
5. They show movement.	5. They donot show any movement.
6. They repair their injured parts.	6. They cannot repair.
7. They depend upon environment for their survival.	7. They donot depend upon environment.
8. They have limited duration of life.	8. They have unlimited duration.

Branches of Botany

1) Morphology: The study of external form, size, shape, colour, structure of living beings.
2) Anatomy: The study of internal structure of living organism by section cutting method.
3) Cytology: The study of cell and cellular content of the living organism.
4) Molecular biology: The branch of biology connected with the study of nature, physio-chemical organization, working and interaction of bio-molecules.
5) Taxonomy: The science which deals about identification, classification, nomenclature and description of living organism.
6) Physiology: The study of different types of body functions and processes.
7) Embryology: The study of fertilization, growth, division and differentiation of the zygote into embryo of living beings.
8) Ecology: The study of living organism in relation to other organisms and their environment.
9) Genetics: The study of inheritance of characters or heredity and variation.
10) Evolution: The gradual, continuous and irreversible process of change and development of simple and primitive things to the complex and organized things.
11) Palaeontology: It deals with the study of fossils or remains and impressions of past organisms present in the rocks of different ages.

Relation to other science

Botany cannot be studied without the knowledge of physical sciences.

1) Relation with Chemistry:

i) All living organisms are made up of organic and inorganic chemicals. The cell is made up of protein and different essential chemicals. Inside the cell, there are present different organelles made by different chemicals.

ii) All living organisms require energy to run their life. For this, living organism must respire due to which digested food materials are burn in presence of oxygen to release energy. This energy is stored in mitochondria in the form of ATP (Adenosine Tri Phosphate).

iii) All living organism shows different metabolic activities. Metabolism involves chemical changes, synthesis, degradation and transformation of bio-molecules. These bio-molecules either combine or dissociate to show different metabolism.

iv) All living organism contain either DNA or RNA as genetic materials. These DNA and RNA are made up of different chemicals that inherit parental characters to offspring.
v) All living organism can produce different enzymes, hormones during their metabolism. These enzyme and hormone perform different specific activities in specific organ of organism which are again made up of different chemicals.

2) Relation with Physics:

i) The arrangement of exoskeleton is on the basis of physical principle. Not only this, the contraction and relaxation of muscle are also physical process.
ii) Photosynthesis, photomorphogenesis, phototropic is also physical process where plant response to the light.
iii) Different process such as diffusion, osmosis is also the physical process.
iv) Some physiological processes like evaporation, transpiration, conduction of water and minerals are dependent upon physical phenomena.
v) The physical phenomenon force, cohesion, surface tension, energy have the important biological application.

3) Relation with Mathematics:

i) The movement of molecules in and out of cells are calculated by mathematics. Not only this, the breaking down of drugs in the body and other physiological processes studied by it.
ii) Study of geometry, topology (changing the object) and other physiological characters of DNA, protein and other cellular structures have shed light on their functions.
iii) Maths helps to design the experiments including clinical trials. All medicines are totally dependent on mathematical phenomena.
iv) It help to formulate that can predict or describe natural occurrence of any organism at any particular place.
v) We can calculate the frequency of spreading any disease.

4) Relation with Statistics:

i) We can correlate the organisms with each other.
ii) We can determine the mean, median, mode of any organisms.
iii) It describes the interactions, relationship and processes in living system.

5) Relation with Geography:

i) Living organisms are directly influence with geographic factors. Various different types of organisms are found in different geographic regions.