



**General  
Biology(Zoology)  
First Stage – Biology Depart  
Lecture: 1 –Introduction to Biology**

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**Biology - The Life Science**

The word Biology means, "The science of life", from the Greek **bios**, life, and **logos**, knowledge. Therefore, Biology is the science of living things.

The life science has been divided into many sub disciplines, such as botany, bacteriology, anatomy, zoology, histology, mycology, embryology, parasitology, genetics, molecular biology, systematics, immunology, microbiology, physiology, cell biology, cytology, ecology and virology.

**Biology:** Is the study of living things.

**Microbiology:** Is the study of microscopic organisms.

**Bacteriology:** The study of bacteria.

**Virology:** The study of viruses.

**Mycology:** The study of fungi.

**Parasitology:** The study of parasite and parasitism.

**Ecology:** is the study of relationships between organisms and their relationships with their environment.

**Taxonomy:** The classification of living things.

**Entomology:** The study of insects.

### **1.1 Introduction**

Classification is a continually evolving scientific effort to group organisms based on knowledge gathered from different fields, and helps to define the relationships among organisms and between organisms and their environments.

The concepts of classification have been started since 4<sup>th</sup> century initiated by the Greek philosopher ARISTOTLE (384-322 BC) who was often called the “father of biological classification”. He first divided organisms into 2 groups - plants and animals. Subsequently, he divided animals into blood and bloodless category and further divided into 3 groups according to how they moved walking, flying, or swimming (land, air, or water). Next, an English naturalist John RAY (1627-1705) used anatomical differences as the prime criterion for classification, bringing out both the resemblances and differences between groups - for example, lung breathing or gill breathing. This is still a preferred method for



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identification of organisms.

Since then, the classification of organisms kept on progressing and the first individual to propose an orderly system for classifying the variety of organisms found on the planet was Swedish scientist Carolus LINNAEUS (1707-1778) in the 18<sup>th</sup> century. In his system of classification, the finest unit in the organization of life is the “species”. He classified plants and animals according to similarities in form and placed the living things into one of two "kingdoms" – i.e. plant kingdom and animal kingdom. He then divided each of the kingdoms into smaller groups called "genera" (singular = genus) and further divided each genera into smaller groups called "species". He also designed a system of naming organisms called binomial ("two names") nomenclature ("system of naming") which gave each organism two names - **genus** (plural = genera) and **species** (plural = species) names. The genus and species names would be similar to your first and last names. Genus is always capitalized while species is never capitalized. To be written correctly, the scientific name must be either underlined or written in *italics*. His classification system is still used today; however, we use a 5 kingdom system (instead of 2 kingdom system). Therefore, modern system of classification of organisms will be studied in details below.

### **1.2 What is biological classification?**

Biological classification is the process by which scientists group living organisms. It can be defined as a process of giving hierarchy of categories by scientific procedure

based on features of organisms and arranging them into different groups. Organisms are classified based on how similar they are. Historically, similarities were determined by examining the physical characteristics of an organism. However, modern classification uses a wide variety of techniques including genetic analysis.

Therefore, biological organisms are classified according to a system of seven ranks below:

1. Kingdom
2. Phylum Class Order Family Genus Species For example, human



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and mango would be classified in the following way:

- |                                 |                                |
|---------------------------------|--------------------------------|
| 1. Kingdom: Animalia            | 1. Kingdom: Plantae            |
| 2. Phylum: Chordata             | 2. Phylum: Magnoliophyta       |
| 3. Class: Mammalia              | OR     3. Class: Mangoliopsida |
| 4. Order: Primata               | 4. Order: Sapindales           |
| 5. Family: Hominidae            | 5. Family: Anacardiaceae       |
| 6. Genus: <i>Homo</i>           | 6. Genus: <i>Mangifera</i>     |
| 7. Species: <i>Homo sapiens</i> | 7. Species: <i>M. indica</i>   |

Note that species names are always written including the Genus in either full or abbreviated, for example, *Homo sapiens* or *H. sapiens* respectively.

Classification has been begun by ancient people that observed nature and had a desire to organise the knowledge gained.

One and half million types of organism have been discovered on this planet and it has been estimated that there may be 10-100 million kinds of organisms. There classification helps us understand the things under the complexity of biological diversity.

### **1.3 Types of biological classification**

There are basically three types of Biological Classification which can be categorized as artificial, natural and phylogenetic.

#### **1.3.1 Artificial Classification**

Artificial Classification uses form, shape as prominent features for grouping organisms. Animals were also classified on basis of red blood cells, habitat such as land, water or air. They were also classified on their basis to fly or not to fly. This system is relatively easy to follow. However, artificial System of Classification has many disadvantages. It relies just on form and shape of organisms and does not take into account other features. So it is difficult to understand the evolution of organism. It leads to misunderstanding of any relationship among organisms. The different types of organisms are arranged in same groups like birds, insects, bats they fly and they are grouped in same



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criteria. The form and shape of organism is not permanent and it changes with time. For Example, some plants keep on changing their shape in different seasons.

### 1.3.2 Natural System of Classification

It takes into account multiple features such as anatomy, physiology, pathology, biochemistry, reproduction & cytology to compare the organisms and establish a relationship between them. It overshadows all the disadvantages of artificial system of classification. It helps to understand the evolution of organism by knowing the relationship between them.

The features undertaken in this classification are constant. In this bird, reptiles and mammals are placed in the different groups based on the multiple features as discussed above. For example humans have 4 chambered hearts, warm blooded nature and de nucleated erythrocytes. Fishes have 2 chambered hearts, cold blooded and respire through gills.

### 1.3.3 Phylogenetic System of Classification

It is defined as a relationship based on the evolutionary aspect of organisms. It is based on Darwin's Concept of Natural Selection. It tells us about the original relationship among organisms. The foremost phylogenetic system of classification was given by Engler & Prantl. They divide the plants into primitive and modern types.

Phlogenetic System relies on fossil records and is not static. It never fulfills as there is difficulty in recording fossils, tracking and keeping record of them as new fossils start appearing. Zoologists and Botanists have entirely different or conflicting view about phylogenetic system of classification. Zoologists rely on structural aspect of organism to link with evolutionary aspect. Botanists do not rely on structural aspect to link with evolutionary aspect.

## **1.4 Characteristics/salient features of animal kingdom**

Though there is great diversity in the animal kingdom, animals can be distinguished from the other kingdoms by a set of characteristics. Though other types of life may share some of these characteristics, the set of characteristics as



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a whole provide a

distinction from the other kingdoms. The set of characteristics provided by Audesirk and Audesirk are:

- 1.5.1 Animals are multicellular - they have multiple cells with mitochondria
- 1.5.2 Animals are heterotrophic, obtaining their energy by consuming energy-releasing food substances thus rely on other organisms for their nourishment
- 1.5.3 Animals typically reproduce sexually - develop from **embryos** (small masses of unspecialized cells)
- 1.5.4 Animals are made up of cells that do not have cell walls
- 1.5.5 Animals are capable of motion in some stage of their lives
- 1.5.6 Animals are able to respond quickly to external stimuli as a result of nerve cells, muscle or contractile tissue, or both.

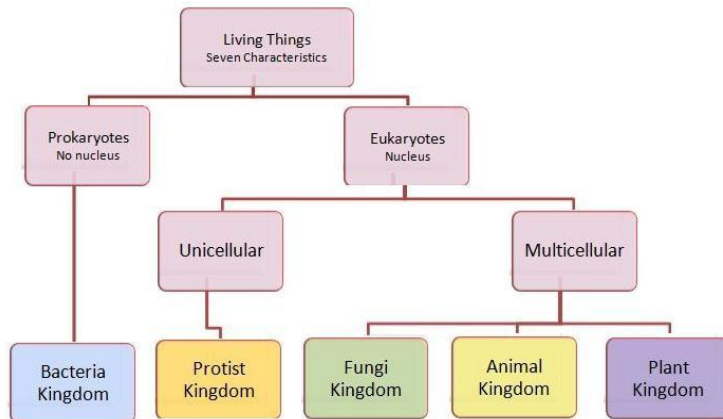
### **1.5 The Five Kingdom System of classification**

Biologist today have classified and divided all living things into five groups they call Kingdoms. These include Kingdom Monera, Kingdom Fungi, Kingdom Protista, Kingdom Plantae, Kingdom Animalia. These Kingdoms are classified based on how living things are the same and how they are different from each other. Therefore, the Kingdom is the topmost of the main divisions/ranks used in biological classification of organisms.

However, it is important to note that biologists are still learning about our world, and are making new discoveries every single day. As our knowledge about the world around us improves, scientists might find a better way to organize and classify life. As a result, these five kingdoms may someday be changed. Therefore, increasingly, the view is to split the Prokaryota into Archaea and Bacteria making six kingdoms. Nevertheless, the most widely accepted system today is the one that established in 1969 by Whittaker, distinguishes between five major Kingdoms of living things as indicated in Fig. 1.1.



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**Figure 1.1** Chart indicating a blending of the classic five-kingdom system

## 1.6.Kingdom Animalia (Animals)

Like many other life forms, animals are multi-cellular. These cells come together, forming tissues, organs and organ systems that help sustain the life of the animal. From elephants to snails, animals come in many shapes and sizes, and can be found all over the world

Animals cannot make their own food. They must rely on other living things, such as plants, fungi, and other animals to sustain them. Without other food sources, animals could not survive.

There are more species of animals than in all the other kingdoms combined. From worms, to blue whales, to bald eagles, animals have evolved to fit a wide variety of niches.