Contents

1 Classification of Living Organisms

Learning Objectives

- Classification and its advantages
- Systems of classification
- Classification of living organisms
- Salient features of each kingdom – Monera, Protista, Fungi, Plantae, Animalia
- General plan of classification
- Naming of organisms and binomial nomenclature

There are millions of organisms around us. They show such a great diversity that it is impossible to know about them or to study about all of them. If we arrange them in groups on the basis of some common features, it will make their study much easier. For example, we go to the library to look for a book. If all the books are placed haphazardly on the racks, it becomes difficult to locate one particular book. However, if books are arranged in a systematic order, locating the book is much easier. The grouping of things on the basis of certain common characteristics is called **classification**. Similarly different kinds of organisms could be classified on the basis of their similarities and dissimilarities. The branch of biology concerned with classification is called **taxonomy**.

Fig. 1.1: Library

ADVANTAGES OF CLASSIFICATION

- It helps us to identify different organisms and place them in particular groups.
- It helps us to study the organisms more easily and systematically.
- It highlights the relationship between different organisms.
- The characteristics of all the members of a group can be studied by studying the characteristics of a few members only.
- Classification also helps in studying the process of evolution from simple to complex organisms.

SYSTEMS OF CLASSIFICATION

There are two systems of classification.

1. Artificial system
2. Natural system

Artificial System

The system of classification based on comparison of one or a few characteristics of a group is called an **artificial system of classification**. It conveys little information. By this classification, different organisms could be grouped together. For example, the mango plant and the pine plant are trees on the basis of their size. However, they show a large number of different features. Similarly for animals, grouping based on presence or absence of wings can only indicate whether an animal can fly or not. It cannot differentiate birds, insects and bats.

Natural System

The system of classification based on comparison of many characteristics of a group is called a **natural system of classification**. It conveys much information about the group. It takes into account many characters such as external structure, internal structure, growth, development, reproduction, life processes, etc. Modern biologists compare structures even at the molecular level. The comparative structures of proteins, DNA and RNA are used to establish relationship of organisms.

CLASSIFICATION OF LIVING ORGANISMS

We know that living organisms are enormous in number and differ greatly in their characters. The main differences in characters include size and shape, structure, metabolism and life cycle. So, for better understanding living organisms have been classified into different groups by different scientists. In this series, one of the earliest scheme of natural system of classification was the two kingdom system proposed by Carolus Linnaeus in 1758. He is therefore known as the 'Father of Classification'.

The Two Kingdom System

Carolus Linnaeus divided all living organisms into two kingdoms:

1. Plantae – The kingdom of plants
2. Animalia – The kingdom of animals

This system of classification got considerable recognition from biologists and remained in use for quite a long period of time. However, as more and more information started emerging on the various groups of plants and animals, the two kingdom system was found to be inadequate. It was criticized as it failed to correctly classify organisms like *Euglena* which possess characters of animal and chlorophyll also. Similarly, fungi and moulds which were placed in Kingdom Plantae possess many characters not common to plants.

To overcome all these difficulties and to come up with a better system of classification that makes the study of living organisms simple and easy, R. H. Whittaker proposed a five kingdom system of classification in 1969.

The Five Kingdom System

Whittaker arranged all organisms into five kingdoms. The classification was based on three criteria.

1. Cell structure of the organism
2. Body structure of the organism
3. Mode of nutrition of the organism

The five kingdoms are:

1. Monera
2. Protista
3. Fungi
4. Plantae
5. Animalia

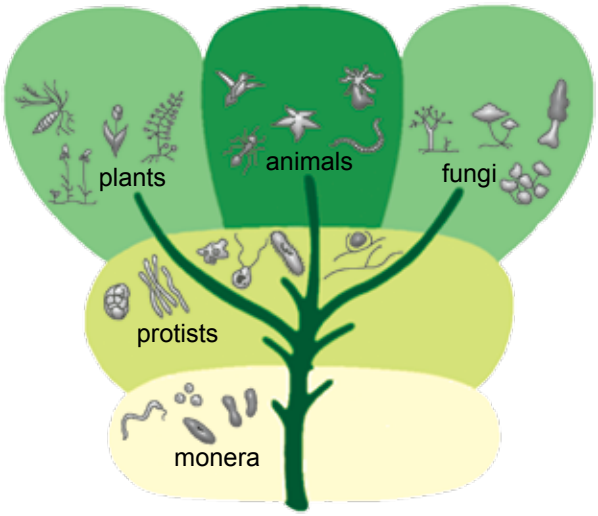


Fig. 1.2: The five kingdom system of classification

Monera

This kingdom includes all prokaryotic organisms whose cells do not contain a well-defined nucleus. The nuclear material (DNA) is present in the cell without being enclosed in the nuclear membrane. Common examples are bacteria and blue-green algae. Their features are enlisted.

- Their cells are microscopic.
- They do not have cell organelles.
- They have a rigid cell wall.

Fig. 1.3: Bacteria

Protista

This kingdom includes both unicellular plants (e.g. *Chlamydomonas*) and animals (e.g. *Euglena*, *Amoeba* and *Paramecium*). They show the following characteristics:

- They are unicellular microorganisms.
- They are eukaryotic, i.e., they have a well-defined nucleus with a nuclear membrane.
- They have all the cell organelles.

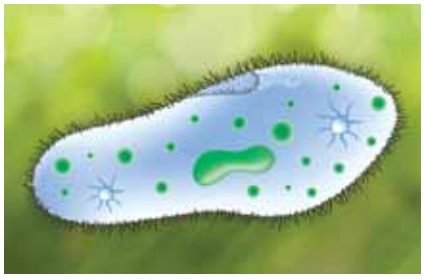


Fig. 1.4: *Paramecium*

Fungi

The common examples of this kingdom are moulds and mushrooms. Fungi have the following features:

- They are mostly multicellular and eukaryotic organisms.
- They are heterotrophs, hence cannot make their own food.
- Most of them are made of thread-like hyphae rather than cells and contain many nuclei in the cytoplasm.

Fig. 1.5: Mushrooms

Plantae

This group includes red, brown and green algae, bryophytes, pteridophytes, gymnosperms and angiosperms. Their main features are:

- They are multicellular and eukaryotic plants.
- They have chlorophyll.
- They are autotrophs, hence can make their own food.

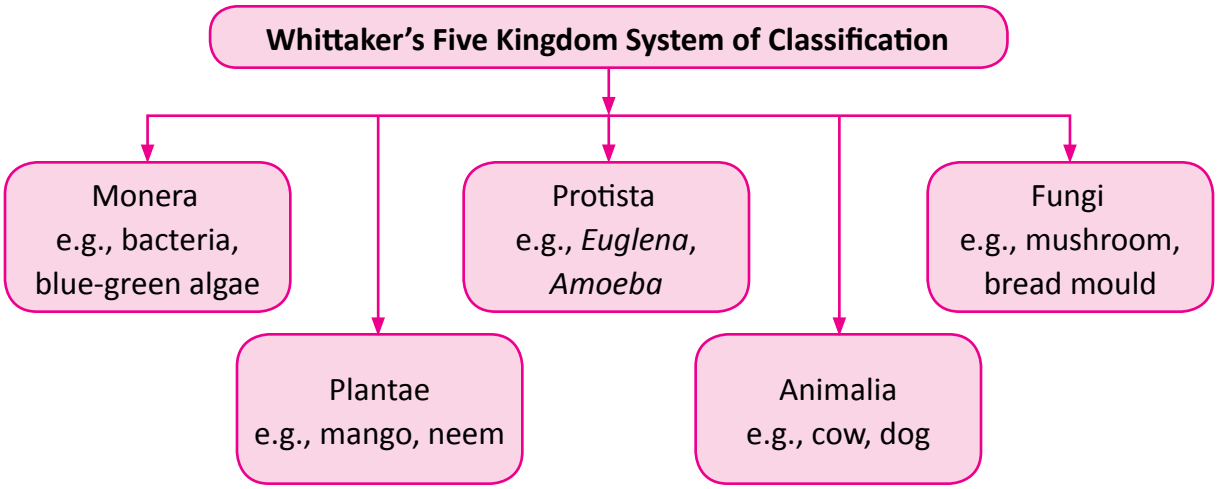
Fig. 1.6: Apple tree

Animalia

This kingdom includes all multicellular animals including human beings. All vertebrates and invertebrates belong to this group. The distinguishing characteristics of members of this kingdom are:

- Their cells are without cell wall and chlorophyll.
- They are heterotrophs, hence cannot make their own food.

Fig. 1.7: Bear



Test Yourself

Fill in the blanks.

1. Grouping of things on the basis of certain common characteristics is called _____.
2. Classification helps to study the organisms in a _____ way.
3. _____ arranged all organisms into five kingdoms.
4. _____ and _____ belong to the Kingdom Monera.
5. Fungi are made up of thread-like structures called _____.

GENERAL PLAN OF CLASSIFICATION

All classifications involve systematic grouping of basic units.

- The basic unit of biological classification is species.
- A species refers to a group of organisms that closely resemble each other and can reproduce among themselves.
- Similar species are grouped into a genus.
- Similar genera (plural of genus) are grouped into a family.
- Similar families are grouped into an order.
- Similar orders are grouped into a class.
- Similar classes are grouped into a phylum (Botanists use the term division instead of phylum).
- Similar phyla constitute a kingdom, the highest unit.

Species
Genus
Family
Order
Class
Phylum
Kingdom

Phyla
Plural of phylum

NAMING OF ORGANISMS

Naming an organism is an important aspect of classification. It helps in identifying the organism and differentiating it from other individuals. However, the common name of a species is different in different parts of the world. For example, *pyaz* in Hindi is onion in English, vengayam in Tamil and irulli in Kannada. These different names can cause confusion and cannot be used for scientific studies all over the world. To avoid this confusion, Carolus Linnaeus, gave the current scientific system of naming. This system is called **binomial nomenclature**. Carolus Linnaeus is considered as the Father of Taxonomy.


Carolus Linnaeus

Binomial Nomenclature

Naming an organism is called **nomenclature**. In binomial nomenclature, the name of an organism is composed of two words in Latin. The first word is the name of the genus and is called the **generic name**. The second word refers to the name of the species and is called the **specific name**. The first letter of the generic name is always written in capital letters whereas the first letter of the specific name is written in small letters. The scientific names are italicized in printing and underlined while writing. The scientific names of a few plants and animals are as follows:

- Wheat – *Triticum aestivum*
- Pea – *Pisum sativum*
- Banana – *Musa paradisiaca*
- Cucumber – *Cucumis sativus*
- Tiger – *Panthera tigris*
- Dog – *Canis familiaris*
- Rice – *Oryza sativa*
- Mango – *Mangifera indica*
- Melon – *Cucumis melo*
- Frog – *Rana tigrina*
- Human – *Homo sapiens*

Test Yourself

Fill in the blanks.

1. Carolus Linnaeus is considered as the father of _____.
2. The scientific name of human beings is _____ _____.

QUICK REVIEW

1. Grouping of things on the basis of certain common characteristics is called classification.
2. There are two systems of classification – the artificial system and the natural system.
3. Carolus Linnaeus divided all organisms into two kingdoms – Plantae and Animalia.
4. Whittaker arranged all living organisms into five kingdoms – Monera, Protista, Fungi, Plantae and Animalia.
5. Kingdom Monera includes microscopic, unicellular and prokaryotic organisms.
6. Kingdom Protista includes unicellular and eukaryotic organisms.
7. Kingdom Fungi includes multicellular, eukaryotic and heterotrophic (non-green) plants.
8. Kingdom Plantae includes multicellular, eukaryotic and autotrophic (green) plants.
9. Kingdom Animalia includes multicellular, eukaryotic and heterotrophic animals.
10. Species is the smallest unit and kingdom is the largest unit of classification.
11. The chronological order of various units is – species-genus-family-order-class-phylum-kingdom.
12. Naming an organism is an important aspect of classification.
13. In binomial nomenclature, the name of an organism consists of two Latin words, the first word is the name of the genus and the second word is the species name.
14. Carolus Linnaeus is considered as the Father of Taxonomy.

EXERCISES

A. Answer in detail.

1. Why should organisms be classified?
2. What is the new system of classification? Write salient features of each kingdom.
3. What is the general plan of classification?
4. What is the advantage of giving scientific names to the organisms?
5. What is binomial nomenclature? Give a few examples.

B. Write short answers.

1. What is a species?

2. Define classification.
3. Why are fungi not included in the Kingdom Plantae?

C. Fill in the blanks.

1. The organisms belonging to Kingdom _____ are autotrophic.
2. Similar families are grouped together _____.
3. Organisms which are closely related and can reproduce among themselves form the _____.
4. Similar genera are grouped together into a _____.
5. Kingdom _____ consists of unicellular and eukaryotic organisms.
6. Giving two names to an organism is called _____ _____.

D. Differentiate between the following.

1. Artificial system and natural system of classification
2. Kingdom Monera and Kingdom Protista
3. Kingdom Plantae and Kingdom Animalia
4. Prokaryotes and eukaryotes

E. Write True or False. Correct the false statements.

1. Kingdom Monera consists of unicellular and eukaryotic organisms.
2. Organisms belonging to Kingdom Fungi have chlorophyll.
3. Kingdom is the smallest unit of classification.
4. Organisms belonging to Kingdom Animalia are heterotrophic.
5. Members of the same species can reproduce among themselves.

F. Find the odd one out. Give reasons to justify.

1.	*Amoeba*	*Paramecium*	*Euglena*	Bacteria
2.	Mango	Pine	Mushroom	Fern
3.	Red algae	Blue-green algae	Green algae	Brown algae

G. Tick the most appropriate answer.

1. Modern scientists have divided the living world into
   (a) two kingdoms. (b) three kingdoms. (c) four kingdoms. (d) five kingdoms.
2. The smallest unit of classification is
   (a) genus. (b) family. (c) species. (d) order.
3. The largest unit of classification is
   (a) kingdom. (b) phylum. (c) order. (d) family.
4. Binomial nomenclature was given by the scientist
   (a) Whittaker. (b) Gregor Mendel. (c) Louis Pasteur. (d) Carolus Linnaeus.