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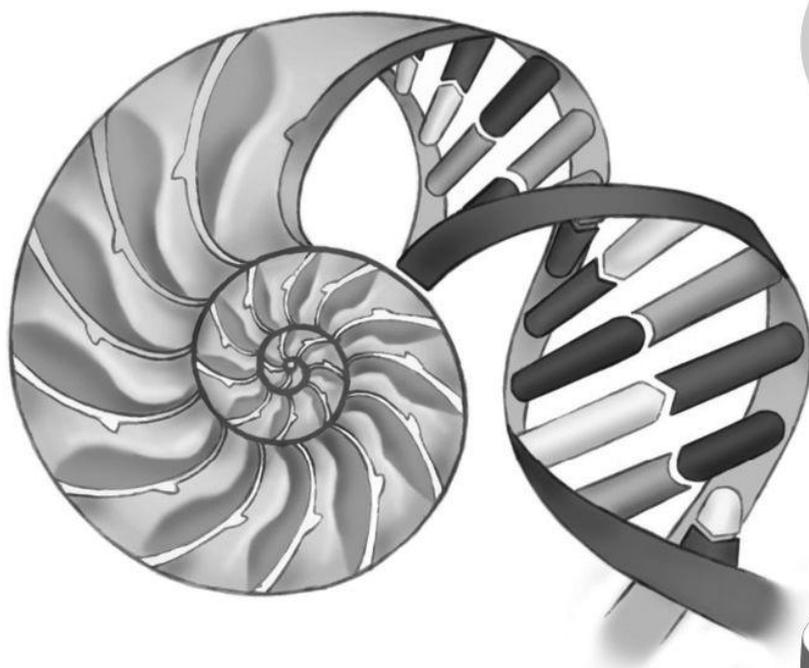
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## CHAPTER

# 1

# DIVERSITY IN THE LIVING WORLD

## KEY CONCEPTS

Common features of living organism are as follows :

- **Shape and size** : Living organism possesses definite shape and size.
- **Protoplasm** : The real living matter in living being is protoplasm which is the physical basis of life. All vital activities take place in the protoplasm.
- **Cell structure** : All living organisms are made up of one or more units structural called **cells**.
- **Metabolism** : Metabolism refers to the sum total of all the chemical reactions occurring in a living body.
- **Sensitivity and adaptability** : Living organism whether prokaryotes or eukaryotes, respond to the external and internal stimuli and adapt themselves to the changes in the environment. Response to stimulus is the defining property of living organism.
- **Growth** : Any permanent and irreversible increase in number, mass or overall size of cells of an organism or its parts is called growth.
- It is the final product of successful metabolism.
- **Reproduction** : Reproduction is the formation of new individuals of similar kind. Reproduction is required for survival of the population and continuity of life.
- There are million of organisms found on earth are recognised by local names that vary from place to place.
- It is necessary to standardize the naming of living organisms so that organism is recognised by the same name globally. This process is called as **nomenclature**.
- Nomenclature is possible when organisms are described correctly. The description of organism which makes possible its naming is called as **identification**.
- Binomial nomenclature refers to present scientific method of naming the micro-organisms, protists, fungi, plants and animals.
- In binomial system, the each name is expressed in two parts *i.e.*, **generic** name and **specific** name. The first word in a biological name represents the genus, while the second component denotes the species name. For example, scientific name of wheat is *Triticum aestivum*. Here the generic name of wheat plant is *Triticum*. This genus includes many species, as common wheat, polish wheat, durum wheat etc. Therefore, the specific names of wheat are also different. The specific name of common wheat is *aestivum*, so the complete name of common wheat is *Triticum aestivum*.
- Generic and specific names are written in Latin language. First letter of the generic name starts with a capital letter and of the species name with a small letter. Both of these words are written in italics and if handwritten, it is underlined.
- Classification is a method to study all the living organisms to divide them into convenient categories on some means of observable characters. The scientific term for these categories is called **taxa**.

**Taxon**

- Taxon is a group of real organisms contained in any category. A natural taxon refers to group of similar, genetically related individuals having certain characters distinct from those of other group. *e.g.*, tiger (species), rose (genus), eagle (family), reptile (order), fish (class), roundworm (phylum).
- Category is an abstract term and represents only rank/level in a hierarchy and does not represent the living organisms *e.g.*, phylum, class, order are categories.
- **Taxonomy** is defined as science of identification, nomenclature and classification of organism.
- **Systematics** is branch of biology deals diversity of living organisms and relationship among them.
- The hierarchial system of classification was introduced by **Linnaeus**.
- Species is defined as “the smallest real basic unit of taxonomy which is reproductively isolated from other group of individuals”. It can interbreed and produce fertile offsprings.  
**Genus** : Genus is a group of closely related species that are alike in broad features of their organisation.  
**Family** : Family is a group of related genera having several common characters.
- **Order** : The category includes one or more related families.
- The similar characters are less in number as compared to different genera included in a family.
- A **class** is made of one or more related orders.
- The term **phylum** is used for animals while **division** is commonly employed for plants.
- A division or phylum is formed of one or more classes.  
**Kingdom** is the highest taxonomic category.
- All plants are included in kingdom plantae and All animals are included in kingdom animalia.
- Taxonomical studies are helpful in the understanding of agriculture, forestry and also knowledge of biodiversity.
- Botanical gardens, herbarium, zoological parks, museums are several aids that help in taxonomical studies called as taxonomical aids.
- Monographs (provide information for revisionary work for taxa), manuals (having complete information about keys, description of families, genus and species) and periodicals (provide information about new additions and update information from time to time) also acts as taxonomical aids.
- **Key** refers to a set of alternate characters in such a manner that helped for identification of plants and animals by selecting and eliminating the characters according to their presence or absence in the organism. There is **species key** for the identification of species in a genus and **genus key** is for the identification of genus in a family and so on.
- **Lead** : Each statement in a key is called a lead. For identification of each taxonomic category (*e.g.*, family or genus) separate taxonomic keys are required.
- **Herbarium** is a collection of pressed and dried plant specimens that are preserved on paper sheets.
- In **botanical garden**, various plants groups are grown for scientific study, conservation, public education, aesthetics and recreation.
- Museum is a building used for the preservation, storage and exhibition of inanimate objects. Biological museums have collections of preserved plant and animal specimens.
- Zoological park or zoological garden or zoo is a place where wild animals are kept in protected natural environment under human care. These animals are kept for public exhibition.

# TEXTBOOK SOLUTIONS

**1. Why are living organisms classified?**

**Sol.** Classification is a method of grouping living organisms into convenient categories based on some observable characters which make their study easier.

For example, Mammals are those who possess mammary glands, hair on body, external pinnae etc.

**2. Why are classification systems changing every now and then?**

**Sol.** Classification system changes when more information become available about the organisms. Additional information are updated from time to time about different organisms at this stage there is a need arises to make changes in the classification system.

**3. What different criteria would you choose to classify people that you meet often?**

**Sol.** In our day to day life we categorize people based on following criteria :

1. Level of education
2. Profession
3. Height and skin colour
4. Native place
5. Sex
6. Hobbies
7. Nature

**4. What do we learn from identification of individuals and populations?**

**Sol.** Identification of individuals and populations determine their exact place or position in the set plan of classification.

**5. Given below is the scientific name of mango. Identify the correctly written name.**

- (a) *Mangifera Indica*
- (b) *Mangifera indica*

**Sol.** (b) *Mangifera indica*

**6. Define a taxon. Give some examples of taxa at different hierarchical levels.**

**Sol.** Taxon is a group of real organisms contained in any category. A natural taxon refers to group of similar, genetically related individuals having certain characters distinct from those of other group.

For example, all the insects form a taxon. So do birds, reptile, algae, grasses, dog, lion and man. Some examples of taxa at different hierarchical levels are :

- (a) The taxon of bacteria is monera and their category is kingdom.
- (b) The sponges form the taxon porifera and their category is phylum.
- (c) *Rosa* is a taxon and genus is its category.

**7. Can you identify the correct sequence of taxonomical category?**

- (a) Species → Order → Phylum → Kingdom
- (b) Genus → Species → Order → Kingdom
- (c) Species → Genus → Order → Phylum

**Sol.** (c)

**8. Try to collect all the currently accepted meanings for the word 'species'. Discuss with your teacher the meaning of species in case of higher plants and animals on one hand and bacteria on the other hand.**

**Sol.** Species is one of the basic units of biological classification. A species is often defined as a group of organisms capable of interbreeding and producing fertile offspring. Sometimes more precise or differing measures such as similarity of DNA, morphology or ecological niche are used to define the basis of species. In case of animals, the name of species is defined by the specific name or the specific epithet. For example, gray wolves belong to the species *Canis lupus*, golden Jackals to *Canis aureus* etc. Both of them belong to same genus *Canis*, but species name varies. But species name of plant is only called species epithet. The 'specific name' in botany is always the combination of genus name and species epithet such as *saccharum* in *Acer saccharum* (Sugar maple).

But bacteria are grouped under four categories based on their shape – spherical, rod-shaped, comma and spiral shaped and species of bacteria is according to their shapes. Thus the meaning of species in higher organism and bacteria are different.

9. Define and understand the following terms:

- (i) Phylum (ii) Class (iii) Family (iv) Order  
(v) Genus

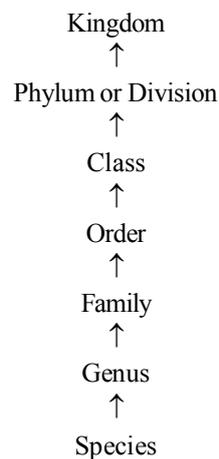
- Sol.** (i) **Phylum** : A phylum is group of related classes having some common features. *e.g.*, protozoa.
- (ii) **Class** : A class is group of related orders, for *e.g.*, order Rodentia, Lagomorpha and Carnivora all having hair and milk glands are placed in class mammalia.
- (iii) **Family** : A family is a group of related genera. The genus *Felis* of cats and the genus *Panthera* of lion, tiger and leopard are placed in the family Felidae.
- (iv) **Order** : An order is a group of related families. The family Felidae of cats and the family Canidae of dogs are assigned to the order carnivora. Cats and dogs have large canine teeth and are flesh-eaters.
- (v) **Genus** : A genus is a group of species alike in the broad features of their organization but different in detail. As per the rules of binomial nomenclatures, a species can not be named without assigning it to a genus.

10. How is key helpful in the identification and classification of organism?

- Sol.** Key refers to a set of alternate characters in such a manner that helped for identification of plants and animals by selecting and eliminating the characters according to their presence or absence in the organism. Every taxonomic category like family, genus and species has separate taxonomic key. There is species key for the identification of species in a genus and genus key is for the identification of genus in a family and so on.

11. Illustrate the taxonomical hierarchy with suitable examples of a plant and an animal.

**Sol.**



	Common name	Biological name	Species	Genus	Family	Order	Class	Phylum
1.	Man	<i>Homo sapiens</i>	<i>Sapiens</i>	<i>Homo</i>	Hominidae	Primata	Mammalia	Chordata
2.	Mango	<i>Mangifera indica</i>	<i>Indica</i>	<i>Mangifera</i>	Anacardiaceae	Sapindales	Dicotyledonae	Angiospermae

## CHAPTER

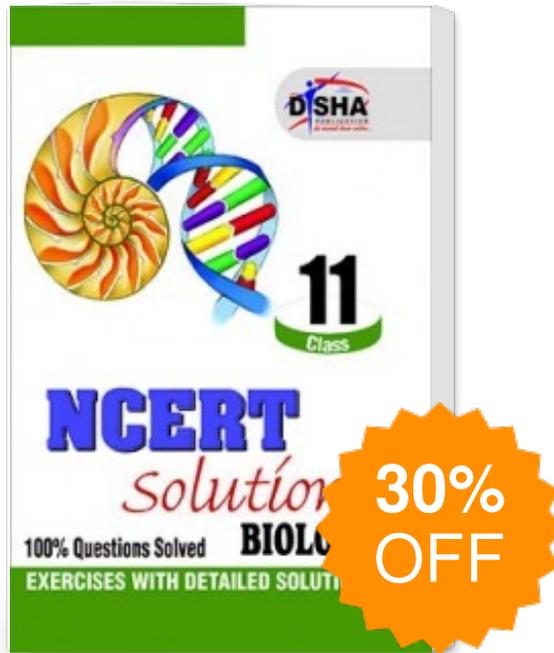
# 2

# BIOLOGICAL CLASSIFICATION

## KEY CONCEPTS

- Biological classification was first proposed by **Aristotle** who used simple morphological characters to classify plants and animals.
- **Linnaeus** named two kingdoms as Plantae and Animalia.
- **Five Kingdom System** was proposed by R.H. Whittaker these are – Monera, Protista, Fungi, Plantae and Animalia.
- **Monera** includes all prokaryotes – mycoplasma, bacteria, actinomycetes and cyanobacteria or blue green algae.
- They are unicellular/colonial/multicellular without nuclear membrane, nucleoplasm and nucleolus plastids, mitochondria and advanced (9 + 2) flagella.
- **Archaeobacteria** is one of the most primitive group of bacteria found in most harsh habitats such as extreme salty areas (halophiles) hot springs (thermoacidophiles) and marshy areas (methanogens).
- Methanogens are present in the guts of several ruminant animals such as cows and buffaloes and they are responsible for the production of methane (biogas) from the dung of these animals.
- **Bacteria** are the simplest, most primitive unicellular organisms.
- They are found everywhere (air, water, soil, food, inside our body etc.
  - Each bacterial cell contains a single chromosomes (nuclear material) that is not enclosed in a nuclear membrane.
- Bacteria show autotrophic as well as heterotrophic mode of nutrition.
- They play an important role in nitrogen fixation, decay and putrefaction, used in industries, in curdling of milk, setting of fibres, tanning of leather, etc., in production of vitamins, antibiotics and medicines.
- Bacteria cause harmful diseases in plants, animals and humans. Denitrifying bacteria reduce fertility of soil by converting nitrates into free nitrogen.
- The new name cyanobacteria has been given to blue green algae or myxophyceae or cyanophyceae class of algae due to their simple prokaryotic organisation like bacteria.
- **Mycoplasma** are the smallest known aerobic prokaryotes without cell wall.
- Mycoplasma have been reported to cause a number of plants and animal diseases and these have also been reported from urinogenital tract of human beings.
- As mycoplasma have no cell wall, hence have no definite shape, *i.e.*, pleomorphic and thus are called Jokers of microbiology.
- **Protists** : They have a typical eukaryotic structure with membrane bound organelles and nucleus.
- Protists are classified into photosynthetic protists slime moulds and protozoan protists.
- Locomotion is by **flagella** (*Euglena*), **cilia** (*Paramecium*) and **pseudopodia** (*Amoeba*, slime

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