CHAPTER I: THE LIVING WORLD

Life: Life is a unique, complex organization of molecules that expresses itself through chemical reactions leading to growth, development, responsiveness, adaptation and reproduction.

Living organisms: The objects exhibiting growth, development, reproduction, responsiveness, metabolism and other characteristics of life.

CHARACTERISTICS OF LIVING ORGANISMS:

1. Growth:

   It is increase in size, weight, volume and in the number of cells. Increase in mass and increase in number of individuals are twin characteristics of growth. The animals grow up to a certain age, whereas the plants grow throughout their life. Unicellular organisms also grow by cell division. In living organisms, growth is from inside.

2. Reproduction:

   It is the production of progeny possessing features more or less similar to those of parents. The living organisms reproduce asexually as well as sexually to multiply their number. Asexual reproduction may occur by fission, fragmentation, regeneration, vegetative propagation etc. In unicellular organisms' growth and reproduction are synonymous. Many organisms like mules, worker bees and infertile human couples, etc. cannot reproduce. **Therefore reproduction is not an all-inclusive characteristic of living organism.** However, no non-living object has the power to reproduce or replicate.

3. Metabolism:

   The sum total of all the chemical reactions occurring in our body is called metabolism. The metabolic reactions can be anabolic (constructive) or catabolic (destructive). In anabolism the complex material is synthesized from simpler ones. E.g. photosynthesis, etc,. And catabolism is breaking down of complex material into simpler ones, like respiration, digestion etc. No non- living material shows metabolism. It is a defining feature of all living organisms without exception.

4.Consciousness:

It is the ability of living organisms to sense their surroundings and respond to environmental stimuli. The stimuli can be physical, chemical or biological. All living organisms, from the prokaryotes to eukaryotes can sense and responds to stimuli. Human being is the only organism who is aware of himself. **Consciousness therefore, become the defining property of living organisms.**

5. Every living organism has a definite life span having birth, growth, maturity, senescence and death. No living organism can be immortal.

BIODIVERSITY:

- Biodiversity is refer as the number and types of varieties of living organisms present on earth. The term was coined by Walter G. Rosen (1985) and popularised by Edward Wilson in 1992.
- The number of species that are known and described ranges between 1.7 – 1.8 millions.

SYSTEMATICS:

- It deals with the study of the kinds and diversity of organisms and the relationships among them. The term was proposed by Carolus Linnaeus in his book 'Systema Naturae'.

IDENTIFICATION:

- It is the finding of correct name and place of an organism in a system of classification. It is done with the help of keys. This is carried out by determining similarity with already known organisms.

NOMENCLATURE:

- It is the process of standardized naming of living organisms such that a particular organism is known by the same name all over the world.
- Codes of Nomenclature:

ICBN -International Code of Botanical Nomenclature.

ICZN -International Code of Zoological Nomenclature.

IC Bac N- International Code of Bacteriological Nomenclature.

ICVN - International Code of Viral Nomenclature.

ICNCP-International Code of Nomenclature for Cultivated Plants.

BINOMIAL NOMENCLATURE:

- It is the system of providing organisms with appropriate and distinct names consisting of two words, first generic and second specific.
- This naming system is given by Carolus Linnaeus. The scientific name for Mango is *Mangiferaindica.*

Rules for nomenclature:

i) Biological names are Latinised and written in italics.
ii)The first word represents the genus, the second word represents specific epithet
iii) Both the generic and specific names, are separately underlined, or given in italic to indicate their Latin origin.
iv)The first word starts with capital letter while the specific name in small letter.

CLASSIFICATION:

- It is the process of grouping organisms into convenient categories based on some easily observable characteristics. It makes the study of organisms convenient/easier.

NEED FOR CLASSIFICATION

- To organise the vast number of plants and animals into categories that could be named, remembered, studied and understood

TAXONOMY:

- It is the branch of study that deals with principles and procedures of identification, nomenclature and classification of organisms or It is the study of principles and procedures of classification.
- The process of classification is based on the external or internal structure along with internal structure of cell, development process and ecological information of organisms.

TAXONOMIC CATEGORY:

- It is a rank or level in the hierarchical classification of organisms. There are seven oblique categories and some intermediate categories. All the categories together constitute a taxonomic hierarchy.

TAXONOMIC HIERARCHY:

- The step-wise arrangement of all categories (categories or taxa or ranks) of classification is known as taxonomic hierarchies.
- In ascending order, the different taxonomic hierarchies are-

Species-> Genus-> Family -> Order -> Class -> Phylum (for animals) / Division (for plants) ->Kingdom.

Species:

- Species are natural population of individuals which resemble one another in all essential morphological and reproductive characters so that they are able to interbreed freely and reproduce fertile offspring.
- It is the lowest category and has the maximum common characteristics.
- For Mango tree, *Indica* is the species and *Mangifera*is the genus (*Mangiferaindica*).
- This biological concept was proposed by Ernst Mayr in 1964.

Genus:

- It is a group or assemblage of related species which resemble one another in certain correlated characters. All the species of genus presumed to have evolved from a common ancestor. Lion, Tiger, Leopard are placed under the same genus *Panthera.*

Family:

- It contains one or more related genera. All the genera of a family have common features or correlated characters. Family Solanaceae contain a number of genera like, *Solanum, Withania, Datura* etc.

Order:

- This category includes one or more related families. Families Felidae and Canidae are included in the same order Carnivora.

Class:

- One or more related orders make a class. The class dicotyledonae of flowering plants contain all dicots which are grouped into several orders like rosales, polemoniales, ranales etc.

Phylum/Division:

- The term phylum is used for animals while Division is used for plants. They are formed of one or more classes. The phylum chordate contains classes like, mammals, aves, reptiles, amphibians etc.

Kingdom:-

- It is the highest taxonomic category. All the plants are included in the kingdom Plantae, while all the animals are included in Kingdom Animalia.

<u>TAXONOMIC AIDS:</u> -

- Techniques, procedures and stored information’s that are useful in identification and classification of organisms are called taxonomic aids.

1) HERBARIUM-

- It is the storehouse of dried, pressed and preserved plant specimen on sheets/papers, and are kept systematically according to accepted system of classification. The herbarium sheets also carry a label providing information about date and place of collection, English, local and botanical names, family, collector's name etc.

Importance:

- It provides information about the local flora as well as the flora of distant places.
- It provides information about ecology of different plants.

Important herbaria:

- Herbarium of National Botanical Research Institute, Lucknow, India.
- Royal Botanical Gardens, Kew (London).

2) BOTANICAL GARDEN-

- Places where living plants of different varieties, collected from different parts of the World, are grown in a scientific and systematic manner. Plants grown here are for identification purpose and each plant is labelled with scientific name and family.

Importance of Botanical Garden:

- It serves as the centres for recreation and aesthetic beauty.
- The living collections of plants provides basis for modern taxonomic studies.

Important Botanical Garden:

- Royal botanical garden, Kew (London),
- Indian botanical garden, Kolkata and
- National botanical garden, Lucknow.

3) MUSEUM:

- Biological museums are those places where collection of preserved animals and plants specimens are exhibited to the public for study and reference. The plants and animals' specimens are kept in chemical solutions and are preserved for a long duration. It is set up in educational institutions like schools and colleges for reference purposes. Insects are preserved in insect boxes after collecting, killing and pinning them.

Important Museum:

- Indian Museum, Kolkata.
- Natural History Museum, London.

4) ZOOLOGICAL GARDEN:

- These are places where various animals are kept within enclosures displayed to the public and may be used for study. It is established where high standard of care is observed and the animals live under more natural condition. The animals provide better recreation to the visitors.

Importance:

- Its establishment helps in providing knowledge about native and exotic wild animals, birds, reptile, fish, etc. To the public in general.

Important Zoological Garden:

- Alipore Zoological Gardens, Kolkata.
- National Zoological Park, Delhi.

5) KEYS:

- Keys are artificial analytical device having a list of statements with dichotomic table of alternate characteristics which is used to identify organisms. Usually two contrasting characters are used. The one present in the organism is chosen while the other is rejected. Each statement of the key is called lead. Separate taxonomic keys are used for each taxonomic category like species, genus, family etc.
- Two types of Key: i) Indented key and b) Bracketed key.
  [Fauna- provide indices for animal species found in a particular area.

Flora- provides indices plant species found in a particular area.]

6) MANUALS:

- They provide information for identification of name of species found in an area.

7) MONOGRAPH:

- It gives comprehensive information of particular taxon like family or genus.