

SHIVALIK SR. SEC. SCHOOL, BHARTHARI ROAD, BEHROR

CLASS XII (LESSON -1)

TOPIC:- Reproduction in organisms

SUBJECT- Biology

Living :- Living is something that is alive, something that can grow, move, reproduce, respire and carry out various cellular activities.

Living Characteristics:-

A. Growth B. Reproduction C. Metabolism

D. Cellular Organization E. Consciousness

(A) Growth :-

Growth is usually defined by the increase in mass and number of individual organisms.

Living things grow due to cell division. Thus, growth is not a defining characteristic.

(B) Reproduction

It is the biological process by which an organism produces an individual like its own for its existence.

Reproduction is of two types- (i) Sexual reproduction (ii) Asexual reproduction.

Most of the mammals like humans reproduce by sexual reproduction. But when we consider unicellular organisms like bacteria, growth and reproduction become ambiguous as both results from the division of the cell.

(C) Metabolism:-

It comprises all the chemical reactions going inside a living cell or body. Thus, it is a *typical characteristic* of living beings.

Metabolism \rightarrow Anabolism + Catabolism

(i) Anabolism :-

The process of building up or synthesis of complex substances from simpler ones. Ex. - Photosynthesis.

(ii) Catabolism:-

The process of breakdown of complex substances into simpler substances, e.g., Respiration, Excretion (releasing waste outside).

(D) Cellular Organization:-

Organisms are typically made up of cells. Which is the basic ,structural and functional unit of life.

They also follow an organization of cells followed by tissues which form organs and in turn again combine to form the organ system.

Organ systems together form an organism. This kind of cellular organization is absent in nonliving beings.

CELL → TISSUE → ORGAN → ORGAN SYSTEM → ORGANISM

(E) Consciousness:-

It is a property by the virtue of which an organism reacts to an external stimulus or change in environment.

It is a typical property of living organisms. They have the ability to sense any change in their environment.

Some Other Characteristics of Living Organisms:

shape & size, life cycle, movement, self-regulation, variations, adaptations, healing & repair, excretion and death.

Listed below are the criteria deciding if a thing is living or non-living:

- A living thing is able to maintain the body's internal environment which is referred to as **homeostasis**.
- Must be capable of building-up nutrients to perform **metabolic processes**.
- Living things possess a highly **organized structure**
- Must be able to **adapt to changes** in the environment
- Must be capable of **increasing in mass and size**
- Must be **capable of responding**

2. Living World : Diversity and Taxonomy

The earth hosts an immense variety of living organisms. According to a survey, the number of species that are known and described are between 1.7-1.8 million.

Biodiversity (Biological diversity) :- It means the number and types of organisms present on the earth, forms of life in the living world. The living world includes all the living organisms, such as microorganisms, plants, animals and humans.

Systematics:-

The word 'Systematics' is derived from the Latin word Systema, which means systematic arrangement of organisms.

- **Linnaeus used Systema Naturae as the title of his book**
- **. He. coined the term Systematics in 1751.**

Systematics is the branch of science that deals with unique properties of species and groups to recognise, describe, name and arrange the diverse organisms.

1961, Simpson, defined systematics as the study of diversity of organisms and all their comparative and evolutionary relationships based on comparative' anatomy, physiology, biochemistry and ecology.

1. Identification. 2. Classification. 3. Nomenclature

1. Identification

It aims at finding the correct name and appropriate position of an organism. The morphological and anatomical characters are examined for proper identification.

2. Classification

Classification is the process by which organisms are grouped into categories based on some easily observable characters.

Biological classification is the scientific arrangement of organisms in a hierarchy of groups and sub-groups on the basis of similarities and differences in their traits.

Advantages of Classification

- (a) It helps to identify an organism easily. (b) New organisms easily get correct place in their respective groups.
- (c) It makes study of fossils easy. (d) It also helps in building evolutionary pathways.

(e) It becomes easy to know the features of whole group by studying one or two organisms of the group.

Thus, based on these characteristics, all living organisms are classified into different taxa.

3.Nomenclature

Nomenclature is the system of naming living organism in a way that a particular organism is known by the same name all over the world.

i. Common Names

The common names or vernacular names are the local names given to an organism in a specific language in a particular region. There are different names of a same organism in different regions even with in a country.

Binomial Nomenclature

- Binomial nomenclature was developed by **Carolus Linnaeus in 1751** (Philosophica Botanica).
- All scientific names for animals under binomial nomenclature were given by Linnaeus in the tenth edition of his book **Systema Naturae (1758)**.
- Linnaeus named plants according to binomial nomenclature in his book **Species Plantarum (1753)**.
- Binomial nomenclature is the system of providing distinct and appropriate names to organisms, each consisting of two words, **first generic name {i.e., name of genus} and second specific epithet (i.e., name of species)**.

The rules framed by Linnaeus and by these codes are as follows

(i) The names are generally in Latin and written in italics. They are Latinised or derived from Latin irrespective of their origin.

(ii) The first word in a biological name represent the genus while, the second component denotes the specific epithet.

(iii) Both the words in a biological name, when handwritten are separately underlined or printed in italics to indicate their Latin origin.

(iv) The first word denoting the genus starts with capital letter while, the specific epithet starts with a small letter, e.g., *Mangifera indica*.

(v) Generic and common names may be same, e.g., *Gorilla gorilla*.

ORGANISMS WITH THEIR TAXONOMIC CATEGORIES

Common Name	Biological Name	Genus	Family	Order	Class	Phylum/ Division
Man	<i>Homo sapiens</i>	<i>Homo</i>	Hominidae	Primate	Chordate	Mammalia
Housefly	<i>Musca domestica</i>	<i>Musca</i>	Muscidae	Diptera	Insecta	Arthropoda
Mango	<i>Mangifera indica</i>	<i>Mangifera</i>	Anacardiaceae	Sapindales	Dicotyledonae	Angiospermae
Wheat	<i>Triticum aestivum</i>	<i>Triticum</i>	Poaceae	Poales	Monocotyledonae	Angiospermae

Rules of binomial nomenclature were initially framed by Linnaeus in his books, *Species Plantarum* and *Systema Naturae*.

The rules were revised again by the following nomenclature codes

- (i) International Code for Botanical Nomenclature (ICBN).
- (ii) International Code of Zoological Nomenclature (ICZN).
- (iii) International Code of Bacteriological Nomenclature (ICBN).
- (iv) International Code of Viral Nomenclature (ICVN).

Advantages of Binomial Nomenclature

- (i) Binomial names are universally acceptable and recognised.
- (ii) They remain same in all languages.
- (iii) The names are small and comprehensive.
- (iv) There is a mechanism to provide a scientific name to every newly discovered organism.

v) The names indicate relationship of a species with other species present in the same genus.

(vi) A new organism can be easily provided with a new scientific name.

Taxonomy :-

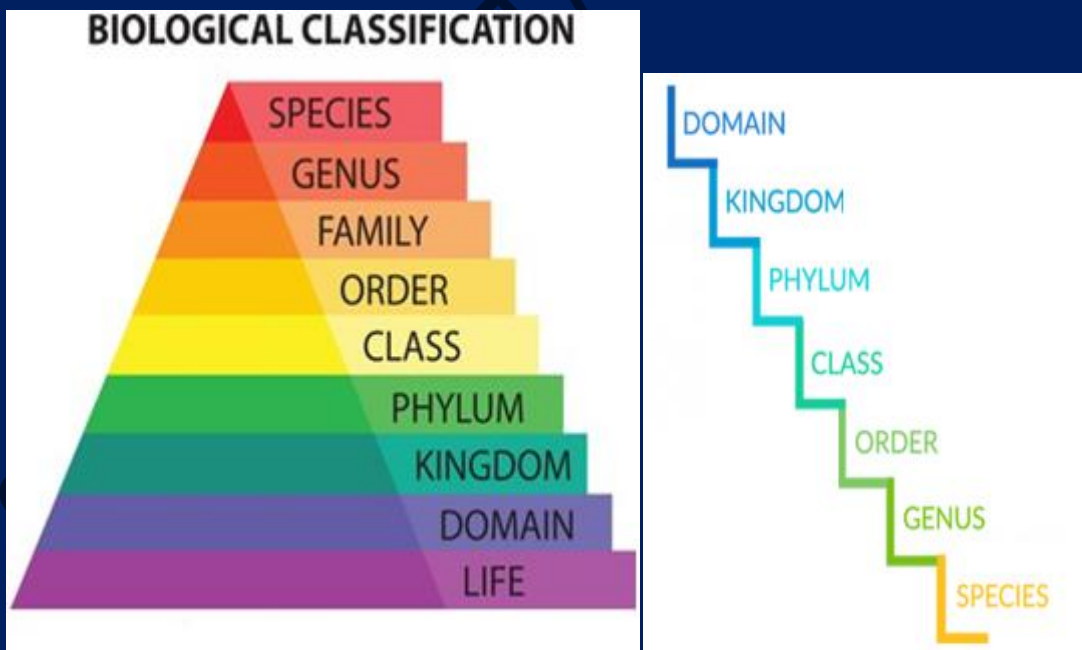
- The word “Taxonomy” is derived from a Greek word – “taxis”, meaning arrangement or division, and “nomos”, meaning method.
- Taxonomy is a branch of Biology that refers to the process of classifying different living species.

Taxon :- A taxon is referred to as a group of organisms classified as a unit.

Taxonomic hierarchy :- “Taxonomic hierarchy is the process of arranging various organisms into successive levels of the biological classification either in a decreasing or an increasing order from kingdom to species and vice versa.”

Category:- A rank or the level of hierarchical classification of organisms is called category.

Carolus Linnaeus is known as → father of taxonomy



Taxonomic Hierarchy Categories

Kingdom

The kingdom is the highest level of classification, which is divided into subgroups at various levels. There are 5 kingdoms in which the living organisms are classified, namely, Animalia, Plantae, Fungi, Protista, and Monera.

Phylum

This is the next level of classification and is more specific than the kingdom. There are 35 phyla in kingdom Animalia. For Example – Porifera, Chordata, Arthropoda, etc.

Class

Class was the most general rank in the taxonomic hierarchy until phyla were not introduced. Kingdom Animalia includes 108 classes including class mammalia, reptilia, aves, etc.

Order

Order is a more specific rank than class. The order constitutes one or more than one similar families. There are around 26 orders in class mammalia .

Family

This category of taxonomic hierarchy includes various genera that share a few similarities. For eg., the families in the order Carnivora include Canidae, Felidae, Ursidae, etc.

Genus

A group of similar species forms a genus. Some genera have only one species and is known as monotypic, whereas, some have more than one species and is known as polytypic. For eg., lion and tiger are placed under the genus Panthera.

Species

It is the lowest level of taxonomic hierarchy. There are about 8.7 million different species on earth. It refers to a group of organisms that are similar in shape, form,

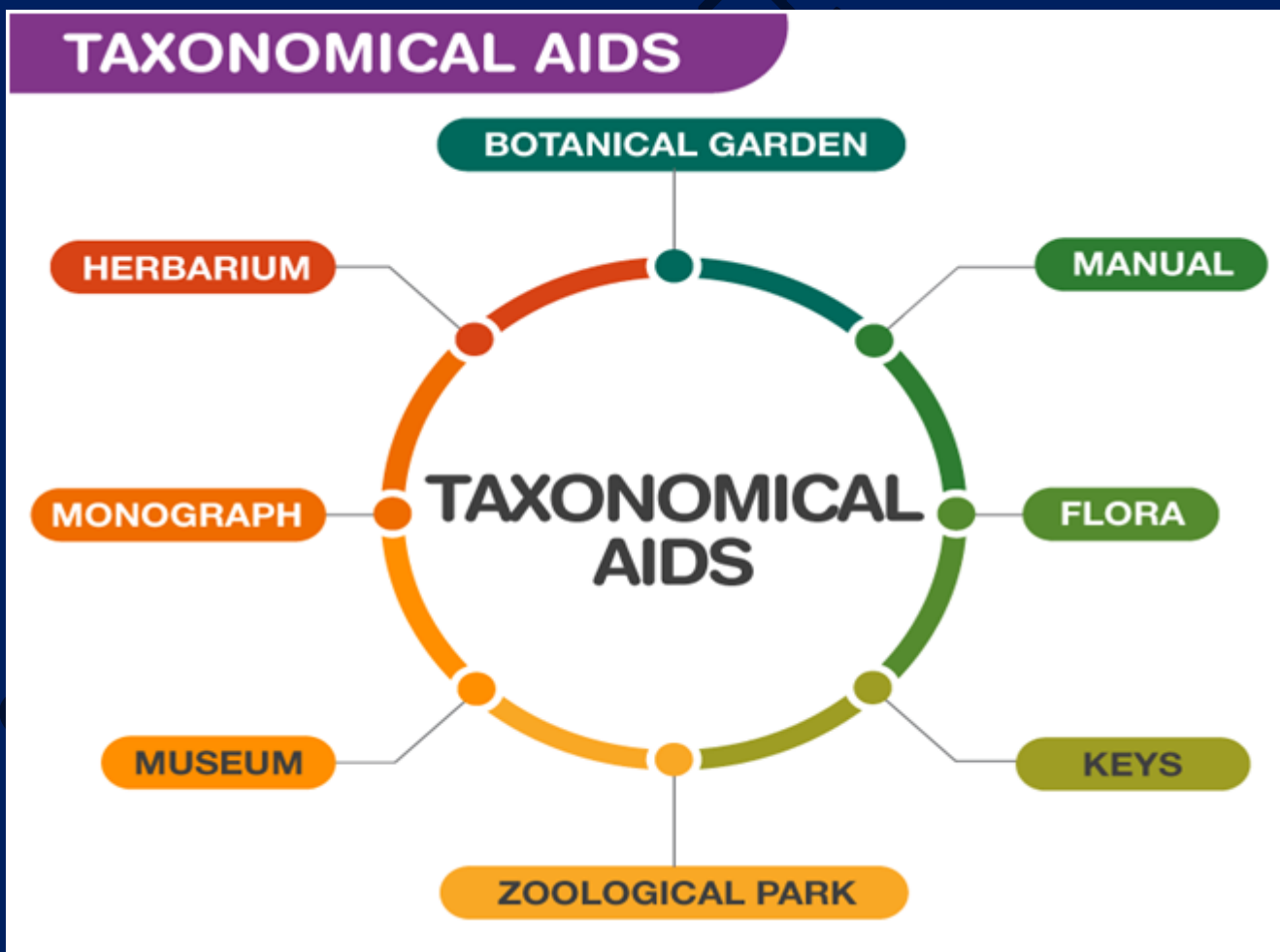
reproductive features. Species can be further divided into sub-species.

Taxonomic categories:

- Hierarchy of steps-each step represents a rank or category.
- Category is a part of overall taxonomic arrangement ,it is called **taxonomy category** and all categories together constitute the **taxonomic hierarchy**.
- Each category is referred as a unit of classification , represents a rank and is commonly termed as **taxon** .
- These taxonomic categories are distinct **biological entities** and not merely morphological aggregates.

Carolus Linnaeus is known as → father of taxonomy

Taxonomical aids :- These are the collections of samples or preserved organisms which help in extensive research for the identification of various taxonomic hierarchy.



Taxonomical Aids

Aids having specimens

1. Herbarium
2. Botanical gardens
3. Museums
4. Zoological parks
5. Key.

Aids without specimens

1. Flora
2. Manuals
3. Monographs
4. Catalogues

Herbarium

- It is a store that houses a collection of preserved plant species.
- Plant specimens are preserved in forms of herbarium sheets which are prepared by drying, pressing and preserving the samples on sheets.
- These sheets are then arranged in their order of classification in the taxonomic hierarchy.

Botanical garden

- These are gardens in which specific plants are grown and are labelled according to their taxonomy.
- the labels carry their scientific names and family.
- The main purpose of botanical gardens is to identify the plant species under consideration.

Museum

- In these museums, plants and animal species are preserved in jars and containers with the help of appropriate preservatives. They may also be dried and preserved.

- Birds and larger animals are usually stuffed before preserving and insects are killed and pinned in the boxes. We sometimes find skeletons of various animals too.

Zoological park

- These are places where animals and birds are kept in protected boundaries.
- An attempt is made to provide them with a habitat closest to their natural habitats. Thus, we get a chance to learn about their natural habits and behaviour.
- Zoological parks are open for human visits.

Key

- This is a taxonomical aid where plants and animals are recognized based on contrasting characteristics known as keys.
- Two contrasting keys are generally kept as a pair, thus leading to acceptance of once and rejection of another.

The Acharya Jagadish Chandra Bose Indian Botanic Garden or Indian Botanical Garden (West Bengal) is the largest and oldest botanical garden in India. The other famous botanical gardens of India are given below:(Top 8 Botanical Gardens)

- 1. Lalbagh Botanical Gardens, Bangalore:**
- 2. Government Botanical Gardens, Ooty:**
- 3. TNAU Botanical Garden, Coimbatore:**
- 4. The Acharya Jagadish Chandra Bose Indian Botanic Garden, Kolkata:**
- 5. The Agri Horticulture Society of India, Alipore, Kolkata:**
- 6. Lloyd's Botanical Garden, Darjeeling:**
- 7. National Botanical Research Institute (NBRI), Lucknow:**
- 8. Botanical Garden of Forest Research Institute (FRI), Dehradun**