

CLASS – 11

BIOLOGY

Chapter – 1

The living world

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Growth and Development

Living

- Organism which shows growth and development can be reproduced and response to environment is called living.
- Following characteristics are exhibit in living organism:
 1. Growth and development
 2. Reproduction
 3. Metabolism
 4. Response to stimuli

- Development is **qualitative characteristics** of organism while growth is **quantitative characteristic**.
- Growth can be measure in term of **increase in mass** (i.e. increase in protoplasmic matter of the cell) and **increase in number** (i.e. the number of the cell in organism increase by cell division).
- Plant – show growth **by cell division at some region** (i.e. shoot tip, root tip, and cambium) throughout their **life span**.
- Animal show growth up to a certain age only.

animal plant show growth in term of increase in mass and number while unicellular organism grows by cell division (i.e. fission).

Living organism show intrinsic growth while non living organism shows extrinsic growth (i.e. adding the mass from outside).

Reproduction

- It is biological process in which organism *give rise to their young one which may or may not similar to parent.*
- Due to diversity of living organism they have adopted its own mechanism to multiply and produce offspring.
- There are mainly two types of reproduction found in organism-

1. Asexual reproduction –

- Single parent involve, Gametes are not formed, Fertilization does not take place, and Offspring are identical (*i.e. morphologically and genetically*) to parents.
- Common in Monera, Protozoa and lower invertebrates (*i.e sponges, jellyfishes, flatworms and annelids*).

2. Sexual reproduction –

- Production of new organism (*i.e. recombinant*) by combining genetic information from two individual of different sex or fertilizing two sex cells.
- Sex cells are sperm/microspore (*i.e. small and motile*) and ovum/ megaspore (*i.e. large and non motile*).

Metabolism

- All biochemical reaction which occurs inside the body is called metabolism.
- Two type of metabolic process is found in living organism:

1. Anabolism:

- Reaction that built materials by combining two small molecules (*i.e. Photosynthesis*).

2. Catabolism:

- Reaction that break down the large material into two small molecules (*i.e. Respiration*).

Metabolic process occurs in all unicellular and multicellular organism.

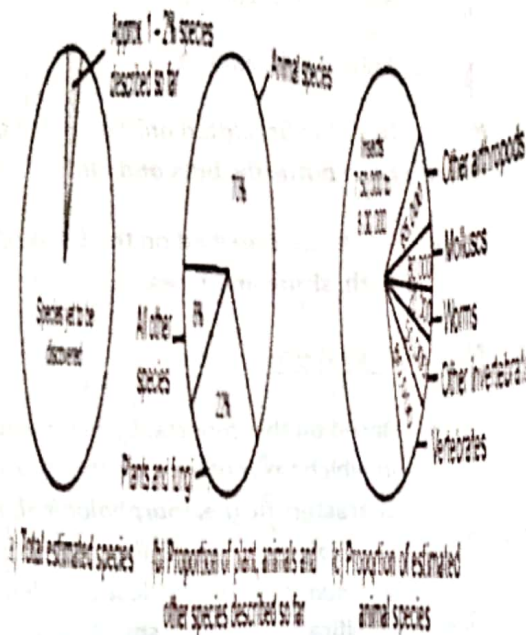
Response to Stimuli or Consciousness

- Ability *to sense their surrounding or environment and response to these environmental stimuli (i.e. it could be physical chemical or biological).*
- Plant – respond to factors (*i.e. water, light, temperature and humidity*) by *increasing or decreasing the rate of transpiration, opening and closing of stomata or by turgidity and wilting* etc.
- Prokaryote to Eukaryotes is response to - *light by photoperiodism, to season by showing cyclic variations* etc.

Diversity in living organism

- Diversity mean difference in organism in term of morphological anatomical ecological and genetically.
- There is large variety of living organism (*i.e. potted plant insects birds and other animals and plants*) found around us which are morphologically and genetically different.
- The general estimation of number of species existed today are **5-30 million** in which half are found in *unexplored tropical rain forests* of the world.

- This great variety of species on earth is resultant of the 3 billion years of evolution.



Nomenclature

- Organism recognize by their common name in different language –

Example: China rose in English, Gural in Hindi, Jaba in Bengali .

- Process of giving the scientific name to organism through which organism recognize by same name in all over the world.
- By doing this we can avoid confusion and standardize the naming of living organism.

Identification

- Determination of an organism being identical with or similar to another already known organism is known as identification.
- Identification can be done through aid of literature or by comparing with organism of known identify.

Classification

- Method of arranging and grouping of organism into various division or taxa is called **classification**.

- Classification is based on some easily recognizable or observable characters.

Example: Mammals are associated with organism having external ear, body with hair etc.

- The scientific term for convenient categories in which organism are grouped is known as **taxa**.

Taxonomy

- The process of classification of organism into different taxa on the basis of their characteristics is known as **taxonomy**.
- It deals with the identification and classification of the organism.
- Characterization, identification, nomenclature and classification of organism are subcategories of taxonomy.

Systematics

- Scientific study of the kind and diversity of living organism and the existing relationship amongst them is termed as **systematic**.
- This word is used by Carlous Linnaeus.
- Systematic deal with study of organism and their relationship.

Binomial Nomenclature

- In this the name of organism consist of two words in which first word is called generic name and the second one is specific name .

Example: *Mangifera indica*

- This system is published by Carlous Linnaeus on 1st January 1758 in "**Systema Naturae**".
- ICBN (i.e. International Code of Botanical Nomenclature) and ICZN (i.e. International Code of Zoological Nomenclature) has develop the principal for naming of a species:

- I. Scientific name of each species should be as per binomial (i.e. first word is genera and second word will be species).
- II. The name should be **italic** if printed and **separately underline** if handwritten.
- III. Generic name always being with **capital letter** while specific name start with **small letter**.
Example: *Mangifera indica*
- IV. The name of taxonomist also added at the end (i.e. *Homo sapiens* L in which L stand for Linn).
- V. If the word are taken from any other language other than Greek or Latin they are Latinized with suitable ending. **Example: *Ficus bengalensis***.
- VI. The organism belonging to two different genera can never have the same generic name even the species name can be repeated. **Example: *Mangifera indica* and *Tamarindus indicus***.

Home work: write scientific name of given organism

Advantage of classification

- Sorting of living organism into small group into the small comprehensible group.
- Makes easy for the **comparisons between the groups of the organism easier**.
- Also help in **description of species as completely as possible**.

Type of classification

Three main system of classification:

1. Artificial system
2. Natural system
3. Phylogenetic system.

Artificial System:

- It based on a limited range of distinguishing characteristics (i.e. **superficial resemblance and differences**).

- In this animal are classified in two categories on the basis of **their flying ability**

1. Animal that can fly
2. Animal that cannot fly

Here the unrelated animals were grouped together like butterfly, bats and birds.

- Plants are classified on the **basis of height** into herb, shrub and trees.

Natural system

- Based on the important similarities of organism in which taxonomist take the maximum characteristic (i.e. **morphological, anatomical, cell biology, physiological reproduction and biochemistry**) which clear the evolutionary significance of organism.
- In this maximum possible number of common feature are grouped to the same species.

Phylogenetic system:

- The study of **evolutionary history of the particular group of organism** is called **phylogeny** and the classification which based on **phylogenetic relationship** is called **evolutionary classification**.
- In this system the taxonomist tries to utilize many type of evidence to discover the evolutionary relationships but it is not always possible because of the gaps that exist in the fossil records of species.

Three Kingdome classifications

- It proposed by Carl worse.
- He classifies organism in three domain

Archaea Bacteria (cell wall without peptidoglycans)	Bacteria	Eukaryote
Methanogens (make methane gas by using carbon	Cynobacteria (Blue green bacteria)	Protista (single cell eukaryote)

dioxide, H and N		
Extreme Halophiles (live in environment as salty)	Eubacteria (True bacteria)	Fungi (organism which breakdown the organic matter)
Extreme thermoacidophiles (live in temperature of 60 degree to 110 degree Celsius)		Plantia (all land plant)
		Animalia (all animal on earth)

- Each genus has one or more than one specific epithets which representing the different organism but having morphological similarity.

Example:

Genus	Species
Solanum	nigrum
Solanum	tuberosum
Panthera	leo
Panthera	tigris

Genus

- It is a group of related species which has characters in common in comparison to species of other genera.

OR

- It is aggregates of closely related species.

Example:

Common Name	Species	Genus
Potato	tuberosum	Solanum
Tomato		
Brinjal		
Lion	leo	Panthera
Tiger	tigris	
Leopard	pardus	

Genus – Panthera differ from genus Felis (viz include cats).

Family

- It has a group of genera with less number of similarities.

Taxonomical Categories

- Classification is multiple step process which involves hierarchy of steps; in which each steps represent a rank or category.
- Each category is part of overall taxonomic arrangement and called **taxonomic category** and all categories together constitute **taxonomical hierarchy**

OR

- Putting up of taxonomical categories in logical sequence is called hierarchy.

Species

- Group of individual organism with fundamental similarities include in species.
- One species should be distinguished from another closely related species based on their morphological differences.

Example:

Genus	Species
Mangifera	indica
Solanum	tuberosum
Panthera	leo

- It characterizes on the basis of vegetative and reproductive feature of plant species.

Example:

Genus	Family
Solanum	Solanaceae
Petunia	
Datura	
Panthera	Felidae
Felis	

Cat and dog have some similarities and difference and they are placed into two different families – Felidae and Cancidae

Order

- Order is identified based on the aggregate of characters.
- It is assemblage of families which have a few similar characters as compare to different genera included in a family.

Example:

Family	Order
Convolvulaceae	Polymoniales
Solanaceae	
Felidae	Carnivora
Cancidae	

Class

- Related order is placed together in same class and each class has a number of orders (i.e. related to some common feature).

Example:

Class	Order	Example
Mammalia	Carnivora	Lio, Cat, Dog
	Herbivora	Rat, Rabbit
	Primates	Man, Gorilla, Monkey

Phylum

- Classes comparing animals like fish, amphibians, reptiles, birds, along with mammals formed the next higher categories i.e. Phylum.

Example:

Class	Phylum	Based character
Pisces	Chordata	Presence of notochord and dorsal hollow neural system.
Amphibia		
Reptilia		
Aves		
Mammalia		

In plant, related classes are put together in higher categories called division.

Kingdom

- All animal belonging to various phyla are grouped into highest category called kingdom.

Example: all animal belonging o various phyla placed into Kingdom Animalia while all plants are placed into Kingdom plantae.

All living organisms have been put in the 5 different kingdoms like Monera, Protista, Fungi, Plantae and Animalia.

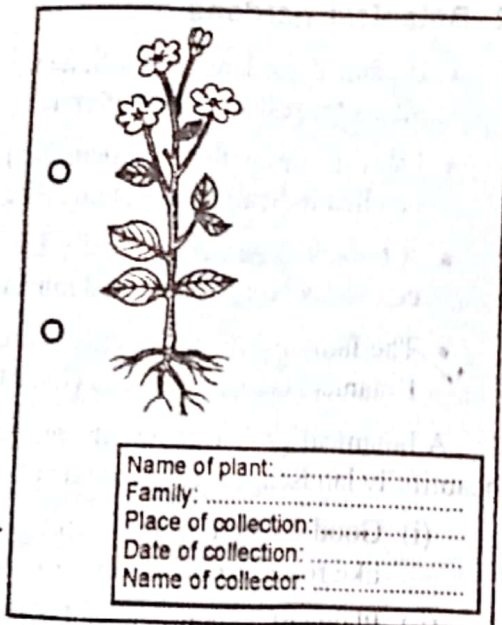
Taxonomical Aids

- **Collection of sample or preserved organism** which help in extensive research for the **identification of various taxonomic hierarchy**.
- It is the main source which helps us in **studying the relative level of a group of organisms, their taxonomic hierarchy and taxonomic rank**.
- Following type of taxonomical aids are :

1. **Herbarium**
2. **Botanical garden**
3. **Museum**
4. **Zoological parks**
5. **Key**

Herbarium

- It is store that houses of **collection of preserved plant species in the form of herbarium sheets** (i.e. organized and arrange according to universal accepted system of classification along with specimen description) which are prepared by **drying, pressing and preserving the sample on the sheets**.



Method of collection and Preservation of plants

Collect wild plant that grow naturally in a specific habitat along with leaves, flower, fruits, and root



Spread the plant on news paper by exposing various part properly and keep the sheet under various folds of a newspaper or blotting paper under a heavy box.



Take a herbarium sheet of 10" by 16" size at which keep the dried plant and sew it with thread and needle.



Prepare a label containing the following information (shown in diagram) for each sheet and pasted on the right hand side of the plant specimen.



Dries specimen should be fumed with carbon bisulphide / DDT / Gammaxene / PDB to protect them from any damage by bacteria fungi and insects.



Arrange the herbarium sheet by putting the plant of the same family in a sequence and put all the sheets together in a folder.

Botanical Garden

- It is large sized tracts that have **collection of living plant for identification and reference for research**.
- Each plant is **labeled with its botanical/scientific name and its family**.

Example:

1. **Royal Botanical Garden, Kew, England**
2. **Indian botanical garden, Kolkata, India**
3. **National Botanical Garden, Lucknow, India**

Museum

- A museum has **collection of preserved plants and animals specimen** (i.e. preserved in containers or jars in preservative solution) for the **study and reference**.
- Each object have **full record like date, source method of acquisition other information** which help to **study the old preserved materials in depth to research scholars**.

Example:

1. **National Museum of Natural History, Delhi**
2. **Natural History Museum, London**

Key

- It is a taxonomical aid which helps in the **identification of animal and plant** based on their **similarities and differences**.
- It consists of series of paired questions or descriptions having only two alternatives which result only acceptance of only one and rejection of other.

Separate taxonomy key are required for separate categories such as family genus and species for identification.

Example

Examples of a simple key

- | | | | |
|---|-----|-----------|--------------|
| 1. Does it have legs | Yes | (Go to 2) | B,C,E,F |
| | No | (Go to 5) | A,D |
| 2. Does it have more than 4 pairs of legs | Yes | (Go to 3) | E,C |
| | No | (Go to 4) | B,F |
| 3. Does it have 7 pairs of legs | Yes | — | Wood louse E |
| | No | — | Millipede C |
| 4. Does it have 3 pairs of legs | Yes | — | Wasp B |
| | No | — | Spider F |
| 5. Does it have a shell | Yes | — | Snail D |
| | No | — | Roundworm A |

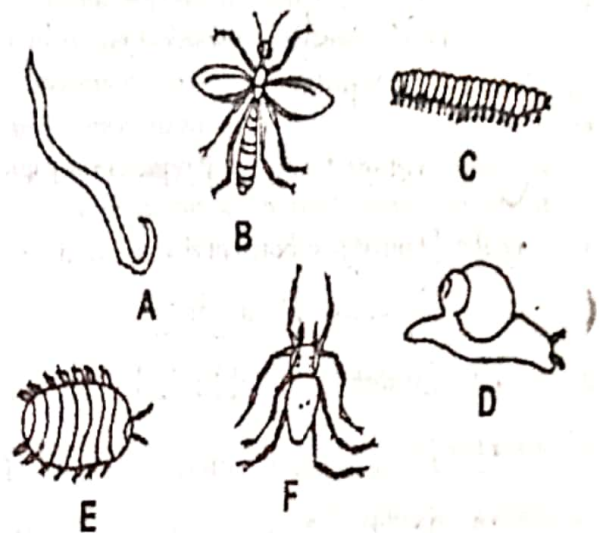


Fig. 1.8 Invertebrates to be identified