

The living world



What is living



Unique features of living organisms

Growth, reproduction, ability to sense environment, respond, metabolism, ability to self replicate, self organise, interact and emergence to this list

Reproduction, likewise is a characteristic of living org.
For multicellular -> sexual
For fungi -> asexual spores
For yeast & hydra -> budding
For planaria -> true regeneration
Fragmentation -> fungi, filamentous alga, protonema of mosses
For unicellular org. Like amoeba growth and reproduction are synonymous
But there are some sterile org. Like mule, worker bees, infertile human, hence it also cannot be an all inclusive defining characteristic of living org.

Another characteristic of life is metabolism
An isolated metabolic reaction outside body in test tube is neither living nor non living. While metabolism is a defining feature of all living org. Without exception.
Isolated reactions are not living things but surely living reactions.
Hence cellular forms/organisation of body is defining feature of life form

All living organisms grow
Increase in mass and in no. Of individuals are twin characteristics of growth. Plants grow by cell division (multicellular) throughout their life. Unicellular org. Also grow by cell division
In animals growth is restricted upto an age. In majority of higher organisms growth and reproduction are mutually exclusive events. Growth has to be internally hence it's not a defining property.

Consciousness, a defining property of living organisms
(Organisms are distinguished unexpectedly)
Every living organisms respond & sense it's environment. (Plants respond to light, water, temp, pollutant, org. And photoperiod affects reproduction in seasonal breeders, both plants & animals. And all animals handle chemicals entering them.)
Only human have self consciousness.
Coma patients are brain dead but body is responding (heart and lungs get replaced by machines)

IMPORTANT POINTS

LIVING ORGANISMS ARE SELF REPLICATING, EVOLVING, SELF REGULATING INTERACTIVE SYSTEMS CAPABLE OF RESPONDING TO EXTERNAL STIMULI

ALL LIVING ORGANISMS (PAST PRESENT AND FUTURE) ARE LINKED TO ONE ANOTHER BY SHARING COMMON GENETIC MATERIAL BUT TO VARYING DEGREES

Property of tissues are not found in cells but present due to interaction among cells and similarly in organelle & molecules.



Diversity in the living world

Each different kind of plant, animal or organisms you see represents a species.
1.7-1.8 million species have been known and described which refers to biodiversity (no. & type of org. present on earth)

Nomenclature

(To solve the possible dispute)
It is only possible when organism is described correctly (identification)
For plants -> ICBN (international code for botanical nomenclature)
For animals -> ICZN (international code for zoological nomenclature)

Binomial nomenclature by Carolus Linnaeus

Contains generic name and specific epithet
UNIVERSAL RULES:-
-> latinised (irrespective of origin), written in italics
-> first word in genus & next is species
-> when handwritten separately underlined & printed in italics which denote latin origin
-> genus starts with capital letter & species with small
Eg- *Mangifera indica* linn

Systematics

Branch of study including, Different organisms, their diversity and relationship b/w them. Latin word *systema* means systematic arrangement of org. Linnaeus used *systema naturae* as the title of his publication.
The scope of systematics was later enlarged to include identification, nomenclature and classification. Systematics takes into account evolutionary relationship b/w org.

Modern taxonomic studies- external, internal structures, cell structure, developmental process, ecological info.

Classification

Grouping into convenient categories based on easily observable characters.
We use convenient categories to study organisms & scientific term for these categories is taxa.
Animals, mammals, dogs represent taxa at different levels.
Based on characteristics all living organisms can be classified into different taxa which is called taxonomy

Processes that are basic to classification- Characterisation, identification, classification and nomenclature
Earlier classifications were based on the 'uses' of various org.

Taxonomic categories

Each step in classification represents a rank or category called taxonomic category and all of them makes taxonomic hierarchy. Each category is referred as unit of classification represents rank & is commonly termed as taxon.

Groups represent category(eg-insects) & it further denotes rank/taxon.

These groups/category are distinct biological entities and not merely morphological aggregates.

Species-

Group of organism with fundamental similarities and can interbreed. Eg- indica, tuberosum, leo, sapiens
One genus may have 1 or more species representing different organisms, but having morphological similarities.

Eg- *P. tigris* & *P. leo*, *S. tuberosum* & *S. nigrum* & *S. melongena*

Genus-

Group of related species
Eg- *solanum* (potato & brinjal), *panthera* (leo, pardus, tigris), *felis* (cats)

Family-

Closely related genera with less no. of similarity.

They are characterised on both vegetative & reproductive features of plant species.

Eg- *solanum*, *petunia*, *datura* are placed in solanaceae family, *panthera* & *felis* are placed in felidae family. Canidae → dog family

Order-

(Assemblage of families)

Order & higher taxonomic categories are identified based on aggregates of characters. Similar characters further decrease. Eg- convolvulaceae solanaceae are in order polymoniales based on floral characters, Carnivora order include felidae and canidae

Class-

Eg- mammalia include order primata (monkey, gorilla, gibbon) & carnivora (tiger, cat, dog)

Phylum (division in plants)

Classes like pisces, amphibia, reptilia, aves, mammalia are included in chordata phylum

Kingdom-
(Highest category)
Eg- plantae

IMPORTANT POINTS

Subcategories in this hierarchy in figure facilitate more sound & scientific placement of various taxa. Higher the category greater is the difficulty of determining the relationship to other taxa at the same level.



Figure 1.1 Taxonomic categories showing hierarchical arrangement in ascending order

TABLE 1.1 Organisms with their Taxonomic Categories

Common Name	Biological Name	Genus	Family	Order	Class	Phylum/Division
Man	<i>Homo sapiens</i>	<i>Homo</i>	Hominidae	Primata	Mammalia	Chordata
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

Taxonomical Aid-

Info gathered or actual specimen for primary source of taxonomic studies and training in systematics

Herbarium-

Collection of dried, pressed & preserved plant specimen & then the sheets are arranged acc. to classification. Info on herbarium sheet- date & place of collection, english local & botanical name, family, collectors name. They serve as quick referral system in studies & become store house, repository for future use

Botanical garden-

Collection of living plants which are grown for identification. Each plant is labelled indicating botanical name & its family. Famous botanical gardens are at Kew (England), Indian Botanical garden, Howrah (India) and at National Research institute, Lucknow (India)

Biological museum-

Set up in schools, colleges & include collection of preserved plant & animal specimens in jars in preservative solutions (formaline). Insects are preserved in insect boxes after collecting, killing and pinning. Larger animals are stuffed and preserved. They also contain collection of skeletons

Zoological parks-

(Wild animals under human care) by which we learn their food habits & behaviour. They are provided with condition similar to natural habitat

Photos are on next page

Key-

Used for identification of plants and animal based on affinity. They are based on contrasting characters generally in a pair called couplet. Results in acceptance of only one & rejection of other. Each statement in key is called a lead. Separate taxonomic keys are required for each taxonomic category such as family, genus and species for identification purposes. Keys are generally analytical in nature.

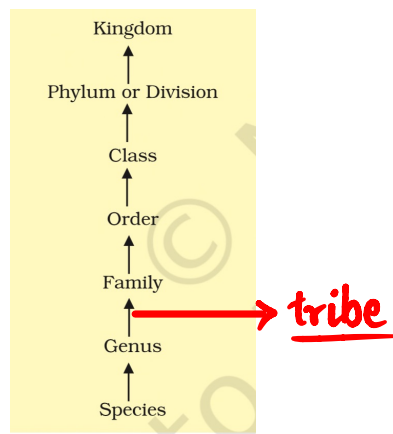


Figure 1.1 Taxonomic categories showing hierarchical arrangement in ascending order



Figure 1.2 Herbarium showing stored specimens

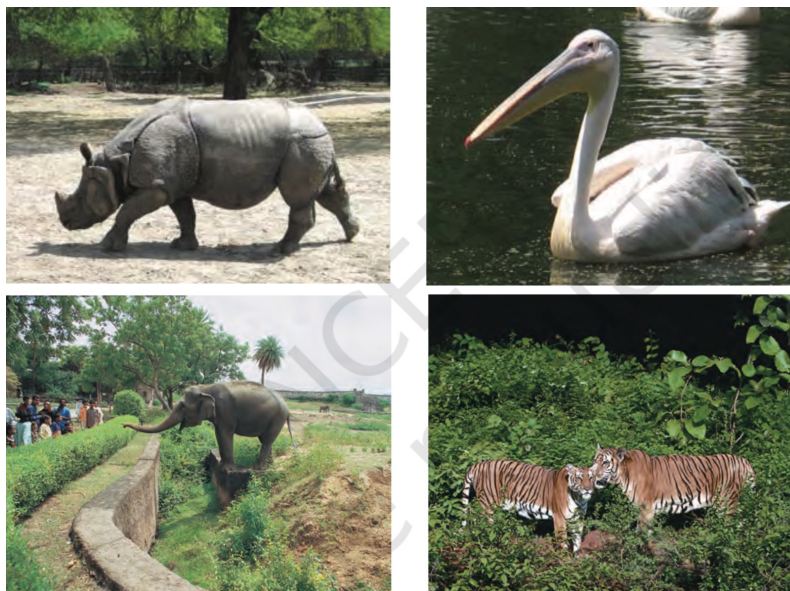


Figure 1.3 Pictures showing animals in different zoological parks of India