

LIVING WORLD

Life

- Life is the property that distinguish living objects from non living objects

Characteristics of living beings

1. Growth

- All living organisms have the capacity to grow
- Increase in **mass** and increase in **number of individuals** are **twin** characteristics of growth.
- A multicellular organism grows by cell division.
- Unicellular organisms also grow by cell division (increase in number).
- In plants**, this growth by cell division occurs **continuously** throughout their life span.
- In animals**, this growth is seen only up to a **certain age**. However, cell division occurs in certain tissues **to replace lost cells**.
- Non-living objects also grow** if we take increase in body mass as a criterion for growth. Mountains, boulders and sand mounds do grow.

Growth, therefore, cannot be taken as a defining property of living organisms.

- A dead organism does not grow.

2. Reproduction

- It is the characteristic of living organisms
- In Living organisms, reproduction refers to **the production of progeny possessing features more or less similar to those of parents**.

- Organisms reproduce by asexual means also.

Example

- Fungi multiply and spread easily due to the millions of **asexual spores** they produce.
- **yeast and hydra**, multiply by **budding**.
- In Planaria (flat worms), we observe true **regeneration**, i.e., a fragmented organism regenerates the lost part of its body and becomes, a new organism.
- **The fungi, the filamentous algae, the protonema of mosses**, all easily multiply by **fragmentation**.
- **In unicellular** organisms like bacteria, unicellular algae or Amoeba, **reproduction is synonymous with growth, i.e., increase in number of cells**. Therefore, in unicellular organisms, there is no distinction in the usage of the terms 'Growth' and 'Reproduction'.
- There are many organisms **which do not reproduce (mules, sterile worker bees, infertile human couples, etc)**.

Hence, reproduction also cannot be an all-inclusive defining characteristic of living organisms.

- No non-living object is capable of reproducing or replicating by itself

3. Metabolism

- The sum total of all the chemical reactions occurring in our body is metabolism .
- No non-living object exhibits metabolism
- Metabolic reactions can be demonstrated outside the body in cell-free systems. An isolated metabolic reaction(s) outside the

body of an organism, performed in a test tube is neither living nor non-living.

Metabolisms is a defining feature of all living organism without exception

4. Cellular organization

- All organisms are made up of one or more cells

Hence, cellular organisation of the body is the defining feature of life forms.

5. Consciousness

- All organism from prokaryote to eukaryotes can sense and respond to environmental cues
- Plants respond to external factors like light, water, temperature, other organisms, pollutants, etc
- All organisms therefore, are 'aware' of their surroundings.
- We sense our environment through sense organs.
- Human being is the only organism who is aware of himself ie: Self Consciousness
- All organisms therefore, are 'aware' of their surroundings.

Consciousness therefore, becomes the defining property of living organisms

- It is very difficult to define the living state of human being. For example, a patient lying in coma in hospitals supported by machines which replace heart and lungs. The patient is otherwise brain dead. The patient who never come back to normal life. **Such persons can neither be considered as living or non living.**
- So We can say that living organisms are **self-replicating, evolving and self-**

regulating interactive systems capable of responding to external stimuli.

DIVERSITY IN THE LIVING

WORLD

- The **number and types of organisms** present on earth is called **Biodiversity**.
- The number of species that are known and described range between 1.7-1.8 million.

SYSTEMATICS

- The study of different kinds of organisms and their diversities, and also the relationships among them is called 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 publication.
- The scope of systematics was later enlarged to include identification, nomenclature and classification.
- Systematics takes into account evolutionary relationships between organisms.

TAXONOMY

- Based on characteristics, all living organisms can be classified into different taxa. This process of classification is taxonomy.
- External and internal structure, along with the structure of cell, development process and ecological information of organisms are essential and form the basis of modern taxonomic studies
- **Characterisation, identification, classification and nomenclature** are the processes that are basic to taxonomy

1. Characterisation:

It is the understanding of characters of organisms such as external and internal structure, structure of cell, development process, ecological information etc.

2. Identification:

- Nomenclature is only possible when the organism is described correctly and we know to what organism the name is attached to. This is called identification.

3. Classification:

- It is the grouping of organisms into convenient categories (taxa) based on characters.
- Based on characteristics, all living organisms can be classified into different taxa. This process of classification is taxonomy

Q) Why living organisms classified?

Ans : it is nearly impossible to study all the living organisms, it is necessary to devise some means to make this possible. This process is classification. Classification is the process by which anything is grouped into convenient categories based on some easily observable characters. The scientific term for these categories is 'taxa' based on characteristics, all living organisms can be classified into different taxa. This process of classification is taxonomy

4. Nomenclature (naming):

It is the providing of standardized names to the organisms such that a particular organism is known by the same name all over the world.

Q) Why the names of living organism should be standardised ?

Ans: There are millions of plants and animals in the world; we know the plants and animals in our own area by their local names. These

local names would vary from place to place, even within a country, hence, there is a need to standardise the naming of living organisms such that a particular organism is known by the same name all over the world. This process is called nomenclature. **The scientific names ensure that each organism has only one name.**

Who can give scientific names?

- Anyone can study, describe, identify and give a name to an organism provided certain universal rules are followed. These rules are framed and standardised by two organizations
 - a) **For plants**, scientific names are based on agreed principles and criteria, which are provided in **International Code for Botanical Nomenclature (ICBN)**.
 - b) **Animal taxonomists** have evolved **International Code of Zoological Nomenclature (ICZN)**.

Binomial Nomenclature

- Biologists follow universally accepted principles to provide scientific names to known organisms.
- Each name has **two components** –
 - **The Generic name and**
 - **The specific epithet.**
- This system of providing a name with two components is called **Binomial nomenclature**. This naming system given by **Carolus Linnaeus** is being practised by biologists all over the world

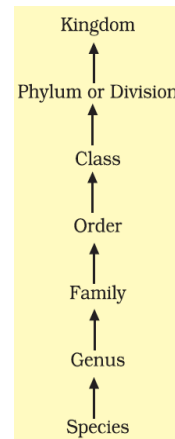
Universal rules of nomenclature

1. Biological names are generally in Latin and written in italics. They are Latinised or derived from Latin irrespective of their origin.
 2. The **first word** in a biological name represents the **genus** while the **second** component denotes the **specific epithet**.
 3. Both the words in a biological name, when handwritten, are separately **underlined**, **or printed in italics** to indicate their Latin origin.
 4. The first word denoting the genus starts with a **capital letter** while the specific epithet starts with a small letter. It can be illustrated with the example of *Mangifera indica*.
- **Name of the author** appears after the specific epithet, i.e., at the end of the biological name and is written in an abbreviated form, e.g., *Mangifera indica* **Linn**. It indicates that this species was first described by **Linnaeus**

TAXONOMIC CATEGORIES

- Classification is not a single step process but involves hierarchy of steps in which each step represents a **rank or category**. Since the category is a part of overall taxonomic arrangement, it is called the taxonomic category and all categories together constitute the taxonomic hierarchy.
- Taxonomical studies of all known organisms have led to the development of common categories such as **kingdom, phylum or division (for plants), class, order, family, genus and species**.
- Each category, referred to as a unit of classification, in fact, represents a rank and is commonly termed as taxon (pl.: taxa).

SOHSS-AREEKODE



Species

- It is the **lowest or basic unit** in taxonomic hierarchy.
- Species are group of **closely related organism which are genetically distinct and are capable of interbreeding to produce fertile offspring**. This definition is given by **Ernst Mayr (Darwin of 20th century)**

Eg: *Mangifera indica*,

Solanum tuberosum (potato) and

Panthera leo (lion).

All the above three names, *indica*, *tuberosum* and *leo*, represent **the specific epithets**

- Each genus may have one or more than one specific epithets representing different organisms, but having morphological similarities

For example: *Panthera* has another specific epithet called *tigris* and *Solanum* includes species like *nigrum* and *melongena*

Genus

- It is a **group of related species**, which resemble one another.

For example:

1. potato, tomato and brinjal are three different species but all belong to the genus **Solanum**.

2. Lion (*Panthera leo*), leopard (*P. pardus*) and tiger (*P. tigris*) with several common features, are all species of the genus **Panthera**.

- **Felis** which includes **cats**

Family

- **Similar genera** are grouped under family.

For example

- 1-Three different genera Solanum, Petunia and Datura are placed in the family **Solanaceae**.
2. Genus Panthera, comprising lion, tiger, leopard is put along with genus, Felis (cats) in the family **Felidae**
3. Dog coming under family **canidae**

Order

- It is a group of **related families** resembling one another in a few characters

For example

1.Plant families like **Convolvulaceae**, **Solanaceae** are included in the order **Polymoniales** mainly based on the floral characters.

2.The animal **order**, **Carnivora**, includes families like **Felidae** and **Candidae**

Class

- It is a **group of related orders** having some common characters.

For example,

1.Order Primata comprising monkey, gorilla and gibbon is placed in **class Mammalia** along with order Carnivora that includes animals like tiger, cat and dog. Class Mammalia has other orders also

Phylum

- It is **group of related class** having some common features.

In case of **plants**, classes with a few similar characters are assigned to a higher category called **Division**

Kingdom

- **All animals** belonging to various phyla are assigned to the highest category called **Kingdom Animalia** in the classification system of animals.
- **All Plants** belonging to **various divisions** are assigned to the highest category called **Kingdom Plantae**
 - As we go higher from species to kingdom, the number of **common characteristics** goes on decreasing
 - **Lower the taxa, more are the characteristics that the members within the taxon share.**

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 Aids

- Taxonomic studies of various species of plants, animals and other organisms are useful in agriculture, forestry, industry and in general in knowing our bio-resources and their diversity.
- These studies would require correct **classification and identification** of organisms.
- Identification of organisms requires intensive laboratory and field studies.

**Indian Botanical Garden, Howrah (India)
and at National Botanical Research
Institute, Lucknow (India).**

- The collection of actual specimens of plant and animal species is essential and is the prime source of taxonomic studies.
- It is used for classification of an organism, and the information gathered is also stored along with the specimens. In some cases the specimen is preserved for future studies.
- Biologists have established certain procedures and techniques to store and preserve the information as well as the specimens. Some of these taxonomic aids are explained below

1. Herbarium

- Herbarium is **a store house** of collected plant specimens that are dried, pressed and preserved on sheets.
- Further, these sheets are arranged according to a universally accepted system of classification.
- These specimens, along with their descriptions on herbarium sheets, become a store house or repository for future use.
- 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.
- Thus Herbaria also serve as quick referral systems in taxonomical studies.

2. Botanical Garden

- These specialised gardens have **collections of living plants for reference**.
- Plant species in these gardens are grown for identification purposes and each plant is labelled indicating **its botanical/scientific name and its family**.

The famous botanical gardens (Royal botanical garden) are at Kew (England),

3. Museum

- Museums have collections of **preserved plant and animal specimens** for study and reference.
- Specimens are preserved in the containers or jars in preservative solutions.
- Plant and animal specimens may also be preserved as dry specimens.
- Insects are preserved in **insect boxes** after collecting, killing and pinning.
- Larger animals like birds and mammals are usually **stuffed** and preserved.
- Museums often have collections of skeletons of animals too.

4. Zoological Park

- These are the places where wild animals are kept in protected environments under human care
- This **enable us to learn about their food habits and behaviour**.
- All animals in a zoo are provided, as far as possible, the conditions similar to their natural habitats

5. Key

- Key is another taxonomical aid used for identification of plants and animals based on the **similarities and dissimilarities**.
- Each statement in the key is called a **lead**.
- The keys are based on the contrasting characters generally **in a pair** called **couplet**. It represents the choice made between two opposite options. This results in **acceptance of only one and rejection of the other**

- Separate taxonomic keys are required for each taxonomic category such as family, genus and species for identification purposes.
- Keys are generally analytical in nature.
- Flora, manuals, monographs and catalogues are some other means of recording descriptions. They also help in correct identification.

Other Taxonomic Aids

Besides above mentioned taxonomic aids, **Flora, manuals, monographs and catalogues** are some other means of recording descriptions and also serves as taxonomic aid for correct identification

Flora

- It contains the actual account of habitat and distribution of **plants of a given area**.
- These provide the index to the plant species found in a particular area.

Manuals

- They are useful in providing information for identification of **names of species** found in an area.

Monographs

- It contains information on **any one taxon**.

Catalogues

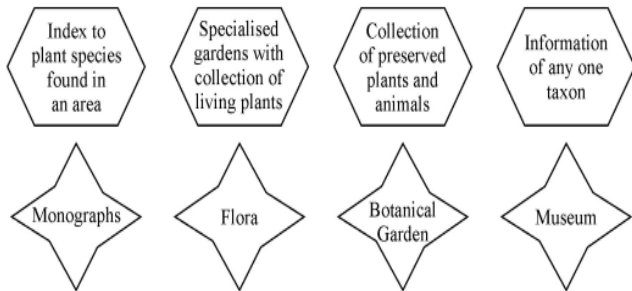
- They are list or register containing names of all the species found in a particular place.



SCAN QR Code for video class

Previous Years Question Paper

1. Match the hexagons with stars correctly
(HSE-Sept-2021)(2)



2. The description containing information on any one taxon is called (HSE Dec-2020)(1)
a) Flora b) Manual c) Monograph d) Key
3. Expand the following (HSE Dec-2020)(2)
a) ICBN b) ICZN
4. Unit of classification is _____.
(a) Taxon (b) Species
(c) Genus (d) Cell (HSE-March 2020) (1)
5.is the taxonomical aid based on contrasting characters generally in a pair called couplet. (HSE-july-2019)(1)
6. Binomial nomenclature was proposed by (HSE-March-2019)(1)
7. Given below the scientific name of frog. Identify the correctly written name
a) *Rana Tigrina*
b) *Ranol tigrina* (HSE-Model-2019)(1)
8. Which among the following represents the CORRECT sequence? . (HSE-Aug-2018)(1)
a) Kingdom ← Phylum ← Class ← Family ← Order ← Genus ← Species.
b) Phylum ← Class ← Kingdom ← Order ← Family ← Species ← Genus
c) Kingdom ← Phylum ← Class ← Order ← Family ← Genus ← Species
d) Kingdom ← Phylum ← Class ← Family ← Genus ← Order ← Species
9. Rearrange the following taxonomic categories in the correct sequence. (HSE-March-2018)(1)
Kingdom ← Class ← Phylum ← Genus ← Family ← Order ← Species
10. ICZN stands for (HSE-model-2018)(1)
a) International Council of Zoological Nomenclature

- b) Indian Council of Zoological Nomenclature
c) International Code of Zoological Nomenclature
d) IndianCode of Zoological Nomenclature
11. Find out the odd one on the basis of taxonomy and justify your answer (HSE-July-2017)(1)
a) Family
b) Order
c) Class
d) Herbarium
e) Phylum
12. Select the correct sequence of taxonomic hierarchy. (HSE-March-2017)(1)
a) Kingdom-Phylum-class-order-genus-family-species
b) Kingdom-phylum,order-class-family-genus-species
c) Kingdom-Phylum-class order-Family-Genus-Species
d) Kingdom-Class-Phylum-Family-Order-Species-Genus
13. Observe the first pair of words and write a suitable word for the second pair
Botanical garden : Living plants
.....: Living animals (HSE Sept-2016)(1)
14. During adventure trip a plus one student got a skull and skeletal part of rare animal from the Chinnar forest. Select suitable location for keeping it from the list taxonomical aids given below (HSE March-2016)(1)
(Herbarium, museum, zoological park, Botanical garden)
15. A student conceived the rules of nomenclature as follows. If you find any mistake in the underlined portions, correct them with appropriate words (HSE September-2015) (1)
a. The first word in a biological name represent species and begins with a Capital letter
b. The second word represents Genus and begins with a small letter
16. Complete the tale using suitable terms

(HSE MARCH-2015) (1)

Common name	Genus	Species	Class	Phylum
Man		Sapiens	Mammalia	

17. Select the correct Generic name and specific epithet from the table given below and write the scientific name of House fly

(HSE AUGUST-2014) (1)

Generic name	Specific epithet
<i>Mangifera</i>	<i>domestica</i>
<i>Musca</i>	<i>indica</i>

18. Align the taxonomical categories in the ascending order. (HSE MARCH-2014)(1)
(Genus, order, phylum, species, family, class, kingdom)
19. Rearrange both the biological category and taxon based on taxonomical hierarchy (HSE OCTOBER-2013) (1)
(Hint-The last two terms of taxon will give the scientific name of house fly)

Category	Taxon
Phylum	Musca
Genus	Insecta
Class	Arthropoda
Species	Domestica

20. After completing a project study based on diversity of spiders, the specimens were intended to be stored for future reference. Select a suitable taxonomical aid from the following for the preservation of specimens. (HSE MARCH-2013) (1)

a) Herbarium b) Museum
c) Zoological park d) Sanctuary
Justify your answer

21. Categorize the following terms into two. Give suitable title for each category.

(HSE-SEPTEMBER-2012)(1)

Species, museum, class, genus,
zoological park, herbarium

22. Taxonomical aids are very useful for classification and identification of organisms. Name any two taxonomical aid

(HSE MARCH-2012)(1)

23. Note the relationship between the first two words and suggest suitable word for the fourth place (HSE MARCH-2011) ($2 \times \frac{1}{2} = 1$)

a. Collection of living plants : botanical garden, animals kept in protected environment:

b. *Homo sapiens* :Man,
Musca domestica :.....

24. Rearrange the following in correct taxonomic hierarchical sequence (HSE MARCH-2010) (1)

Sapiens->Hominidae->Homo->Mammalia->Primata->Chordata

25. Raju collected a skull of animal and a living rare animal during a study tour. Select the suitable location for each from the list given in the brackets (HSE MARCH-2009)(1)
(Botanical garden, Zoological park, Herbarium, Museum)