

## **Chapter-1 The Living World**

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### **Very Short Answer Questions**

**1. What does ICBN stand for?**

A: International Code for Botanical Nomenclature.

**2. What is flora?**

A: It is a publication containing actual account of habitat, distribution and systematic listing of plants of a given area.

**3. Define metabolism. What is the difference between anabolism and catabolism?**

A: The sum total of all the chemical reactions occurring in the body of a living organism is called metabolism.

The constructive metabolic reactions are anabolism and destructive metabolic reactions are catabolism.

**4. Which is the largest Botanical garden in the world? Name a few well known botanical gardens in India?**

A: Royal Botanical Garden at Kew, England.

Indian Botanical Garden, Howrah.

National Botanical Research Institute, Lucknow.

**5. Define the terms couplet and lead in taxonomic key?**

A: The taxonomic keys generally based on a pair of contrasting characters. This pair is called couplet.

Each statement in the keys is called as lead.

**6. What is meant by manuals and monographs?**

A: These are publications or records containing information regarding plants. Manuals contain names of species found in an area. Monographs contain information on any one taxon.

**7. What is systematics?**

A: The study of different kinds of organisms, their diversities and also the relationships among them is referred as systematic.

**8. Why are living organisms classified?**

A: It is impossible to study all living organisms without any means.

Classification is the mean to make possible the study of all living organisms. So the organisms classified.

**9. What is the basic unit of classification? Define it?**

A: Species.

Species is a group of individual organisms with fundamental similarities.

**10. Give the scientific name of Mango. Identify the generic name and specific epithet?**

A: *Mangifera indica*.

Generic Name: *Mangifera*.

Specific epithet: *indica*.

**11. What is growth? What is the difference between the growth in living organisms and growth in non-living objects?**

A: Increase in mass and increase in number of individuals is growth.

In living organisms growth is from inside.

In non-living organisms it is by accumulation of material on the surface.

## Short Answer Questions

1. **What is meant by identification and nomenclature? How is the key help in the identification and classification of an organism?**

A: We know the plants and animals in our locality by their local names. These local names vary from location to location within a country. Due to this a single name may be used for different plants or a single plant may have different names. To eliminate this confusion there is a need to standardize 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** or naming. Nomenclature is providing a single valid scientific name to an identified organism.

Nomenclature or naming is possible only when the organism is described correctly and accurately identified. This is **identification**. Identification is to determine whether the collected organism is entirely new or already known. In plants this identification is done by directly comparing the characters with an authenticated specimen or indirectly with the help of keys.

Keys are contrasting characters expressed in pairs called couplet. This results in accepting one and rejecting the other and ultimately identifying the plant. For example

A. Roots tap root not fibrous

a) Leaves with reticulate venation not parallel

i) Leaves with stipules ----- plant X

ii) Leaves without stipules ---plant Y

a) Leaves with parallel venation ----- plant Z

A. Roots are fibrous

b) Leaves with parallel venation not reticulate --- plant P

b) Leaves with reticulate venation----- plant Q

2. **What are taxonomical aids? Give the importance of herbaria and museums?**

A: For accurate identification and classification of an organism or plant require intensive laboratory and field studies. Any device that assists or help in identification and classification of the plant is **called Taxonomical aids**. Such taxonomic aids are Herbaria, Museums and Botanical Gardens.

For this, the collection of actual specimen of plants or animal species is essential. This is the prime source of taxonomic studies.

To determine its identification, the specimen is directly compared with an authentic specimen already described and identified earlier.

**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. Herbaria serve as quick referral systems in taxonomical studies.

**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. Museums like herbaria serve as referral systems in taxonomical studies.

3. **Define Taxon. Give some examples of taxa at different hierarchical level?**

A: Classification involves hierarchy of steps in which each step represents a rank or category. Each of these categories is referred as taxon.

In plant classification highest taxon is Plant kingdom. The hierarchy of plant kingdom is

Plant kingdom

Division

Class

Order

Family

Genus

Species

Few examples of at different hierarchical levels

Common Name	Biological Name	Genus	Family	Order	Class	Division
Mango	<i>Mangifera indica</i>	<i>Mangifera</i>	Anacardiaceae	Sapindales	Dicotyledonae	Spermatophyta
Pea	<i>Pisum sativum</i>	<i>Pisum</i>	Fabaceae	Rosales	Dicotyledonae	Spermatophyta
Tomato	<i>Lycopersicon esculentum</i>	<i>Lycopersicon</i>	Solanaceae	Polemoniales	Dicotyledonae	Spermatophyta
Onion	<i>Allium cepa</i>	<i>Allium</i>	Liliaceae	Coronorae	Monocotyledonae	Spermatophyta

4. **How are botanical are useful in conserving biodiversity? Define the terms Flora, manuals, monographs and catalogues?**

A: Botanical Gardens are specialised gardens that 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 are at Kew (England), Indian Botanical Garden, Howrah (India) and at National Botanical Research Institute, Lucknow (India). As many different kinds and groups of plants are grown here in protected environment these gardens conserve biodiversity.

Flora 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 are useful in providing information for identification of names of species found in an area. Monographs contain information on any one taxon.

Catalogues are compilations of plant information including names and classifications.

Flora, manuals, monographs and catalogues are means of recording descriptions. They help in correct identification.

5. **Explain binomial nomenclature?**

A: 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 practiced by biologists all over the world. This naming system using a two word format was found convenient. Let us take the example of mango to understand the way of providing scientific names better. The scientific name of mango is written as *Mangifera indica*. Let us see how it is a binomial name. In this name *Mangifera* represents the genus while *indica*, is a particular species, or a specific epithet. Other universal rules of nomenclature are as follows:

1. Biological names are generally in Latin and written in italics. They are Latinised if they are from other languages.
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.

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## Long Answer Questions

**1. What is meant by ‘living’? Give a detailed account of any four defining features of life forms?**

A: ‘Living’ is growing, reproducing, ability to sense environment and mount a suitable response, metabolising etc by organisms.

**1. All living Organisms Grow:**

Increase in mass and increase in number of individuals are twin characteristics of growth. A multi-cellular organism grows by cell division. 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. Unicellular organisms also grow by cell division. One can easily observe this in *vitro* culture by simply counting the number of cells under the microscope. Increase in body mass is considered as growth. Non-living objects also grow if we take increase in body mass as a criterion for growth. Mountains, boulders and sand mounds do grow. However, this kind of growth exhibited by non-living objects is by accumulation of material on the surface. In living organisms, growth is from inside. A dead organism does not grow.

**2. Reproduction is a characteristic of living organisms:**

In multicellular organisms, reproduction refers to the production of progeny possessing features more or less similar to those of parents. Invariably this reference is to sexual reproduction. Organisms reproduce by asexual means also. Fungi multiply and spread easily due to the millions of asexual spores they produce. In lower organisms like yeast and hydra, we observe 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. When it comes to unicellular organisms like bacteria, unicellular algae or *Amoeba*, reproduction is synonymous with growth, i.e., increase in number of cells.

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

**3. Another characteristic of life is metabolism:**

All living organisms are made of chemicals. These chemicals, small and big, belonging to various classes, sizes, functions, etc., are constantly being made and changed into some other

biomolecules. These conversions are chemical reactions or metabolic reactions. There are thousands of metabolic reactions occurring simultaneously inside all living organisms, be they unicellular or multi-cellular. All plants, animals, fungi and microbes exhibit metabolism. The sum total of all the chemical reactions occurring in our body is metabolism. No non-living object exhibits metabolism. Hence, metabolism is a defining feature of all living organisms without exception.

#### 4. Responsibility:

Ability to sense the surroundings or environment and respond to these environmental stimuli could be physical, chemical or biological. We sense our environment through our sense organs. Plants respond to external factors like light, water, temperature, other organisms, pollutants, etc. All organisms, from the prokaryotes to the most complex eukaryotes can sense and respond to environmental cues. Photoperiod affects reproduction in seasonal breeders, both plants and animals. All organisms handle chemicals entering their bodies. All organisms therefore, are 'aware' of their surroundings.

## 2. Define the following terms with examples?

i) Class

ii) Family

iii) Order

iv) Genus

v) Division

A: **Class:**

This category includes related orders. For example, order Rosales comprising rose, pea, and gulmohar is placed in class Dicotyledonae along with order Passiflorales that includes plants like cucumber, pumpkin and bitter gourd. Onions, palms along with grasses are included in Monocotyledonae.

**Family:**

The next category, **Family**, has a group of related genera with still less number of similarities as compared to genus and species. Families are characterised on the basis of both vegetative and reproductive features of plant species. Among plants for example, three different genera *Solanum*, *Petunia* and *Datura* are placed in the family Solanaceae.



**Order:**

Generally, order and other higher taxonomic categories are identified based on the aggregates of characters. Order being a higher category, is the assemblage of families which exhibit a few similar characters. The similar characters are less in number as compared to different genera included in a family. Plant families like Convolvulaceae, Solanaceae are included in the order Polymoniales mainly based on the floral characters.

**Genus:**

Genus comprises a group of related species which has more characters in common in comparison to species of other genera. We can say that genera are aggregates of closely related species. For example, potato, tomato and brinjal are three different species but all belong to the genus *Solanum*.

**Division:**

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

Classes comprising plants with two cotyledons and single cotyledons constitute the next higher category called Division. All these, based on the common features like presence seeds covered or naked. These are included division Spermatophyta.