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CHAPTER NOTES

The Living World Class 11 Notes | CBSE Biology Chapter 1

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The Living World Class 11 Notes | CBSE Biology

Chapter 1

The Living World is Chapter 1 of CBSE Class 11 Biology — the gateway chapter that teaches you how biologists make sense of the staggering variety of life on Earth. It answers two big questions: what does it mean to be “living”, and how do we name and organise millions of organisms so that a scientist in India and one in Japan can talk about the exact same plant?

By the end of these notes you will be able to list the defining features of life, place any organism in the correct taxonomic hierarchy, write a scientific name following binomial nomenclature rules, and recall every taxonomic aid (herbarium to monograph) with confidence. This is a high-yield, fact-heavy NEET chapter and an easy-marks board topic carrying roughly 3–4 marks, and it sets up all of biological classification that follows.

Table of Contents

- Key Concepts — What is living, diversity, characteristics, taxonomic categories, nomenclature, taxonomic aids
 - Weightage in Board & Entrance Exams
 - Important Definitions
 - Illustrative Examples
 - Important Questions for Board Exams
 - Quick Revision Points
-

Key Concepts

1. What is “Living”? Diversity in the Living World

Look around — a mango tree, a crow, a mushroom, the bacteria on your skin. Every one of these is a **living organism**, yet they look nothing alike. This incredible variety of life forms is called **biodiversity**.

So far about **1.7–1.8 million** species have been identified and described, but the actual number on Earth is estimated to be far higher. Because new organisms are discovered constantly, biologists need a universal system to name, describe, and group them — this is the job of **taxonomy**.

Key idea: The number of species known is always less than the number that actually exists; classification turns chaos into order.

2. Characteristics of Living Organisms

No single property defines life on its own. Living things are best recognised by a combination of features. The two most reliable, **defining characteristics** are metabolism and consciousness, while others like growth and reproduction can be shown by non-living things or be absent in some living things.

Growth

Living organisms grow by **increase in mass and increase in number of cells**. In plants growth continues throughout life; in animals it occurs only up to a certain age. Crucially, living things grow **from inside** (intrinsic), whereas non-living things like a mountain or a crystal grow by accumulation of material **on the surface** (extrinsic). Growth, therefore, is **not** a defining property of life — a dead organism does not grow.

Reproduction

The ability to produce young ones of the same kind. It may be sexual, asexual, by budding, fragmentation, or regeneration. However, many organisms (mules, sterile worker bees, infertile human couples) do not reproduce yet are clearly alive — so reproduction is also **not** an all-or-none defining feature.

Metabolism

The sum total of all chemical reactions occurring in the body. This **is** a defining feature — all living organisms, without exception, are made of chemicals undergoing constant reactions. Isolated metabolic reactions in a test tube are neither living nor non-living, but cellular metabolism is the defining feature of life.

Cellular Organisation

All living bodies are made of one or more cells. This cellular organisation of the body is the defining feature of life at the structural level.

Consciousness

The ability to sense the environment and respond to stimuli (light, heat, sound, chemicals, other organisms). This is the **most obvious and the defining characteristic** of living organisms. A patient in a coma supported by machines shows how difficult it is to define life precisely.

Other properties: self-replication, self-organisation, interaction, and the emergence of novel properties at higher levels of organisation (the whole is more than the sum of its parts).

3. Taxonomy and Systematics

Taxonomy is the science of **identification, nomenclature, and classification** of organisms based on characters. Its basic processes are characterisation, identification, classification, and nomenclature.

Systematics (from the Latin *systema*) is the study of the **diversity of organisms and all their comparative and evolutionary relationships**. It is broader than taxonomy — it includes taxonomy plus the evolutionary relationships (phylogeny) among organisms.

- “**Systema Naturae**” was the title of Carolus Linnaeus’s famous work.
 - **Carolus Linnaeus** is regarded as the **Father of Taxonomy**.
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4. Nomenclature — Naming Organisms

Common (local) names vary from place to place, so they cannot be used in science. To give every organism one universally accepted name, scientists use **scientific names** governed by international codes.

- **ICBN** — International Code for Botanical Nomenclature (for plants).
 - **ICZN** — International Code of Zoological Nomenclature (for animals).
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5. Binomial Nomenclature and Its Rules

Binomial nomenclature is the system of giving each organism a scientific name made of **two words**: the **genus** (generic name) and the **species** (specific epithet). It was given by **Carolus Linnaeus**.

Examples: *Mangifera indica* (mango), *Homo sapiens* (human), *Panthera leo* (lion).

Universal Rules of Nomenclature

- Biological names are generally in **Latin** and written in *italics* (because they are latinised).
 - The name has two components: the first word is the **genus** and the second is the **specific epithet (species)**.
 - When handwritten, both words are **separately underlined** to show their Latin origin.
 - The **genus name starts with a capital letter**; the **species name starts with a small (lower-case) letter**.
 - The name of the **author** appears after the specific epithet, in an abbreviated form and not italicised — e.g. *Mangifera indica* Linn. (Linn. = described by Linnaeus).
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6. Taxonomic Categories (Taxonomic Hierarchy)

Every organism is placed in a series of categories arranged in a definite order — this is the **taxonomic hierarchy**. Each rank or level is called a **taxon** (plural: taxa) and represents a real, distinct biological group.

The hierarchy, from lowest to highest, is:

Species → Genus → Family → Order → Class → Phylum (Animals) / Division (Plants) → Kingdom

Key rule: as you go **up** the hierarchy (species to kingdom), the number of common characteristics **decreases** and the number of organisms **increases**. Going **down**, common characters increase and the group becomes smaller and more specific.

Species

The **basic (lowest) unit** of classification. A species is a group of individuals with **fundamental similarities** that can interbreed. Example: *indica* in *Mangifera indica*; *sapiens* in *Homo sapiens*.

Genus

A group of **related species** that have more characters in common with one another than with species of other genera. Example: *Panthera* includes lion (*P. leo*), tiger (*P. tigris*), and leopard (*P. pardus*).

Family

A group of **related genera** with fewer similarities than genus and species. Plant families are based on vegetative and reproductive features. Example: genera *Solanum*, *Petunia*, and *Datura* belong to family **Solanaceae**.

Order

An assemblage of **related families** based on a few similar characters. Example: families Convolvulaceae and Solanaceae are placed in the order **Polymoniales**.

Class

A group of **related orders**. Example: order Primata (with monkeys, gorillas, gibbons) and order Carnivora (with tiger, dog) are placed in class **Mammalia**.

Phylum / Division

Classes with a few similar characters are grouped into a **Phylum** (for animals) or a **Division** (for plants). Example: classes Pisces, Amphibia, Reptilia, Aves, and Mammalia form the phylum **Chordata** (animals with a notochord and a dorsal hollow nerve cord).

Kingdom

The **highest** category. All animals belong to **Kingdom Animalia** and all plants to **Kingdom Plantae**.

[TABLE: Taxonomic categories of Human, Housefly, Mango and Wheat — showing how each is placed from Species up to Kingdom.]

7. Taxonomical Aids

To study and identify organisms, biologists rely on collections, records, and reference tools called **taxonomical aids**. These are heavily tested in NEET, so learn the one-line definition of each.

Herbarium

A store house of **collected, dried, pressed plant specimens** mounted on sheets and arranged according to a universally accepted classification. Each sheet carries a **label** with date, place of collection, scientific name, family, collector's name, etc. A herbarium acts as a quick referral system.

Botanical Gardens

Collections of **living plants** grown for reference. Each plant is labelled with its botanical/scientific name and family. Famous examples: **Royal Botanical Garden, Kew (England)**; **Indian Botanical Garden, Howrah (Kolkata)**; National Botanical Research Institute, Lucknow.

Museum

Places where **collections of preserved plant and animal specimens** are kept for study. Specimens are preserved in containers/jars in **preservative solutions**; insects are pinned in boxes; larger animals are **stuffed**. Museums also keep skeletons of animals.

Zoological Parks (Zoos)

Places where **wild animals are kept in protected, near-natural conditions**. They let us study the food habits and behaviour of animals.

Key

An analytical tool used for the **identification** of plants and animals based on similarities and dissimilarities. Each statement in a key is a **couplet**, representing two contrasting characters; choosing one leads to the next step. Keys are generally analytical in nature, and separate taxonomic keys are needed for each taxonomic category.

Flora, Manuals, Monographs and Catalogues

- **Flora:** contains the **actual account of habitat and distribution** of plants of a given area; gives an index to the plant species found in a particular region.
- **Manuals:** provide information for the **identification of names of species** found in an area.
- **Monographs:** contain information on **any one taxon** (a single complete study of one group).
- **Catalogue:** an alphabetical list of species with brief descriptions, used as a record/reference.

Weightage in Board & Entrance Exams

Exam	Typical Weightage	Most-Tested Areas
CBSE Board (Class 11)	3–4 marks	Characteristics of life, taxonomic hierarchy, binomial nomenclature rules
NEET	1–2 questions	Order of taxonomic categories, taxonomical aids (flora/manual/monograph), nomenclature rules
State CETs / Other Entrances	1–2 questions	Father of Taxonomy, ICBN/ICZN, herbarium vs museum

[TABLE: Question-type split — VSA (1 mark): definitions, full forms, who-is-who; SA (2–3 marks): characteristics of living, rules of nomenclature; LA (5 marks): taxonomic hierarchy with example, taxonomical aids described.]

Important Definitions

Term	Definition
Biodiversity	The total number and variety of organisms (species) present on Earth
Metabolism	The sum total of all chemical reactions occurring in the body — a defining feature of life
Taxonomy	Science of identification, nomenclature and classification of organisms
Systematics	Study of diversity of organisms and their comparative, evolutionary relationships
Taxon	A unit/group of any rank in the taxonomic hierarchy (e.g., a species, a genus, a family)
Binomial nomenclature	Naming an organism with two words — genus + specific epithet (given by Linnaeus)
Species	Basic unit of classification — a group of similar individuals that can interbreed
Genus	A group of related species sharing common features
Herbarium	Store house of dried, pressed plant specimens mounted on sheets
Flora	A book giving the actual account of habitat and distribution of plants of an area
Monograph	A publication containing information on any one taxon
Key	An analytical tool for identification based on contrasting characters (couplets)

Illustrative Examples

Example 1

Write the correct way to express the scientific name of the mango, and point out two rules it follows.

Answer: *Mangifera indica* Linn. The genus (*Mangifera*) begins with a capital and the specific epithet (*indica*) with a small letter; both are italicised (or separately underlined when handwritten); the author "Linn." is added after, not italicised.

Example 2

Arrange the following taxonomic categories in the correct order from lowest to highest: Order, Species, Phylum, Genus, Class, Kingdom, Family.

Answer: Species → Genus → Family → Order → Class → Phylum → Kingdom.

Example 3

Lion, tiger and leopard are different species but share the genus name *Panthera*. What does this tell you about a genus?

Answer: A genus is a group of **related species** with more characters in common with each other than with species of other genera — hence *Panthera leo*, *P. tigris* and *P. pardus* share the genus *Panthera*.

Example 4

Genera *Solanum*, *Petunia* and *Datura* are placed together. Name the taxon and explain the principle.

Answer: They belong to the family **Solanaceae**. A family is a group of **related genera**, grouped on the basis of common vegetative and reproductive (floral) features.

Example 5

A student claims a growing mountain and a growing crystal are “alive” because they increase in size. Refute this.

Answer: Non-living things grow by accumulation of material **on the surface (extrinsic)**, whereas living organisms grow **from within (intrinsic)** by cell division. Growth alone is therefore not a defining feature of life.

Example 6

Match each aid to its use: (a) Herbarium (b) Flora (c) Monograph (d) Zoological park.

Answer: (a) Store house of dried, pressed plant specimens on sheets; (b) account of habitat and distribution of plants of an area; (c) information on a single taxon; (d) keeping wild animals in protected, near-natural conditions for study.

Important Questions for Board Exams

1-Mark Questions (VSA)

1. Who is regarded as the Father of Taxonomy?
2. Expand ICBN and ICZN.
3. Name the basic unit of classification.
4. Why is growth not considered a defining property of living organisms?
5. What is a taxon? Give one example.

2–3-Mark Questions (SA)

1. State any three universal rules of binomial nomenclature with an example.
2. Differentiate between taxonomy and systematics.
3. Explain why metabolism and consciousness are considered defining features of life while reproduction is not.

4. Distinguish between a herbarium and a botanical garden.

5-Mark Questions (LA)

1. Define taxonomic hierarchy. Arrange the categories from species to kingdom and explain how common characters and number of organisms change as you move up.
 2. Describe any four taxonomical aids used in the study of plants and animals.
 3. What are the defining characteristics of living organisms? Discuss growth, reproduction, metabolism and consciousness with examples.
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Quick Revision Points

- About 1.7–1.8 million species described so far; classification brings order to this diversity
 - Defining features of life: metabolism, cellular organisation, and consciousness
 - Growth (intrinsic vs surface accumulation) and reproduction are NOT defining features
 - Taxonomy = identification + nomenclature + classification; Systematics also includes evolutionary relationships
 - Carolus Linnaeus = Father of Taxonomy; wrote "Systema Naturae"
 - Binomial nomenclature: two Latin words — Genus (capital) + species (small), italicised/underlined, author added after
 - ICBN for plants, ICZN for animals
 - Hierarchy: Species → Genus → Family → Order → Class → Phylum/Division → Kingdom
 - Going up the hierarchy: common characters decrease, number of organisms increases
 - *Panthera* (genus) → Solanaceae (family) → Polymoniales (order) → Mammalia (class) → Chordata (phylum)
 - Taxonomical aids: herbarium, botanical garden, museum, zoological park, key, flora, manual, monograph, catalogue
 - Flora = distribution; Manual = identification of names; Monograph = one taxon; Key = couplets of contrasting characters
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Next Chapter: Chapter 2 — Biological Classification



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