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GENERAL SCIENCE

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Unit I

Biology

CHAPTER

1

DIVERSITY WORLD

1.1 Classification

Scientists have estimated that there are around 8.7 million species of plants and animals in existence out of which nearly 1.2 million species have already been identified and described so far.

This number is so huge that it is extremely difficult to study each and every single species separately. Thus, species were grouped into convenient categories based on some easily observable characters. This process is known as classification. Based on characteristics, all living organisms can be classified into different taxa. This process of classification is taxonomy

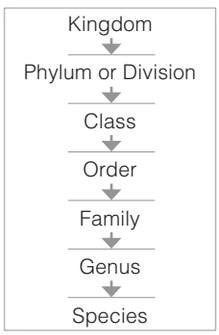

Figure: Taxonomic categories showing hierarchial arrangement in descending order

- **Species:** It comprises *related organisms* that share *common characteristics* and are *capable of interbreeding*.
- **Genus:** Genus comprises a group of *related species* which has *more characters in common in comparison to species of other genera*
- **Family:** It has a group of related genera with still a *smaller number of similarities* as *compared to genus and species*
- **Order:** It 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
- **Class:** This category includes related orders. For example, order Primata comprising monkey, gorilla and gibbon is placed in class Mammalia along with order Carnivora that includes animals like tiger, cat and dog.
- **Phylum/Division:** Classes comprising animals like fishes, amphibians, reptiles, birds along with mammals constitute the next higher category called Phylum. 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. The Kingdom Plantae, on the other hand, is distinct, and comprises all plants from various divisions.

Common	Biological	Genus	Family	Order	Class	Phyium/ Division
Man	Homo sapiens	Homo	Hominidae	Primates	Mammalia	Chordata
Housefly	Musca domestica	Musca	Muscidae	Diptera	Insecta	Arthropoda
Mango	Mangifera indica	Mangifera	Anacardiaceae	Sapindales	Dictoyledonae	Angiospermae
Wheat	Triticum aestivum	Triticum	Poaceae	Poales	Monoctyledonae	Angiospermae

1.2 Kingdom Classification

- Initially **Linnaeus** proposed two kingdom classification i.e., *plantae* and *animaliae* in his book *systema naturae*.
- After various evolutions, **R.H. Whittaker** (1969) proposed a *Five Kingdom Classification*.
- The kingdoms defined by him were named Monera, Protista, Fungi, Plantae and Animalia.
- The main **criteria for classification** used by him included *cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships*.
- In the five kingdom classification of Whittaker there is **no** *mention of lichens and some acellular organisms like viruses, viroids (infectious agent) and prions (infectious agent)*.

Table: Kingdom Classification and characteristics

Five Kingdoms					
Characters	**Monera**	**Protista**	**Fungi**	**Plantae**	**Animalia**
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	**Eukaryotic**
Cell wall	Noncellulosic (Polysaccharide + amino acid)	Present in some	Present with chitin	Present (cellulose)	Absent
Nuclear membrane	**Absent**	**Present**	**Present**	**Present**	Present
Body organisation	Cellular	Cellular	Multiceullar/ loose tissue	Tissue/organ	Tissue/organ/ organ system
Mode of nutrition	Autotrophic (chemosynthetic and photosynthetic) and Heterotrophic (saprophytic/parasitic	Autotrophic (Photosynthetic) and Heterotrophic	Heterotrophic* (Saprophytic/ Parasitic)	Autotrophic** (Photosynthetic)	Heterotrophic (Holozoic/ Saprophytic etc.)
Examples	Bacteria are the sole members of the Kingdom Monera	Members of Protista are primarily aquatic. Dinoflagellates, Euglenoids, Slime moulds and Protozoans come under thus	Mushroom, Mucor etc.	All plants except fungi and members of Monera and Protista having cell walls	Almost all animals except protozoan

* **Heterotrophic:** Heterotrophic nutrition is a mode of nutrition in which organisms depend upon other organisms for food to survive. They can't make their own food like Green plants. Heterotrophic organisms have to take in all the organic substances they need to survive.

** **Autotrophic:** Autotrophic nutrition is a process where an organism prepares its own food from a simple inorganic material like water, mineral salts and carbon dioxide in the presence of sunlight."

Monera: It includes all prokaryotic organism like bacteria, cynobacteria and archaebacteria. Filamentous bacteria also come under this kingdom. All organism of this kingdom are microscopic.

Protista: This includes unicellular forms like Amoeba that are usually found in aquatic habitats. On the basis of mode of nutrition they are autotrophic, parasitic and saprophytic. Diatoms, flagellates and protozoa come under this kingdom.

*Euglena have both *heterotrophic* and *autotrophic* mode of nutrition. So, it is placed between plant and animal.

Fungi: This kingdom includes non-green plants. It has saprophytic nutrition grow on dead and decaying organic matter. The cell wall is composed of chitin.

Example: Mushroom, mucor, etc.

Plantae: This kingdom includes all plants except algae, diatoms, fungi and member of monera and protista.

Animalia: Almost all animal comes under this kingdom except protozoans.

1.3 Kingdom Plantae

- Plantae includes algae, bryophytes, pteridophytes, gymnosperms and angiosperms

Algae

- Algae are *chlorophyll-bearing*, simple, thalloid, autotrophic and *largely aquatic* (both fresh water and marine) organisms.

Bryophytes

- The word bryophyte is the collective term for *mosses, hornworts and liverworts*.
- They are *spore-producing*, rather than seed-producing, plants and they *are all without flowers*.

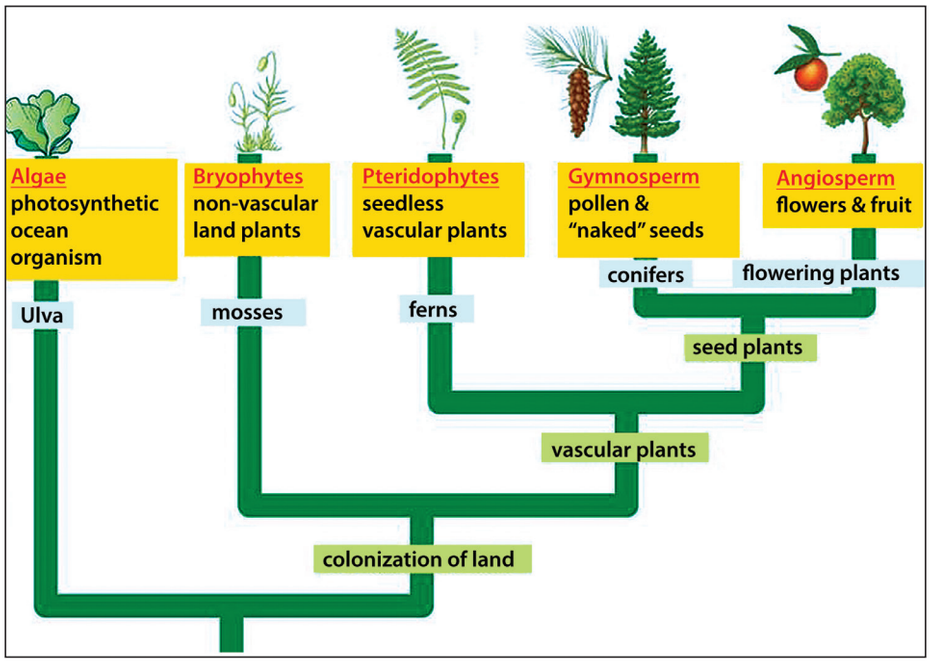

Figure: Evolution of plants from algae to angiosperms

- They are also called **amphibians of the plant kingdom** because these plants can *live in soil* but are dependent on *water for sexual reproduction*.

Pteridophytes

- These include *horsetails* and *ferns*
- Evolutionarily, they are the **first terrestrial plants to possess vascular tissues** – xylem and phloem.

  Xylem tissue transports water and nutrients from the roots to different parts of the plant, and also plays a role in structural support in the stem.

  Phloem tissue transports organic compounds from the site of photosynthesis to other parts of the plant.
- They are also *spore-producing*, rather than seed-producing, plants and they are **all without flowers**.

Gymnosperms

These include medium-sized trees or tall trees and shrubs

These are *vascular plants* in which the *ovules are not enclosed by any ovary wall* and remain exposed and thus have naked seeds.

Examples: conifers, pines, firs, cycads etc.

Angiosperms

Angiosperms are plants that *produce flowers* and bear their *seeds in fruits*.

They are the largest and most diverse group within the kingdom Plantae.

Examples: lilies, orchids, grasses, peas, roses, sunflower, apple, mango etc.

■■■■

TRY SOME QUESTIONS

1. Which one of the following sets of elements was primarily responsible for the origin of life on the Earth ? [CSE Prelims : 2012]

(a) Hydrogen, Oxygen, Sodium
(b) Carbon, Hydrogen, Nitrogen
(c) Oxygen, Calcium, Phosphorus
(d) Carbon, Hydrogen, Potassium

Ans. (b)