

DIVERSITY IN THE LIVING WORLD

- The number of species that are known and described ranges between 1.7-1.8 million (1.25 million animals and 0.5 million plants).
- This refers to biodiversity or the number and types of organisms present on earth.
- Taxonomy: Taxis = arrangement, nomos = law
- This word was proposed by A.P. de. Candolle in his book "Theories elementaries de la botanique" (Theory of elementary botany)

Rules and Recommendations of Nomenclature

Taxonomy Includes Study of Following Points

- **Identification:** A process by which an organism is recognised from the other already known organisms and is assigned to a particular taxonomic group is called identification.
- **Nomenclature:** Naming of organisms according to international scientific rules is called nomenclature.
Explanation: Nomenclature is the term used to describe the systematic practice of assigning names to living organisms once they have been identified and classified. This process is fundamental to the field of taxonomy and biology, providing a standardized way to refer to and distinguish different species. Nomenclature ensures clarity and precision in scientific communication, allowing researchers and scholars across the globe to share information about various organisms using a universally recognized set of names. The rules and conventions governing nomenclature help maintain consistency and accuracy in the identification and classification of living entities, fostering a common language within the scientific community.
- **Classification:** A process by which any organism is grouped into convenient categories on the basis of some easily observable characters.

Binomial Nomenclature

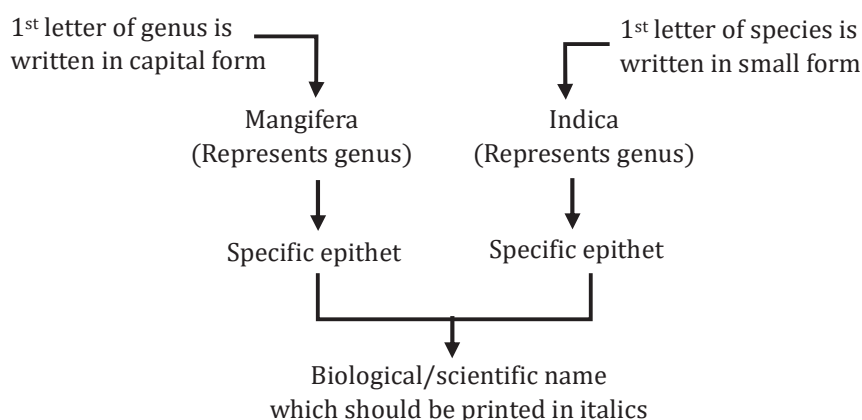
Biologists universally adhere to internationally established codes of rules or principles when assigning scientific names to known or newly discovered organisms. The system of binomial nomenclature, developed by Carolus Linnaeus, serves as the cornerstone for scientifically naming various organisms, providing a clear and standardized approach. This nomenclatural system involves the use of two-word names, with the first part representing the generic name and the second part serving as the specific epithet.

Binomial Nomenclature Rules:

- **Language Origin:** Scientific names are typically derived from the Latin language, regardless of the organism's origin. New names are either directly from Latin or Latinized to maintain consistency.
- **Single Name:** Each organism is designated only one name, consisting of two words. The first word signifies the genus, while the second denotes the specific epithet.
- **Formatting:** Scientific names are printed in italics or underlined when handwritten, indicating their Latin origin.
- **Capitalization:** The first word, representing the genus, starts with a capital letter, while the specific epithet begins with a lowercase letter.
- **Author's Name:** The name of the author or discoverer is written after the specific epithet in an abbreviated form.
For instance, "*Mangifera indica* Linn." indicates that Linnaeus first described this species.
- **Binomial Epithet:** The combination of the generic name, species epithet, and author citation collectively forms the binomial epithet.

- Principle of Priority:** This principle holds utmost importance in the International Code of Botanical Nomenclature (ICBN). The first validly given name to an organism is considered the preferred name. Subsequent valid names are regarded as synonyms. Linnaeus's names in the 10th edition of *Systema Naturae* (1758) for animals and *Species Plantarum* (1753) for plants take precedence, and no names are recognized prior to these editions. The principle of priority ensures a systematic and consistent approach to naming organisms within the realm of scientific taxonomy.

Method of writing biological or scientific name can be memorized as



The table displays the common and scientific names of various plants and animals commonly found in the given context.

Common names	Scientific names	Generic names	Specific epithet
Human	Homo sapiens	Homo	sapiens
Lion	Panthera leo	Panthera	leo
Dog	Canis familiaris	Canis	familiaris
Onion	Allium cepa	Allium	cepa
Wheat	Triticum aestivum	Triticum	aestivum
Brinjal	Solanum melongena	Solanum	melongena
Rose	Rosa indica	Rosa	indica
Pigeon	Columba livia	Columba	livia

Developed Of Binomial Nomenclature

The architect behind the formulation of the binomial nomenclature system, a structured approach to naming organisms, is Carolus Linnaeus. This innovative system, established in 1751, involves assigning specific names to organisms using two parts – the first part designates the genus, and the second part identifies the specific epithet. Developed by Linnaeus, this method provides a systematic and universally accepted way to uniquely identify and categorize living organisms, contributing significantly to the field of biological taxonomy.

Need for Classification

The Earth is home to an extensive array of plants, animals, and various organisms, each exhibiting diverse forms and structures. Given the sheer magnitude of this biological diversity, individually studying every distinct creature becomes impractical. To facilitate a more accessible and simplified approach to their study, organisms are systematically categorized into different ranks or categories based on observed similarities and differences among them.

Despite the immense variety, a hierarchical system of groups and subgroups is established, organized on the basis of easily observable characteristics. This hierarchical classification serves to arrange organisms into a structured series, making it possible to study them systematically. In essence, the process of classification aims to categorize and arrange every known organism into a specific scientific order, thereby providing a framework that facilitates a more manageable and systematic exploration of the diverse world of living entities.

Classification

Once an organism is identified and assigned a name, it is then grouped together with similar organisms to facilitate and simplify its study. Biological classification, a scientific process, involves arranging every organism in a hierarchical series of groups and sub-groups. This arrangement is based on the similarities and differences in their traits or characteristics. The act of categorizing different organisms using easily observable traits is referred to as "Classification."

Take, for example, familiar terms like wheat, dog, or rat. Each of these organisms is recognized by specific characteristics, allowing us to distinguish them from one another. These distinguishing characteristics help assign a category to each organism, with the specific terms for these categories being "taxa." Consequently, all living organisms can be classified into different taxa based on the specific characteristics they exhibit. The scientific discipline that deals with the principles and procedures of classification is known as "Taxonomy."

While classical taxonomy relies on observable morphological characters, modern taxonomic studies incorporate essential features such as the examination of both external and internal structures, cell structure, developmental processes, and ecological information of organisms. Characterization, identification, classification, and nomenclature are fundamental processes within taxonomy.

Taxonomic studies have a long history, dating back to ancient times, as humans have always been curious about nature and the diversity of organisms within it. This curiosity has driven humans to explore and understand more about the natural world. Additionally, humans have exploited certain extensively studied organisms for their own benefit. In ancient times, early humans needed to identify sources of food, clothing, and shelter for survival, leading to the classification of these resources based on their usage.

For instance, in Vedic literature, 740 plants and 250 animals were identified and classified. Aristotle, in the 4th century BC, further divided living beings into animals, human beings, and plants.

Systematics

- The term systematics coined by Carolus Linnaeus. The latter is known as 'Father of Taxonomy'.
- 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.
- It is the study of diversity and differentiation of organisms based on their phenotypic, genetic and phylogenetic relationships.
- Systematic includes identification, nomenclature, classification and evolutionary relationships between organisms.

Types of Taxonomy

- **Cytotaxonomy:** The use of cytological characters of plants in classification or in solving taxonomic problems is called cytotaxonomy. Cytotaxonomy is based on cytological information like chromosome number, structure and behavior etc.
- **Chemotaxonomy:** It is based on the chemical constituents of plants. The basic chemical compounds used in chemotaxonomy are alkaloids, carotenoids, tannins, polysaccharide, nucleic acids, fatty acids, amino acids, aromatic compounds etc.