

# Carolus Linnaeus System for Classifying Organisms

## Guided Notes – Student Edition

### Classification

Classification is the area of Biology responsible for \_\_\_\_\_ organisms into smaller groups. In the same way that the books in a library are sorted according to their respective topics, science also has a way of categorizing the 1.5 million \_\_\_\_\_ that have been discovered so far.



### The Importance of Classification

All living organisms are made up of cells and demonstrate each of the seven key life processes below:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Classification or taxonomy uses a hierarchy of \_\_\_\_\_ based on the degree of \_\_\_\_\_ between species and how they carry out the above life processes to sort each species into their respective levels. These levels also make studying populations of organisms easier as they have many shared \_\_\_\_\_. When a new organism is identified, scientists can place them into an appropriate group by observing the way in which they carry out each of these seven \_\_\_\_\_.

### Classification systems

The philosopher \_\_\_\_\_ was the first person to classify living organisms over 2300 years ago. He grouped animals based on their \_\_\_\_\_ into those with red blood and those into another group which he

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termed '\_\_\_\_\_'. Plants were also classified as trees, \_\_\_\_\_ or weeds. Aristotle's classification system was improved upon in the 18<sup>th</sup> century by Carl Linnaeus. Linnaeus, a Swedish naturalist is known as the 'Father of Taxonomy' due to his contributions to classification. His two most important contributions to taxonomy were:

1. Creation of a \_\_\_\_\_ system.
2. Invention of the \_\_\_\_\_, still in use today.



Linnaeus developed the method of naming and organizing species that is still in use today.

Linnaeus was an avid collector of plant and animal specimens. In 1735, he developed a standardized way of grouping and naming the species in his collection. This led him to publish the first edition of \_\_\_\_\_ (The System of Nature), a guide explaining his method of classifying organisms. As he continued to collect specimens, more editions of *Systema Naturae* were published. By the time the tenth edition of his guide had been published in 1758, Linnaeus had classified approximately 4,400 animal and 7,700 plant species using his \_\_\_\_\_ naming system. This edition, formally known as “The System of nature through the three kingdoms of nature, according to classes, orders, genera and species” was deemed to be some of the most significant work contributing to Biology of his time.

### Linnaeus' Classification System

Linnaeus proposed that organisms could be divided into three broad groups, which he called '\_\_\_\_\_. These kingdoms were named \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. The kingdoms then divided into \_\_\_\_\_, with each class dividing into \_\_\_\_\_ which were then further divided into \_\_\_\_\_ (singular genus). Each genus was finally divided into \_\_\_\_\_. Each subsequent level contains a smaller number of organisms that are more \_\_\_\_\_ to each other than that of the previous level. Although there have been some modifications made to Linnaeus' method, this basic structure is still used for classification in Biology today.

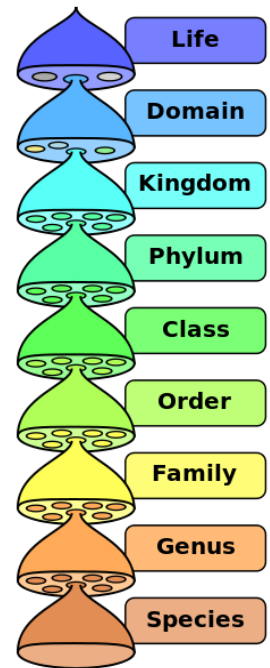
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### Modifications to Linnaeus' Classification

Linnaeus originally had **five** levels of organization within his classification system – kingdoms, classes, orders, genera and species. However, as more species have been discovered and improvements in technology, for example, \_\_\_\_\_ has provided evidence of relationships between certain groups of organisms, more levels have been deemed necessary. This means that the modernized classification system has \_\_\_\_\_ levels, rather than five.

- The broadest level of classification is now the ' \_\_\_\_\_' rather than the ' \_\_\_\_\_'.
- Each domain contains several kingdoms.
- Each kingdom is divided into \_\_\_\_\_. Each phylum is divided into classes followed by an \_\_\_\_\_, family, genus, and \_\_\_\_\_. Each level of classification is also called a taxon (plural taxa).



### The Taxonomic Hierarchy – in Detail

#### 1. Domain

Domains are also sometimes called super kingdoms or empires. These are the highest taxonomic level of organisms with the largest number of \_\_\_\_\_ organisms. The tree of life (shown below) consists of three domains - \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. The first two contain \_\_\_\_\_ or single-celled organisms whose cells have no true nucleus. The third domain, Eukarya, are \_\_\_\_\_ whose cells contain a true nucleus and membrane-bound organelles. These organisms are \_\_\_\_\_.

#### 2. Kingdom

Domains are split into kingdoms. There are five kingdoms which are covered in this course – Monera, \_\_\_\_\_, Fungi, \_\_\_\_\_ and \_\_\_\_\_. The kingdom Monera includes bacteria and cyanobacteria and belongs to the \_\_\_\_\_ domain. The other four kingdoms belong to the Eukarya domain. A kingdom contains a number of \_\_\_\_\_.

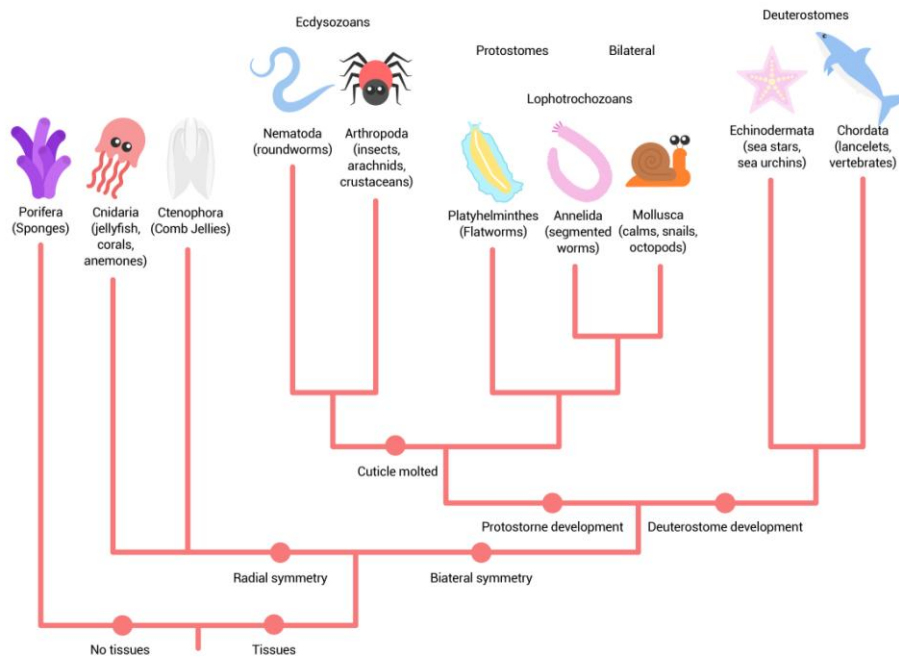
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### 3. Phylum

Each kingdom is divided into phyla (singular: phylum). Organisms belonging to the same phylum will have a similar \_\_\_\_\_, both externally and internally. For example, the Animal (or Animalia) kingdom contains 36 major phyla including:

- Chordata - organisms which possess a \_\_\_\_\_, a large rod which extends the length of the organism during at least part of their development. Including \_\_\_\_\_ and other mammals, bony fish, \_\_\_\_\_ and birds.
- Arthropoda - organisms which have a hard \_\_\_\_\_, segmented bodies and many limbs. Including spiders, \_\_\_\_\_ and crustaceans.
- Mollusca - organisms which have a soft body and in some cases, a \_\_\_\_\_. Including clams, \_\_\_\_\_, octopus and \_\_\_\_\_.



An evolutionary tree of some major animal phyla

Phyla have also been developed and rearranged as scientists discover more species, more categories and subcategories are put in place.

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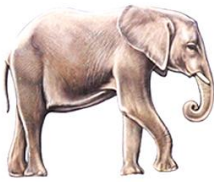
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### 4. Class

Each phylum contains a number of different \_\_\_\_\_. For example, classes within the Chordata phylum include

- Mammalia - \_\_\_\_\_ - \_\_\_\_\_ organisms which feed their young \_\_\_\_\_ from mammary glands. For example, humans, cats, \_\_\_\_\_ and many livestock.
- Reptilia - \_\_\_\_\_ - \_\_\_\_\_ organisms with four limbs and \_\_\_\_\_ skin. For example, lizards, \_\_\_\_\_ and snakes.
- Osteichthyes – aquatic organisms, which lay eggs and have \_\_\_\_\_. For example, \_\_\_\_\_.

### ANIMALS OF THE CLASS MAMMALIA (MAMMALS)



Proboscidea  
(Elephants)



Carnivora  
(Meat-eaters)



Cetacea  
(Whales & Porpoises)



Marsupialia  
(Pouched Animals)



Perissodactyla (Odd-toed  
Hoofed Animals)



Sirenia  
(Dugongs & Manatees)



Edentata  
(Toothless Mammals)



Artiodactyla  
(Even-toed Hoofed Animals)



Pholidata  
(Pangolin)



Dermoptera  
(Colugos)



Primates  
(Apes & Monkeys)



Rodentia  
(Gnawing Mammals)



Insectivora  
(Insect-eaters)



Monotremata  
(Egg-laying Mammals)



Chiroptera  
(Bats)



Pinnipedia  
(Seals & Sea Lions)



Lagomorpha  
(Pikas, Hares & Rabbits)

### 5. Order

Each class contains a number of \_\_\_\_\_. For example, there are many orders in the Mammalia class, such as:

- Cetacea (whales, \_\_\_\_\_ and porpoises)
- Carnivora (meat-eaters, e.g. \_\_\_\_\_)
- Primates (those with larger than average \_\_\_\_\_, e.g. monkeys, apes and \_\_\_\_\_)
- Chiroptera (mammals capable of flight, e.g. \_\_\_\_\_)

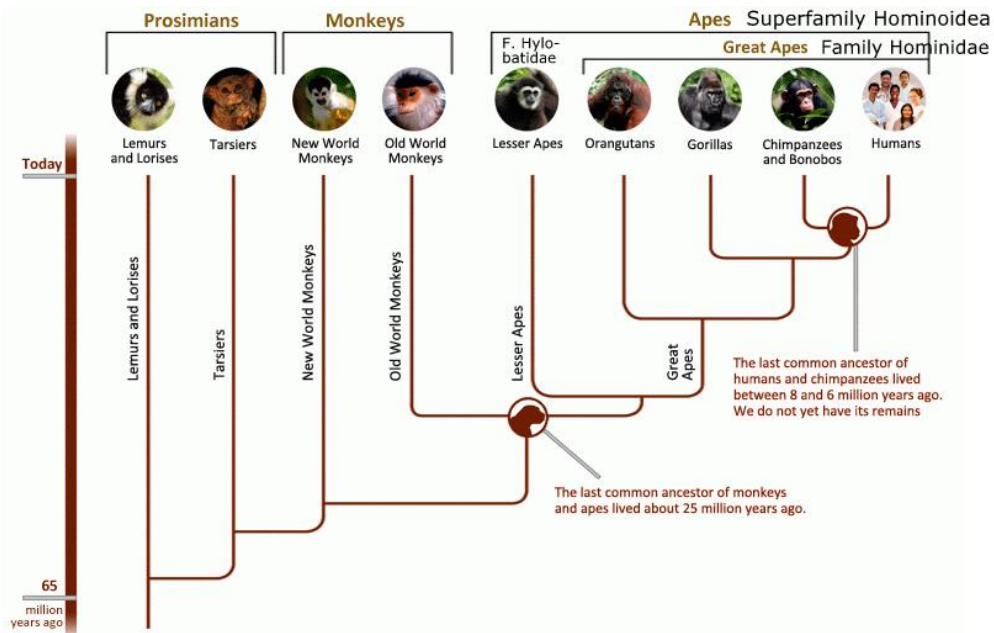
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### 6. Family

From an order, organisms are grouped into \_\_\_\_\_. For example, the order of Primates (seen in the image below) contains the families:

- Hominidae – great \_\_\_\_\_ and humans
- Cercopithecidae – old world monkeys such as \_\_\_\_\_ and macaques



### 7. Genus

Finally, each family is classified into \_\_\_\_\_ (singular genus). These are the names that are most commonly used to describe an organism. Each genus is classified into a number of \_\_\_\_\_. For example, within the primate family, the genus *Homo* for all \_\_\_\_\_ species or *Pongo* for the genus of the \_\_\_\_\_.

### 8. Species

The smallest taxonomic group is the species. A species is typically defined as a group of organisms that can \_\_\_\_\_ and produce \_\_\_\_\_ offspring. Species share a common gene pool and are usually reproductively isolated from other species. This means that interbreeding is unlikely for behavioral, \_\_\_\_\_ or morphological reasons. In some cases, \_\_\_\_\_ may exist within a species. These groups are often capable of interbreeding.

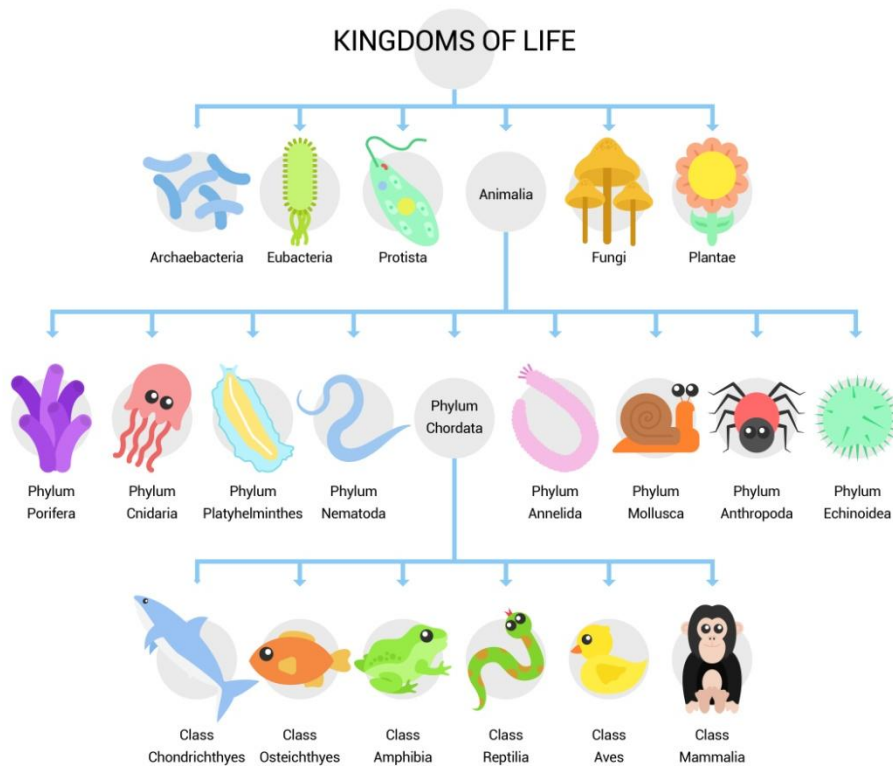
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Species which are closely related, for example, members of cat families, dog families and horse families are often able to interbreed and form \_\_\_\_\_. This usually occurs in unnatural conditions, such as in zoos where mating opportunities with members of the same species are \_\_\_\_\_. In many cases, these hybrids produce \_\_\_\_\_ offspring which are unable to breed.

For example:

- A horse and a donkey will produce a \_\_\_\_\_.
- A lion and a \_\_\_\_\_ will produce a Liger or Tigroid (depending on the gender).
- A lion and a \_\_\_\_\_ will produce a Leocon.



### Binomial Nomenclature system

Organisms are often called different names depending on the region that they are found in. These names are called \_\_\_\_\_. Linnaeus overcame this problem when he proposed a system for nomenclature of living organisms which he called the \_\_\_\_\_.

In this method, an organism has a name consisting of \_\_\_\_\_ parts.



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The first part of the name is the \_\_\_\_\_ and is written beginning with a \_\_\_\_\_ letter. The second part of the name is the \_\_\_\_\_ and is written in \_\_\_\_\_ letters. Both the genus and species are Latin and written in italics or underlined. This allows them to stand out to the reader. For example, the binomial name of human is \_\_\_\_\_.

Genus: *Homo* (man in Latin)  
 Species: *Sapiens* (wise in Latin)



When the name is first introduced in a body of text, the name is written in full, e.g. *Homo sapiens*. However, any subsequent mention of the name is typically written using the initial of the genus, followed by a full stop, then species in lowercase letters e.g. \_\_\_\_\_.

In the case where a number of species belonging to the same genus are being discussed, scientists will often refer to the group by the \_\_\_\_\_ followed by the abbreviation 'sp'. For example, multiple species of bear may be referred to as *Ursus sp*. This indicates to the reader that the information applies to many species of bear, rather than just *Ursus americanus*, the American black bear.

