

Classification of living organisms

Classification can be defined as grouping organisms according to their features similarities. The science of classifying organisms is called Taxonomy. All organisms in the living world are classified and named according to an international system of criteria. The rules of classification apply only to formal scientific names, not to common names. The groups are arranged from the largest group of organisms to the smallest with an example for classification of human :

Domain :Eukaryote

Kingdom :Animalia

Phylum(plural phyla) :Chordata

Class :Mammalian

Order :Primate

Family :Hominidae

Genus(plural genera) :Homo

Species :sapiens

Binomial nomenclature

When writing a scientific name, the genus name is written first and starts with a capital letter, and the species name is written second and starts with a small letter. The scientific name ought to be printed in italics when typed and underlined separately when handwritten.

The scientific name can be also abbreviated, where the genus is shortened to only its first letter followed by a period. For example, humans have the binomial name *Homo sapiens*) *Homo sapiens*)or *H. sapiens* .

The genus name is generally a noun, while the species modifier is an adjective. Thus ‘*Homo sapiens* means “human knowing”. The generally accepted

criterion for defining a species is that organisms of the same species interbreed under natural conditions to yield fertile offspring. Individuals of different species normally do not mate. If they are forced to mate, the mating is either unsuccessful or the offspring are sterile.

For example, a horse (*Equus caballus*) can be mated to a donkey (*Equus asinus*) and the result will be a mule. However, mules are sterile and cannot reproduce. Thus, the horse and donkey are classified as different species. A quarterhorse and a thoroughbred can mate and produce a fertile offspring. Therefore, both are classified as the same species: *Equus caballus*.

For humans, there is only one living species: *Homo sapiens*. However, in past ages other species, such as *Homo erectus*, may have coexisted with *Homo sapiens*. *Homo erectus* is considered a separate species because presumably it could not mate with *Homo sapiens*.

The Domain (المجاميع)

The domain is the broadest category, while species is the most specific category available. About 1.8 million species have been given scientific names. Thousands more are added to the list every year. Tropical forests and deep ocean areas very likely hold the highest number of still unknown species.

Domains :

The domains are organized based on the difference between eukaryotes and prokaryotes. The three domains are as follows :

Archea (Archeobacteria) : (consists of archeobacteria, bacteria which live in extreme environments. The kingdom Archaea belongs to this domain.

Eubacteria : consists of more typical bacteria found in everyday life. The kingdom Eubacteria belongs to this domain .

Eukaryote : encompasses most of the world's visible living things. The kingdoms Protista, Fungi, Plantae and Animalia fall under this category

All living organisms can be sorted into one of two groups depending on the fundamental structure of their cells. These two groups are the prokaryotes and the eukaryotes.

prokaryotic cell and Eukaryotic cell

Prokaryotes : from Old Greek *pro-* before and *karyon* meaning nut referring to the cell nucleus, also spelled (procaryotes) are organisms without a cell nucleus (karyon), or any other membrane-bound organelles. Most are unicellular, but some prokaryotes are multicellular.

Prokaryotes are organisms made up of cells that lack a cell nucleus or any membrane-encased organelles. This means the genetic material DNA in prokaryotes is not bound within a nucleus. Additionally, the DNA is less structured in prokaryotes than in eukaryotes. In prokaryotes, DNA is a single loop. In Eukaryotes, DNA is organized into chromosomes. Most prokaryotes are made up of just a single cell (unicellular) but there are a few that are made of collections of cells (multicellular). Scientists have divided the prokaryotes into two groups, the Bacteria and the Archaea.

Eukaryotes : are organisms whose cells are organized into complex structures by internal membranes and a cytoskeleton. The most characteristic membrane bound structure is the nucleus. This feature gives them their name, (also spelled "eucaryote,") which comes from the Greek **Eu-**meaning good/true and **Karyon**, meaning nut, referring to the nucleus. [Animals](#), plants, fungi, and protists are eukaryotes.

Eukaryotes are organisms made up of cells that possess a membrane-bound nucleus (that holds genetic material) as well as membrane-bound organelles. Genetic material in eukaryotes is contained within a nucleus within the cell and DNA is organized into chromosomes. Eukaryotic organisms may be multicellular or single-celled organisms. All animals are eukaryotes. Other eukaryotes include plants, fungi, and protists.

Compare prokaryotic and eukaryotic cells.

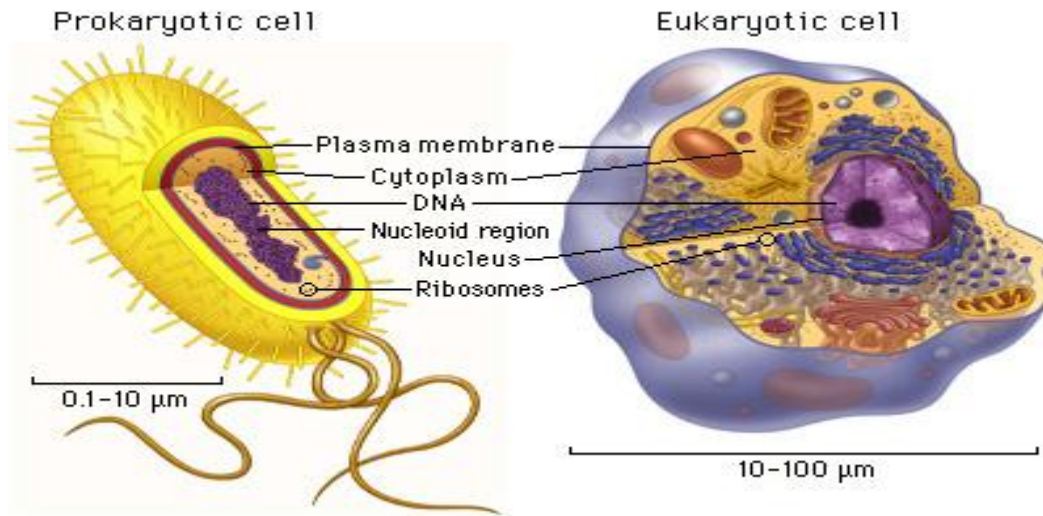
Similarities :

1. They both have DNA as their genetic material.
2. They are both membrane bound.
3. They both have ribosomes .
4. They have similar basic metabolism .
5. They are both amazingly diverse in forms.

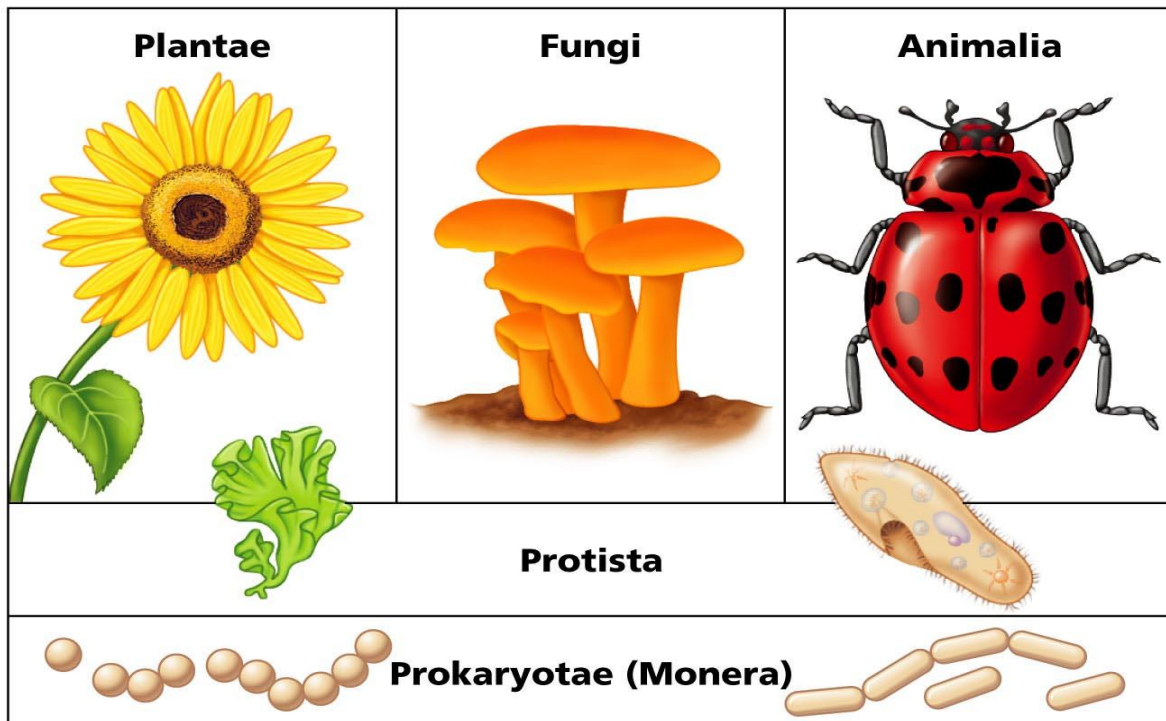
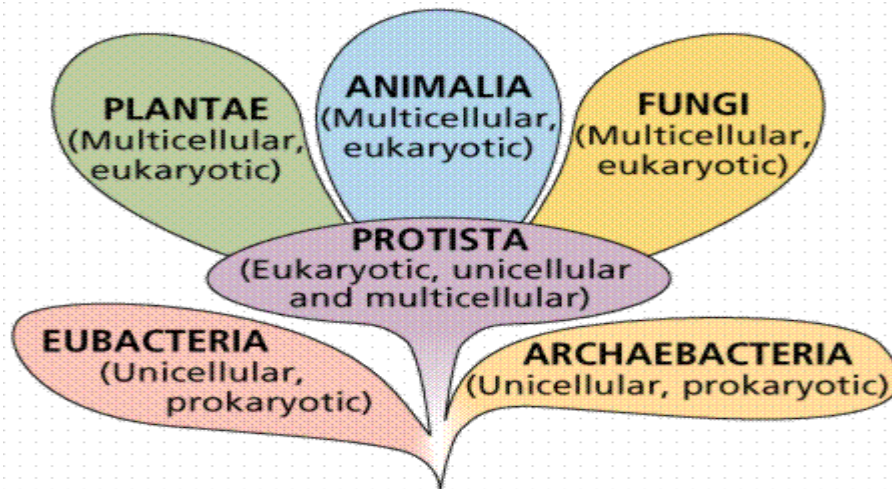
Differences :

1. eukaryotes have a nucleus, while prokaryotes do not
2. eukaryotes have membrane-bound organelles, while prokaryotes do not. The organelles of eukaryotes allow them to exhibit much higher levels of intracellular division of labor than is possible in prokaryotic cells.
3. Eukaryotic cells are, on average, ten times the size of prokaryotic cells.
4. The DNA of eukaryotes is much more complex and therefore much more extensive than the DNA of prokaryotes.
5. Prokaryotes have a cell wall composed of peptidoglycan, a single large polymer of amino acids and sugar . Many types of eukaryotic cells also have cell walls, but none made of peptidoglycan.

6. The DNA of prokaryotes floats freely around the cell; the DNA of eukaryotes is held within its nucleus and associated with histones (proteins)
7. Eukaryotes undergo mitosis; prokaryotes divide by binary fission (simple cell division)



Living organisms are subdivided into 5 major **kingdoms**, including the Monera, the Protista (Protoctista), the Fungi, the Plantae, and the Animalia. Each kingdom is further subdivided into separate **phyla** or **divisions**. Generally "animals" are subdivided into phyla, while "plants" are subdivided into divisions. These subdivisions are analogous to subdirectories or folders on your hard drive. The basic characteristics of each kingdom and approximate number of species are summarized in the following table:



Copyright © 2006 Pearson Education, Inc., publishing as Benjamin Cummings.

Viruses

are the smallest biological particle (the tiniest are only 20 nm in diameter).
However,

- they are not biological organisms so they are not classified in any kingdom of living things

- They do not have any organelles and cannot respire or perform metabolic functions.
- Viruses are merely strands of DNA or RNA surrounded by a protective protein coat called a **capsid**.
- Viruses only come to life when they have invaded a cell. Outside of a host cell, viruses are completely inert.
- Viruses have been classified into more than 160 major groups. Viruses are classified based on their
 - a. shape,
 - b. replication properties,
 - c. and the diseases that they cause.
- Furthermore, the shape of a virus is determined by the type and arrangement of proteins in its capsid.
- Viruses pathogenic to humans are currently classified into 21 groups.

*****Note*****:

Viruses can also attack bacteria and infect bacterial cells. Such viruses are called **bacteriophages**.

Viral Replication

As previously stated, viruses are not a biological life form so they cannot reproduce by themselves. They need to take over a functioning eukaryotic or prokaryotic cell to replicate its DNA or RNA and to make protein coat for new virus particles.

In order to enter a cell, a virus must attach to a specific receptor site on the plasma membrane of the host cell. The proteins on the surface of the virus act as keys which fit exactly into a matching glycoprotein on the host cell membrane. In some viruses, the attachment protein is not on the surface of the virus but is in the capsid or in the envelope.

There are two forms of viral replication: the **lytic cycle** and the **lysogenic cycle**.