

Lec:one

Biology

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GENERAL INTRODUCTION

Definition of Biology:

Biology is a natural science concerned with the study of life and living organisms, including their structure, function, growth, evolution, distribution, and taxonomy. The word biology is derived from Greek origin: Bios means life and logos means science or the study of living things.

living things : All animals , plants, bacterium, protist, fungus are living things. If something is living it will carry out all of the seven activities

Non-living things: Sand, wood and glass are all non-living things.

The Seven Characteristics of Living Things

1-Feeding

All living organisms need to take substances from their environment to obtain energy, to grow and to stay healthy.

2-Movement

All living organisms show movement of one kind or another. All living organisms have internal movement, which means that they have the ability of moving substances from one part of their body to another. Some living organisms show external movement as well - they can move from place to place by walking, flying or swimming.

3-Breathing or Respiration

All living things exchange gases with their environment. Animals take in oxygen and breathe out carbon dioxide.

4-Excretion

Excretion is the removal of waste from the body. If this waste was allowed to remain in the body it could be poisonous. Humans produce a liquid waste called urine. We also excrete waste when we breathe out. All living things need to remove waste from their bodies.

5-Growth

When living things feed they gain energy. Some of this energy is used in growth. Living things become larger and more complicated as they grow.

6-Sensitivity

Living things react to changes around them. We react to touch, light, heat, cold and sound, as do other living things.

7-Reproduction

All living things produce young. Humans make babies, cats produce kittens and pigeons lay eggs. Plants also reproduce. Many make seeds which can germinate and grow into new plants.

All these characters can be Summarized in:

A--Degree of orderliness.

B--Ability to respond to stimuli.

C--Capacity to grow, develop and reproduce by using hereditary molecules.

D--Possession of regulatory processes, which control and coordinate life functions.

Branches of Biology:

Biology can be divided into two major fields: zoology and botany. *Zoology* deals with animals, while botany deals with plants. Each of these major fields includes different life sciences* such as:

Morphology: A branch of biology that deals with form and structure of animals and plants. Such study on the cellular level is known as Cytology. On tissue level, it is known as Histology

Embryology: The study of formation and development of embryo
Anatomy - study of the animal form, particularly human body

Biotechnology - applied science that is concerned with biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use

Cell biology - the study of cells at the microscopic or at the molecular level. It includes studying the cells' physiological properties, structures, organelles, interactions with their environment, life cycle, division and apoptosis

Ecology - the scientific study of the relationships between plants, animals, and their environment

Immunobiology - a study of the structure and function of the immune system, innate and acquired immunity, the bodily distinction of self from non self, and laboratory techniques involving the interaction of antigens with specific antibodies

Microbiology - the branch of biology that deals with microorganisms and their effects on other living organisms

Molecular Biology - the branch of biology that deals with the formation, structure, and function of macromolecules essential to life, such as nucleic acids and proteins, and especially with their role in cell replication and the transmission of genetic information

Mycology - the study of fungi

Parasitology - the study of parasites and parasitism

Pathology - the study of the nature of disease and its causes, processes, development, and consequences

Pharmacology - the study of preparation and use of drugs and synthetic medicines

Physiology - the biological study of the functions of living organisms and their parts

Toxicology - the study of how natural or man-made poisons cause undesirable effects in living organisms

Virology - study of viruses

Zoology - The branch of biology that deals with animals and animal life, including the study of the structure, physiology, development, and classification of animals.

Genetics: A branch of biology that deals with the heredity and variation of organisms

Importance of biology

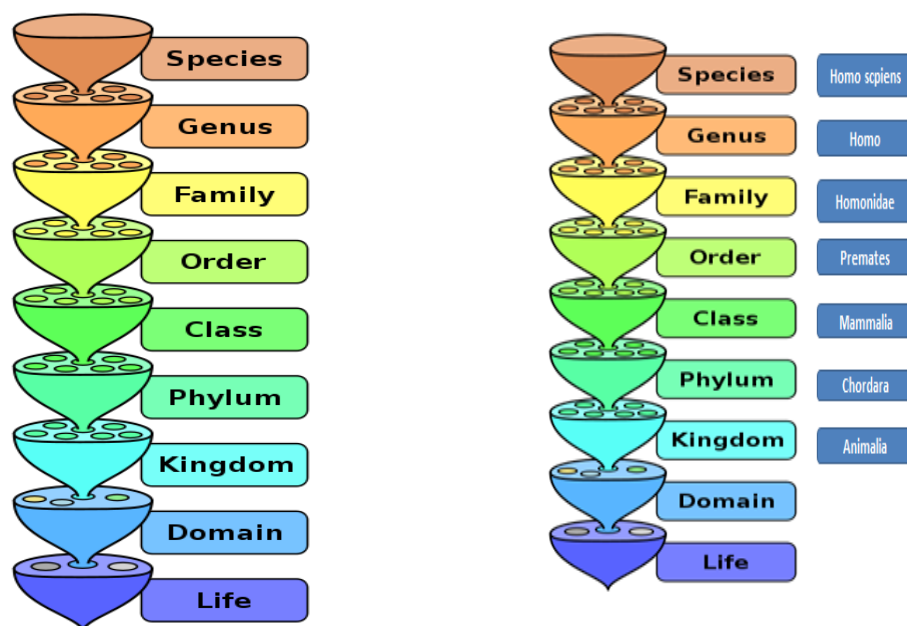
The many branches of biology have much to tell us about what the human body is made up of, how it works, and how it's affected by what we eat, the air we breathe, and every other aspect of the world around us. It can help us prevent, cure, and even eliminate disease

Taxonomy

Is the science of defining groups of biological organisms on the basis of shared characteristics and giving names to those groups. Organisms are grouped together into taxa (singular: taxon) and given a taxonomic rank;

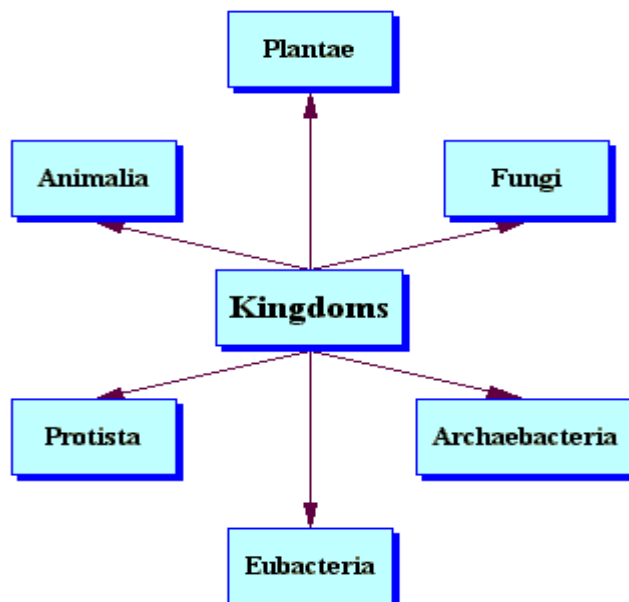
groups of a given rank can be aggregated to form a super group of higher rank and thus create a taxonomic hierarchy.

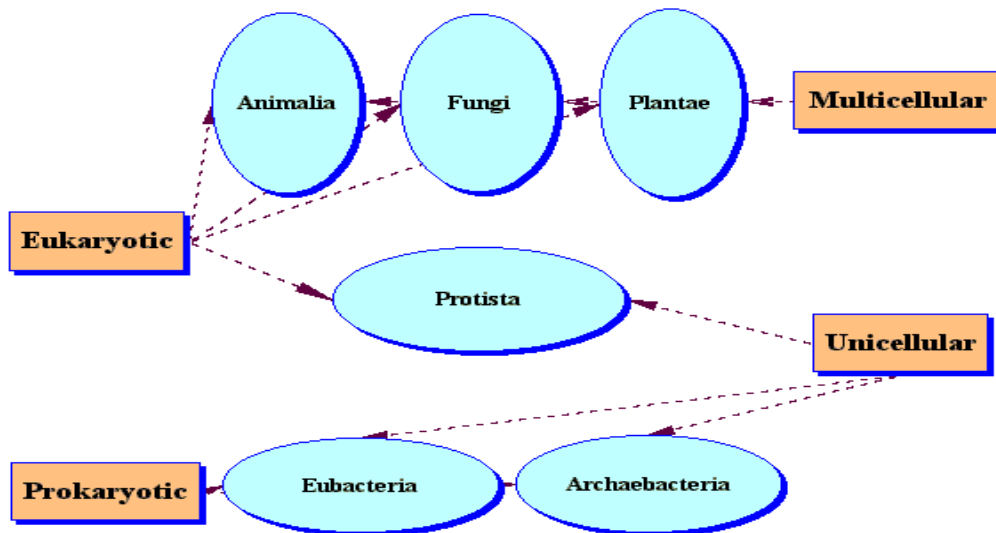
Species are arranged in a hierarchical system in which genera are grouped into families, families into orders, orders into classes, classes into phylum (alternatively called division in plants, fungi and bacteria), phyla into kingdoms, kingdom into domain. The following figure shows the hierarchical system used in classifying organisms



The hierarchical system of humans

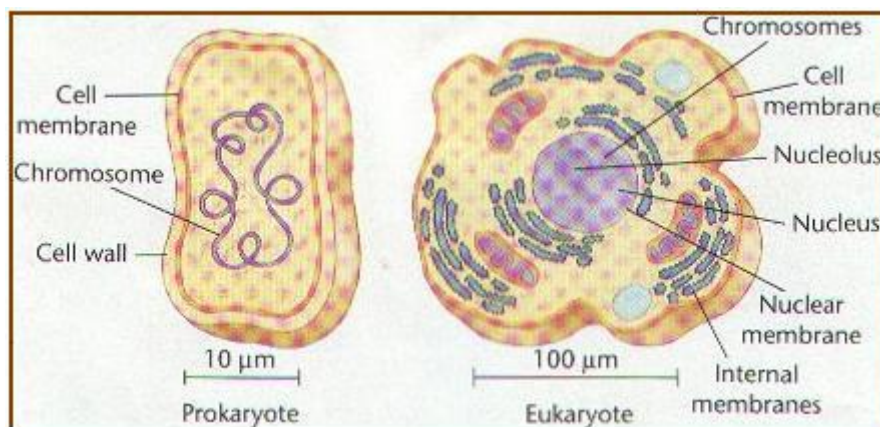
The earliest classification system recognized only two kingdoms (plants and animals). As biologists discovered microorganisms and learned more about other organisms, the number of kingdoms increased. Biologists now use their, six-kingdom system, which included two of prokaryotes and four of eukaryotes.





Prokaryotes: are organisms without a cell nucleus or any other membrane-bound organelles. Most are unicellular, but some prokaryotes are multicellular.

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.



The difference between the structure of prokaryotes and eukaryotes is so great that it is considered to be the most important distinction among groups of organisms.

Summary of differences between prokaryote and eukaryote cells

Prokaryotic cells	Eukaryote cells
Small cell (< 5µm)	Larger cells (> 10 µm)
Always unicellular	Often multicellular
No nucleus or any membrane bound organelles	Always have nucleus and membranes bound organelles.
DNA circular, without proteins	DNA is linear and associated with proteins to form chromatin.
Ribosomes are small 70S	Ribosomes are large 80S
No cytoskeleton	Always have cytoskeleton
Motility by rigid rotating flagellum made from flagellin	Motility by flexible waving cilia or flagella made from tubulins.
Cell division is by binary fission	Cell division is by meiosis and mitosis.
Reproduction is always asexual	Reproduction is sexual and asexual.

Comparing the Six Kingdoms

Classification	Prokaryote		Eukaryote			
	Archaea	Bacteria	Protista	Fungi	Plantae	Animalia
Body Form (unicellular/ multicellular)	unicellular	unicellular	Unicellular/ muticellular	Unicellular/ muticellular	Unicellular/ muticellular	Unicellular/ muticellular
Mitochondria (absent/ present)	Absent	Absent	Present	Present	Present	Present
Cell Wall (absent/ present)	Present (different from bacterial CW)	Present (peptidoglyca n)	Present in some	Present (chitin)	Present (cellulose)	Absent
Nutrition (absorption, photosynthesis, chemosynthesis, ingestion)	Absorption, photosynthesis, chemosynthesis	Absorption, photosynthesi s, chemosynthes is	Absorption, photosynthesis, ingestion	Absorption	Photosynthes is	Ingestion
Nervous System (absent/ present)	Absent	Absent	Absent	Absent	Absent	Present
Motility (absent/ present)	Present in some	Present in some	Present in some	Absent	Absent	present