



Lec 1: Biology

Biology: is a science that deals with the study of life and living organisms, including their structure, function, growth, evolution, origin, distribution, and taxonomy.

✚ The word biology means, "The science of life", from the Greek Bios means life and logos means science. Therefore, Biology is the science of Living Things. That is why Biology is sometimes, known as Life Science.

The cell is the basic structural, functional, and biological unit of all known living organisms.

A **cell** is the smallest unit of life that can replicate independently, and cells are often called the "**building blocks of life**". The study of cells is called **cell biology** or **cytology**.

Cell biology or Cytology is a branch of biology that studies the different structures and functions of the cell and focuses mainly on the idea of the cell as the basic unit of life.

✚ Cell biology explains the structure, organization of the organelles they contain, their physiological properties, metabolic processes, Signaling pathways, life cycle, and interactions with their environment.

Organisms can be classified as

- ✓ **Unicellular** (consisting of a single cell; including bacteria)
- ✓ **Multicellular** (including plants and animals). While the number of cells in plants and animals varies from species to species, humans contain more than 10 trillion (10^{12}) cells.



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Cell theory

Robert Hooke in (1665) who described the cella (open spaces) of plant tissues discovered the cell.

The cell theory is a widely accepted explanation of the relationship between cells and living things. The cell theory states:

1. All organisms are composed of cells.
2. Cell is the structural and functional unit of life.
3. Cells arise from pre-existing cells.

The cells vary considerably, in shape and size; also, there is wide variation in the number of cells in different organisms.

Cell types

There are two distinctive types of cells:

1. **Prokaryotic cells:** Prokaryotes lack a nucleus (though they do have circular DNA) and other membrane-bound organelles (though they do contain ribosomes).

Bacteria and Archaea are two domains of prokaryotes.

2. **Eukaryotic cells:** Eukaryotes have distinct nuclei bound by a nuclear membrane and membrane-bound organelles (mitochondria, chloroplasts, lysosomes, rough and smooth endoplasmic reticulum, vacuoles). In addition, they possess organized chromosomes, which store genetic material. Protists, fungi, animals, and plants all consist of eukaryotic cells.

“**Protist**” is an informal term referring to a group of mostly **unicellular** eukaryotes.



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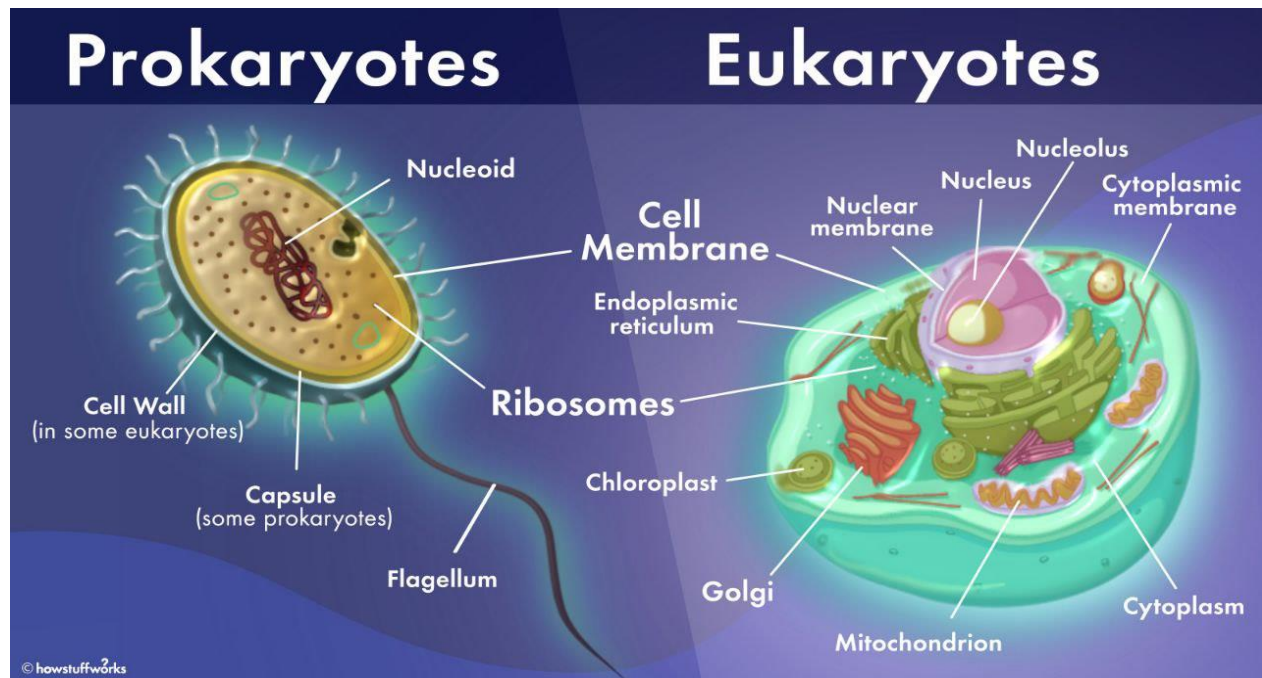
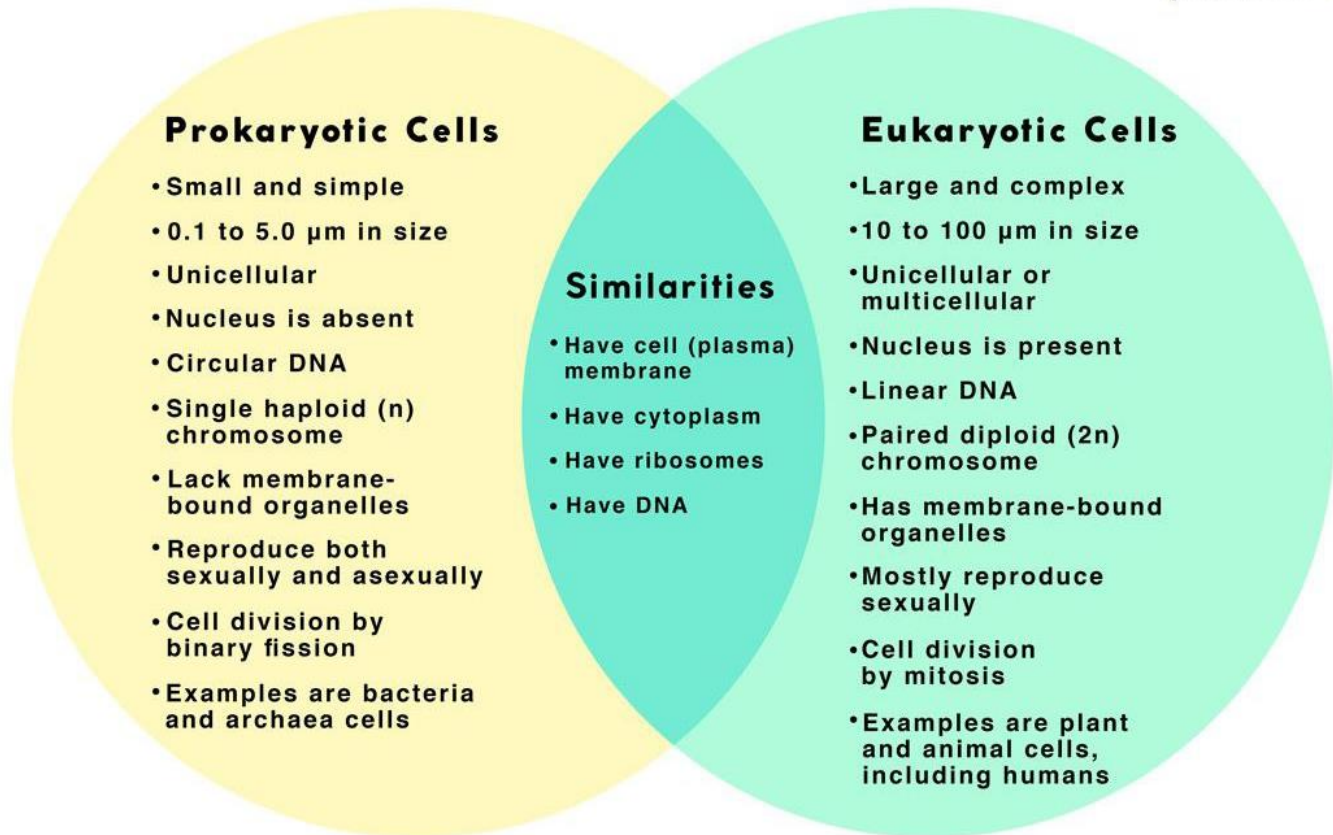
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Table 1: Comparison of features of prokaryotic and eukaryotic cells

	Prokaryotes	Eukaryotes
Typical organisms	bacteria, archaea	protists, fungi, plants, animals
Typical size	~ 1–5 μm	~ 10–100 μm
Type of nucleus	nucleoid region; no true nucleus	true nucleus with double membrane
DNA	circular (usually)	linear molecules (chromosomes) with histone proteins
RNA/protein synthesis	coupled in the cytoplasm	RNA synthesis in the nucleus protein synthesis in the cytoplasm
Ribosomes	50S and 30S	60S and 40S
Cytoplasmic structure	very few structures	highly structured by endomembrane and a cytoskeleton
Cell movement	flagella made of flagellin	Flagella and cilia containing microtubules; lamellipodia and filopodia containing actin
Mitochondria	none	one to several thousand
Chloroplasts	none	in algae and plants
Organization	usually single cells	single cells, colonies, higher multicellular organisms with specialized cells
Cell division	binary fission (simple division)	mitosis (fission or budding) meiosis
Chromosomes	single chromosome	more than one chromosome
Membranes	cell membrane	Cell membrane and membrane-bound organelles





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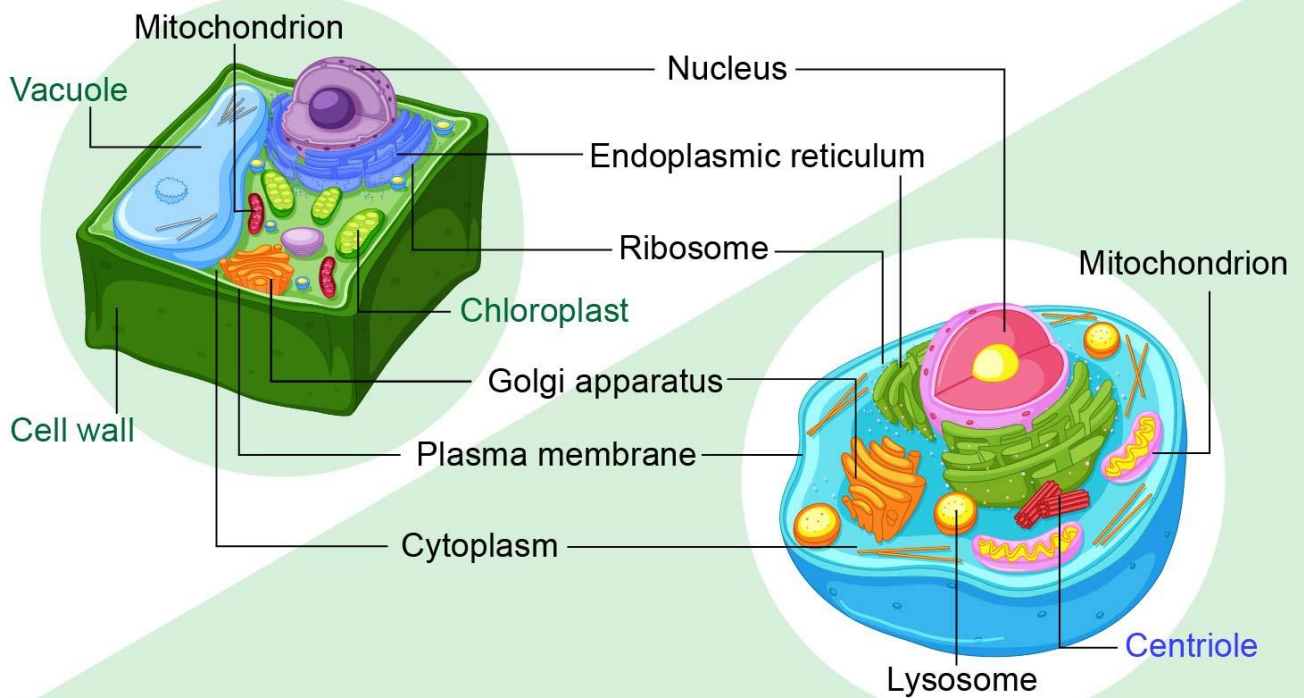
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Plant cell	Animal cell
Plant cell surrounded by a rigid cell wall	Animal cells do not have a cell wall
Larger in size	Smaller in size
Plant cells have plastids	Animal cells do not have plastids
Presence of a large vacuole is seen in plant cells.	Whereas there are very small vacuoles as compared to plant cells are seen in animal cells.
Centrosomes are absent in plant cells	Animal cells have centrosomes.

PLANT CELL



ANIMAL CELL