



SNS COLLEGE OF TECHNOLOGY



Coimbatore-35.

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

COURSE NAME : 19GET277 - Biology for Engineers

IV YEAR/ VII SEMESTER

UNIT – I INTRODUCTION TO LIFE

Topic: Structure of prokaryotic and eukaryotic cell

Mrs.M.Lavanya

Assistant Professor

Department of Computer Science and Engineering



Cell Types

Prokaryotes

- Prokaryotes are generally small cells that are enclosed by the plasma membrane.
- Depending on the species, they have a distinctive cell wall, varying in composition.
- Prokaryotes do not contain a nucleus and membrane-bound organelles.
- They possess circular or linear DNA.
- The chromosomal area and the cytoplasm are found in the protoplasm of prokaryotes.
- Prokaryotes are divided into two domains: archaea and bacteria.

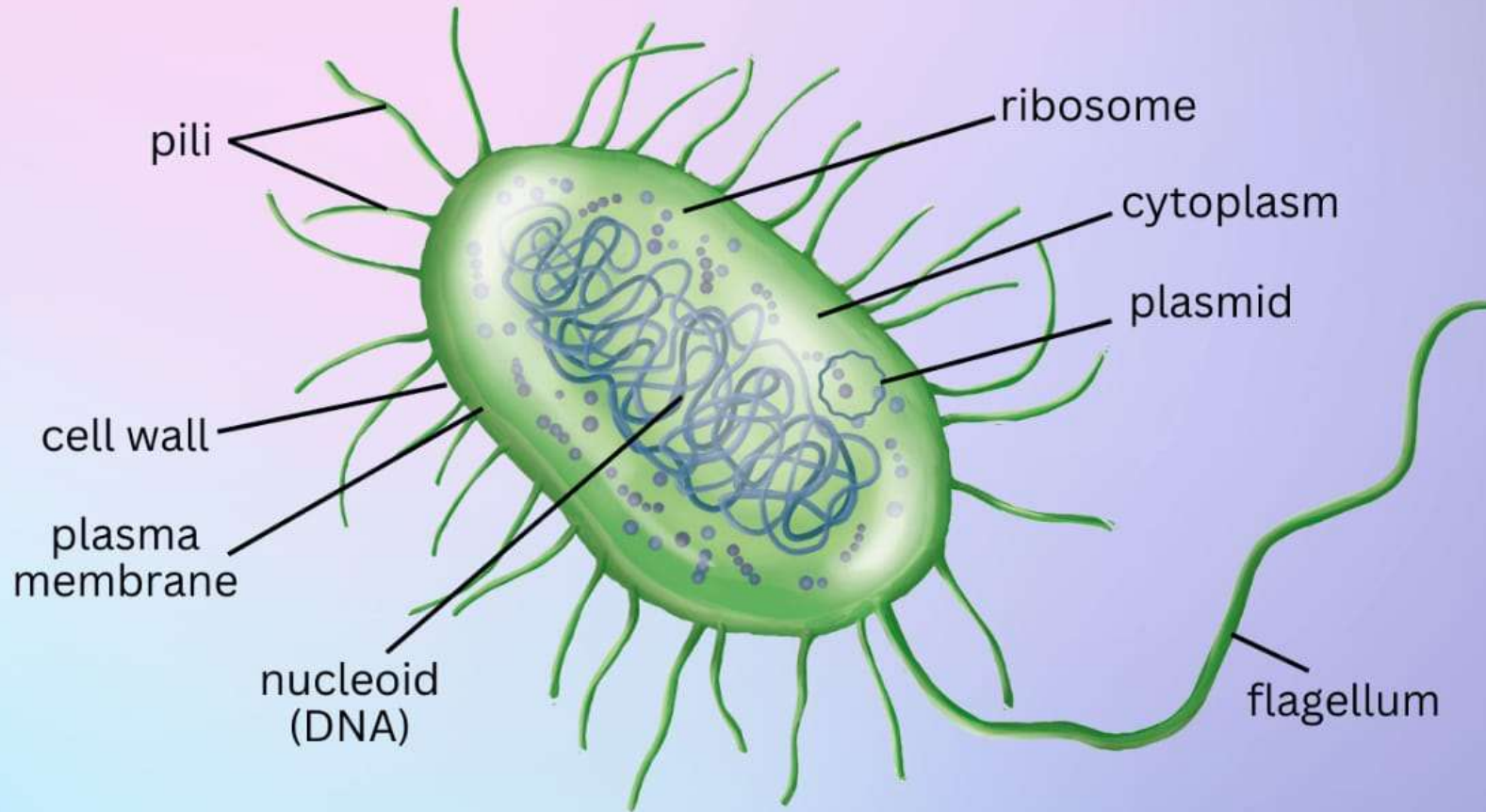


Eukaryotes

- Eukaryotic cells have a nucleus, organelles, and a plasma membrane surrounding them.
- Eukaryotic cells evolved particular organelles, parts of the cell that have a specific function.
- These organelles include the endoplasmic reticulum, which sorts and bundles proteins;
- the mitochondria, which provide energy; and
- chloroplasts, found in plants and produce food from sunlight and carbon dioxide.



Prokaryotic Cell



sciencenotes.org



Plant Cell Structure

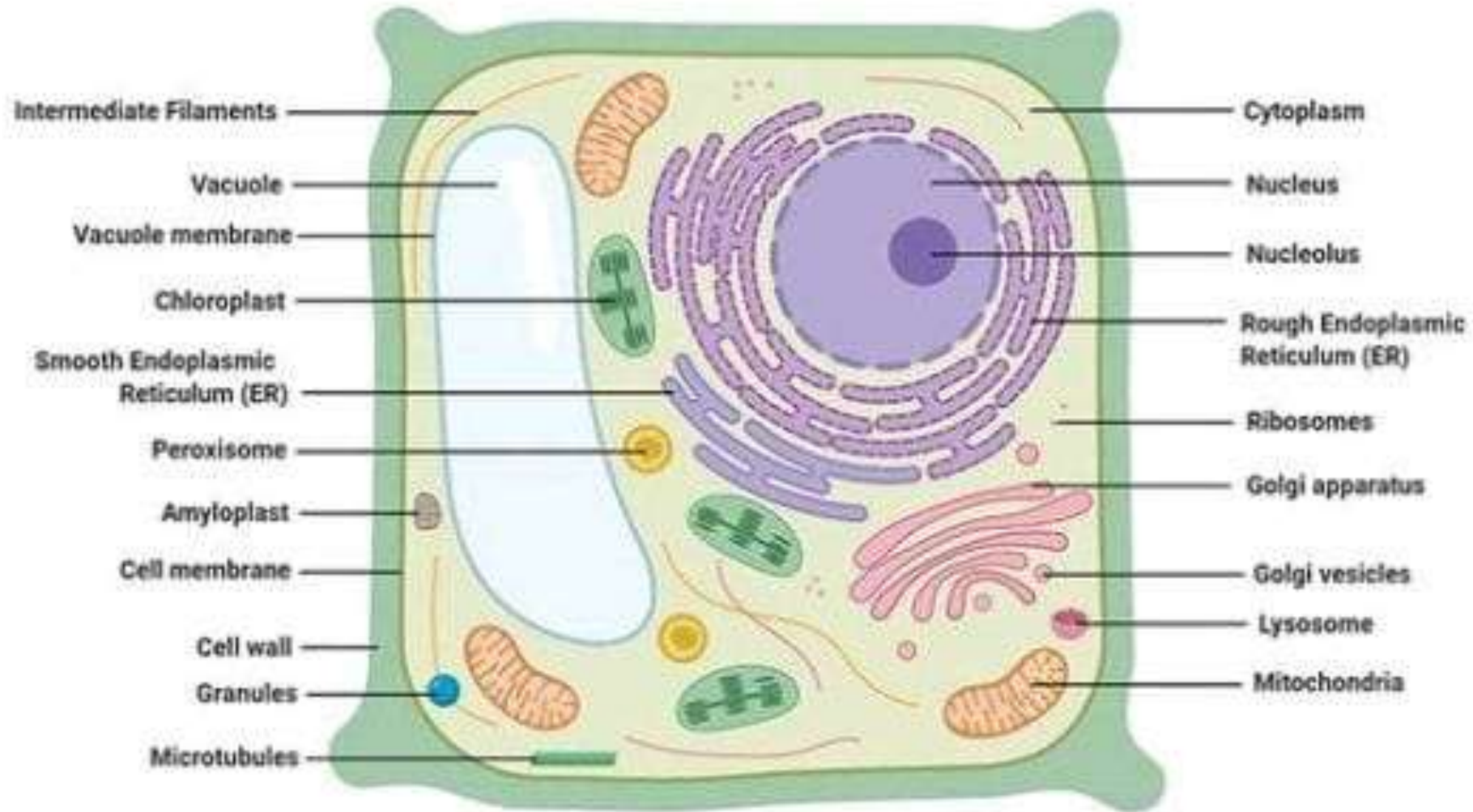
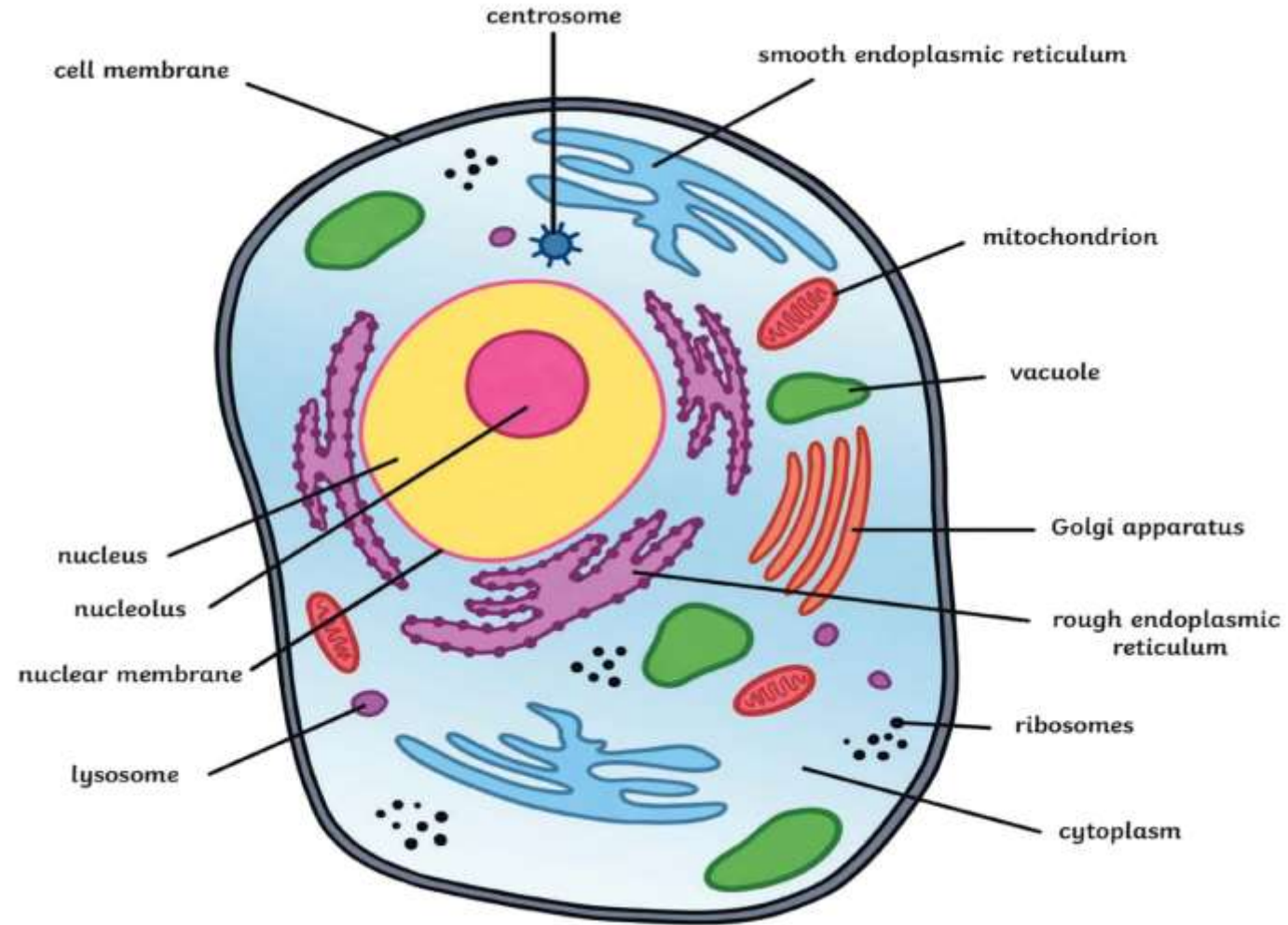


Figure: Plant Cell Structure, Image Copyright © Sagar Aryal, www.microbenotes.com



Animal Cell Structure





	Prokaryotes	Eukaryotes
Type of Cell	Always unicellular	Unicellular and multi-cellular
Cell size	Ranges in size from 0.2 μm – 2.0 μm in diameter	Size ranges from 10 μm – 100 μm in diameter
Cell wall	Usually present; chemically complex in nature	When present, chemically simple in nature
Nucleus	Absent. Instead, they have a nucleoid region in the cell	Present
Ribosomes	Present. Smaller in size and spherical in shape	Present. Comparatively larger in size and linear in shape
DNA arrangement	Circular	Linear
Mitochondria	Absent	Present
Cytoplasm	Present, but cell organelles absent	Present, cell organelles present



Endoplasmic reticulum	Absent	Present
Plasmids	Present	Very rarely found in eukaryotes
Ribosome	Small ribosomes	Large ribosomes
Lysosome	Lysosomes and centrosomes are absent	Lysosomes and centrosomes are present
Cell division	Through binary fission	Through mitosis
Flagella	The flagella are smaller in size	The flagella are larger in size
Reproduction	Asexual	Both asexual and sexual
Example	Bacteria and Archaea	Plant and Animal cell



The Prokaryotic Cell

Prokaryotic are simple structures, usually unicellular and lack membrane-bound structures. Moreover, the DNA is found in the form of bundles called nucleoids.

- The following structures and organelles can be found in a prokaryotic cell, apart from common structures:
- Nucleoid: Bundles of DNA found in the central region of the cell.
- Cell wall: The cell wall serves as a structure and protection from the outside environment. Prokaryotes usually have a rigid cell wall made up of peptidoglycans.



- Capsule: A layer of carbohydrates surrounding the cell wall that helps attach to surfaces.
- Pili: They are rod-shaped structures involved in DNA transfer and attachment.
- Flagella: They are thin, hair-like structures that aid in movement.



- Prokaryotes are organised into three domains: Eukarya, Bacteria, and Archaeans. Cyanobacteria, a prokaryote, are capable of performing photosynthesis.
- Prokaryotic cells produce clones of themselves through binary fission and rely more on horizontal genetic transfer for their variation.
- Binary fission is a simpler and faster process than mitosis and involves DNA replication, chromosomal segregation, and ultimately cell separation into two daughter cells genetically identical to the parent cell. In contrast, mitosis does not involve the nuclear envelope, centromere, and spindle formation.



The Eukaryotic Cell

Eukaryotes are complex organisms with a nucleus and other organelles enclosed in a plasma membrane.

- Here are the primary components of eukaryotic cells.
- Nucleolus: The nucleolus is the part of the nucleus where ribosomal RNA is produced.
- Cell wall: The cell wall, also called the cytoskeleton, provides the structure that enables cell division.



- Mitochondria: They are responsible for energy production; hence, they are known as the cell's powerhouse.
- Endoplasmic reticulum: It plays a role in protein maturation and transportation.
- Vesicles and vacuoles: They are membrane-bound sacs aid in transportation and storage.



- Many eukaryotes also have the Golgi apparatus, chloroplasts, and lysosomes.
- Most eukaryotes undergo sexual reproduction resulting in offspring with genetic material, a mixture of the parents' genome. In this process of sexual recombination, genetic variation is generated.
- Mitosis is followed by cytokinesis in eukaryotic cells. This is a multi-stage process in which the nuclear membrane disintegrates, and the chromosomes are sorted and divided so that each daughter cell obtains two sets of chromosomes. Cytokinesis occurs when the cytoplasm divides to produce two genetically identical daughter cells.



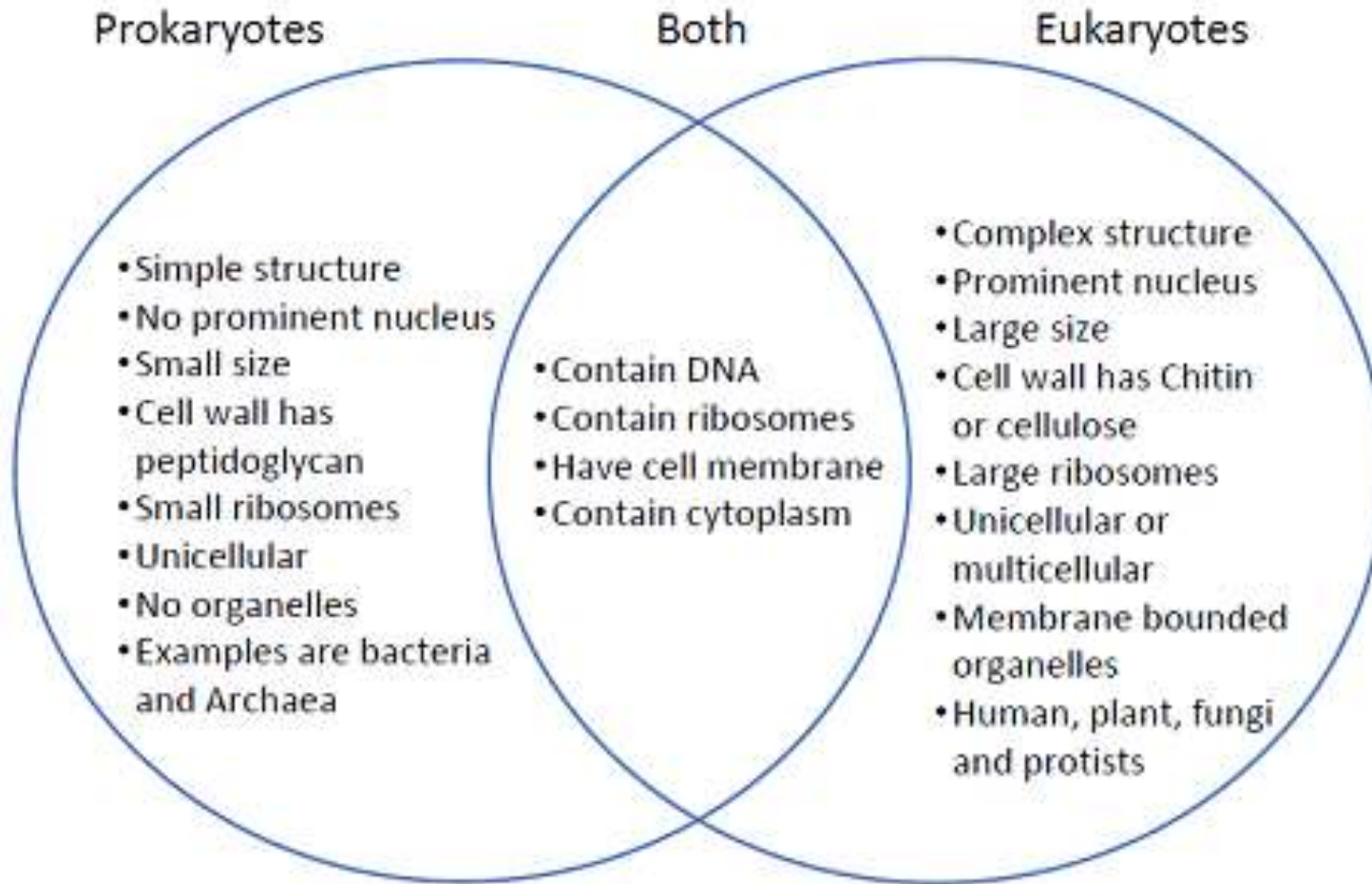
Parts of Prokaryotic and Eukaryotic Cells and Venn Diagram

Every cell shares a few common features, whether it is a prokaryote or eukaryote. These components include:

- **Cytoplasm:** Comprises the jelly-like fluid in which cellular structures are suspended.
- **Plasma membrane:** This membrane encloses the interior of a cell and protects it from its surrounding environment.
- **Ribosomes:** These are the factories that synthesise proteins.
- **DNA:** A cell's genetic material.



Venn Diagram of Prokaryotes and Eukaryotes





Difference between Prokaryotes and Eukaryotes

Feature	Prokaryotic Cell	Eukaryotic Cell
Presence of nucleus	Absent	Present
Cell size	1-10 μm	10-100 μm
Number of cells	Usually unicellular	Usually multicellular
Cell wall	Complex	Simple
Number of chromosomes	Does not contain a true chromosome instead have a plasmid	One or more
Cytoskeleton	May be absent	Present



Membrane-bound nucleus	Absent	Present
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DNA arrangement	Circular	Linear
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Ribosomes	Smaller	Larger
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Vesicles	Present	Present
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Golgi apparatus	Absent	Present
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Vacuoles	Present	Present
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Permeability of nuclear membrane	Absent	Selective
Mitochondria	Absent	Present
Endoplasmic reticulum	Absent	Present
Microtubules	Absent or rare	Present
Lysosomes and peroxisomes	Absent	Present
Genetic recombination	Partial, unidirectional transfers DNA	Meiosis and fusion of gametes
Example	Bacteria and Archaea	Animals and Plants

