

MICROBIOLOGY

Quick Science Revision

Classification & Evolution of



Domain	Characteristics	Examples
Bacteria	Prokaryotic, unicellular, lack nucleus and membrane-bound organelles. Cell wall made of peptidoglycan.	Escherichia coli, Bacillus subtilis, Lactobacillus acidophilus
Eukarya	Eukaryotic, can be unicellular or multicellular. Have a nucleus and membrane-bound organelles. Cell wall (if present) is made of cellulose or chitin.	Humans, mushrooms, amoebas, plants
Archaea	Prokaryotic, unicellular. Often found in extreme environments like high temperature, high salt, or high acidity. Cell wall is made of pseudopeptidoglycan.	Halobacterium salinarum, Pyrodicticum ferrireducens

Evolution

- Life on Earth began as simple organic molecules.
- These molecules combined to form more complex molecules like amino acids and nucleic acids.
- The first simple cells were prokaryotes, which appeared about 3.5 billion years ago.
- Over time, these cells evolved into more complex eukaryotic cells.
- The process of evolution is driven by natural selection, where organisms better suited to their environment survive and reproduce.

Microscopy

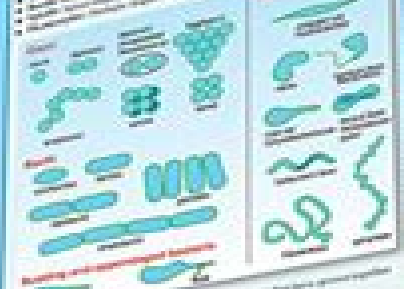
- Light microscopes use visible light to view specimens. They can magnify up to 1000 times.
- Electron microscopes use a beam of electrons to view specimens. They can magnify up to 1,000,000 times.
- Fluorescence microscopes use light of different wavelengths to excite fluorescent dyes in the specimen.

Stains

- Gram stain: Used to differentiate bacteria into Gram-positive and Gram-negative.
- Wright stain: Used to stain blood smears to identify different types of white blood cells.
- India ink: Used to identify the bacterium *Xanthomonas*.

Structure & Types of

Prokaryotic & Eukaryotic Cells Structure & Growth Characteristics



Growth and Reproduction

- Binary fission:** A prokaryotic cell divides into two identical daughter cells.
- Mitosis:** A eukaryotic cell divides into two identical daughter cells.
- Meiosis:** A eukaryotic cell divides into four non-identical daughter cells, each with half the genetic material.

Enzymes

- Enzymes are proteins that act as biological catalysts, speeding up chemical reactions.
- They are highly specific, meaning each enzyme only catalyzes a particular reaction.
- Factors affecting enzyme activity include temperature, pH, and substrate concentration.

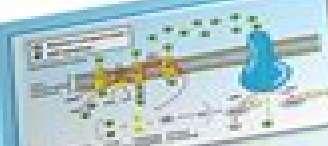


Metabolism

- Catabolism:** The breakdown of complex molecules into simpler ones, releasing energy.
- Anabolism:** The synthesis of complex molecules from simpler ones, requiring energy.
- Respiration:** The process by which cells convert glucose and oxygen into carbon dioxide and water, releasing energy.

Photosynthesis

- Plants and some bacteria use photosynthesis to convert light energy into chemical energy (glucose).
- The process occurs in the chloroplasts of plants and the thylakoids of bacteria.



Cell Membrane

- The cell membrane is a phospholipid bilayer that separates the cell from its environment.
- It is selectively permeable, allowing some substances to pass while blocking others.
- Transport proteins facilitate the movement of molecules across the membrane.



Cytoskeleton

- The cytoskeleton is a network of protein fibers that maintains the cell's shape and organization.
- It is involved in cell division, movement, and the transport of materials within the cell.

Signal Transduction

- Cells receive signals from their environment through receptors on the cell membrane.
- These signals trigger a series of events inside the cell, leading to a specific response.

Cellular Respiration

- Glycolysis:** The first stage of cellular respiration, where glucose is broken down into pyruvate.
- Krebs Cycle:** The second stage, where pyruvate is further broken down, releasing carbon dioxide.
- Electron Transport Chain:** The final stage, where electrons from the previous stages are used to produce ATP.

Photosynthesis

- Light-dependent reactions:** The first stage, where light energy is used to produce ATP and NADPH.
- Calvin Cycle:** The second stage, where carbon dioxide is fixed into glucose using the energy from the light-dependent reactions.

Cell Division

- Mitosis:** A process where a cell divides into two identical daughter cells.
- Meiosis:** A process where a cell divides into four non-identical daughter cells, each with half the genetic material.

Genetics

- DNA:** The molecule that carries the genetic information.
- Chromosomes:** Structures made of DNA and proteins that contain genes.
- Mendel's Laws:** Principles of inheritance that describe how traits are passed from parents to offspring.

Evolution

- Natural Selection:** The process by which organisms better suited to their environment survive and reproduce.
- Speciation:** The formation of new species from existing ones.

Microbiology

- Bacteriology:** The study of bacteria.
- Virology:** The study of viruses.
- Fungal Microbiology:** The study of fungi.

Immunology

- Antibodies:** Proteins that recognize and neutralize foreign substances (antigens).
- White Blood Cells:** Cells that fight off infections and disease.

Plant Biology

- Photosynthesis:** The process by which plants convert light energy into chemical energy.
- Transpiration:** The loss of water vapor from plants.

Animal Biology

- Cellular Respiration:** The process by which animals convert glucose and oxygen into energy.
- Homeostasis:** The ability of an organism to maintain a stable internal environment.

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