

BIOLOGY

Evolution, cytology, energy & life, cell transport, cell reproduction, organismal reproduction & meiosis, genetics & Mendel, molecular & population genetics

BASIC CONCEPTS

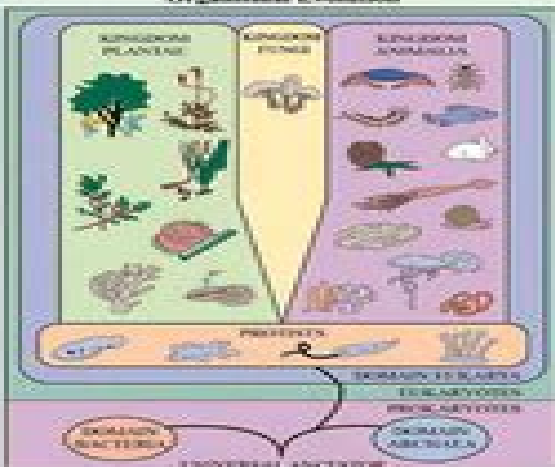
1. **Biology** is the study of life.
2. The characteristics of life are metabolism, reproduction, growth, movement, responsiveness, and complex organization.
3. The **scientific method** is how scientists study biology.
 - A. Based on the observation of phenomena to formulate hypotheses that are both testable and falsifiable (in case they are wrong).
 - B. Used to test hypotheses, collect data, and analyze data statistically (if necessary).

EVOLUTION

Evolution is the concept that all organisms are related to each other by common ancestry; it is the unifying theme in biology.

1. **Natural selection:** A mechanism, formulated by 19th-century biologists Charles Darwin and Alfred Wallace, for the occurrence of evolution based on the survival of those offspring best adapted to the conditions in which they live.
 - A. Individuals sexually reproduce, creating many more offspring than could possibly survive.
 - B. These offspring are not identical (in most situations) but show variations based on genetic differences.
 - C. Essentially, those individuals with variations that allow them to survive (i.e., adaptations) to the age of reproduction can pass their genes on to the next generation.
 - D. Thus, nature is selecting offspring and shaping the evolution of species.

Organismal Evolution



2. **Artificial selection:** Humans select traits in an organism's offspring (e.g., pets, farm crops).

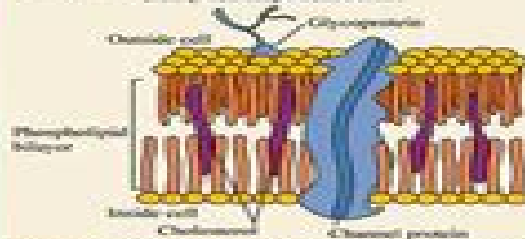
Domesticated Animals

Cell Theory

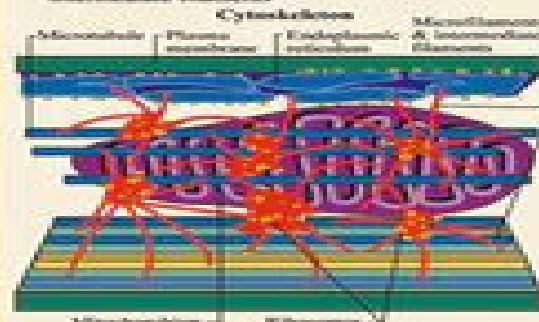
All living things are composed of cells and come from cells.

1. **Cell size:** Small to maximize the ratio of surface area to volume for regulating the internal cell environment.
2. **Cell (plasma) membrane:** Composed of a fluidlike phospholipid bilayer, proteins, cholesterol, and glycoproteins.

Cell (Plasma) Membrane



3. **Cell walls:** Outside of the cell membrane in some organisms composed of carbohydrates (e.g., cellulose for plants, chitin for fungi) or carbohydrate derivatives (e.g., peptidoglycan for bacteria).
4. **Cytoplasmic Material:** outside the nucleus.
 - A. Site for metabolic activity.
 - B. Cytosol: Solution with dissolved substances such as glucose, CO_2 , O_2 , etc.
 - C. **Organelles:** Membrane-bound subunits of cells with specialized functions.
5. **Cytoskeleton:** Supportive and metabolic structure composed of microtubules, microfilaments, and intermediate filaments.



Prokaryotic Cells

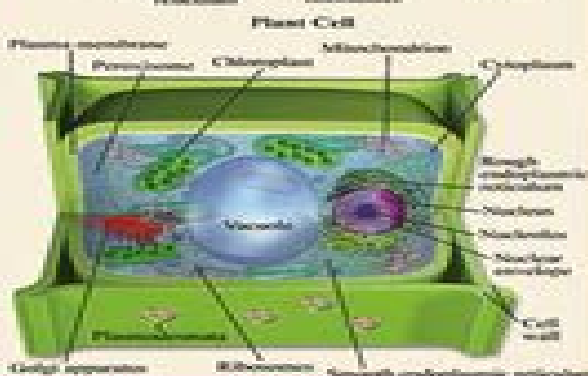
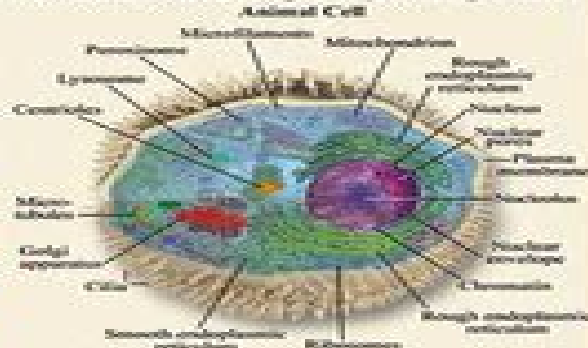
Prokaryotes have a simple cellular organization with no nucleus or other membrane-bound organelles.



Eukaryotic Cells

Eukaryotes have a complex cellular organization; membrane-bound organelles, located inside the cell membrane, include the following:

1. **Nucleus:** Contains DNA in the form of chromosomes; controls cellular activities via genes.
2. **Nucleolus:** Located within the nucleus; site for ribosome synthesis.
3. **Rough endoplasmic reticulum:** Has ribosomes, which are necessary for protein synthesis.
4. **Smooth endoplasmic reticulum:** Involved primarily in lipid synthesis, as it lacks ribosomes.
5. **Golgi apparatus:** Packaging center for molecular synthesis; carbohydrate.
6. **Lysosome:** Contains hydrolytic enzymes for intracellular digestion.
7. **Peroxisome:** Involved in hydrogen peroxide synthesis and degradation.
8. **Chloroplast:** Site of photosynthesis.
9. **Chromoplast:** Contains xanthophyll pigments.
10. **Leukoplast:** Stores starch.
11. **Mitochondrion:** Produces adenosine triphosphate (ATP).
12. **Vacuole:** General storage and space-filling structure.



Basic Biology Study Guide

Speedy Publishing

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