

BIOLOGY

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

BASIC CONCEPTS

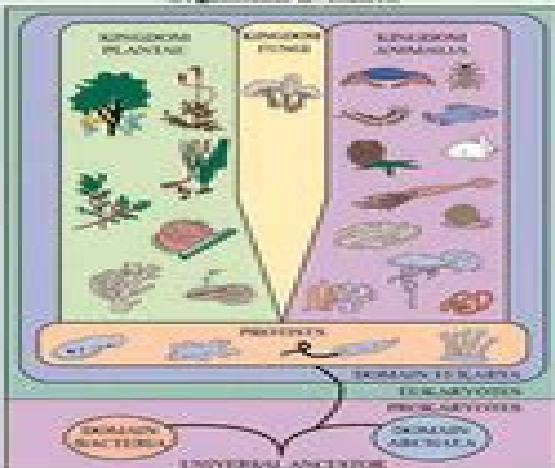
1. **Biology** is the study of life.
2. The characteristics of life are metabolism, reproduction, growth, movement, responsiveness, and complex organization.
3. The **scientific method** is how scientists study biology.
 - A. Based on the observation of phenomena to formulate hypotheses that are both 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

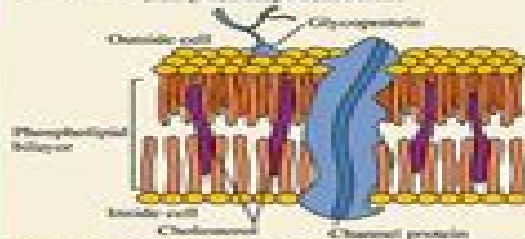
CYTOLOGY: THE STUDY OF CELLS

Cell Theory

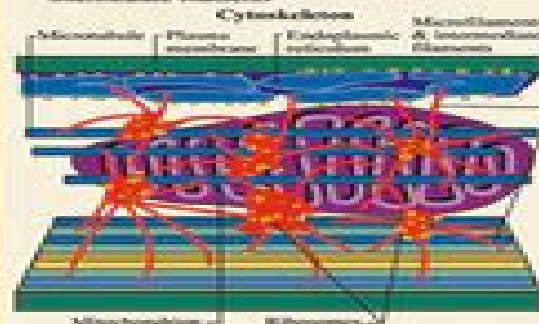
All living things are composed of cells and come from cells.

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. **Cytoplasm:** Material inside 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

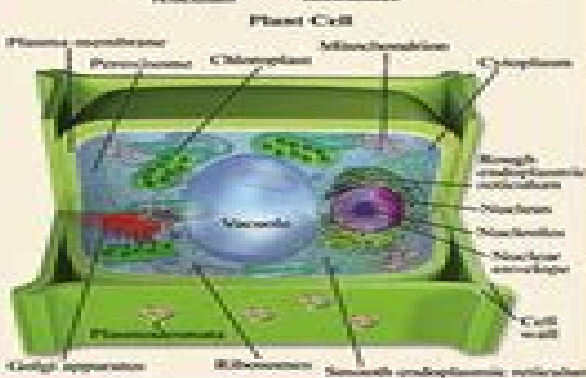
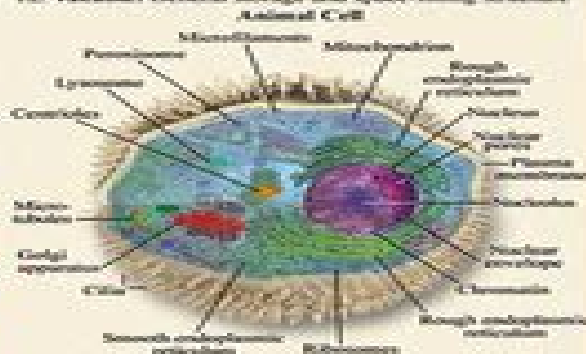
Prokaryotes have a simple cellular organization with no nucleus or other membrane-bound organelles.



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.



Teaching Resources Study Guide Biology

Puja Mehta



Teaching Resources Study Guide Biology:

Resources for Teaching Middle School Science Smithsonian Institution, National Academy of Engineering, National Science Resources Center of the National Academy of Sciences, Institute of Medicine, 1998-03-30 With age appropriate inquiry centered curriculum materials and sound teaching practices middle school science can capture the interest and energy of adolescent students and expand their understanding of the world around them *Resources for Teaching Middle School Science* developed by the National Science Resources Center NSRC is a valuable tool for identifying and selecting effective science curriculum materials that will engage students in grades 6 through 8 The volume describes more than 400 curriculum titles that are aligned with the National Science Education Standards This completely new guide follows on the success of *Resources for Teaching Elementary School Science* the first in the NSRC series of annotated guides to hands on inquiry centered curriculum materials and other resources for science teachers The curriculum materials in the new guide are grouped in five chapters by scientific area Physical Science Life Science Environmental Science Earth and Space Science and Multidisciplinary and Applied Science They are also grouped by type core materials supplementary units and science activity books Each annotation of curriculum material includes a recommended grade level a description of the activities involved and of what students can be expected to learn a list of accompanying materials a reading level and ordering information The curriculum materials included in this book were selected by panels of teachers and scientists using evaluation criteria developed for the guide The criteria reflect and incorporate goals and principles of the National Science Education Standards The annotations designate the specific content standards on which these curriculum pieces focus In addition to the curriculum chapters the guide contains six chapters of diverse resources that are directly relevant to middle school science Among these is a chapter on educational software and multimedia programs chapters on books about science and teaching directories and guides to science trade books and periodicals for teachers and students Another section features institutional resources One chapter lists about 600 science centers museums and zoos where teachers can take middle school students for interactive science experiences Another chapter describes nearly 140 professional associations and U S government agencies that offer resources and assistance Authoritative extensive and thoroughly indexed and the only guide of its kind *Resources for Teaching Middle School Science* will be the most used book on the shelf for science teachers school administrators teacher trainers science curriculum specialists advocates of hands on science teaching and concerned parents

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