

BIOLOGY

THE BASIC PRINCIPLES OF BIOLOGY

Basic Concepts

Biological Science: The Study of Life

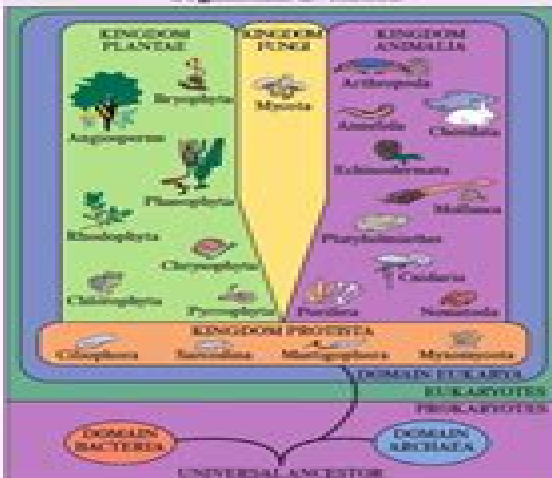
- A. The Scientific Method: How scientists study biology
1. Observe phenomena and formulate testable and falsifiable (in case they are wrong) hypotheses
 2. Test hypotheses, collect data, and analyze statistically (if necessary)
- B. What is life?
1. Characteristics: Metabolism, reproduction, growth, movement, responsiveness, complex organization.

Evolution

Concept that all organisms are related to each other by common ancestry; The unifying theme in biology.

- A. Natural Selection: A mechanism for the occurrence of evolution.
1. Survival of those offspring best adapted to the conditions in which they live.
 - a. Individuals produce sexually 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.
 2. Charles Darwin and Alfred Wallace, 19th century biologists, formulated the concept of natural selection.

Organismal Evolution



- B. Artificial Selection: Human selects traits in offspring (ex: pets, farm crops).

Domesticated Animals



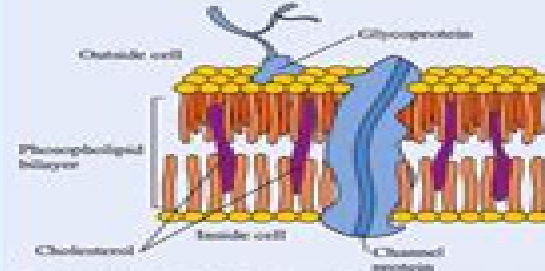
Cytology: The Study of Cells

Cell Theory:

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

- A. Cell Size: Small to maximize surface area to volume ratio for regulating internal cell environment.
- B. Cell (Plasma) Membrane: Composed of fluid-like phospholipid bilayer, proteins, cholesterol and glycoproteins.

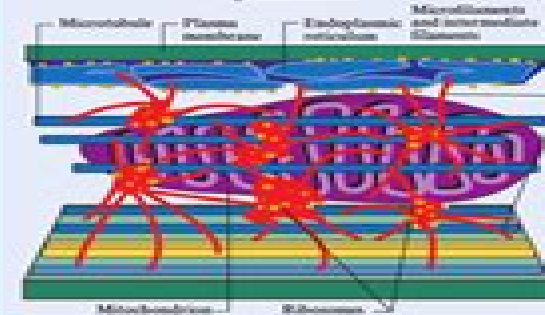
Cell (Plasma) Membrane



- C. Cell Wall: Outside of cell membrane in some organisms; composed of carbohydrate (e.g., cellulose or chitin) or carbohydrate derivative (e.g., peptidoglycan).
- D. Cytoplasm: Material outside nucleus.

1. Site for metabolic activity
 2. Cytosol: Solutions with dissolved substances such as glucose, CO_2 , O_2 , etc.
 3. Organelles: Membrane-bound subunits of cells with specialized functions
- E. Cytoskeleton: Supportive and metabolic structure composed of microtubules, microfilaments, and intermediate filaments.

Cytoskeleton



Prokaryotic Cells:

Simpler cellular organization with no nucleus or other membrane-bound organelles.



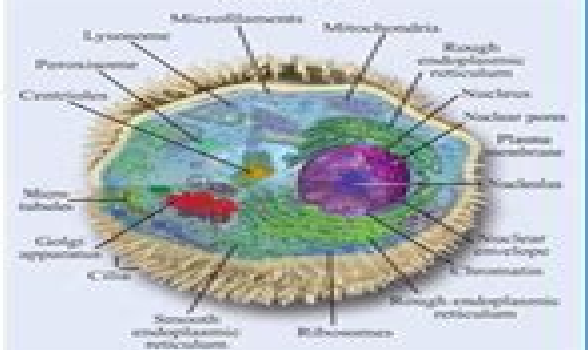
Eukaryotic Cells:

Complex cellular organization

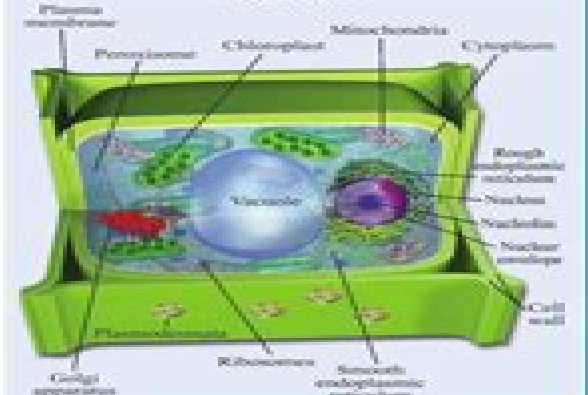
- A. Membrane: Bound organelles including the following:

1. Nucleus: DNA/chromosomes, control cellular activities via genes
2. Nucleolus: Located within nucleus, site for ribosome synthesis
3. Rough endoplasmic reticulum: With ribosomes, involved in protein synthesis
4. Smooth endoplasmic reticulum: Without ribosomes, involved primarily in lipid synthesis
5. Golgi apparatus: Packaging center for molecules; carbohydrate synthesis
6. Lysosome: Contains hydrolytic enzymes for intracellular digestion
7. Peroxisome: Involved in hydrogen peroxide synthesis and degradation
8. Chloroplast: Site of photosynthesis
9. Chromoplast: Non-green pigments
10. Leukoplast: Stores starch
11. Mitochondrion: ATP production
12. Vacuole: General storage and space-filling structure

Animal Cell



Plant Cell



Biology Quick Study Academic

W. Randy Brooks



Biology Quick Study Academic:

Biology Terminology Randy Brooks, 2013-12-31 Essential terminology for Biology study pulled together in one guide to maximize success in College and High School courses Succinct definitions by our resident Ph D Biology author and professor ensure the usefulness of this handy guide from high school to college **Biology** Jake Bernstein, 1996 *Molecular Biology* BarCharts, Inc, Randy Brooks, 2012-05-31 Annotation BarCharts three panel Molecular Biology QuickStudy R guide provides a detailed review of the principal areas of biology at the molecular level A perfect resource for students in an introductory molecular biology course or those in higher level courses who are in need of a refresher this guide includes up to date information on biomolecules DNA replication transcription and more all essential knowledge for the successful biology student Color coded sections are enhanced by diagrams and illustrations highlighting major processes and structures

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School Science and Mathematics , 1903

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