



BIOLOGY

CLASSIFICATION

A. LEVELS OF TAXONOMIC CLASSIFICATION – (largest to smallest) Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species.

B. TREE OF LIFE



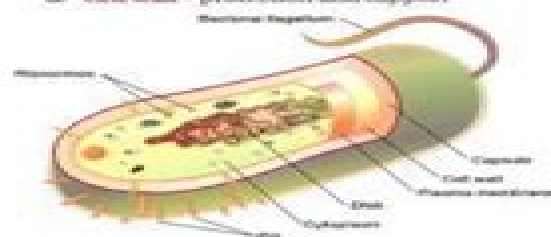
CELL BIOLOGY

A. CELL THEORY

1. All living things are made up of one or more cells.
2. The cell is the basic unit of structure and function.
3. All cells come from existing cells.

B. PROKARYOTIC CELL STRUCTURE

1. **Plasma membrane** – regulates what enters and leaves the cell
2. **Flagellum** – locomotion
3. **Ribosomes** – sites of protein production (RNA) – protein synthesis
4. **Pili** – used for attachment to other bacteria or to a host
5. **Plasmid** – small circle of DNA separate from main chromosome loop
6. **Cell wall** – protection and support



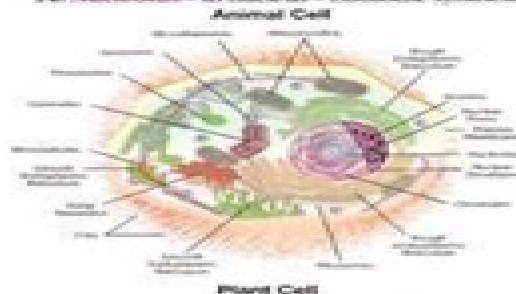
C. EUKARYOTIC CELL STRUCTURE

1. **Plasma membrane** – regulation of internal environment
2. **Mitochondria** – membrane-enclosed – energy-producing reactions
3. **Chloroplasts** – plants – photosynthesis
4. **Lysosomes** – storage for digestive enzymes
5. **Smooth Endoplasmic Reticulum (SER)** – protein and lipid synthesis
6. **Rough Endoplasmic Reticulum (RER)** – produces, modifies, and transports proteins – has ribosomes attached
7. **Ribosomes** – particles composed of ribonucleic acid (RNA) – protein synthesis
8. **Golgi apparatus** – stores, modifies, and packages secretory products
9. **Peroxisomes** – contain oxidative enzymes
10. **Vacuoles** – fluid-filled spaces – storage
11. **Cell wall** – plants – protection and support

12. **Centriole, centrosome** – animal cells – cell division

13. **Cilia, flagella** – locomotion and ingestion

14. **Nucleolus** – in nucleus – ribosome synthesis



- D. LIMITATIONS ON CELL SIZE** – As cell size increases, surface area-to-volume ratio increases. If the ratio becomes too high, the cell surface is not large enough to carry out its function. It cannot allow materials into or out of the cell quickly enough to support necessary life processes.

E. STRUCTURE OF THE CELL MEMBRANE



EXCHANGE BETWEEN CELL AND ENVIRONMENT

- A. DIFFUSION** – movement of ions or molecules down a concentration gradient
- B. OSMOSIS** – movement of water molecules across a membrane down a concentration gradient
1. **Isotonic medium** – same solute concentration as cell
 2. **Hypertonic medium** – higher solute concentration than cell; cell loses H₂O (shrivels)
 3. **Hypotonic medium** – lower solute concentration than cell; cell gains H₂O (swells)
- C. ACTIVE TRANSPORT** – movement against a concentration gradient; requires energy input from cell

D. ENDOCYTOSIS – cell encloses material (includes phagocytosis of solid particles); a form of active transport

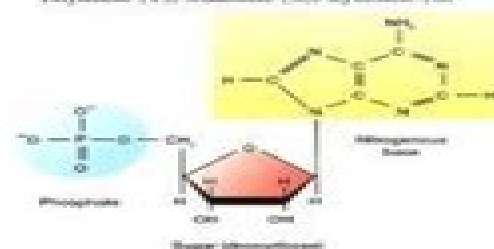
E. EXOCYTOSIS – cell discharges vacuole-enclosed material; a form of active transport

METABOLIC AND ENERGY-PRODUCING PATHWAYS

- A. ENZYME** – protein catalyst speeds reaction by lowering energy of activation
1. **Substrate** – molecule on which enzyme acts
 2. **Coenzyme** – binds briefly to enzymes; activates and assists enzymes
 3. **ATP** – adenosine triphosphate; energy stored in phosphate-phosphate bonds; energy released when bonds are hydrolyzed
 4. **NAD** – nicotinamide adenine dinucleotide; part of electron transport system
- B. PHOTOSYNTHESIS** – chloroplasts – $6CO_2 + 6H_2O + \text{light, chlorophyll} \rightarrow C_6H_{12}O_6 + 6O_2$
- C. CELLULAR RESPIRATION** – generates ATP
1. **Glycolysis** – initial stage of respiration – cytoplasm – anaerobic – activation of glucose (by ATP), with production of pyruvate (net gain of 2 ATP)
 2. **Krebs (citric acid) cycle** – second stage of respiration – mitochondria – aerobic – pyruvate breaks down with production of CO_2 , 2 ATP and many electron carriers
 3. **Electron (hydrogen) transport chain** – third stage of respiration – mitochondria – aerobic – hydrogen and electrons stripped from carriers with production of 32 ATP

DNA

- A. NUCLEOTIDES** – subunits of nucleic acids
1. **Phosphate**
 2. **Sugar** (deoxyribose in DNA, ribose in RNA)
 3. **Nitrogenous base** (four in DNA): Adenine (A), Thymine (T), Guanine (G), Cytosine (C)



B. STRUCTURE OF DNA

1. **Sugar-phosphate groups** – sugar is deoxyribose
2. **Nucleotides**
3. **Double helix** – sugar-phosphate groups form backbone (sides of "ladder"); pairs of nucleotides form "rungs of ladder"; nucleotide pairs joined by hydrogen bonds; A always pairs with T; C always pairs with G

MOLECULAR GENETICS

A. DEFINITIONS

1. **Gene** – a location on a chromosome; typically codes for one polypeptide
2. **Alleles** – different forms of a gene
3. **Chromosome** – structure made up of DNA and associated proteins
4. **Genotype** – genetic makeup of an organism
5. **Phenotype** – visible expression of genetic makeup

Stars Ninth Grade Biology Study Guide

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Table of Contents Stars Ninth Grade Biology Study Guide

1. Understanding the eBook Stars Ninth Grade Biology Study Guide
 - The Rise of Digital Reading Stars Ninth Grade Biology Study Guide
 - Advantages of eBooks Over Traditional Books
2. Identifying Stars Ninth Grade Biology Study Guide
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Stars Ninth Grade Biology Study Guide
 - User-Friendly Interface
4. Exploring eBook Recommendations from Stars Ninth Grade Biology Study Guide
 - Personalized Recommendations
 - Stars Ninth Grade Biology Study Guide User Reviews and Ratings
 - Stars Ninth Grade Biology Study Guide and Bestseller Lists

5. Accessing Stars Ninth Grade Biology Study Guide Free and Paid eBooks
 - Stars Ninth Grade Biology Study Guide Public Domain eBooks
 - Stars Ninth Grade Biology Study Guide eBook Subscription Services
 - Stars Ninth Grade Biology Study Guide Budget-Friendly Options
6. Navigating Stars Ninth Grade Biology Study Guide eBook Formats
 - ePub, PDF, MOBI, and More
 - Stars Ninth Grade Biology Study Guide Compatibility with Devices
 - Stars Ninth Grade Biology Study Guide Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Stars Ninth Grade Biology Study Guide
 - Highlighting and Note-Taking Stars Ninth Grade Biology Study Guide
 - Interactive Elements Stars Ninth Grade Biology Study Guide
8. Staying Engaged with Stars Ninth Grade Biology Study Guide
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Stars Ninth Grade Biology Study Guide
9. Balancing eBooks and Physical Books Stars Ninth Grade Biology Study Guide
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Stars Ninth Grade Biology Study Guide
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Stars Ninth Grade Biology Study Guide
 - Setting Reading Goals Stars Ninth Grade Biology Study Guide
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Stars Ninth Grade Biology Study Guide
 - Fact-Checking eBook Content of Stars Ninth Grade Biology Study Guide
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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