

Cell unit notes

Literature, Russian Literature



Cell Unit Notes I. Life Processes - What makes something living? A. Biotic: Having life's conditions Abiotic: Not having life's conditions Homeostasis: The condition of maintaining a constant internal environment in living organisms.

B. Characteristics of living Organisms (LIFE)

1. Nutrition - Food for energy and body (cell) repair and development
2. Transport - Move materials were needed in organism
3. Respiration - Able to generate energy for life processes
4. Synthesis - Able to combine matter to make needed products
5. Assimilation - Able to combine products to make body (cell) parts
6. Growth - Changes over time
7. Excretion - Expels waste material
8. Reproduction - Able to produce new living organisms with life characteristics
9. Metabolism - Has chemical reactions to maintain homeostasis

II. Development of the Cell Theory

The cell theory took several hundred years to develop. It took new technology and the ability to accept new ideas to accomplish what we have today.

A. Important men to know in Cell Theory Development

1. Robert Hooke: (1665) English - Observed Cork and named small units " cells"
2. Anton von Leeuwenhoek: (1675)Dutch - Made some of first detailed microscopes, observed blood, teeth scrapings, etc.
3. Henry Dutrochet: (1824) France - Proposed that all living things were made of cells
4. Robert Brown: (1831) English - Observed plant and animal cells and named nucleus in both.
5. Matthias Schleiden: (1838) German - Discovered plants composed of cells
6. Theodor Schwann: (1839) German - Discovered animals composed of cells
7. Rudolph Virchow: (1855) German - Determined that cells come from other cells.

B. The cell theory states:

1. All organisms are made of one or more cells.
2. Cells are the basic unit of life. They carry on life activities.
3. Living cells come from other living cells. (Cell division)

III. Cell Diversity A.

Two main types of cells

1. Prokaryote: (prokaryotic) Simple cells that lack a nucleus and many membrane organelles. Example - Bacteria.
2. Eukaryote: (Eukaryotic) Complex cells that have a nucleus and other membrane organelles. Example- plant and animal cells.

B. Cell size

1. Eukaryote cells are much larger than prokaryote cells. Cells range in size from 2 meters(very small just long, giraffe nerve cell in neck) to . 2 microns(10^{-6})
2. Important question: Why are single cells so small? The surface area to volume ratio increases too much to supply the cell with nutrients and remove waste. The smaller the cell the easier these processes are. Needed materials can't get in and out of the cell fast enough.

C. Cell shape

1. Cells come in most any shape thought of . They are not all round or square. Plant cells hold their shape better because of their cell walls.

IV. Cell Organelles and their functions

A. Organelles are cell structures found inside the cell that perform specific functions for life activities.

1. Nucleus: Controls cells activities. Contains DNA, which makes up chromosomes that carry genetic information
2. Nuclear membrane: Surrounds the nucleus and controls what goes in and out of the nucleus
3. Nucleolus: Found in the nucleus. Helps form RNA and ribosomes.
4. Cell wall: Rigid outside structure found in plant cells and some prokaryote. Composed of cellulose in plants. Gives support, shape and controls what goes in and out of the cell.
5. Cell membrane: (plasma membrane) Thin, flexible envelope that surrounds cell material. Protects and controls what goes in and out of the cell.
6. Rough endoplasmic reticulum: (rough ER) Maze of tubes generally connected to the nucleus that have ribosome's on them. They help transport material through cell and detoxify wastes.
7. Smooth endoplasmic reticulum: (smooth ER) same as rough ER,

but without the ribosome's. 8. Ribosome's: Small dots through out the cytoplasm that help in forming proteins. Site of protein synthesis. 9. Cytoplasm: fluid that contains all cell organelles. Where most chemical reactions take place in a cell. 10. Mitochondria: Bean shaped, referred to as “powerhouse of cell”. Produces (ATP) energy from nutrients through the process of cellular respiration 11. Vacuoles: Store nutrients, waste and other cell materials. 12. Lysosome: Special vacuoles that contain digestive enzymes that help breakdown nutrients and remove old or damaged cell parts. 13. Golgi apparatus: (G. complex) series of flat membranes that help package and secret cell products. Help form vacuoles with needed cell materials inside. 14. Microtubules: Small hollow tubes made of proteins that help form cytoskeleton and cilia or flagella. 15. Micro filaments: Long strands of protein that help build the cytoskeleton of cells. Also used in muscles allowing contractions. 16. Cilia: Small, short hair-like projections on the cell membrane that are used for locomotion or movement of body fluids. 17. Flagella: Long whip-like projections on the cell membrane, used for locomotion. 18. Plastids: Organelles found only in photo synthetic cells that produce and store carbohydrates. a. Leucoplasts: colorless plastids that store starches and other plant nutrients. b. Chromoplasts: plastids that contain plant pigments. These give leaves, fruits, etc. their various colors. c. Chloroplast: contain chlorophyll. Is the site of photosynthesis which is the production of carbohydrates. 19. Centrioles: A pair of specialized microtubules found in animal cells that help in cell division. Help separate chromosomes in mitosis V. Plant versus Animal Cells A. What makes plant cells different from animal cells? 1. Plant cells have: (animal cells don't)

*Plastids *Cell wall *Many have large central vacuole

2. Animal cells have: (plant cells don't) *Centrioles

B. Organisms levels of organization - smallest to largest

1. Cell - tissue - organ - system - organism

Example: one stomach cell - several layers of tissue in the stomach - the stomach organ - part of digestive system - all body systems make whole organism (nervous, skeletal, etc.)

C. Make a simple drawing of a plant and animal cell Label items that show the key differences. [pic] [pic]

VI. Cell Membrane

A. Maintaining a constant cell environment is the job of the cell membrane. It does it by regulating what comes in and goes out of the cell.

B. Cell membrane structure - Phospholipids bilayer with protein and carbohydrate structures [pic]

C. Permeability of the membrane

1. Permeable membrane: Any substance can move across the membrane.

2. Selectively Permeable or Semi permeable membrane: Allows some substances through and blocks others.

D. Cell Transport - Passive Transport vs. Active Transport (1 thru 3 are passive transport they do not require added energy, natural flow)

1. Diffusion: The movement of molecules or particles from an area of high concentration to low concentration. Trying to reach an equilibrium of concentration. They move because particles are in constant motion in nature. [pic]

2. Facilitated Diffusion: Diffusion across a membrane that is helped by specific carrier proteins. It occurs faster and is specific for certain particles.

3. Osmosis: The diffusion of water across a semi permeable membrane against a concentration gradient. [pic]

4. Active Transport: The transport of particles across a cell membrane against diffusion natural concentration gradient. Therefore it requires the use of energy and helper proteins.

5. Endocytosis: is the term applied when transport is into the cell.

[pic] a. Phagocytosis: Is the process of engulfing large particles or whole cells into another cell. b. Pinocytosis: Is the process of bringing fluids into a cell. 6. Exocytosis: is the term applied when transport of material is out of the cell.

E. Effects of Osmosis 1. Isotonic Solution: A solution that contains the same amount of dissolved substances (solute) in it as the interior of the cell. This makes an equal concentration gradient. [pic][pic] 2. Hypotonic Solution: A solution that contains a lower concentration of dissolved substances (solute) than the cell. This makes the concentration of water higher outside the cell so water moves into the cell. [pic][pic] 3. Hypertonic solution: A solution that contains a higher concentration of dissolved substances (solute) in it than the cell. This means there is more water inside the cell so it moves out of the cell making it shrink. [pic][pic] [pic] [pic]