**Module 4A: Cell Structure & Function**
**Module 4B: The Classification & Evolution of Organisms**
**Class Notes (arc)**

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**Instructions**: Complete the class notes from the ppt slides. Use MS Words to fill in the blanks.

## Cell Structure & Function

- 1. **The Cell Theory**: 1. All living things are made of cells.
  A cell is the structural unit of all living things.

- 2. **The Historical Context of the Cell Theory**: Robert Hooke coined the term "cell." Anton van Leeuwenhoek made better microscope He used them to look at a variety of substances and called them animalcules. Mathias Jakob Schleiden concluded that all plants were made of cells. Theodor Schwann concluded that all animals were made of cells

- 3. **Initial Observations of Cells: Cell wall** outer non-living part of plant cells.
  Protoplasm is all the living material that makes up a cell.
  (nucleus + cytoplasm = PROTOPLASM). Nucleus contains the genetic information of the cell. Cytoplasm fluid part of the protoplasm. Organelles "little organs within the protoplasm.

- 4. **Different Kinds of Cells:** Two major cell types: Prokaryotic cells and Eukaryotic cells. **Prokaryotic cells**: Structurally simple cells, lack a nucleus lack **most** other Organelles. Example: Bacteria.

- **Eukaryotic cells**: More complex, have a nucleus and other organelles. Example: plants, animals, fungi

## 5. Cell Components

**Organelles Composed of Membranes:** Plasma membrane (cell membrane), Endoplasmic reticulum, Golgi apparatus, Lysosomes, Peroxisomes, Vacuoles a d vesicle, Nuclear Membrane.

**5A. Cell Membranes:** The CELL MEMBRANE is composed of Phospholipid bilayer and protein, together with carbohydrates, fats & cholesterol. The cell membrane is also called the Plasma membrane One important function of the cell membrane is to control and exit of molecules to and from the cells

**5B**. **The Endoplasmic Reticulum (ER):** Consists of folded membranes and tubes throughout the cell. Provides a large surface area for important chemical reactions. The ER also functions in internal TRANSPORT of MACROMOLECULES **Two** types of ER: **Rough**: Has RIBOSOMES

attached on its surface. Sites of PROTEIN SYNTHESIS **Smooth**: Lacks RIBOSOMES. Metabolizes FATS, DETOXIFIES damaging chemicals.

**5C. The Golgi Apparatus (Golgi body)**: Stacks of flattened membrane SACS Resembles a **stack of pancakes**. Functions: MODIFIES, PACKS, & SHIPS substances for **secretion**. Activates LYSOSOMES

**5D. Lysosomes:** Vesicles containing DIGESTIVE ENZYMES. Capable of digesting CARBOHYDRATES, PROTIENS, LIPIDS, & NUCLEIC ACIDS. These enzymes only work at ph5. These enzymes are INACTIVATES at a higher ph. The **functions** of lysosomes are basically DIGESTION and DESTRUCTION.
**5E. Vacuoles and Vesicles:** MEMBRANE enclosed sacs VACULES: Larger sacs, STORAGE container in the cell. VESICULES: Smaller vacuoles.

**5 F**. **The Nuclear Membrane:** Separates the GENETIC material from the REST of the cell. Controls ENTRY to & EXIT from the nucleus through holes called NUCLEAR PORE complexes.
**6. Energy Converting Organelles**
**A**. **Mitochondrion**: Present both in PLANT & ANIMAL cells. Sausage shaped structures. Contain ENZYMES for making ATP. Function: AEROBIC CELLULAR RESPIRATION takes place here.

Food + OXYGEN → Carbon dioxide + water + ATP (energy for cell activity) B. **Chloroplasts**: Present ONLY in PLANT cells. It is a container of a green pigment called CHLOROPHIL. It helps to trap sunlight energy to make SUGAR. Function: Perform PHOTOSYNTHESIS.
CARBON DIOXIDE + water + LIGHT ENERGY → SUGAR + oxygen. 7. **No membranous Organelles:** RIBOSPMES, CYTOSKELETON, CENTRIOLES, CILIA & FLAGELLA, INCLUSIONS

7 A. **Ribosomes:** Present both free in the CYTOPLASM and attached to the ROUGH ER Made of RNA and PROTEINS Composed of two subunits

Function: Are the sites of PROTEIN SYNTHESIS.

7 B. **Cytoskeleton:** Provides, SHAPE, SUPPORT, AND MOVEMENT.
7 C. **Centrioles:** Two sets of MICROTUBULES arranged at right angles to each other. Located in a region called the CENTROSOME Present only in ANIMAL CELLS. Functions in CELL DIVISION.

**7D. Cilia and Flagella:** HAIR-LIKE like projections extending from the cell. Help in MOVEMENT of cells. Flagella**:** Long and FEW in number. Cilia: Small and NUMEROUS
**8. Nucleus:** The material inside the nucleus is called the NUCLEPLASM It contains

CHROMATIN Chromatin is composed of DNA & PROTEIN. Coiled up dense strands of chromatin are called CHROMOSOMES. The difference between chromatin & chromosome is their FORM. The nucleus may contain one or more NUCLEOLI which is the site of ribosome synthesis.

**8. Getting Through Membranes:** The mechanisms by which molecules can get through membranes are: DIFFUSION, OSMOSIS, FACILITATED DIFFUSION, ACTIVE TRANSPORT, ENDOCYTOSIS,

**9A. Diffusion:** DIFFUSION is the net movement of molecules from an area of HIGH concentration to an area of LOW concentration. Ex. OXYGEN, CARBON DIOXIDE, NUTRIENTS move in and out of the cells in this way. It is PASSIVE transport.
**8 B. Osmosis:** Diffusion of WATER through a SELECTION permeable membrane (differentially permeable membrane) is called OSMOSIS. A selectively permeable membrane will allow only SOME ***selective molecules*** to pass through and not all).
**8 C. Facilitated Diffusion:** Diffusion of molecules with the help of a CARRIER PROTEIN is called FACILATED DIFFUSION. (GLUCOSE molecules move in this way). Molecules move from HIGH TO LOW. It is PASSIVE transport.

**8 D. Active Transport:** Moves molecules across a membrane UP their concentration gradient, from LOW TO HIGH. (IONS move in and out of cells in this way). During ACTIVE TRANSPORT **only**, an outside source of ENERGY (ATP) is required. A carrier protein (molecule) is required for both FACILITATED DIFFUSION & ACTIVE TRANSPORT

**8E. Endocytosis:** Moves LARGE molecules or sets of molecules INTRO the cell**.**
**I. Phagocytosis**: During PHAGOCYTOSIS material is ENGULFED directly by the cell. (EX. Destruction of BACTERIA bib). II. PINOCYTOSIS will allow intake of LIQUIDS (Ex. *molecules dissolved in water).*
**8 F. Exocytosis:** Moves LARGE molecules or sets of molecules OUT of the cell.

## The Classification & Evolution of Organisms

**1. The Classification of Organisms:** The naming of organisms is a TECHNICAL process. Naming organisms involves two different activities. A. TAXONOMY: The naming of organisms. B. PHYLOGENY: Demonstrating how organisms are related EVOLUTIONARILY

2. **Taxonomy:** The first person who attempted to classify organisms was a Swedish doctor named CAROLOUS LINNAEUS. He developed the BINOMIAL SYSTEM of NOMENCLATURE to name organisms (*two*-word naming system).
3. **Binomial System of Nomenclature:** Scientific names of organisms are in LATIN. The first part of an organism's scientific name is the GENUS to which the organism belongs. The second part is the SPECIFIC EPITHET. In order to clearly identify the scientific name, BINOMIAL

names are either *italicized* or UNDERLINED. A SPECIES is a group of closely related organisms. A HOMO SAPIENS is a group of organisms that look alike and interbreed.

The first letter of the genus is capitalized; the specific epithet is not. The correct way to write the scientific name for humans is

| Homo sapiens |
|---|

**4. The Organization of Species into Logical Groups:** All living things can be broadly classified into three categories called the DOMAINS.
They are Domain BACTERIA Domain ARCHEA, & Domain EUCARYA. The domain BACTERIA is the oldest group. The domains ARCHEA and EUCARYA are derived from the Bacteria.

**5. Domains Bacteria & Archaea:**
Members of the Domains BACTERIA & ARCHEA have some common characteristics:
Cell type: PROKARYOTIC; Cell structure: CELL WALL present.
Body form: UNICELLULAR; Nutrition: AUTOTROPHIC (can make their own food) Ex. cyanobacteria. Some are HETEROTROPHIC (cannot make their own food).

**5. Domain Encarta:** Cell type: EUKARYOTIC Size: LARGER than PROKARYOTES
Cell content: Contain specialized MEMBRANOUR ORGANELLES

Domain EUCARYA consists of four KINGDOMS. Kingdom PROTISTA Kingdom FUNGI, Kingdom PLANTAE, and Kingdom ANIMALIA.

**Summary Table: Domain Encarta**

| Kingdoms | Protista | Fungi | Plantae | Animalia |
|---|---|---|---|---|
| Cell type | Eukaryotic | Eukaryotic | Eukaryotic | Eukaryotic |
| Cell structure | Mostly no Cell wall | Cell wall made of chitin | Cell wall made of cellulose | No Cell wall |
| Body form & Motility | Mostly Unicellular, Some Multicellular Motile | Mostly Multicellular Mostly nonmotile | Multicellular Nonmotile | Multicellular Motile |
| Nutrition | Autotrophic & Heterotrophic | Heterotrophic<br>Decomposers | Autotrophic | Heterotrophic |
| Example | Amoeba, paramecium | Mushrooms, molds, yeast | Ferns, trees | Birds, ants, fish |

**6. Organization of Organisms:** The taxonomic subdivisions from largest to smallest are KINGDOM, PLYLUM, CLASS, ORDER, FAMILY, GENUS, SPECIES , (The sequence of the groups can be remembered by using this sentence: *King Philip Came Over For Good Spaghetti).*

**7. Classification of Humans:**

Domain: EUCAYA

Kingdom: ANIMALIA

Phylum: CHORDATA animals with stiff rod like backbone);
Class: MAMMALA (animals with hair and mammary glands);
Order: PRIMATES (animals with large brain and opposable thumbs);
Family: HOMINNADAE no tail, upright posture);
Genus: HOMO ; Species: HOMO SAPIENS ;
Scientific name:

| Homo sapiens |
|---|

**8. Additional Notes:**
Mammals, birds, reptiles, amphibians, and fish represent **CLASSES** within the phylum **CHORDATA.**

**9. Acellular Infectious Particles:**
Particles that show some cellular characteristics, but not all, are called ACELLULAR. Most of these cause diseases. Examples: VIRUSES viroid's and prions.