

Unit 3 - The Cell -Anatomy and Physiology Notes

- Know the Cell Theory
- Compare and contrast the structure of prokaryotic cells with that of eukaryotic cells.
- Identify Cellular Organelles and Functions



MAMMOTH SCIENCE	——————————————————————————————————————
	Endoplasmic Reticulum
	Lysosomes
	Mitochondria
	Chloroplasts
	Ribosomes
	Cilia / Flagella
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cience	

MAMMOTH	———— Menu ————	×
	Vacuoles	
	Cytoplasm / Cytoskeleton / Cell Wall	
	Cell / Plasma Membrane	
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Early Discoveries

Discoveries:

- B. In 1665, **Robert Hooke** used a microscope to examine a thin slice of cork.
 - 3. What he saw looked like small boxes.
 - 4. He called these boxes "cells", after the rooms that monks lived in.
- B. In 1673, Anton Van Leeuwenhoek (a Dutch microscope maker), was first to view organisms (living things).
 - Leeuwenhoek used a simple, handheld microscope to view pond water & scrapings from his teeth.







Discoveries Continued

C. In 1838, a German botanist named Matthias

Schleiden concluded that all plants were made of cells.

- 1. Schleiden is a cofounder of <u>cell theory.</u>
- D. In 1839, a German zoologist named Theodore
 Schwann concluded that all animals were made of cells.
 - 1. Schwann also co-founded cell theory.
- E. In 1855, a German medical doctor named Rudolph
 Virchow observed, under the microscope, cells
 dividing.
 - 1. He reasoned that all cells come from other preexisting cells by **cell division**.





Cell Theory





But what about Viruses

- 3. What is living? Viruses
 - a. Viruses are nonliving.
 - b. They have some properties of life but not others
 - c. Viruses cannot be killed.
 - d. They can't maintain a constant internal state (*homeostasis*).
 - e. Disease-causing, nonliving particle.
 - f. Composed of an inner core of nucleic acid.
 - g. Enclosed by one or two protein coats.
 - h. Reproduces only in living cells a host



3.



Cell Size

01

Surface Area

- 1. Factors Affecting Cell Size
 - b. Surface area (plasma membrane surface) is determined by multiplying length times width (L x W)



- b. Volume of a cell is
 determined by multiplying
 length times width times
 height (L x W x H)
- c. Therefore, Volume
 increases FASTER than the
 surface area

03 Basic Cell Structures

- 2. Eukaryotes are cells that have a nucleus and membrane-bound organelles
- Includes protists, fungi, plants, and animals
- 4. More **complex** type of cells
- 5. Contain 3 basic cell structures:

a) Nucleus

- b) Cell Membrane
- c) Cytoplasm with organelles
- d) er, then the cell must divide
- e) Therefore, the cells of an organism are
 - close in size



Eukaryotes- Up Close





Cells - Overview

01

General

- A. Cells are the basic units of organisms
- B. Cells can only be observed under microscope
- C. Basic types of cells:
 - 4. Prokaryotic
 - 5. Eukaryotic

cell

- D. Although <u>ALL</u> living things are made of cells, organisms may be:
 - 1. Unicellular composed of one

02 Prokaryotes

- **1. Multi-cellular-** composed of many cells that may organize into tissues, etc.
- E. Cells may be Prokaryotic
 - Prokaryotes include bacteria & lack a nucleus or membrane-bound structures called organelles.
 - 2. Prokaryotes have:
 - c) Nucleoid region that contains the DNA
 - b) Cell membrane & cell wall

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Continued

 c) Contain ribosomes (no membrane) to make proteins in their cytoplasm



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Prokaryote - Up Close





Organelles

01

Organelles

IV.Organelles

- A. Characteristics:
 - 2. Very small (Microscopic)
 - 3. Perform various functions for a cell
 - 4. Found in the cytoplasm
 - 5. May or may not be membrane-bound



- 1. Controls the normal activities of the cell
- 2. Contains the DNA in chromosomes
- 3. Bounded by a nuclear envelope
 - (membrane) with pores
- 4. Usually the largest organelle
- 5. Each cell has a fixed number of chromosomes that carry genes
- 6. Genes control cell characteristics
- 7. DNA is located in the nucleus.





The Nucleus - Parts



a. The Nucleolus

- 2) Inside nucleus
- 3) Cell may have 1 to 3 nucleoli
- 4) Disappears when cell divides
- 5) Makes ribosomes that make proteins
- **b.** The Nuclear Envelope:
 - 1) Double membrane surrounding nucleus
 - 2) Also called nuclear membrane
 - 3) Contains nuclear pores for materials to enter &
 - leave nucleus
 - 4) Connected to the rough ER





Golgi Apparatus



Golgi Bodies

C. Golgi Bodies (Apparatus)

- 1. Stacks of flattened sacs.
- 2. Have a shipping side (trans face)
 - and receiving side (cis face).
- 3. Receive proteins made by ER.
- 4. Transport vesicles with modified proteins pinch off the ends
- 5. Modify, sort, & package molecules
 - from ER for storage or transport
 - out of cell





Endoplasmic Reticulum

D. Endoplasmic Reticulum

- 1. Network of hollow membrane tubules
- 2. Connects to nuclear envelope & cell membrane
- 3. Functions in Synthesis of cell products & Transport
- 4. Two kinds of ER ---ROUGH & SMOOTH
 - e. Rough ER
 - 6. Have ribosomes on its surface.
 - 7. Makes membrane proteins and proteins for export out of the cell.
 - b. Smooth ER lacks ribosomes on its surface.
 - 1. Is attached to the ends of a rough ER.
 - 2. Makes cell products that are used inside the cell.
 - 3. Makes membrane lipids (steroids).
 - 4. Regulates calcium (muscle cells).
 - 5. Destroys toxic substances (Liver).





Lysosomes



Lysosomes

- E. Lysosomes:
 - 1. Contain digestive enzymes
 - 2. Break down food, bacteria, and worn

out cell parts for cells

- c. Cells take in food by phagocytosis
- d. Lysosomes digest the food & get rid of wastes
- Programmed for cell death (AUTOLYSIS)
- Lyse (break open) & release enzymes to break down & recycle cell parts)



Mitochondria

F. Mitochondria

- 1. Powerhouse" of the cell.
- 2. Generate cellular energy (ATP) Surrounded by a double membrane.
- 3. Folded inner membrane called cristae (increases surface area for more chemical reactions).
- 4. Interior called matrix.
- 5. Breaks down glucose to
- 6. Release energy (ATP).
- 7. Active cells like muscle cells have more mitochondria.
- 8. Both plants & animal cells have mitochondria.
- 9. Site of cellular respiration

10. Has its own DNA.

11.Mitochondria come from cytoplasm in the egg cell during fertilization. You inherit your mitochondria from your mother!





Chloroplasts



G. Chloroplasts

- 1. Found only in producers (organisms containing chlorophyll).
- 2. Contains its own DNA.
- Contains enzymes & pigments for photosynthesis.
- 4. Never in animal or bacterial cells.
- 5. Surrounded by a double membrane.
- 6. Outer membrane smooth.
- 7. Inner membrane modified into sacs called

Thylakoids.

- h. Thylakoids in stacks are called **Grana** and are interconnected.
- Stroma gel like material surrounding thylakoids.



Ribosomes

H. Ribosomes

- 1. Made of proteins and rRNA.
- 2. "Protein factories" for cell.
- Join amino acids together to make proteins.
- 4. Process is called protein synthesis.
- 5. Can be attached to
 - Rough ER.
- Can be free (unattached) in the cytoplasm.





Cilia & Flagella



I. Cilia & Flagella

- Made of protein tubes called microtubules.
- Microtubules arranged (9 + 2 arrangement).
- Functions- moving cells, moving fluids, or small particles across the cell surface.
- Cilia are shorter and more numerous on cells.
- Flagella are longer and fewer (usually 1-3) on cells.



Centrioles

J. Centrioles

- 1. Found only in animal cells.
- 2. Paired structures near the nucleus.
- 3. Made of a bundle of microtubules.
- Appear during cell division forming a mitotic spindle.
- Help to pull chromosome pairs apart to opposite ends of the cell.





Vacuoles



Vacuoles К.

- 1. Fluid filled sacs for storage.
- 2. Small or absent in animal cells.
- 3. Plant cells have a large Central Vacuole.
- 4. No vacuoles in bacterial cells.
- 5. Can store sugars, proteins, minerals, lipids, Water Vacuole
- 6. wastes, salts, water, and enzymes.
- 7. Contractile Vacuole
 - h. Found in unicellular protists like paramecia.
 - Regulate water intake by pumping out İ. excess (homeostasis).
 - Keeps the cell from lysing (bursting).].





Other Components of the Cell

01

Cytoplasm

A. Cytoplasm

- Jelly-like substance enclosed by cell membrane.
- Provides a medium for chemical reactions to take place.
- 4. Contains organelles to carry out specific jobs
- 5. Found in ALL cells.

Cytoskeleton

02

B. Cytoskeleton

- 1. Helps cells maintain cell shape.
- 2. Also help move organelles

around.

- 3. Made of proteins.
- 4. Microfilaments are threadlike
 - & made of **ACTIN**.
- 5. Microtubules are tube-like & made of **TUBULIN**.

03

Cell Wall

C. Cell Wall

- 1. Non Living layer.
- 2. Found in plants, fungi, & bacteria.
- 3. Made of cellulose in plants.
- Made of peptidoglycan in bacteria.
- 5. Made of chitin in Fungi.
- 6. Supports and protects the cell.
- Found outside of the cell membrane.



Other Components





Cell Membrane



D. Cell or Plasma Membrane

1. Composed of a double layer of

phospholipids and proteins.

- 2. Surrounds outside of ALL cells.
- Controls what enters or leaves the cell.
- 4. Living layer.
- 5. The cell membrane is fluid.
- 6. Molecules in cell membranes are

constantly moving and changing.



Thank you!

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