SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF RADIOGRAPHY AND IMAGING TECHNOLOGY

COURSE NAME : HUMAN ANATOMY AND PHYSIOLOGY RELEVANT TO RADIOLOGY

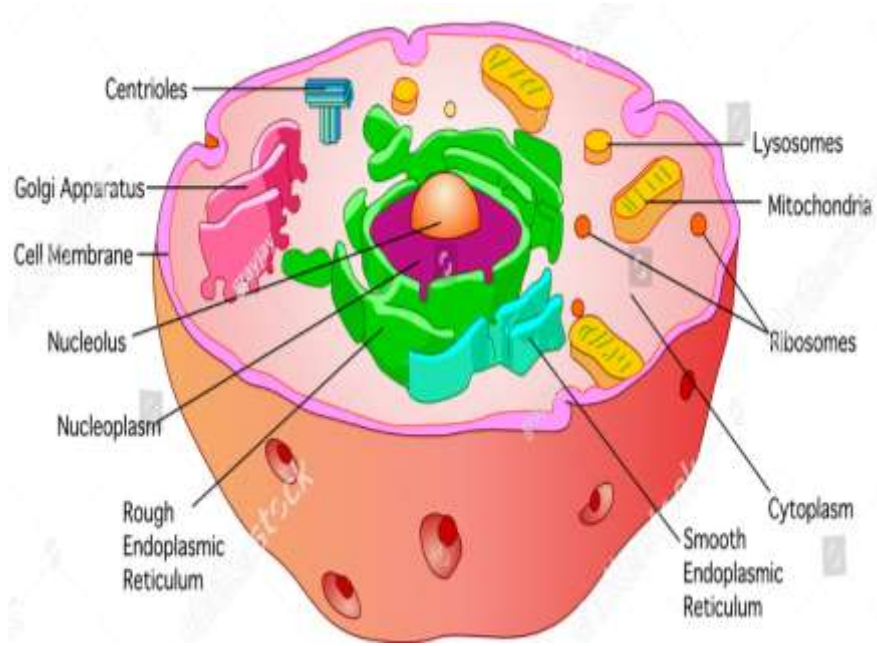
UNIT : GENERAL STRUCTURE OF HUMAN BODY

TOPIC : CELL – STRUCTURE AND FUNCTION

FACULTY NAME : MRS.G.HELANA JOY

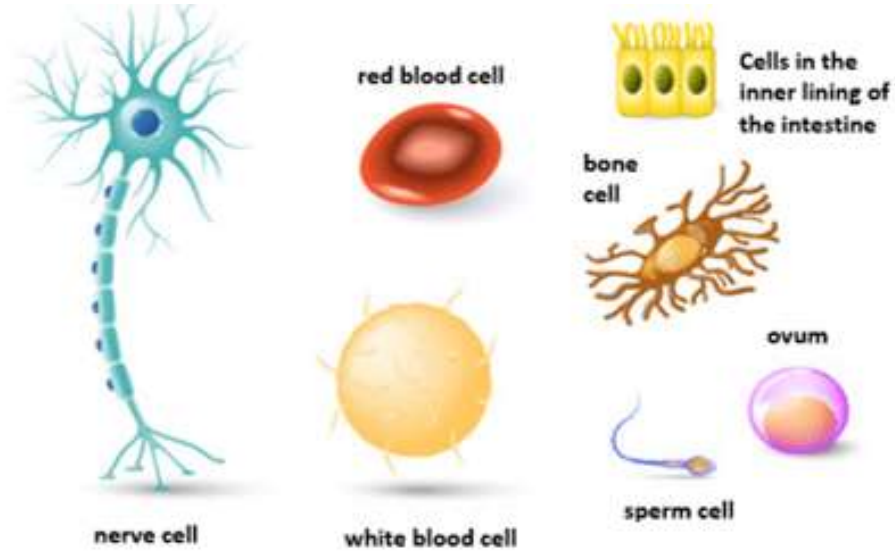
INTRODUCTION (Define)

- The fundamental structural and functional unit of all known living organisms.
- Smallest unit of life that can replicate independently.
- Humans are multicellular organisms, comprised of trillions of cells.



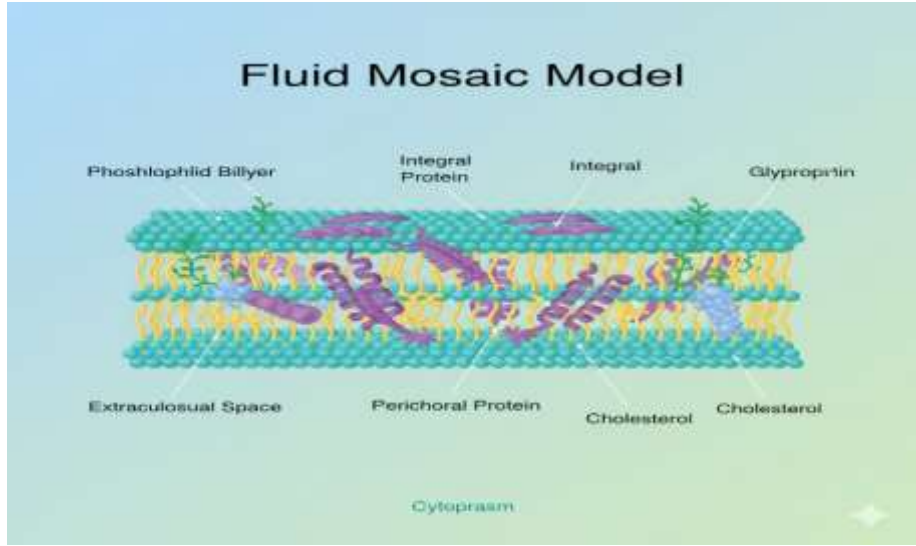
INTRODUCTION (Define)

- Different cell types (e.g., nerve cells, muscle cells, blood cells) have specialized functions.



THE CELL MEMBRANE (PLASMA MEMBRANE)

- **Structure:** Phospholipid bilayer with embedded proteins, cholesterol, and carbohydrates.
- **Fluid mosaic model:** Dynamic, semi-permeable barrier.



THE CELL MEMBRANE (PLASMA MEMBRANE)

➢ **Functions:**

- Selective permeability: regulates passage of substances.
- Cell recognition.
- Cell signaling (receptors).
- Cell adhesion.

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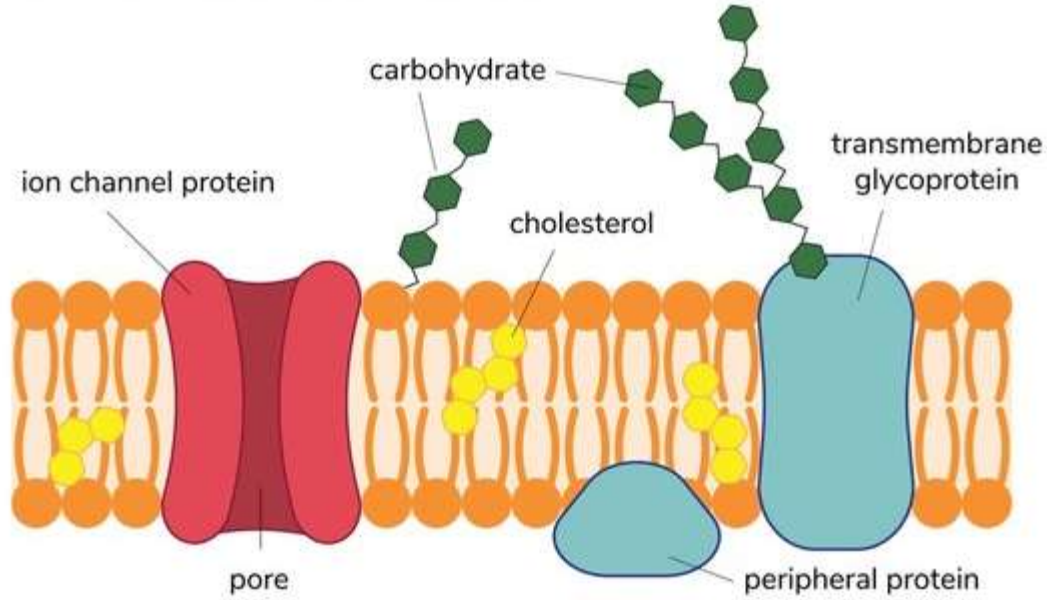
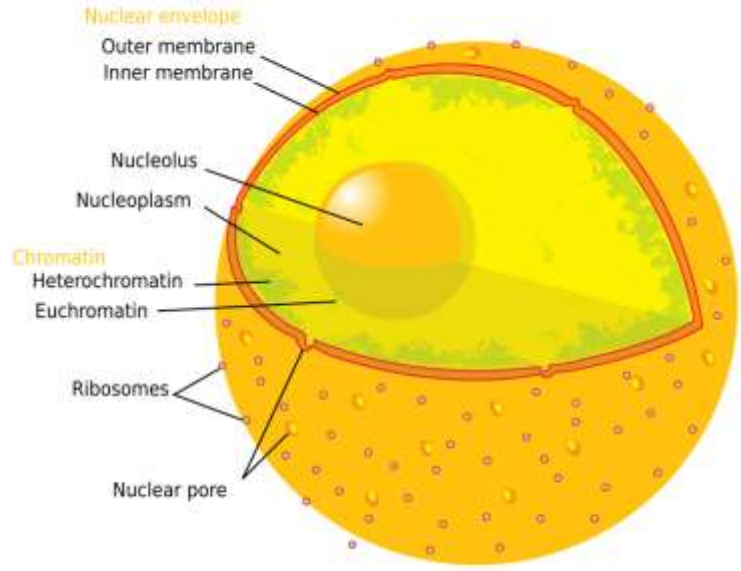


THE NUCLEUS

- **Structure:** Nuclear envelope (double membrane), nuclear pores, nucleolus, chromatin (DNA + proteins).
- **Function:**

- Houses the cell's genetic material (DNA).
- Controls cell growth, metabolism, and reproduction.
- Site of ribosome synthesis (nucleolus).
- Directs protein synthesis.



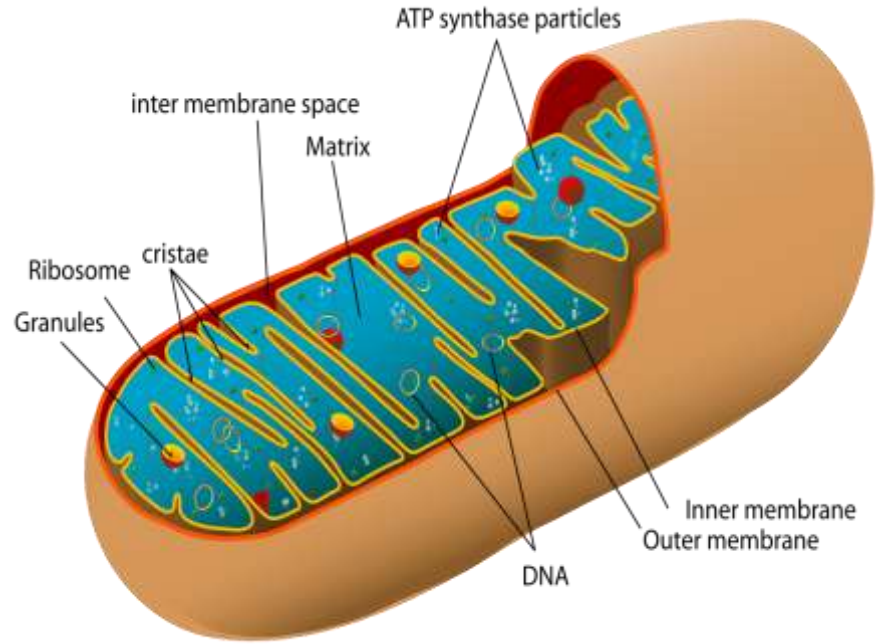
MITOCHONDRIA- Powerhouses of the Cell

- **Structure:** Double membrane; outer smooth, inner folded into cristae; contains matrix with DNA and ribosomes.

Known as the *"powerhouse"* of the cell.

- **Functions:**

- Site of cellular respiration.
- Generates ATP (adenosine triphosphate) – the cell's energy currency.

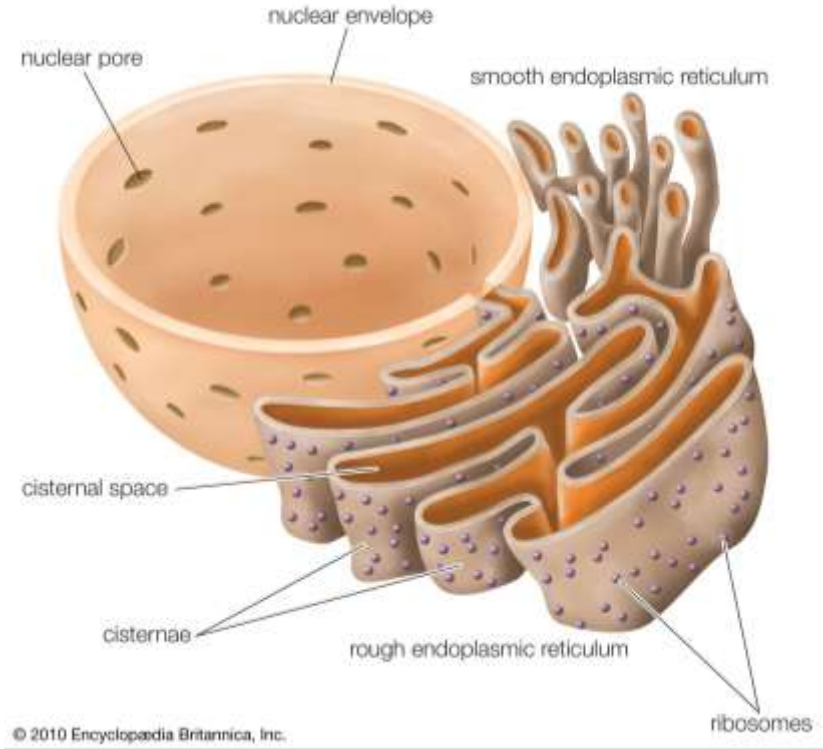


ENDOPLASMIC RETICULUM (ER)

- **Structure:** Network of tubules and sacs; rough ER (with ribosomes) and smooth ER (without).

Rough ER: Connected to the nucleus.

- **Functions:** Rough ER synthesizes proteins; smooth ER synthesizes lipids, detoxifies drugs, and stores calcium

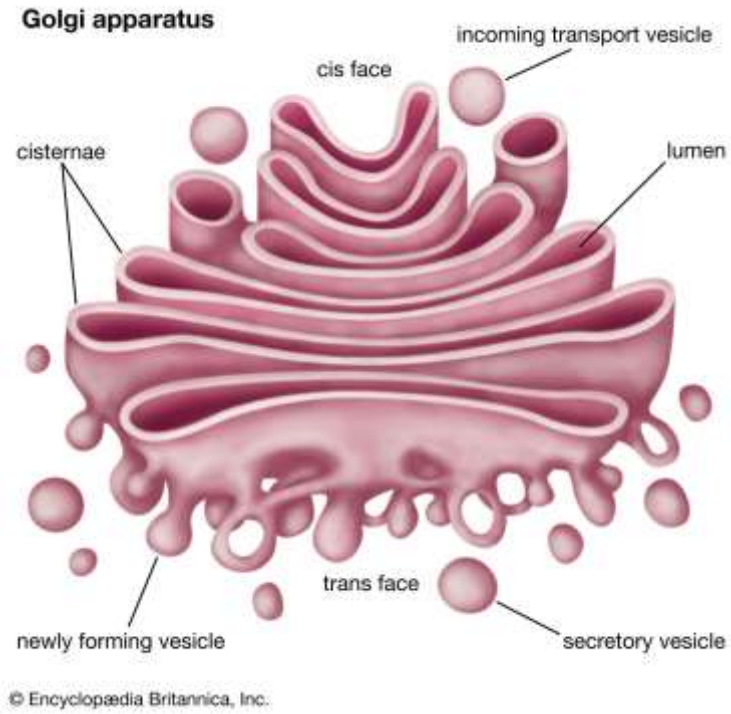


GOLGI APPARATUS

➢**Structure:** Stack of flattened membrane-bound sacs called cisternae.

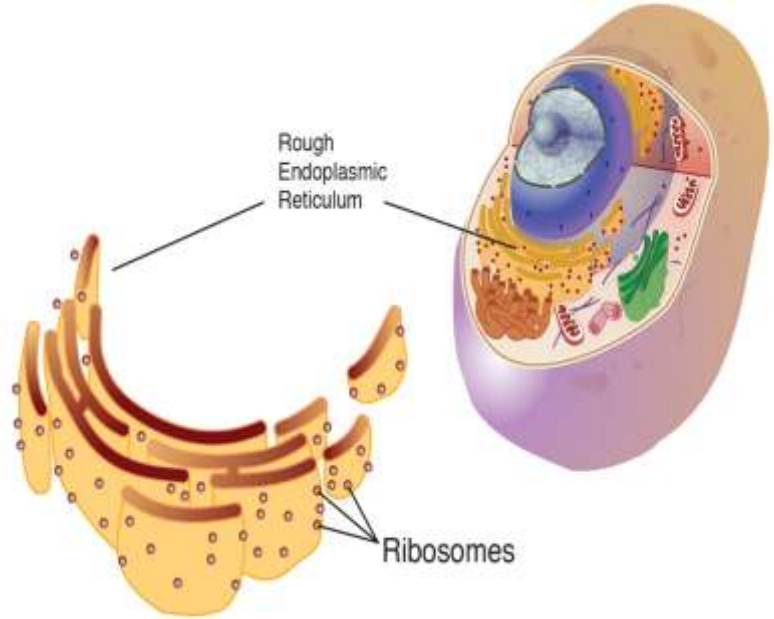
➢**Function:**

- Modifies, sorts, and packages proteins and lipids from the ER.
- "Post office" of the cell.
- Forms lysosomes and secretory vesicles.



RIBOSOMES - PROTEIN FACTORIES

- **Structure:** Composed of ribosomal RNA (rRNA) and protein. Two subunits (large and small).
- **Location:** Free in the cytoplasm or attached to the rough ER.
- **Function:** Site of protein synthesis (translation of mRNA into protein).

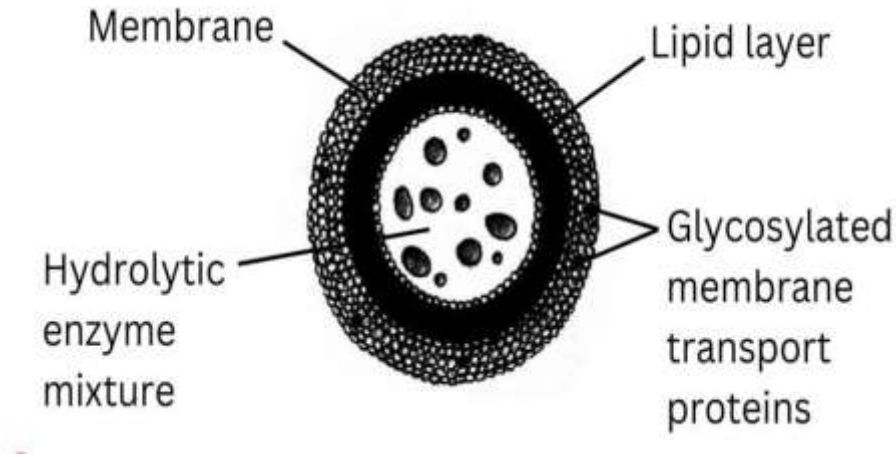


LYSOSOMES AND OTHER ORGANELLES

- **Lysosomes:** Membrane-bound sacs with hydrolytic enzymes; digest waste and foreign materials.

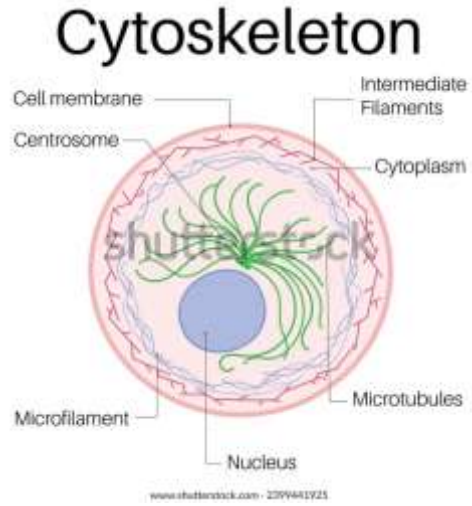
Other organelles:

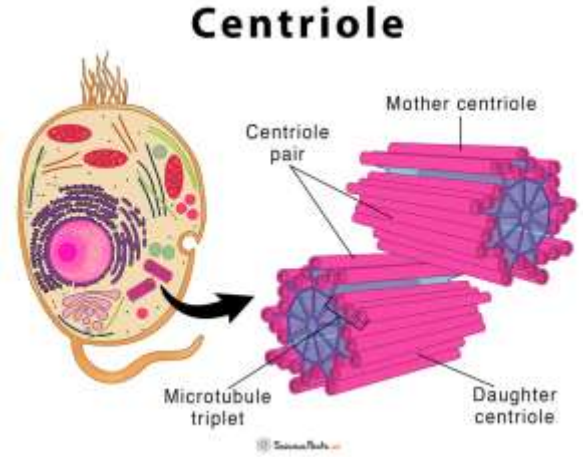
- **Ribosomes:** Protein synthesis (free or bound to ER).
- **Cytoskeleton:** Microtubules, microfilaments, intermediate filaments for structure and movement.



LYSOSOMES AND OTHER ORGANELLES

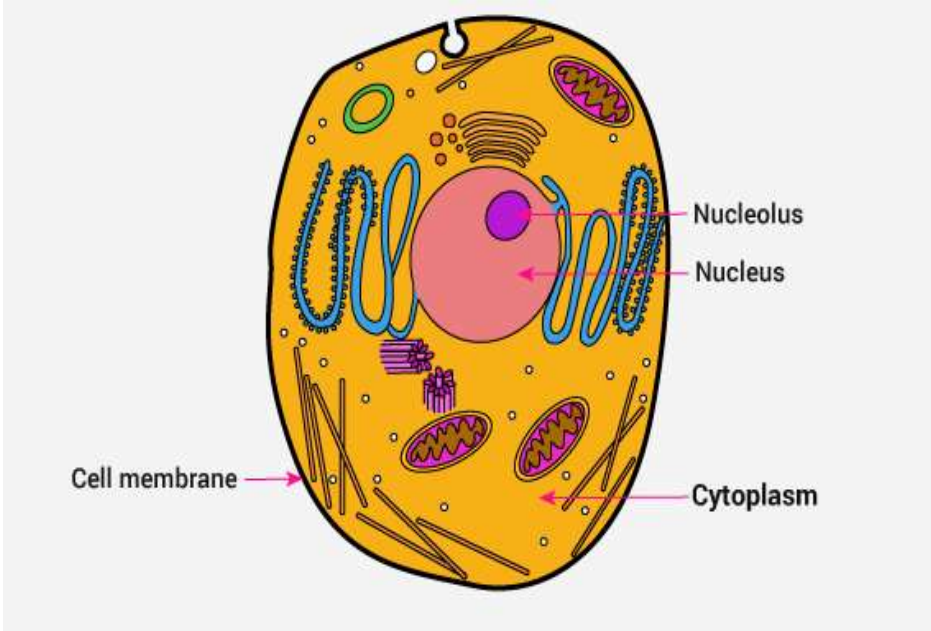
- **Centrioles:** Organize microtubules during cell division.
- **Functions:** Lysosomes act as "recycling centers"; cytoskeleton provides support and enables motility.





CYTOPLASM AND OVERALL CELL FUNCTIONS

Cytoplasm: Gel-like fluid (cytosol) filling the cell; site of metabolic reactions.



Key functions of the cell:

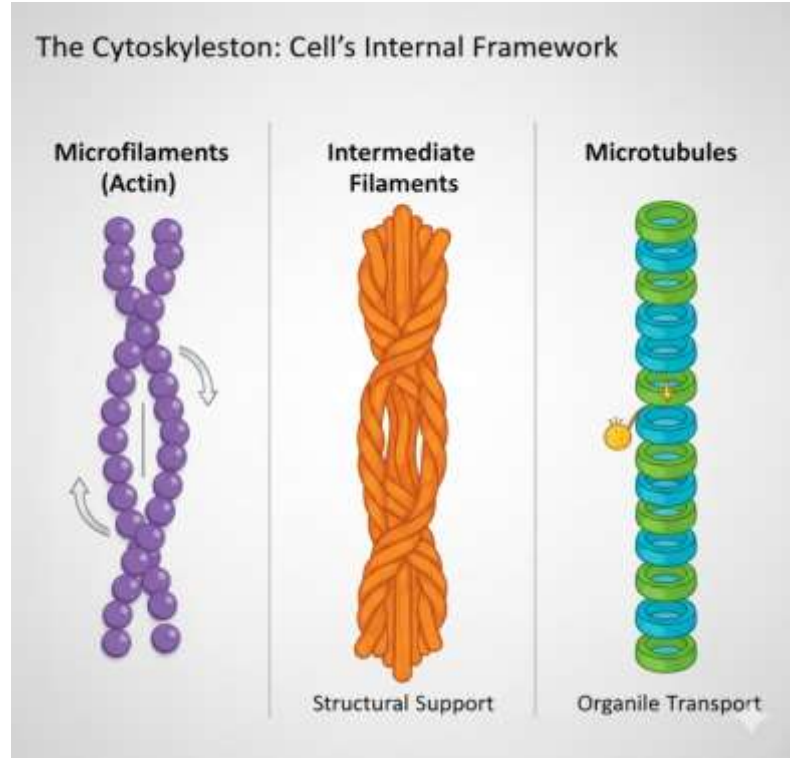
- *Metabolism:* Energy production and biosynthesis.
- *Growth and division:* Mitosis/meiosis.
- *Response to stimuli:* Signaling pathways.
- *Homeostasis:* Maintaining internal balance

CYTOSKELETON - CELL'S INTERNAL FRAMEWORK

Structure: Network of protein filaments throughout the cytoplasm.

Components:

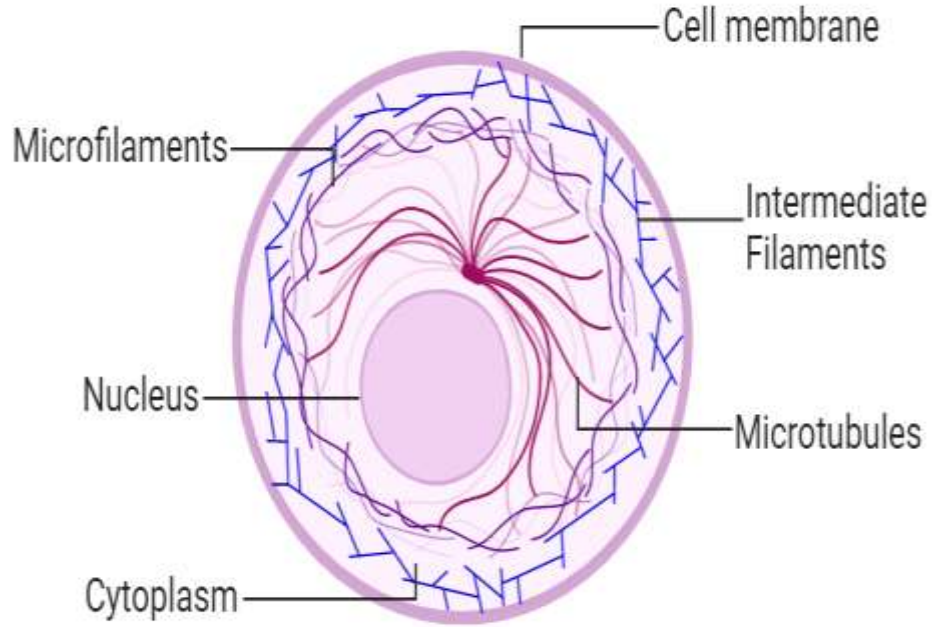
- **Microfilaments (Actin Filaments):** Cell shape, muscle contraction, cell division.
- **Intermediate Filaments:** Provide structural support, anchor organelles.
- **Microtubules:** Cell shape, organelle movement, cilia/flagella, mitotic spindle.



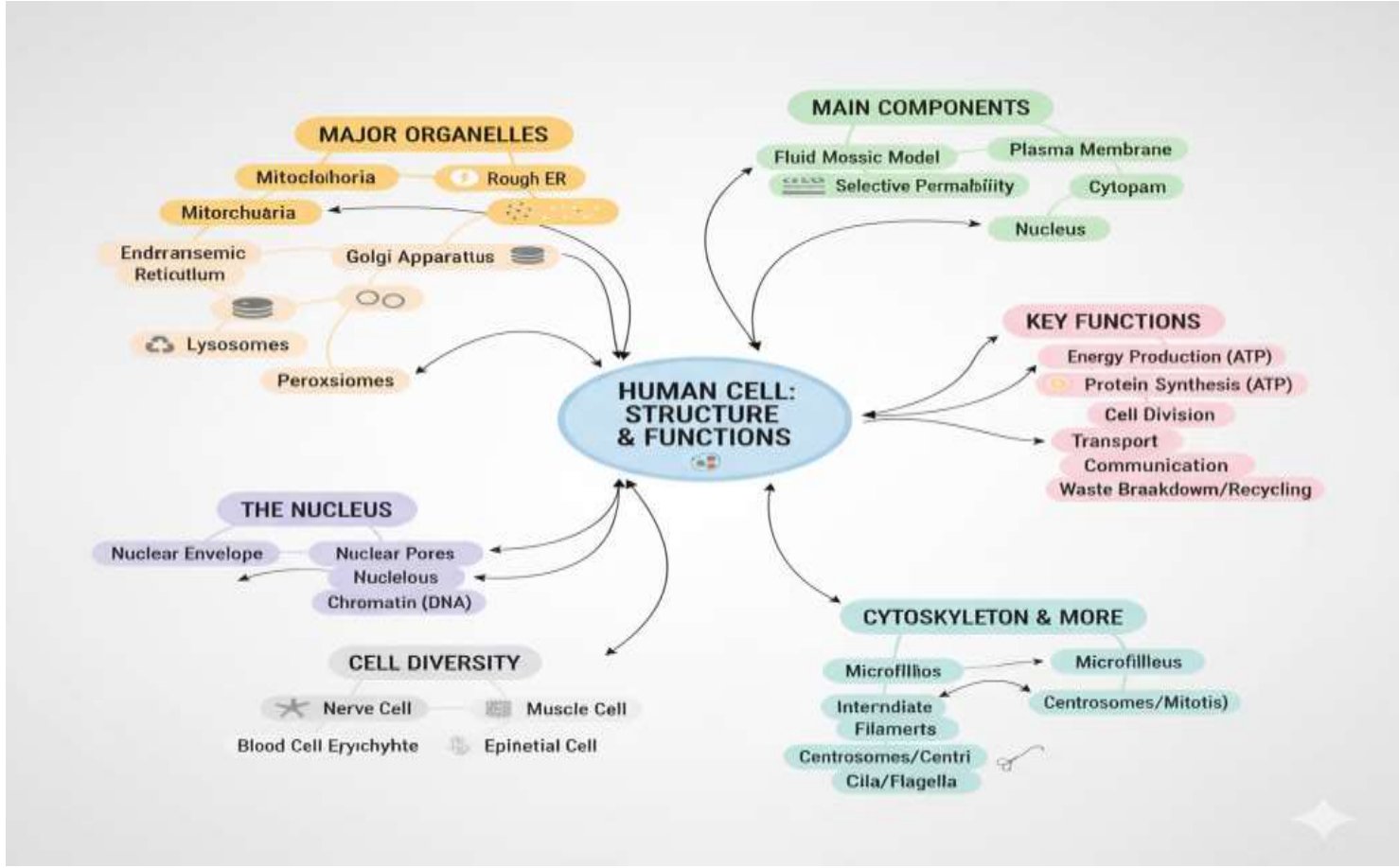
CYTOSKELETON - CELL'S INTERNAL FRAMEWORK

➢**Function:**

- Maintains cell shape.
- Anchors organelles.
- Aids in cell movement and division.
- Intracellular transport.



SUMMARY


HUMAN CELL: STRUCTURE & FUNCTIONS
MAJOR ORGANELLES
Mitocloihoria
Rough ER
Mitorchuaria
Endrransemic Reticutlum
Golgi Apparattus
Lysosomes
Peroxsiomes
MAIN COMPONENTS
Fluid Mossic Model
Plasma Membrane
Selective Permalbiity
Cytopam
Nucleus
KEY FUNCTIONS
Energy Production (ATP)
Protein Synthesis (ATP)
Cell Division
Transport
Communication
Waste Braakdowm/Recycling
THE NUCLEUS
Nuclear Envelope
Nuclear Pores
Nuclelous
Chromatin (DNA)
CELL DIVERSITY
Nerve Cell
Muscle Cell
Blood Cell Eryichyhte
Epinetial Cell
CYTOSKYLETON & MORE
Microfillios
Microfillleus
Interndiate Filamerts
Centrosomes/Mitotis)
Centrosomes/Centri
Cila/Flagella

References

- Clark, M. A., Douglas, M., & Choi, J. (2018, March 28). *Biology 2e*. OpenStax. https://openstax.org/details/books/biology-2e

- **https://byjus.com/biology/cells/**

- **https://openstax.org/books/biology-2e/pages/4-1-studying-cells**