SNS COLLEGE OF ALLIED HEALTH SCIENCE

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

DEPARTMENT OF OPERATION THEATRE AND ANESTHESIA TECHNOLOGY

COURSE NAME: 1131 – BASIC SCIENCES - PHYSIOLOGY

UNIT: 1 – THE CELL AND THE BLOOD

TOPIC: THE CELL AND IT'S ORGANELLES

SUBTOPIC: INTRODUCTION TO THE CELL AND PLASMA MEMBRANE

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THE CELL

LATIN WORD CELLA **Compartment**

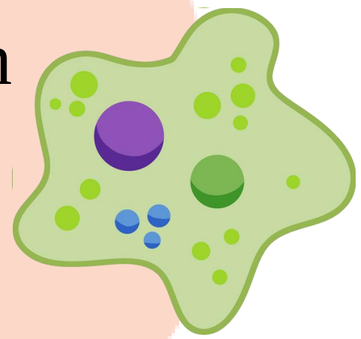
- Basic structural and functional unit of all living organisms
- Cell was first discovered by ROBERT HOOKE in 1665
- Human body has 75 trillion number of cells
- Cells are made up MACROMOLECULES - Nucleic acid, Protein, Carbohydrate, Lipids

THE CELL

ORGANISMS

UNICELLULAR ORGANISMS

Organisms which contain only one cell

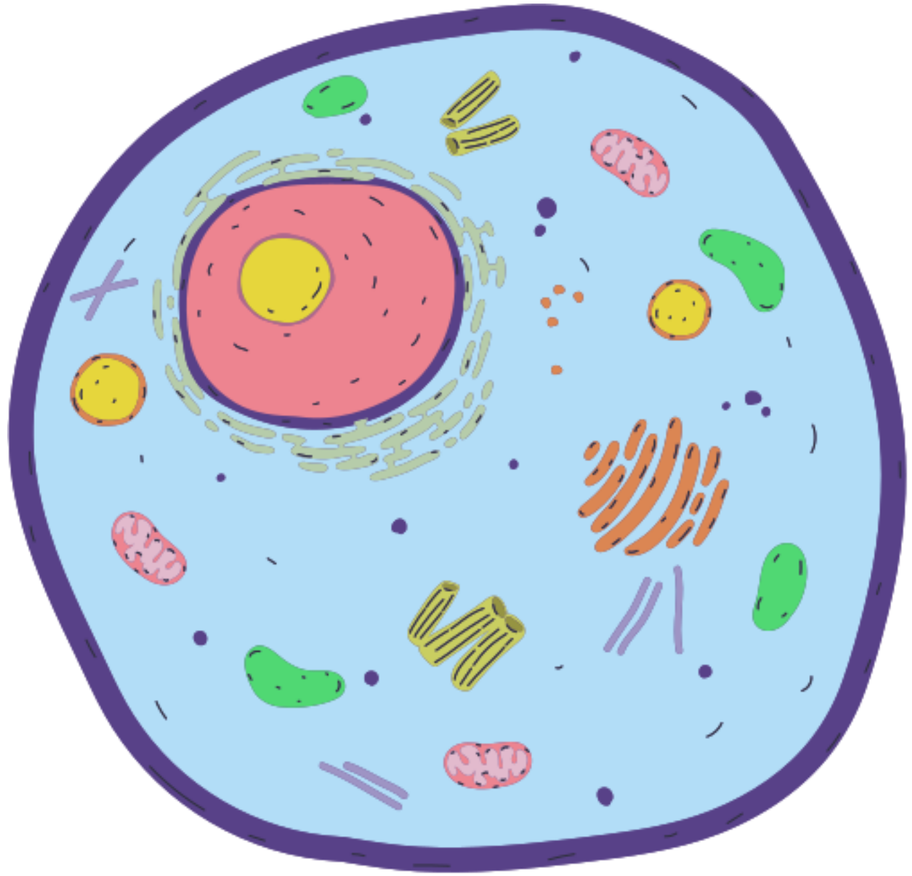


MULTICELLULAR ORGANISMS

Organisms which has more than one cell

CELL THEORY

- All living organisms composed of one or more cells
- New cells are created from pre-existing cells
- Cells are structutal and functional unit of all living organisms

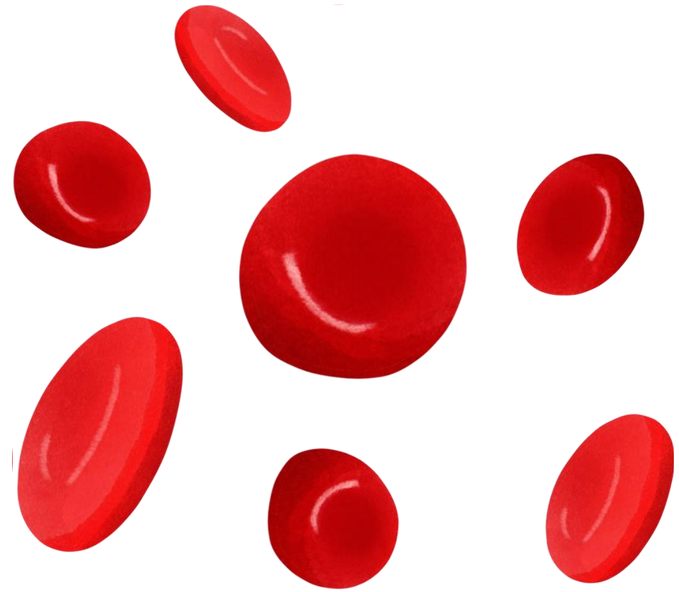


CELL THEORY

The structure of Cell determine it's function

Eg 1 - RBC is biconcave shape and has no nucleus and no Organelles

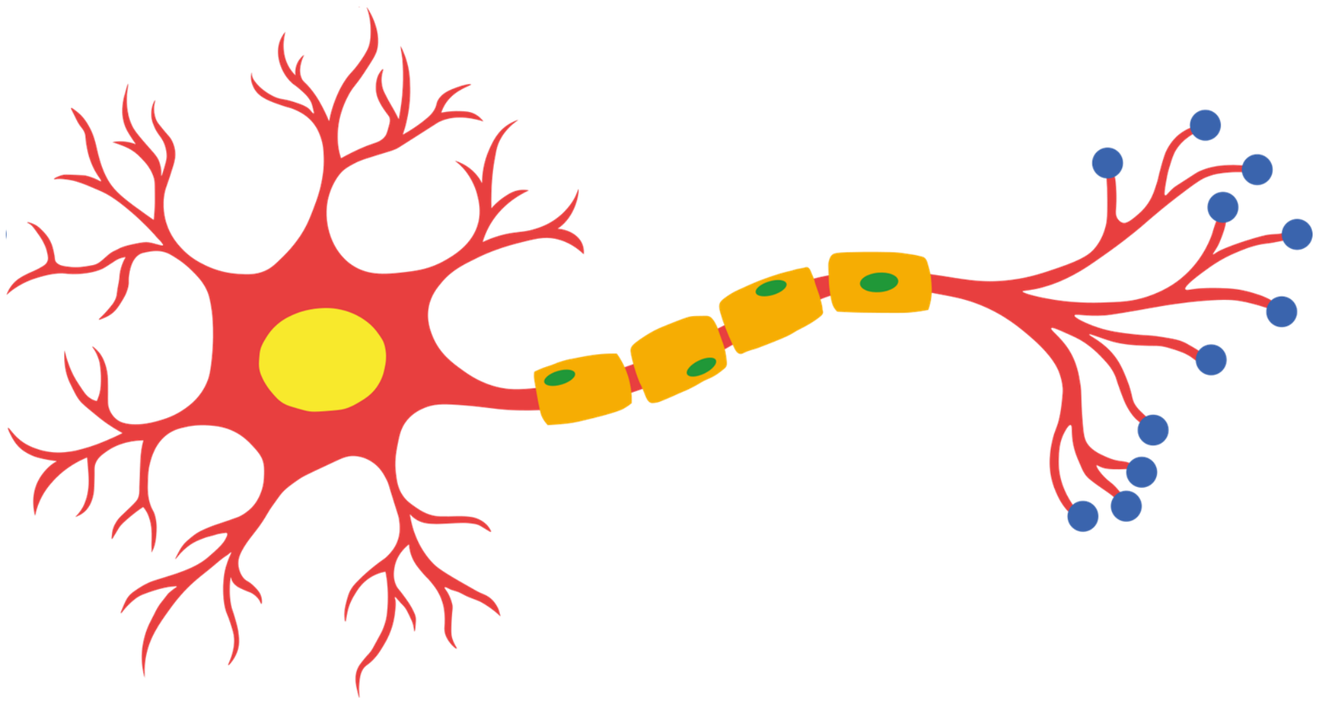
Sac carries hemoglobin (carries oxygen from lungs and gills to all body tissues and carbondioxide back to the lungs where it is excreted



CELL THEORY

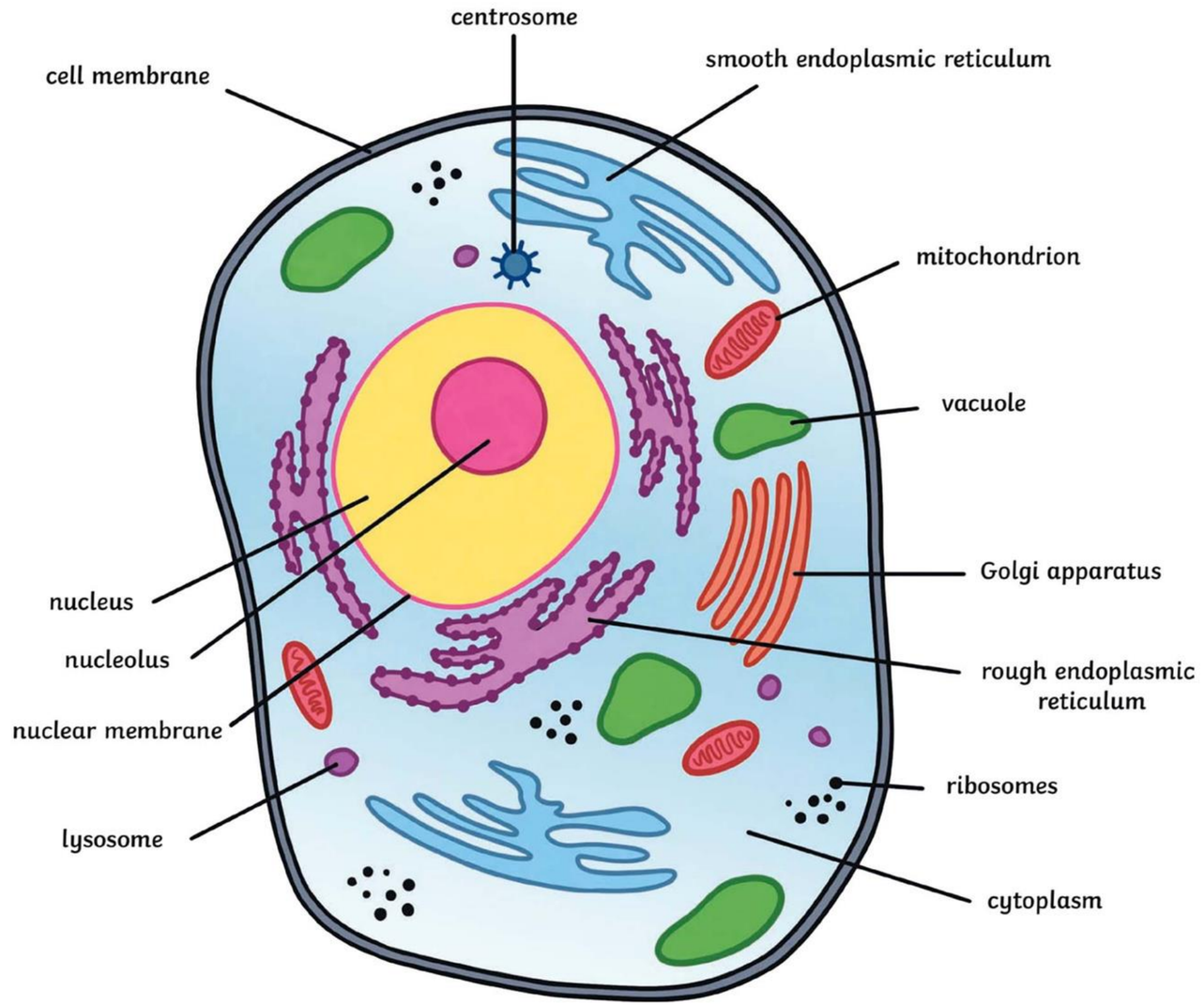
The structure of Cell determine it's function

Eg 2 - Neuron - sends and receives signals from our brain



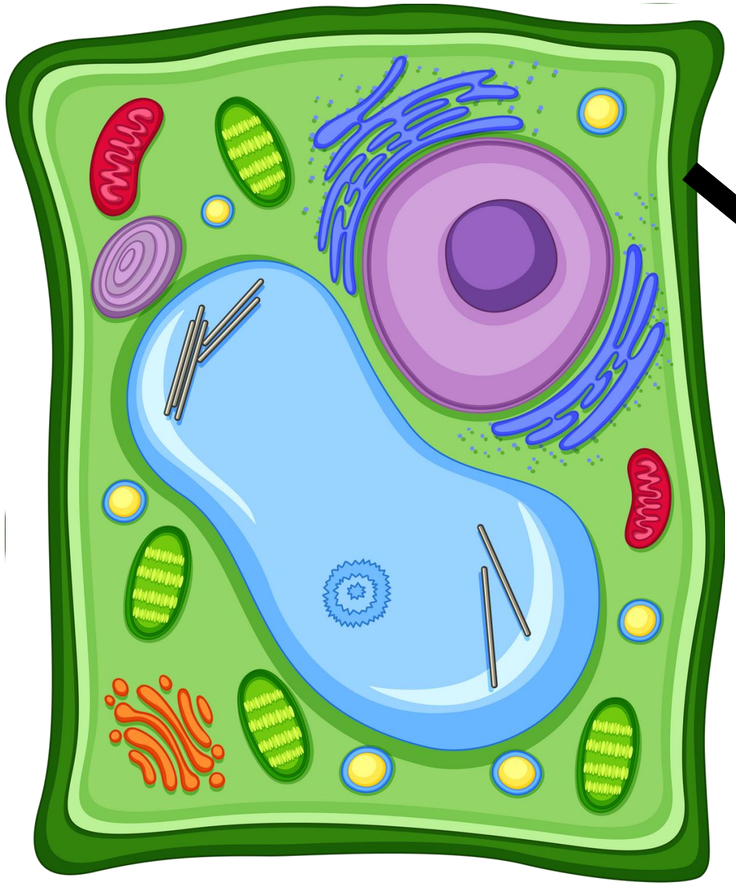
PRINCIPLE PARTS OF THE CELL

- Plasma Membrane
- Cytoplasm
- Nucleus



PLASMA MEMBRANE

- The outer lining membrane that separates the internal components of cell from extracellular material
- It is also called as Cell membrane, Plasmalemma Or cell wall
- It is a thin and delicate membrane
- Thickness: 6-10nm (80°A or 80 AU)

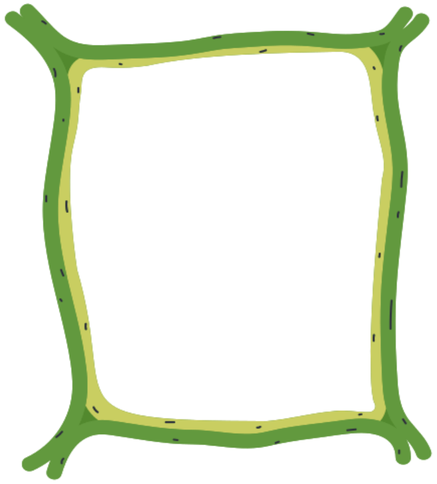


PLASMA MEMBRANE

STRUCTURE

- The structure of plasma membrane can be seen under electron microscope
- The plasma membrane is arranged in 3 layers that is tri-laminar structure
- The basic tri-laminar structure is generally described as "Unit Membrane"
- The 3 layers are -

1. Outer layer - Protein
2. Middle layer - Lipid
3. Inner layer - Protein

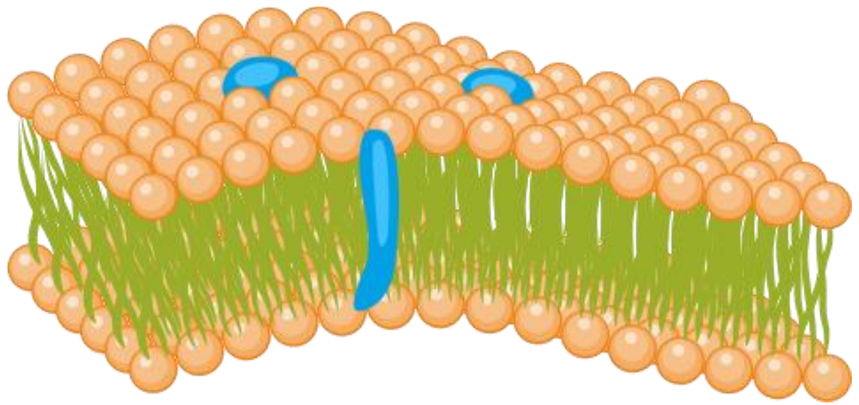


PLASMA MEMBRANE

- Protein layer is made up of two types of proteins. They are

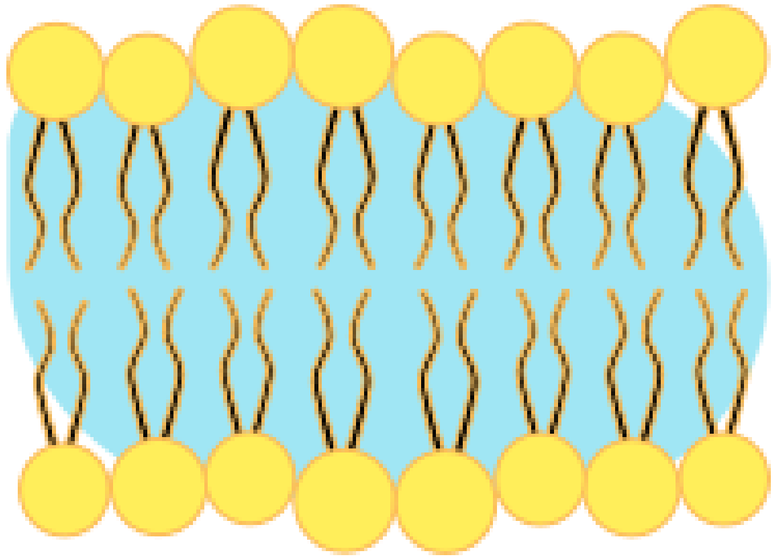
1. Integral Protein
2. Peripheral Protein

- The integral proteins will extend across the lipid layer, which form the membrane pores
- The peripheral proteins are present on either side of lipid layer, they do not extend across the lipid layer
- The thickness of each protein layer is 25 A degree
- Proteins are generally Glycoproteins



PLASMA MEMBRANE

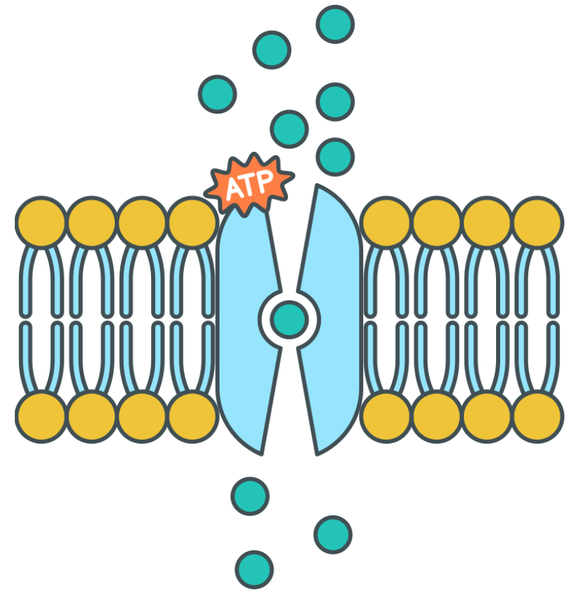
- Lipid layer is made up of Phospholipid
- Phospholipid molecules line in 2 rows with their heads lying on the surface and tails pointing at each other
- The head end is having phosphate group and is water soluble which is known as hydrophilic end
- The tail end consist of 2 fatty acids and is water insoluble which is known as hydrophobic end
- The thickness of lipid layer is 30 A degree



PLASMA MEMBRANE

FUNCTIONS

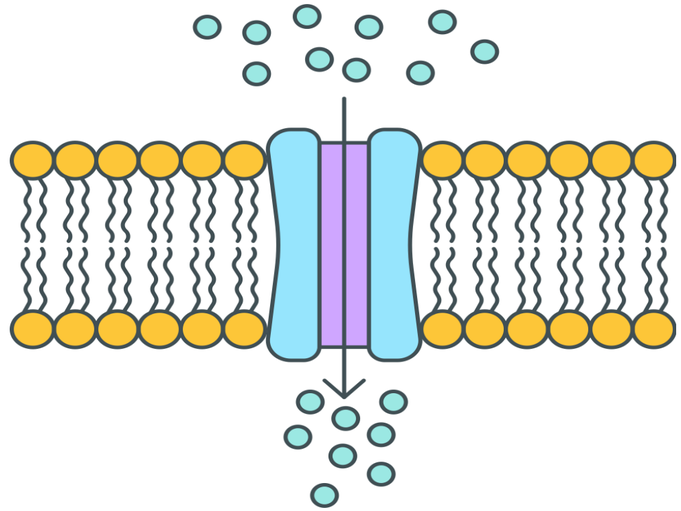
- It gives shape and structure to cell
- It plays an important role in cell signaling and communication
- It regulates the materials that enters and leaves the cell
- It is a selectively permeable membrane - permits passage of certain substances and restricts the passage of certain substances Oxygen, Carbondioxide, Water can easily cross through cell wall but Fe 2+, Na, K cannot cross easily so it will bind with protein and then gets transported



PLASMA MEMBRANE

The transportation through plasma membrane occurs in 2 ways. They are -

- ACTIVE TRANSPORT - Transportation of substances by the utilization of energy that is ATP in the process like primary active transport, secondary active transport, phagocytosis, pinocytosis, endocytosis, exocytosis is called active transport
- PASSIVE TRANSPORT - Transportation of substances without utilization of energy that by simple diffusion, osmosis, filtration is called as passive transport



IN-CLASS ASSESSMENT

QUESTION 1:

Who first discovered the cell in 1665?

a) Theodor Schwann

b) Matthias Schleiden

c) Robert Hooke

d) Anton van Leeuwenhoek

IN-CLASS ASSESSMENT

QUESTION 2:

According to cell theory, new cells are created from:

a) Extracellular materials

b) Pre-existing cells

c) Macromolecules only

d) Spontaneous generation

IN-CLASS ASSESSMENT

QUESTION 3:

What is the thickness of the plasma membrane?

a) 11-15 nm

b) 6-10 nm

c) 20-25 nm

d) 1-5 nm

IN-CLASS ASSESSMENT

QUESTION 4:

Which part of the phospholipid in the plasma membrane is hydrophilic?

a) Integral proteins

b) Protein layer

c) Phosphate head

d) Fatty acid tails

IN-CLASS ASSESSMENT

QUESTION 5:

Active transport through the plasma membrane requires:

a) Osmosis only

b) Simple diffusion

c) No energy

d) Energy in the form of ATP

IN-CLASS ASSESSMENT

ANSWERS :

1. c
2. b
3. b
4. c
5. d

SUMMARY

- The cell is the basic structural and functional unit of living organisms, discovered by Robert Hooke, with humans having about 75 trillion cells composed of macromolecules like nucleic acids, proteins, carbohydrates, and lipids.
- Cell theory states all organisms are made of cells, new cells arise from pre-existing ones, and cells determine structure & function (e.g., RBCs for oxygen transport, neurons for signaling).
- The plasma membrane (6–10 nm thick) is a trilaminar structure with outer/inner protein layers and a middle phospholipid bilayer (hydrophilic heads outward, hydrophobic tails inward).
- It regulates transport (active requiring ATP, passive not) and maintains cell integrity.

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THANK YOU