

# Коротко обо мне



BIOLOGY



- **Профильные предметы:**  
**химия и биология**
- **Закончила 11 класс на отлично**
- **В 10 классе сдала биологию на А\***
- **Занимаюсь научной деятельностью**

# Организационные моменты

- Задавайте вопросы
- На полях оставьте место для science specific words
- Рисуйте, проводите аналогии и делайте концепт карты

**В последующем вся информация будет опубликовываться в группе в ВК**

BIOLOGY



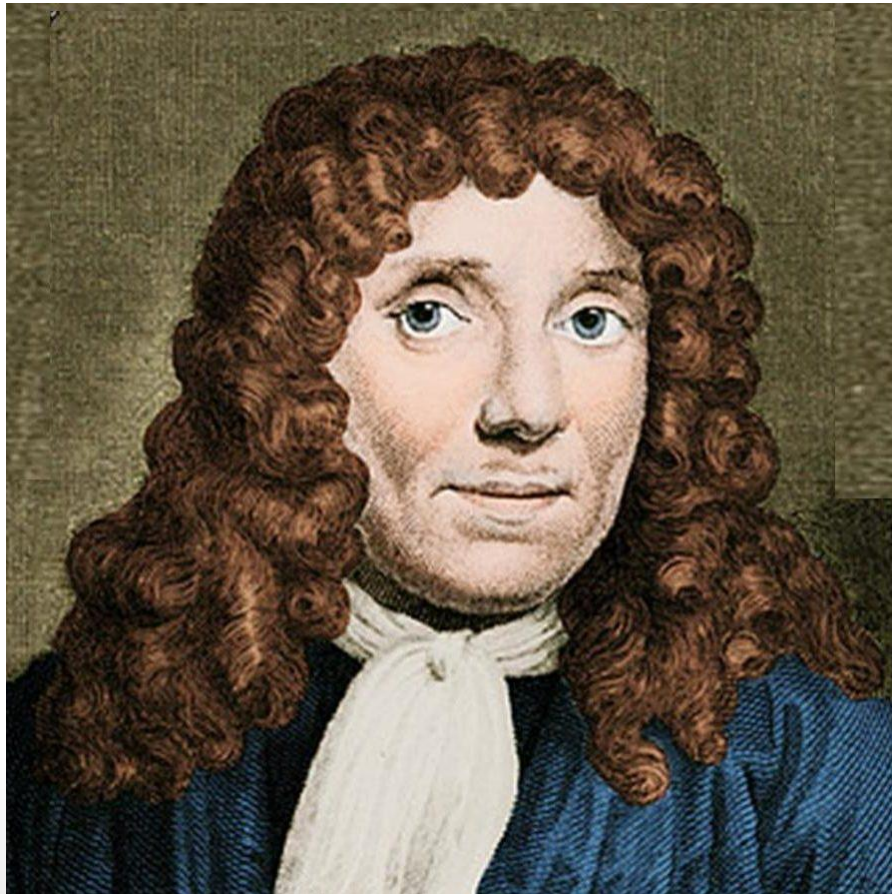
# Cell structure

# Строение клетки

BIOLOGY



**Anton Van Leeuwenhoek**



**Robert Hooke**



# Клеточная теория

## Cell Theory

- The cell theory In 1838 M.J. Schleiden and Theodore Schwann formulated the “cell theory.”
- **Which maintains that:**
- **1. all organisms are composed of cells.**
- **2. cell is the structural and functional unit of life, and**
- **3. cells arise from pre-existing cells.**





# Клетки могут отличаться друг от друга по своему внутреннему строению

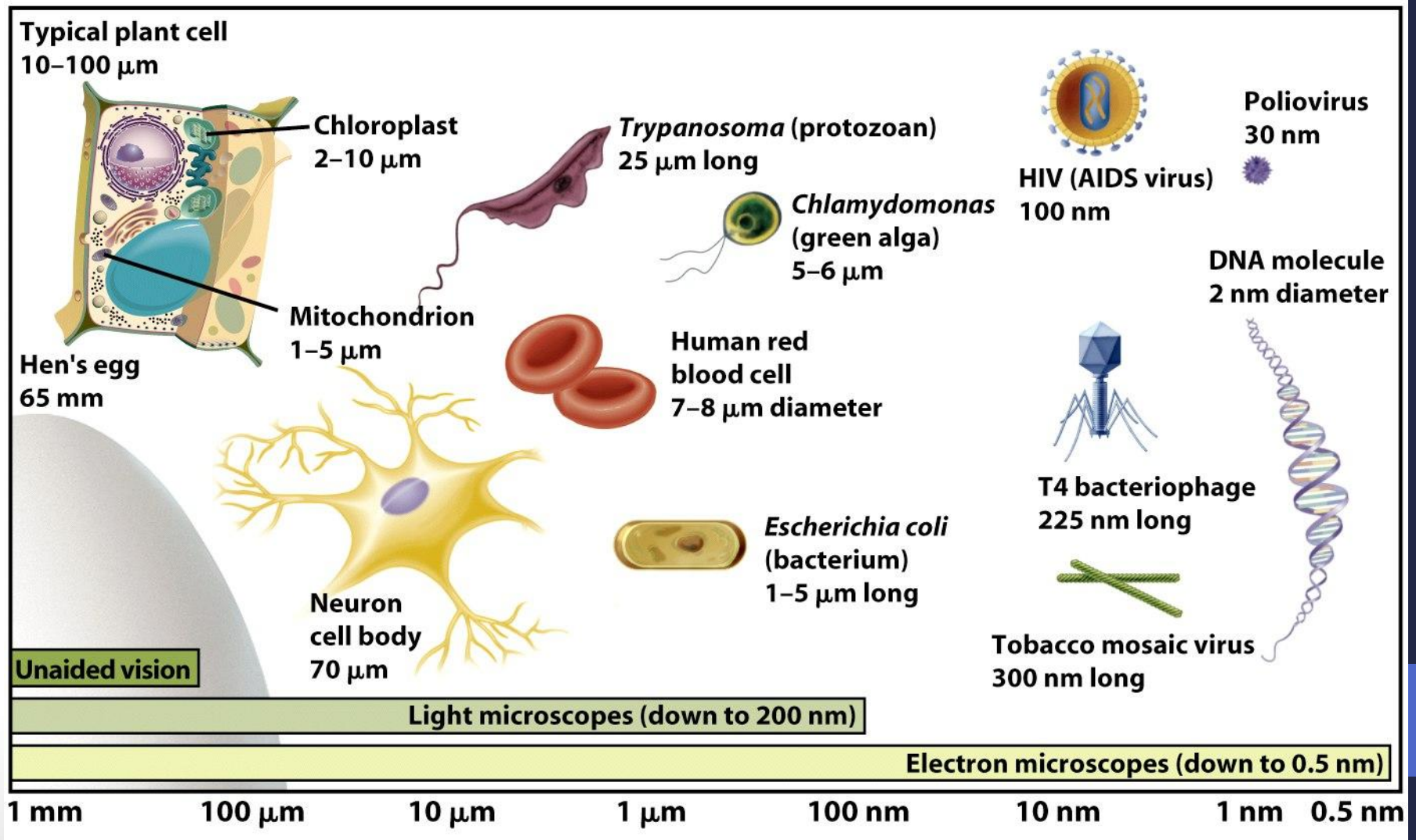
- But every cell has three major components:

**plasma membrane**

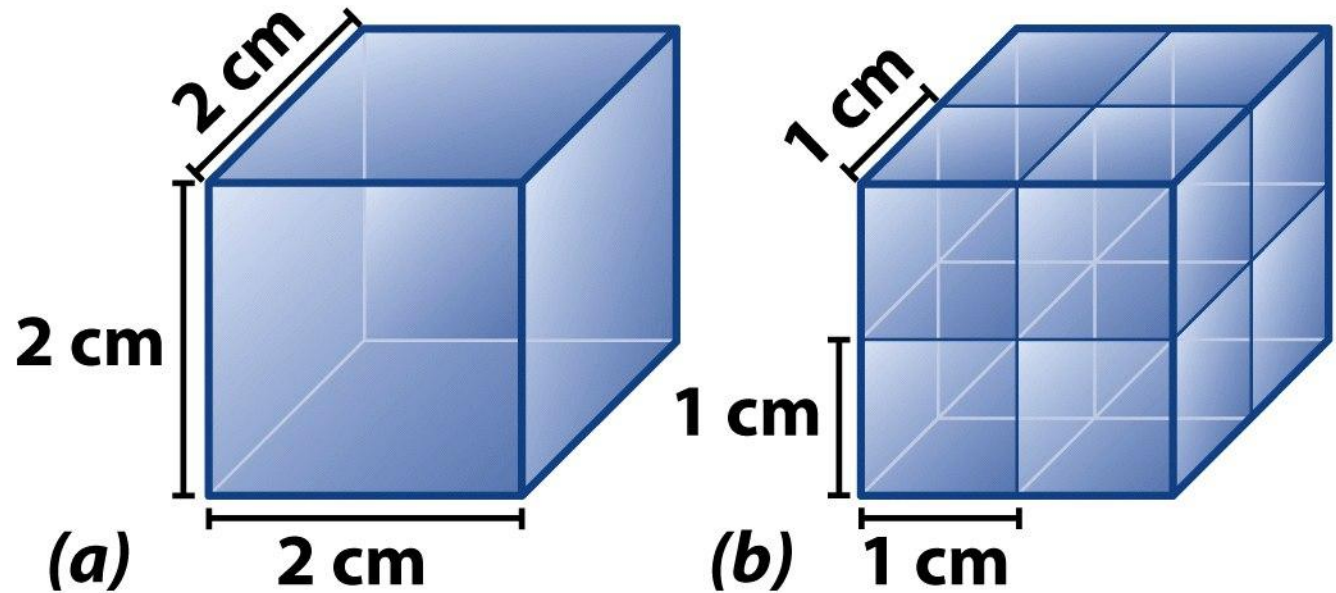
**cytoplasm**

**DNA (naked in bacteria) and enclosed by a nuclear membrane in all other organisms**

# Cell Size



# Cells Have Large Surface Area-to-Volume Ratio

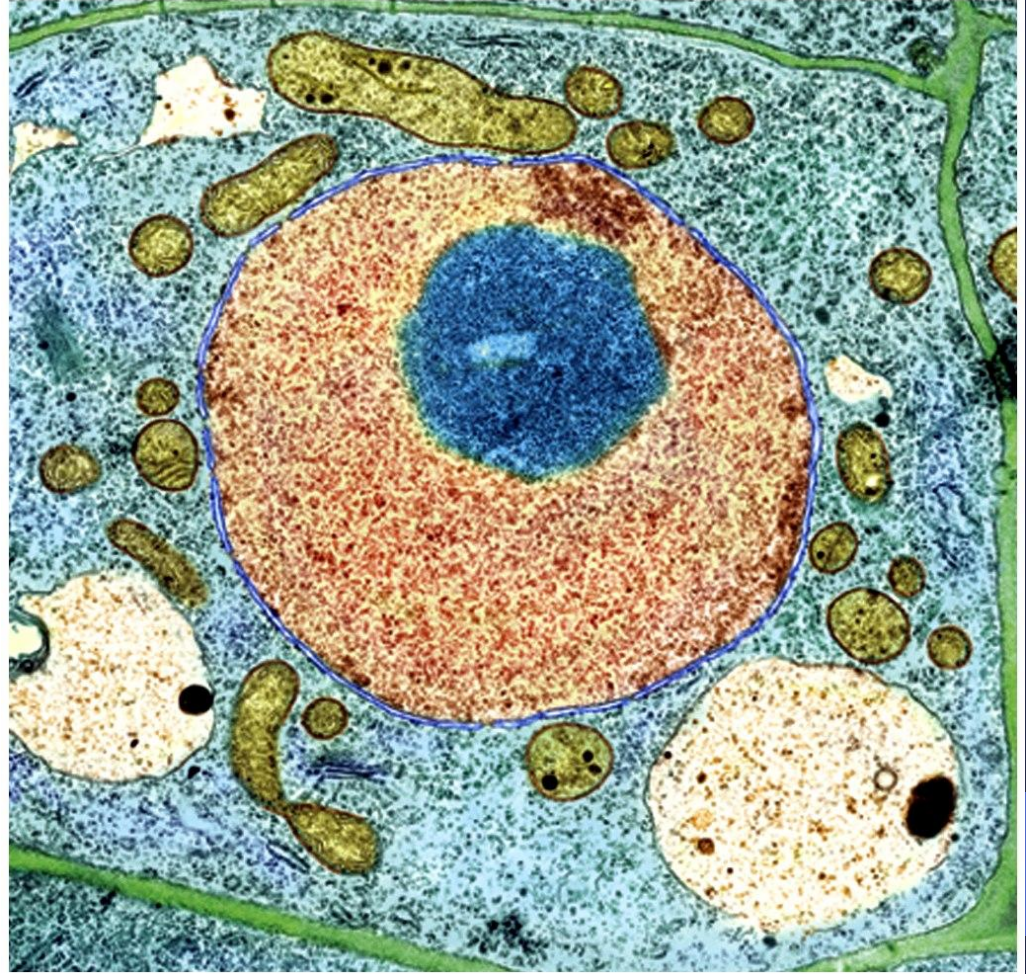


Number of cells	1	8
Total surface area	24 cm <sup>2</sup>	48 cm <sup>2</sup>
Total volume	8 cm <sup>3</sup>	8 cm <sup>3</sup>
Surface area/volume	<b>24/8 = 3:1</b>	<b>48/8 = 6:1</b>



# Cell Types

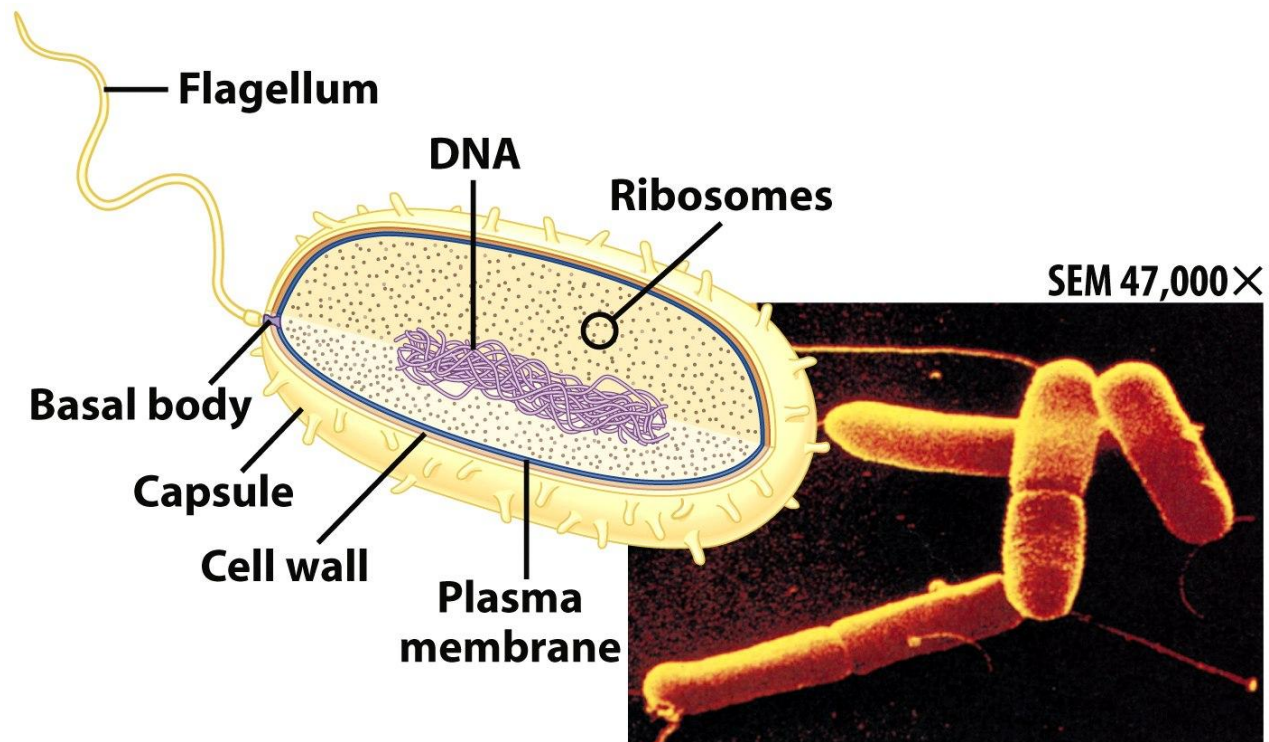
- Prokaryotic
- Eukaryotic





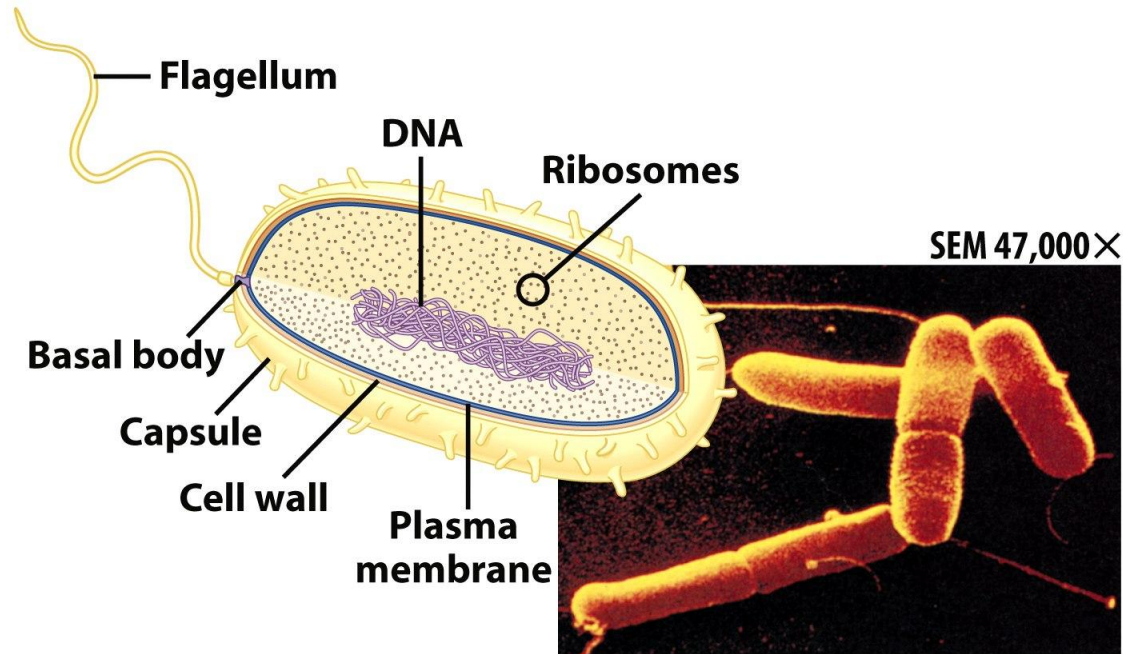
# Prokaryotic Cells

- First cell type on earth
- Cell type of Bacteria and Archaea



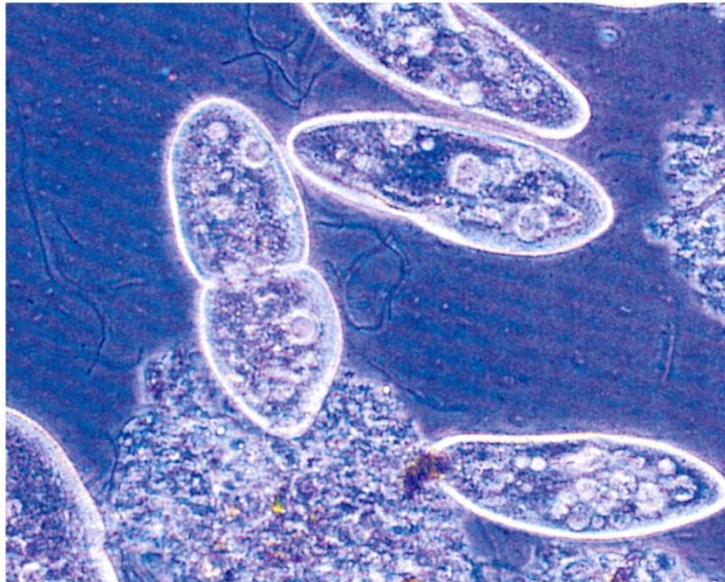
# Prokaryotic Cells

- No membrane bound nucleus
- Nucleoid = region of DNA concentration
- Organelles not bound by membranes



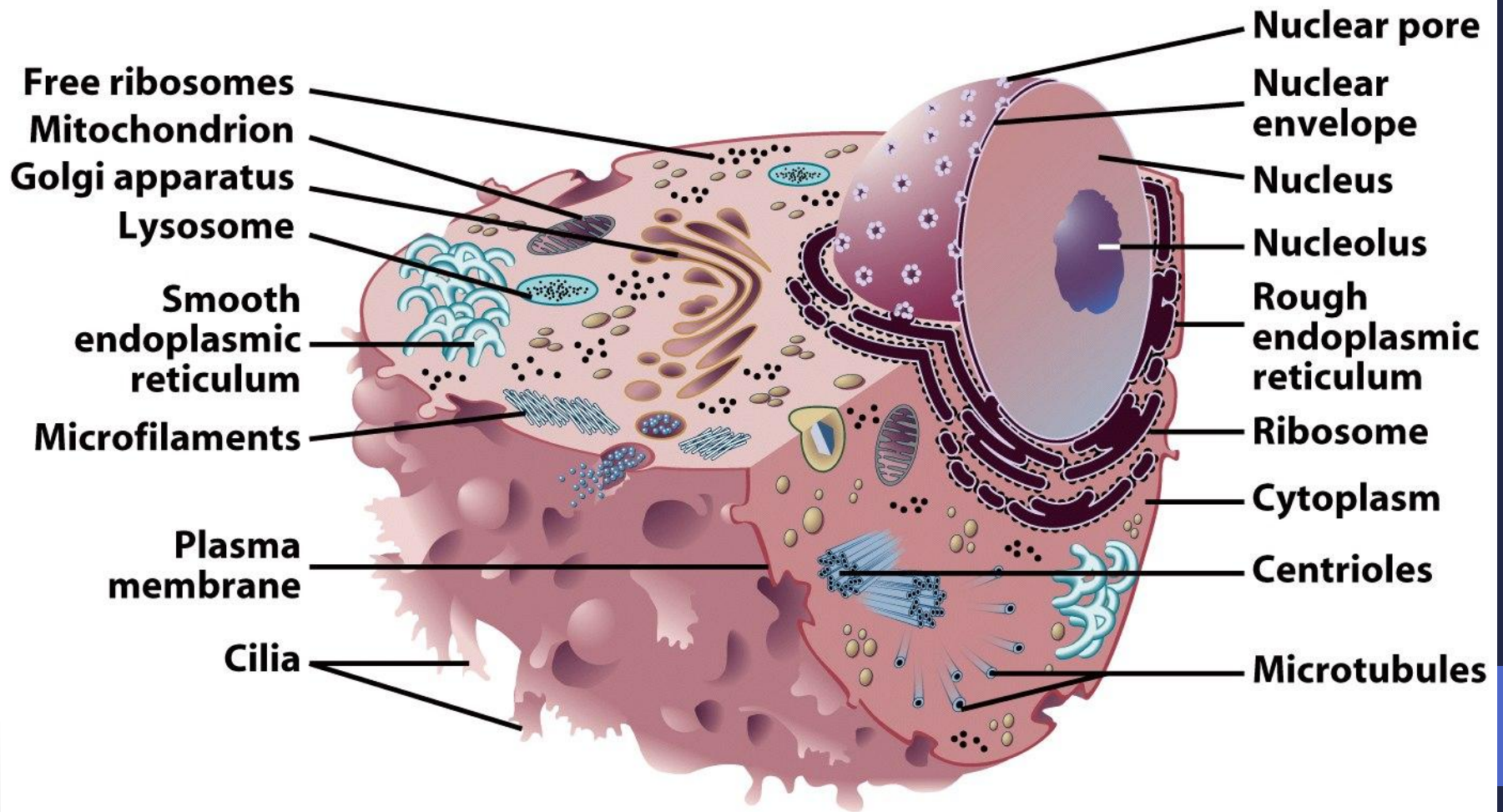
# Eukaryotic Cells

- Nucleus bound by membrane
- Include fungi, protists, plant, and animal cells
- Possess many organelles



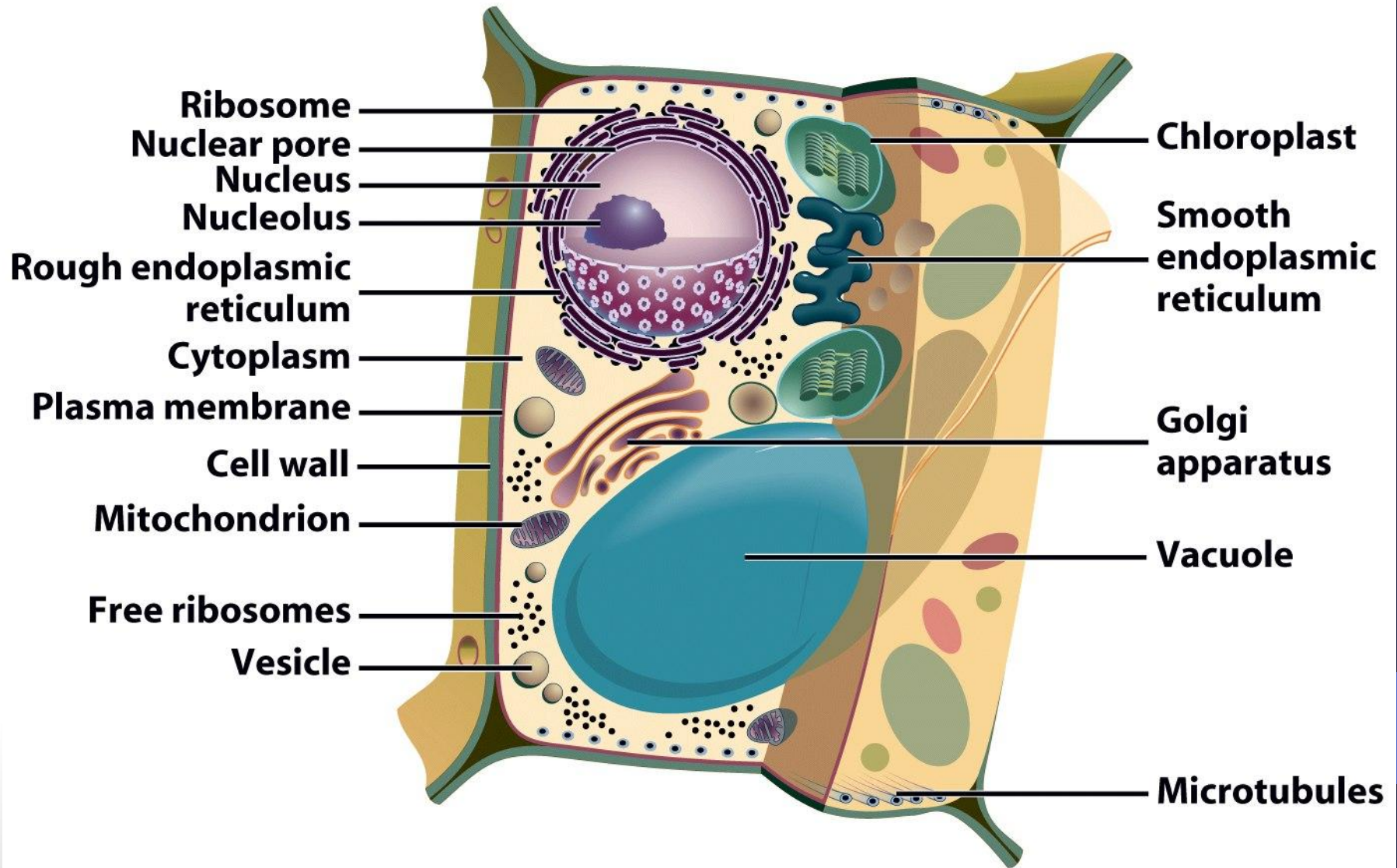
**Protozoan**

# Representative Animal Cell



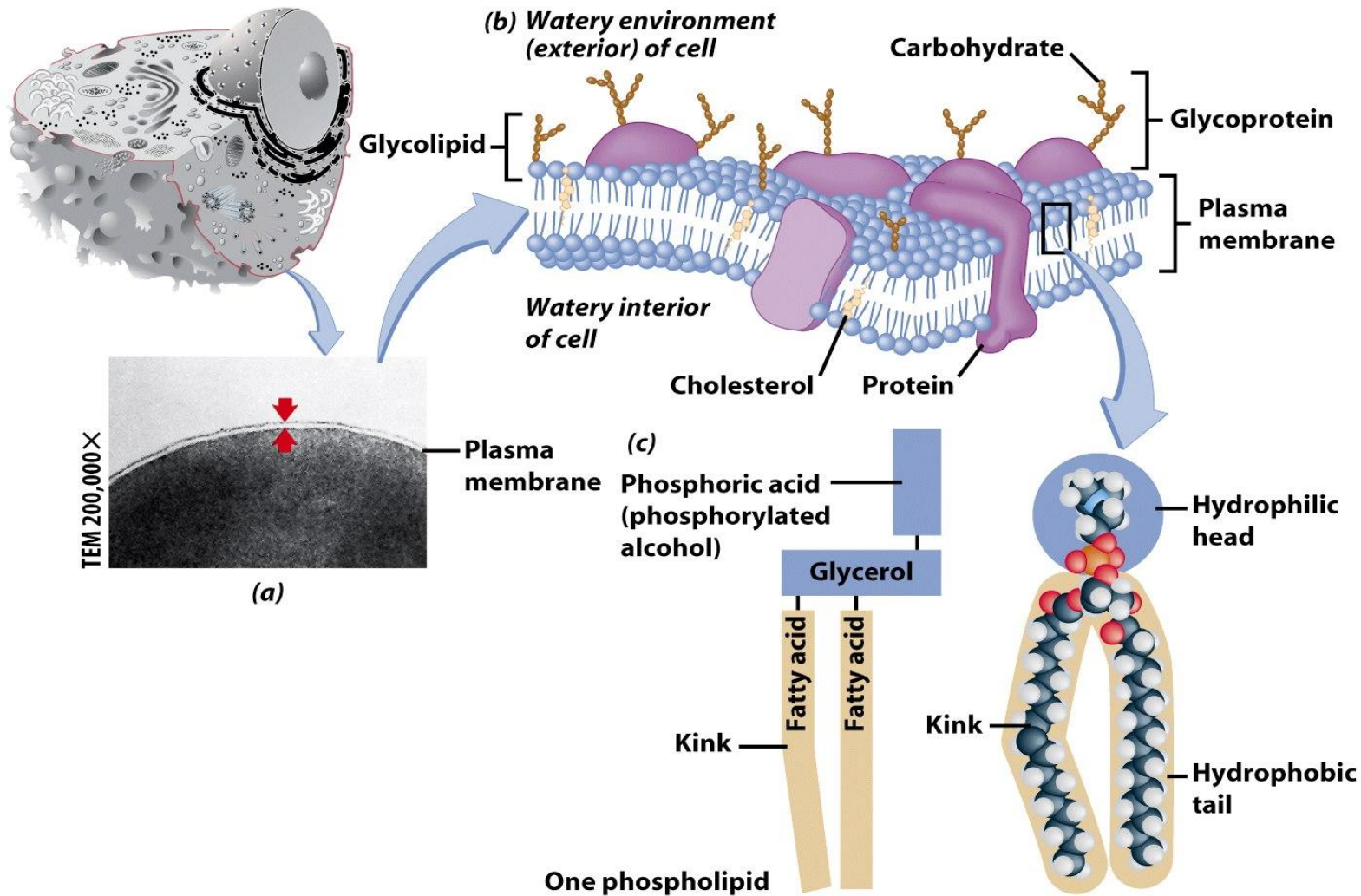


# Representative Plant Cell



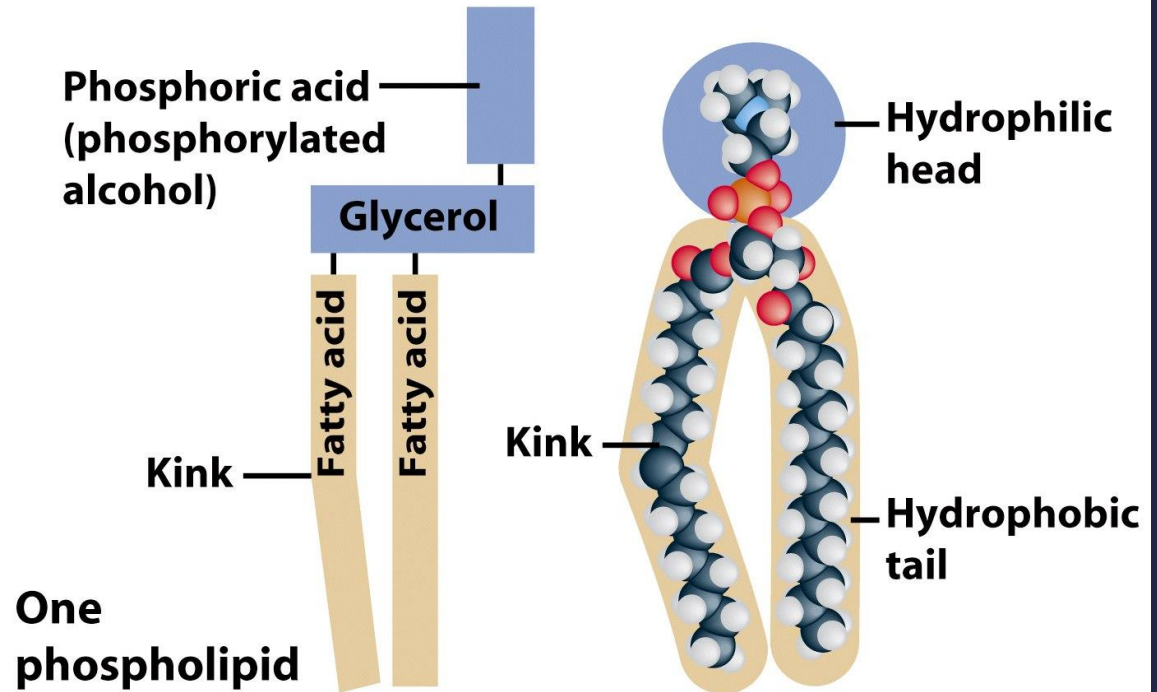
# Plasma Membrane

Double layer of phospholipids & proteins



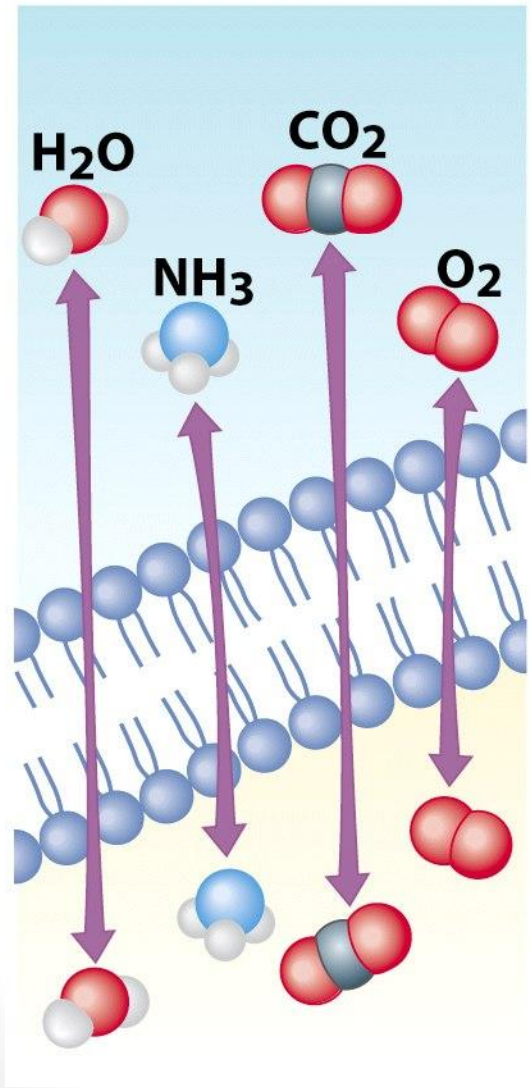
# Phospholipids

- Polar
  - Hydrophilic head
  - Hydrophobic tail
- Interacts with water

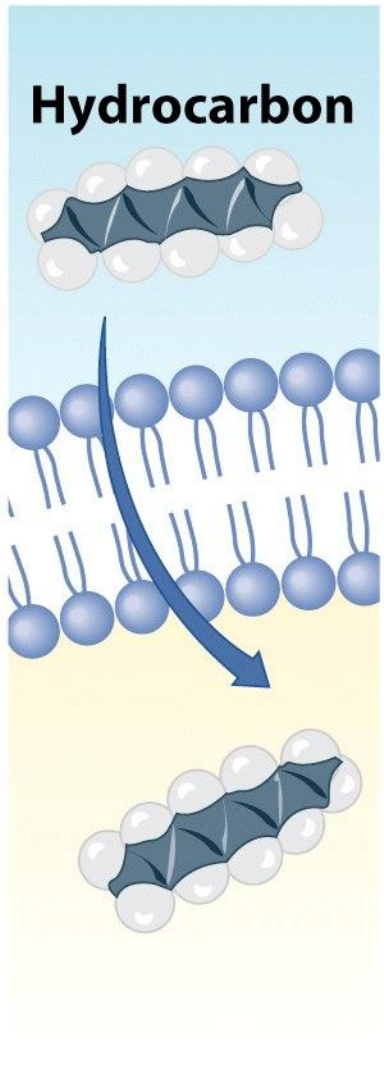




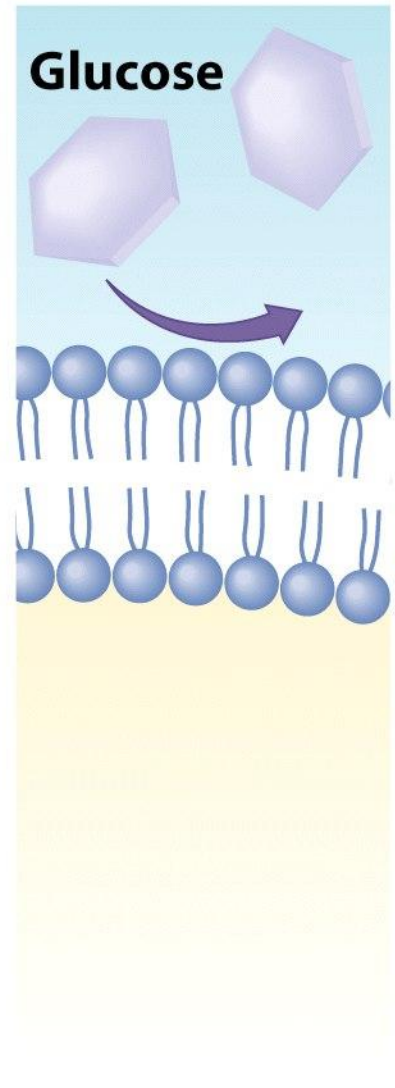
**(a)**  
Small uncharged molecules



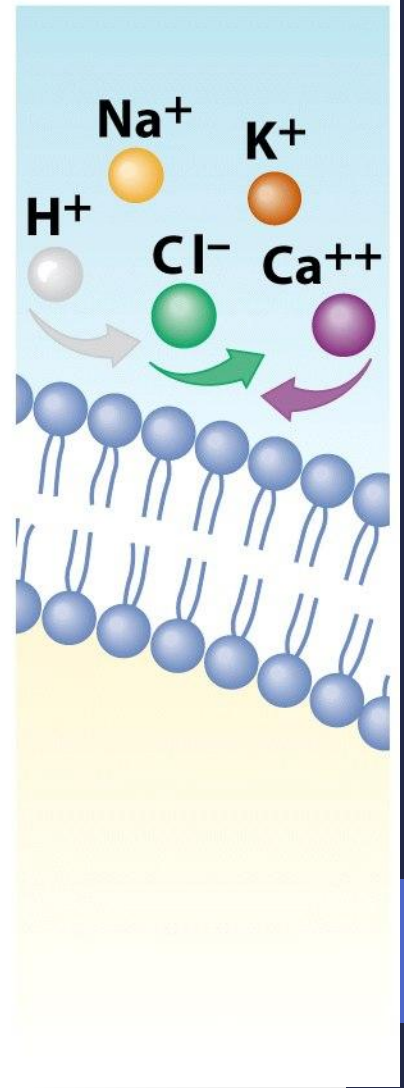
**(b)**  
Lipid-soluble substances



**(c)**  
Water-soluble substances



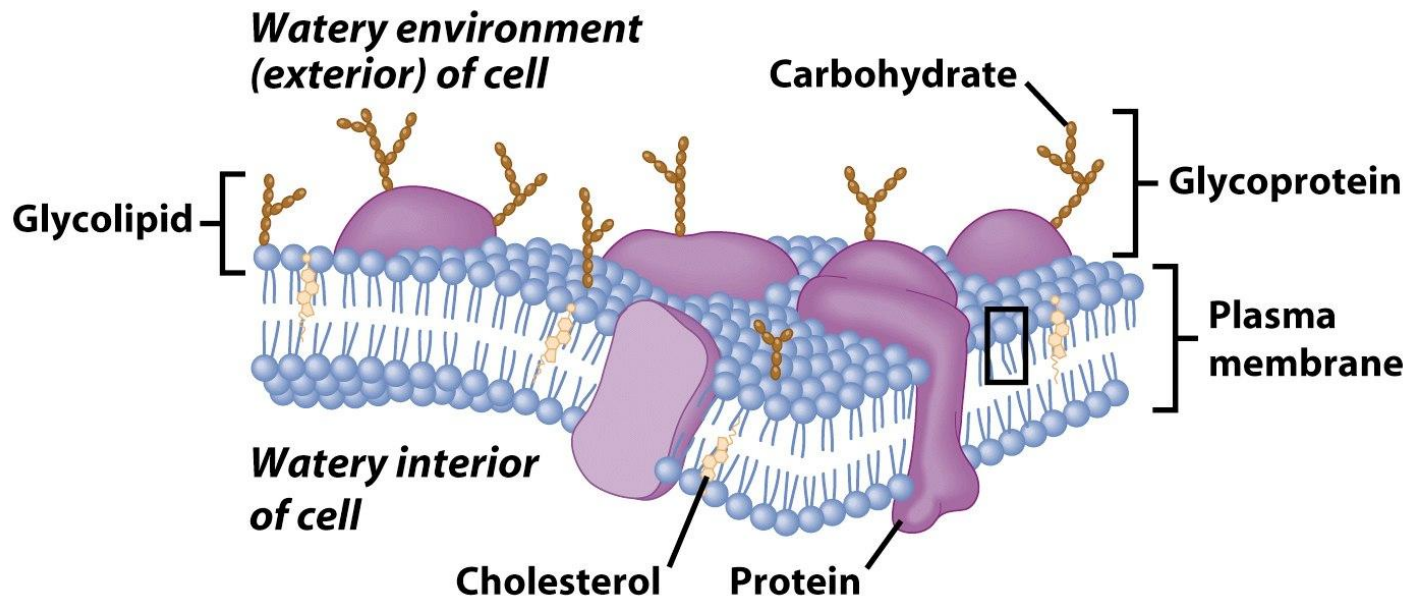
**(d)**  
Ions





# Membrane Proteins

1. Channels or transporters
  - Move molecules in one direction
2. Receptors
  - Recognize certain chemicals



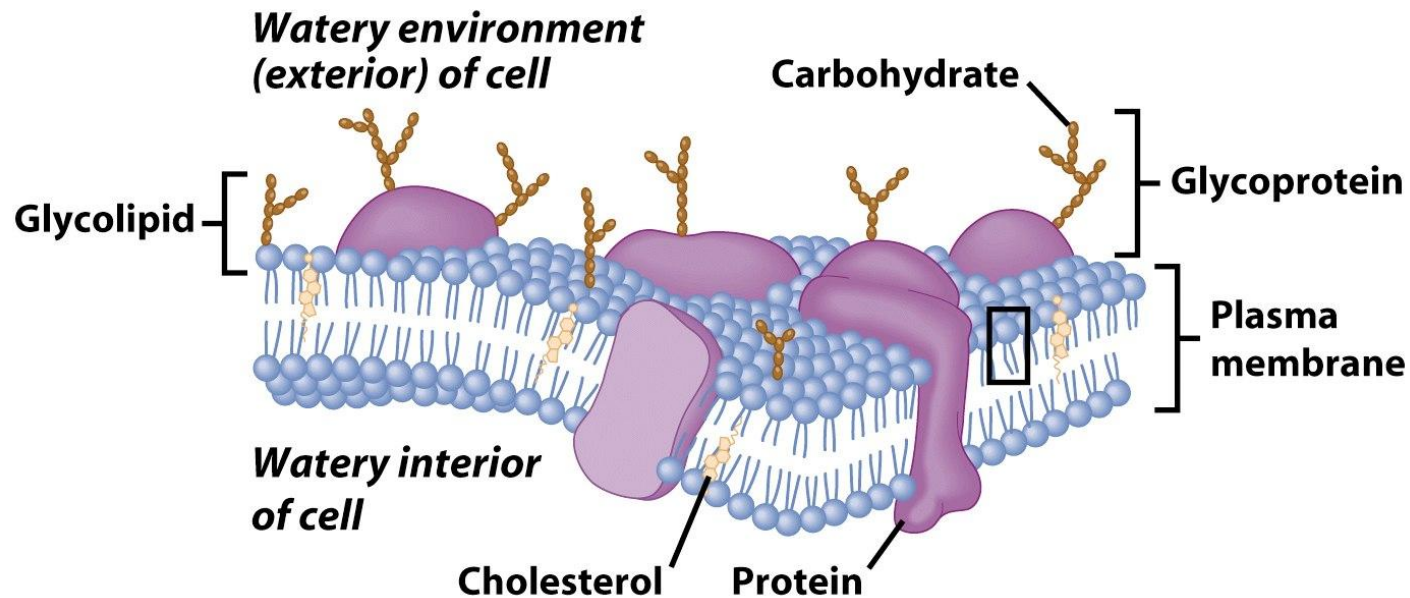
# Membrane Proteins

## 3. Glycoproteins

- Identify cell type

## 4. Enzymes

- Catalyze production of substances



# Cell Walls

- Found in plants, fungi, & many protists
- Surrounds plasma membrane



# Cell Wall Differences

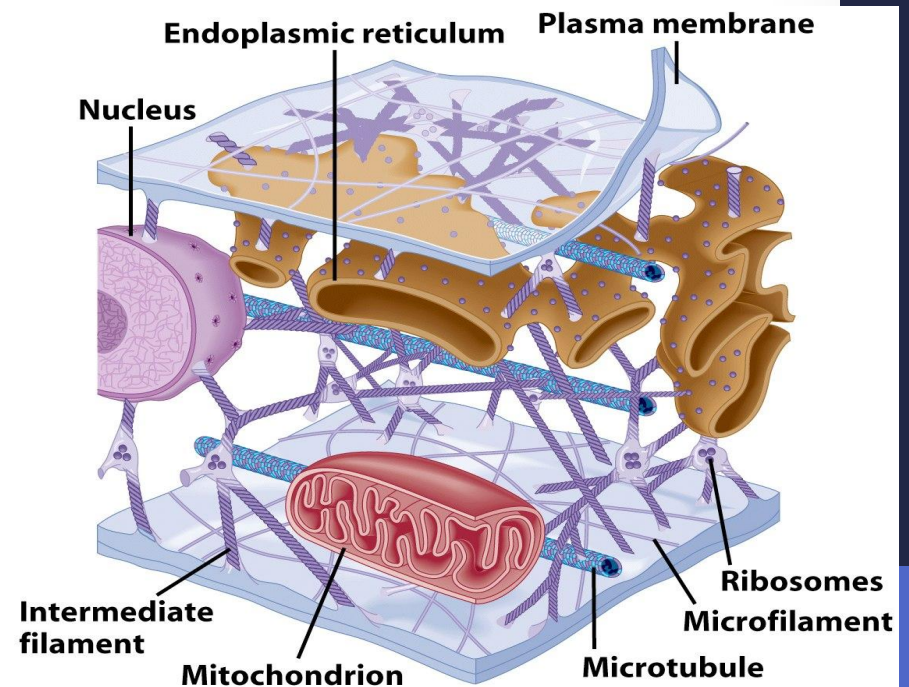
- Plants – mostly cellulose
- Fungi – contain chitin





# Cytoplasm

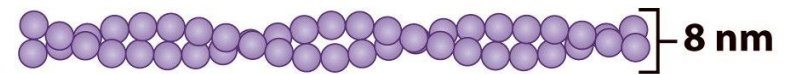
- Viscous fluid containing organelles
- components of cytoplasm
  - Interconnected filaments & fibers
  - Fluid = cytosol
  - Organelles (not nucleus)
  - storage substances



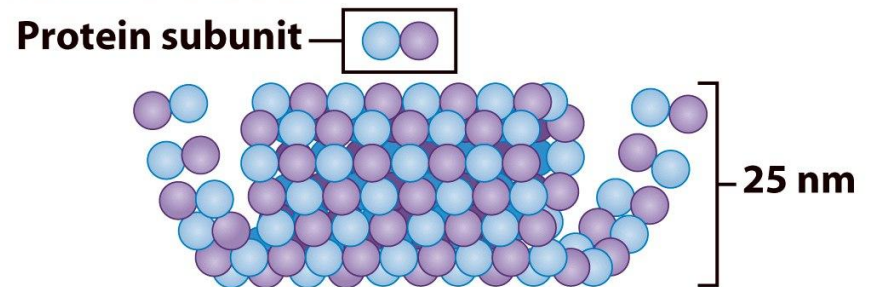
# Cytoskeleton

- Filaments & fibers
- Made of 3 fiber types
  - Microfilaments
  - Microtubules
  - Intermediate filaments
- 3 functions:
  - mechanical support
  - anchor organelles
  - help move substances

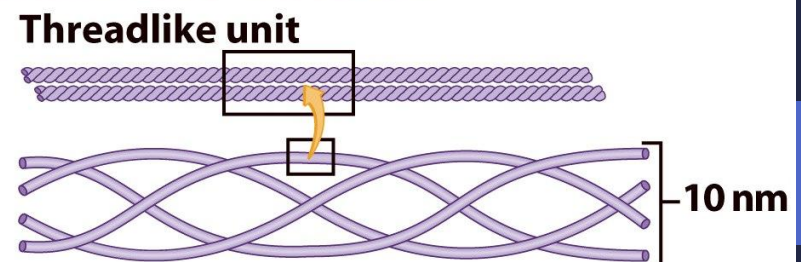
**(a) Microfilament**



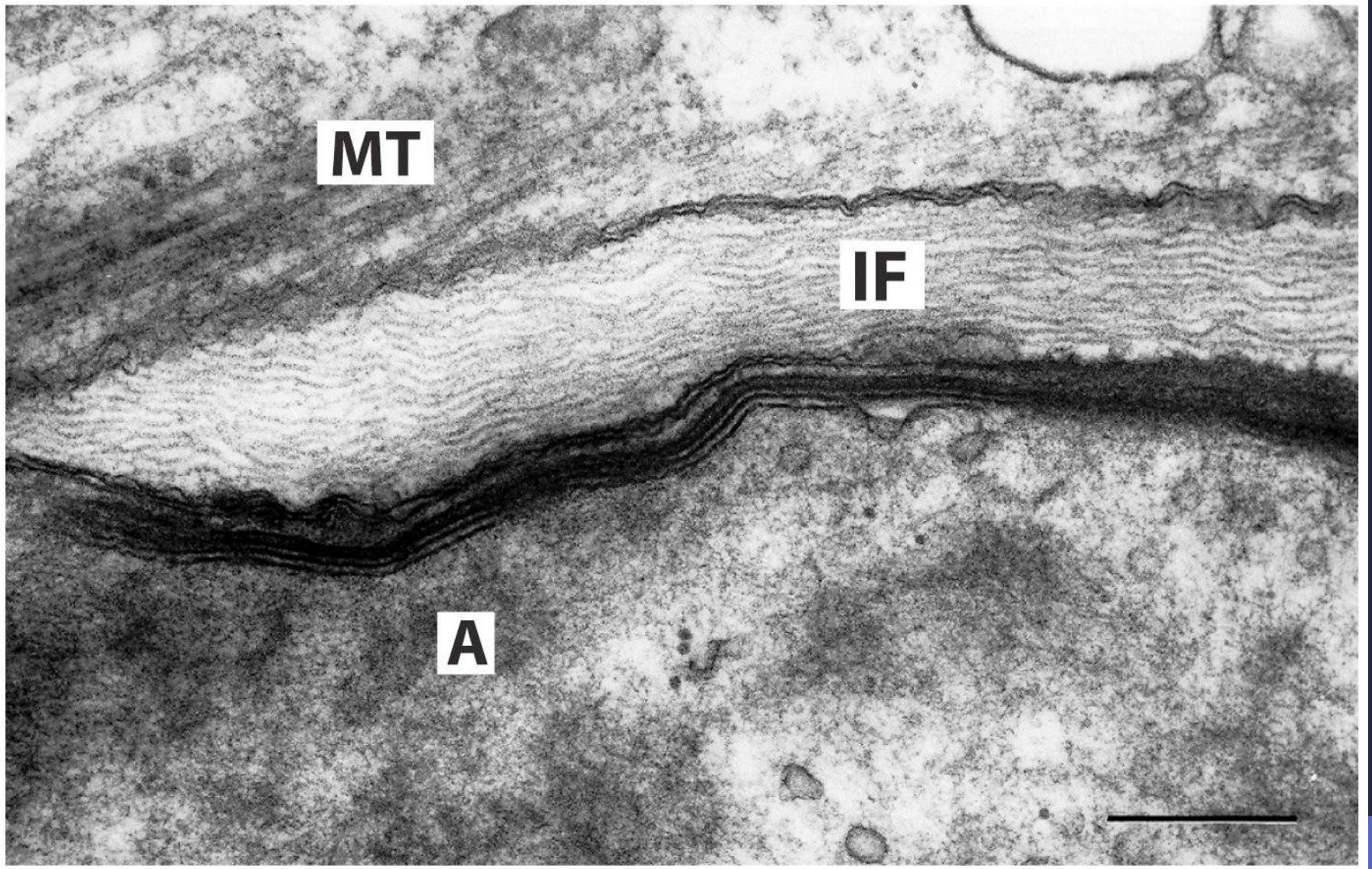
**(b) Microtubule**



**(c) Intermediate filament**







**A = actin, IF = intermediate filament, MT = microtubule**



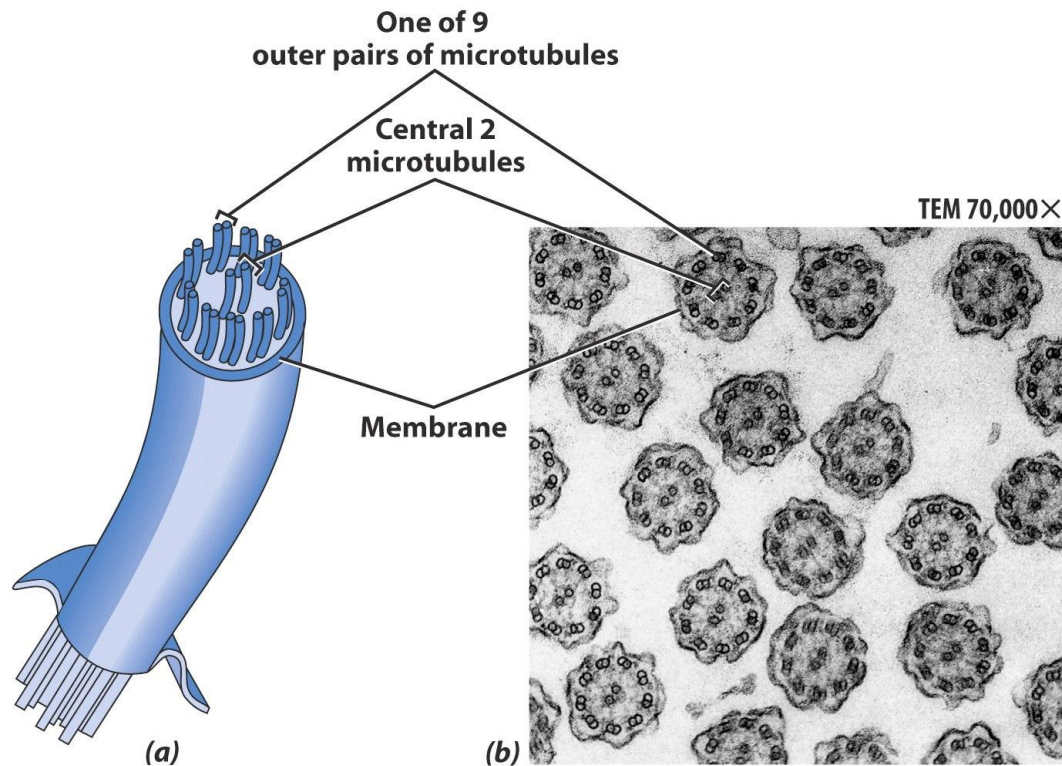
# Cilia & Flagella

- Provide motility
- Cilia
  - Short
  - Used to move substances outside human cells
- Flagella
  - Whip-like extensions
  - Found on sperm cells
- Basal bodies like centrioles



# Cilia & Flagella Structure

- Bundles of microtubules
- With plasma membrane



# Centrioles

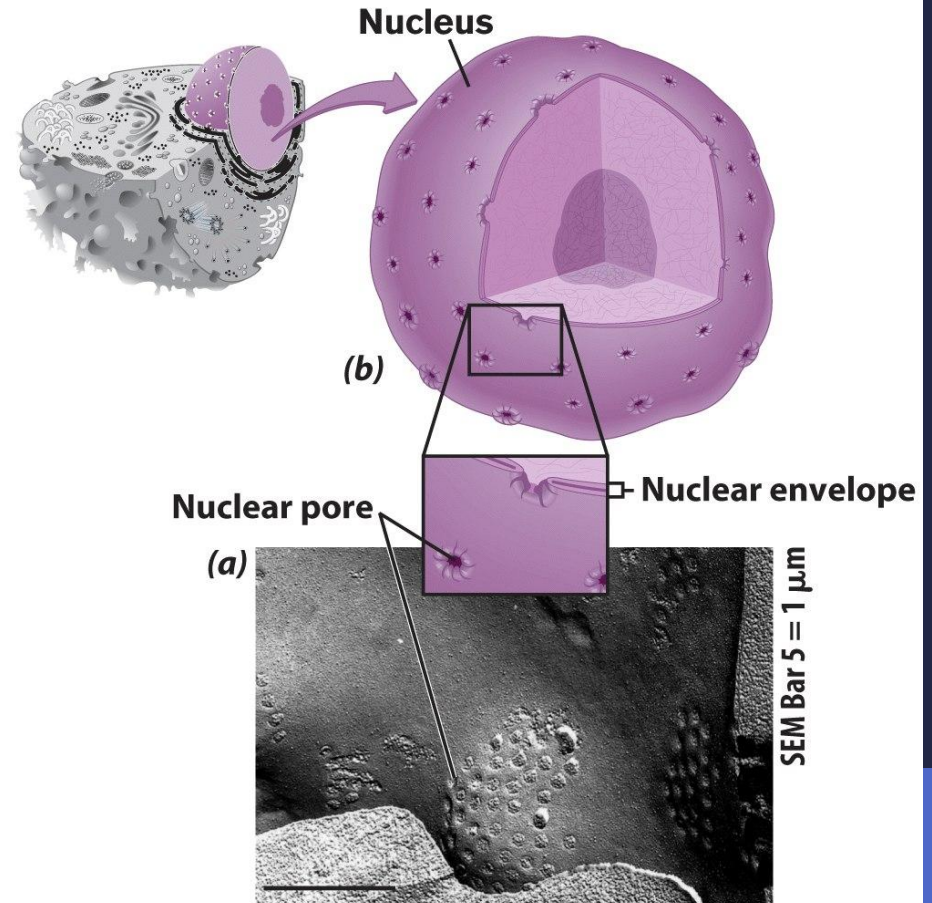
- Pairs of microtubular structures
- Play a role in cell division





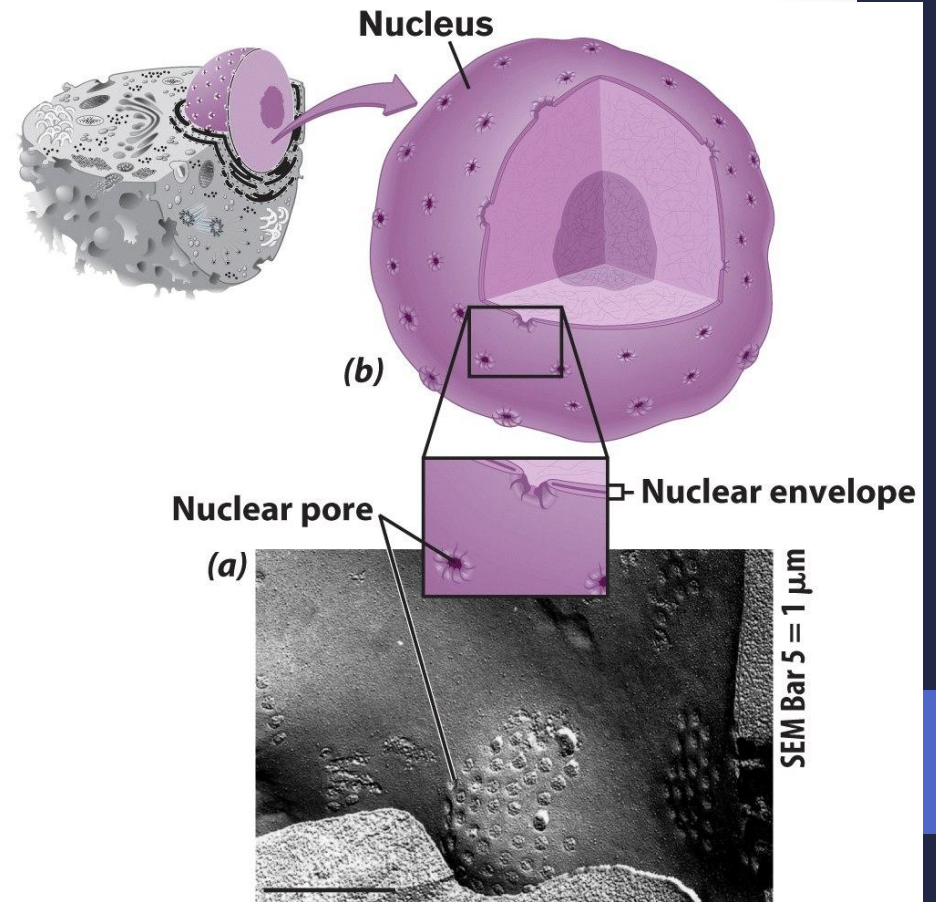
# Nucleus

- Control center of cell
- Double membrane
- Contains
  - Chromosomes
  - Nucleolus



# Nuclear Envelope

- Separates nucleus from rest of cell
- Double membrane
- Has pores



# DNA

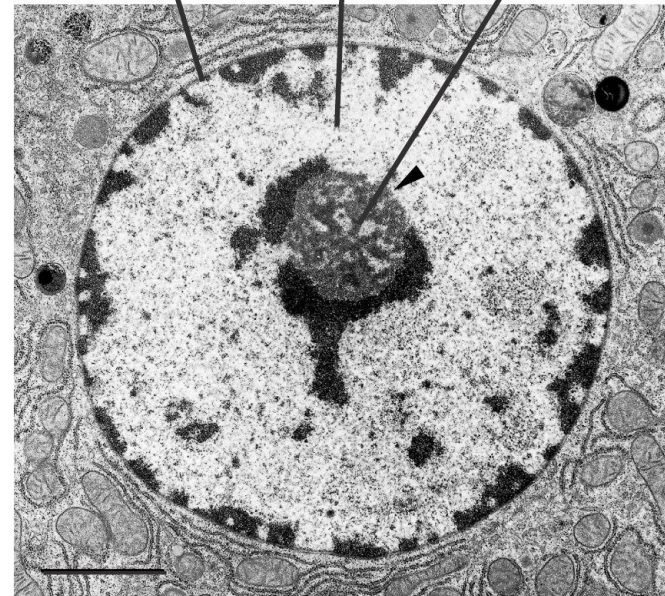
- Hereditary material
- Chromosomes
  - DNA
  - Proteins
  - Form for cell division
- Chromatin



# Nucleolus

- Most cells have 2 or more
- Directs synthesis of RNA
- Forms ribosomes

**Nuclear membrane Nucleus Nucleolus**



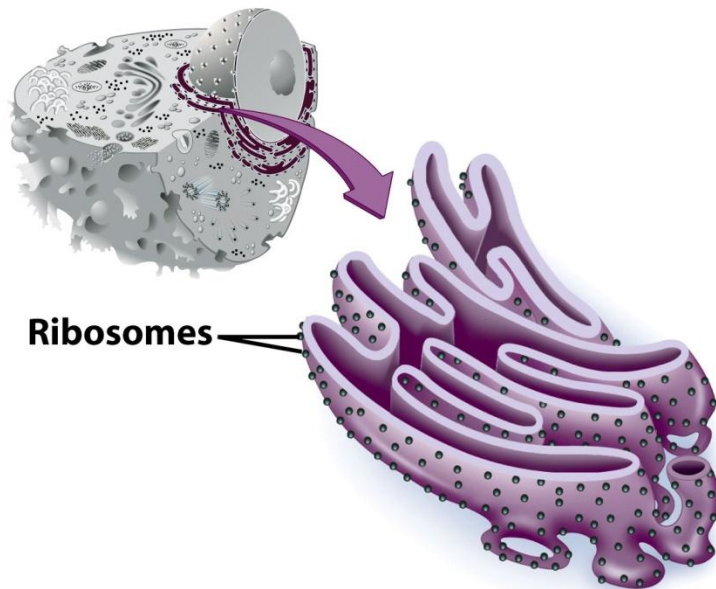


# Endoplasmic Reticulum

- Helps move substances within cells
- Network of interconnected membranes
- Two types
  - Rough endoplasmic reticulum
  - Smooth endoplasmic reticulum

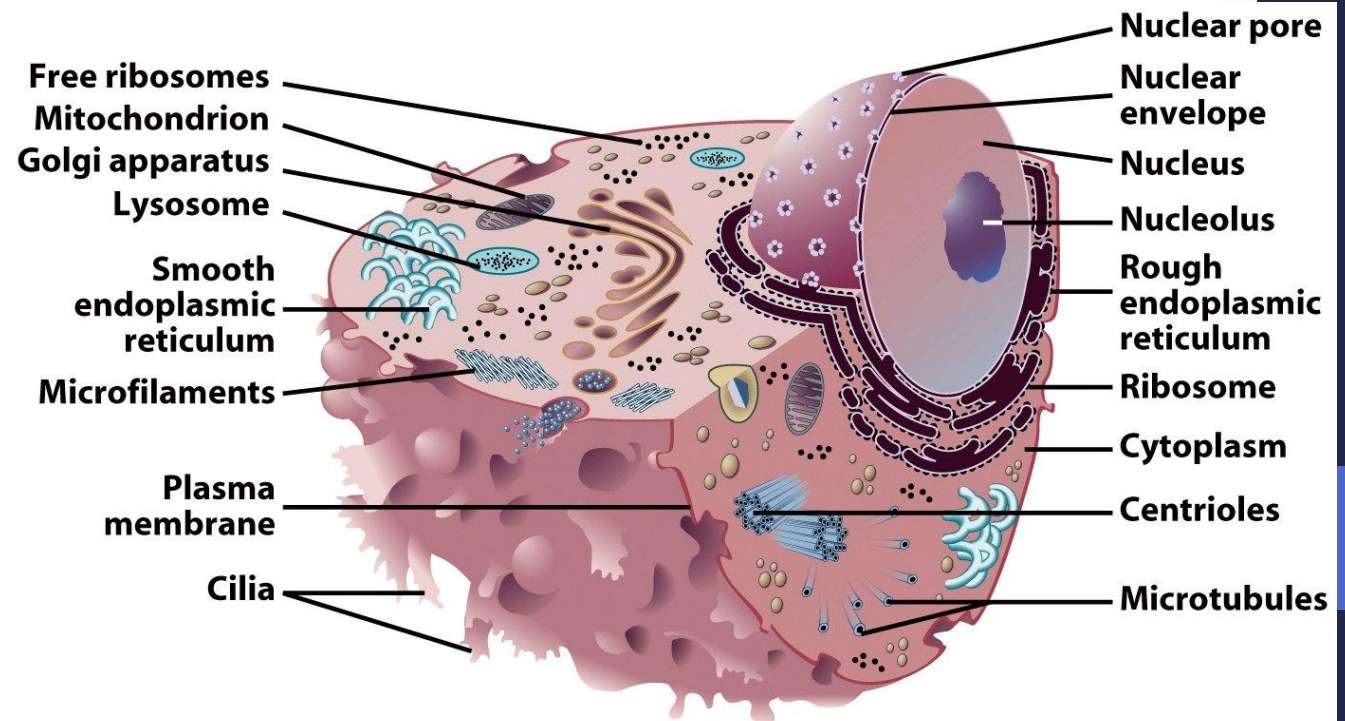
# Rough Endoplasmic Reticulum

- Ribosomes attached to surface
  - Manufacture proteins
  - Not all ribosomes attached to rough ER
- May modify proteins from ribosomes



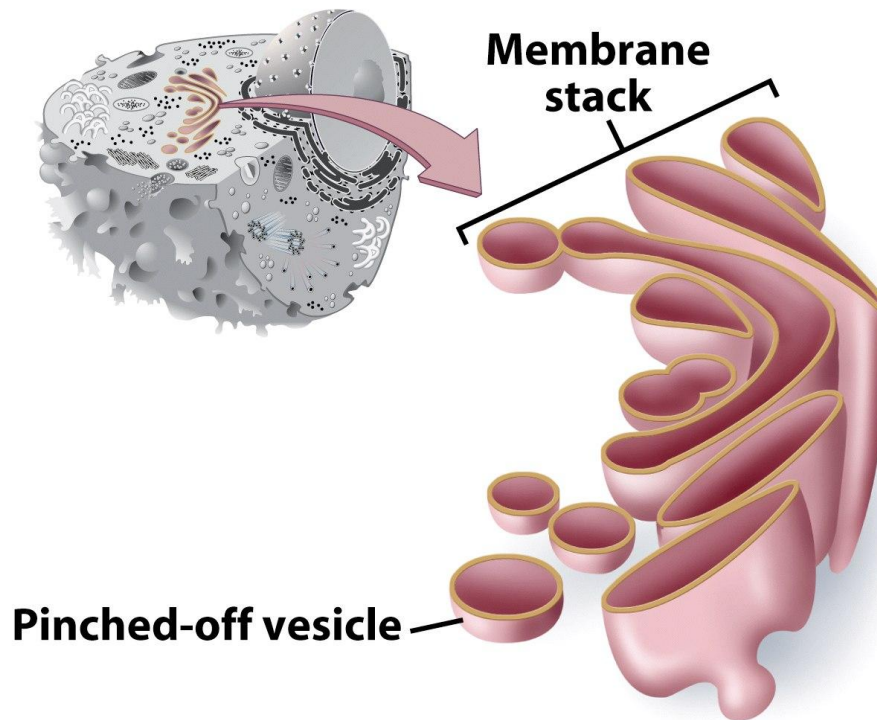
# Smooth Endoplasmic Reticulum

- No attached ribosomes
- Has enzymes that help build molecules
  - Carbohydrates
  - Lipids



# Golgi Apparatus

- Involved in synthesis of plant cell wall
- Packaging & shipping station of cell





# Golgi Apparatus Function

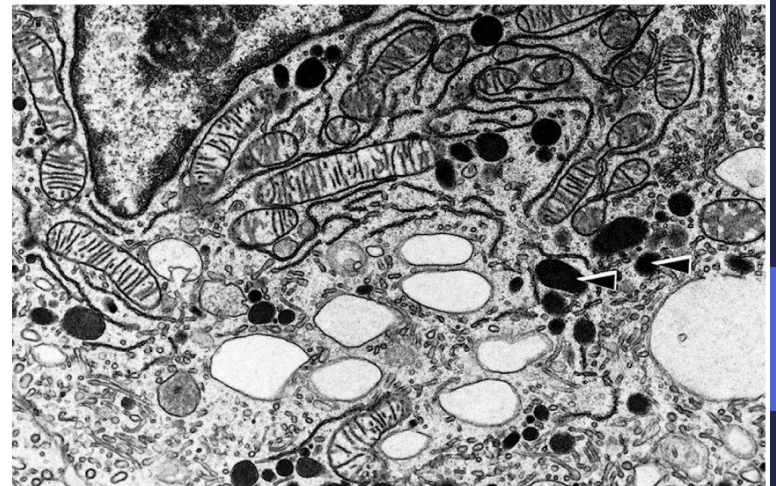
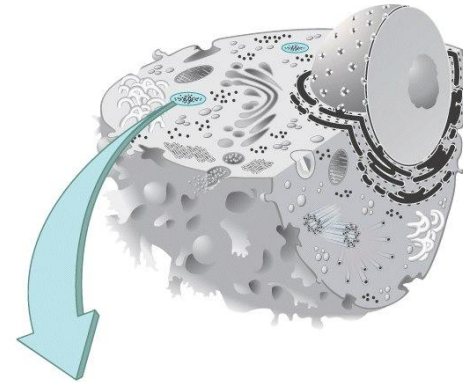
1. Molecules come in vesicles
2. Vesicles fuse with Golgi membrane
3. Molecules may be modified by Golgi

# Golgi Apparatus Function (Continued)

4. Molecules pinched-off in separate vesicle
5. Vesicle leaves Golgi apparatus
6. Vesicles may combine with plasma membrane to secrete contents

# Lysosomes

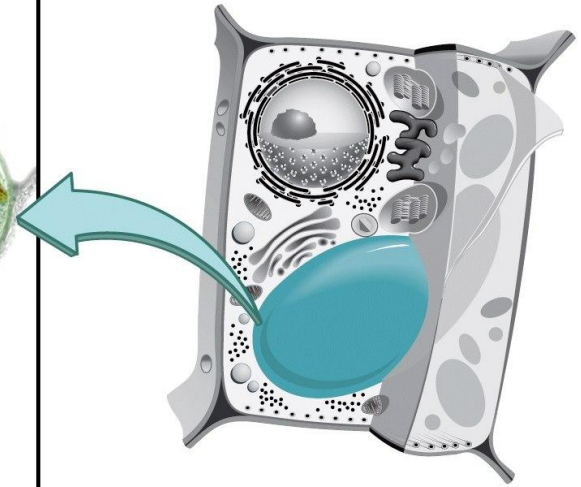
- Contain digestive enzymes
- Functions
  - Aid in cell renewal
  - Break down old cell parts
  - Digests invaders





# Vacuoles

- Membrane bound storage sacs
- More common in plants than animals
- Contents
  - Water
  - Food
  - wastes

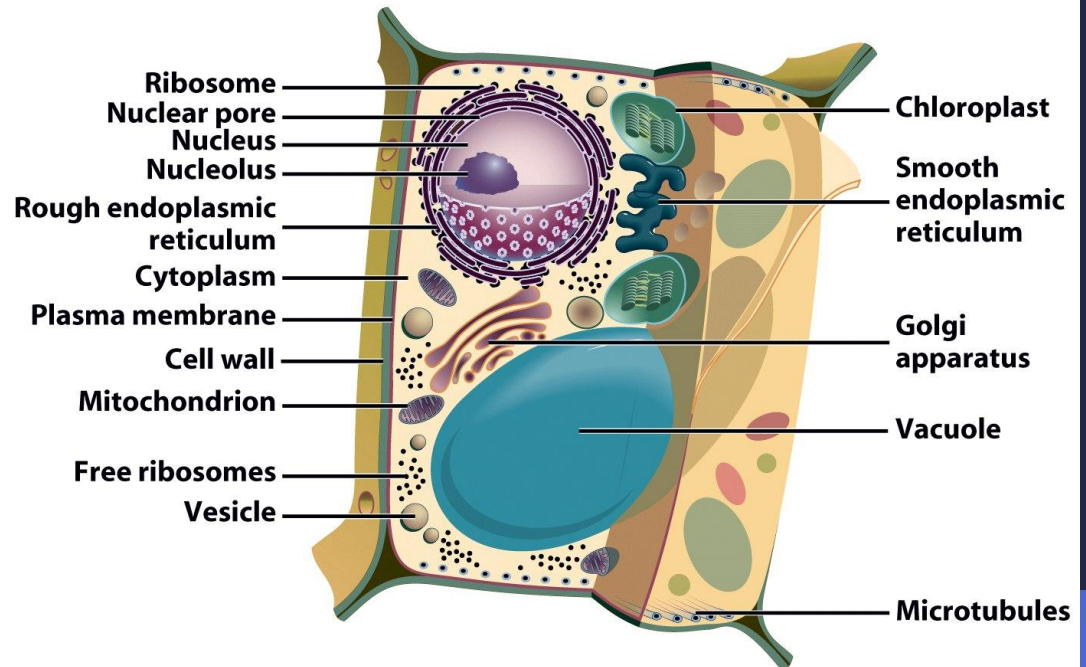


# Bacteria-Like Organelles

- Release & store energy

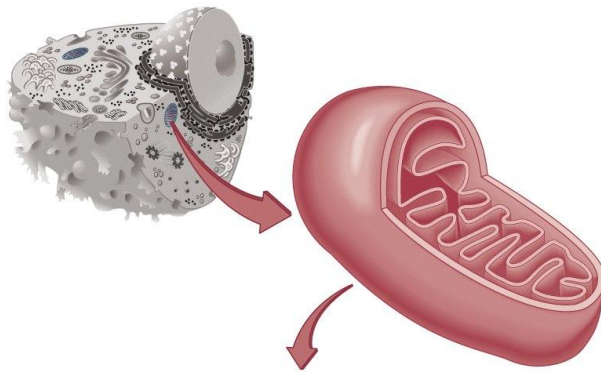
- Types

- Mitochondria  
(release energy)
- Chloroplasts  
(store energy)



# Mitochondria

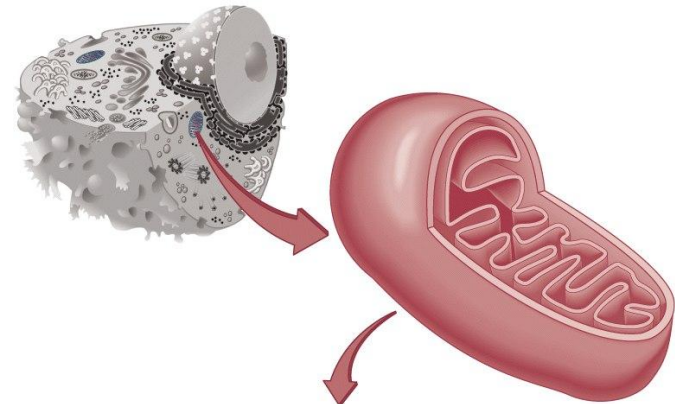
- Have their own DNA
- Bound by double membrane





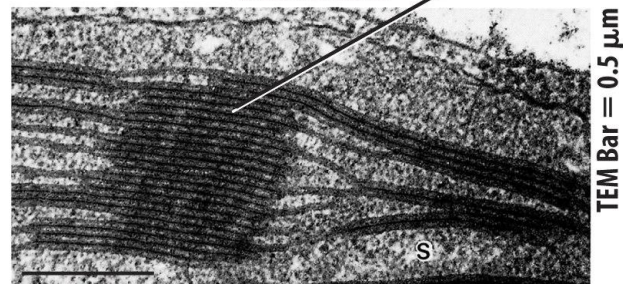
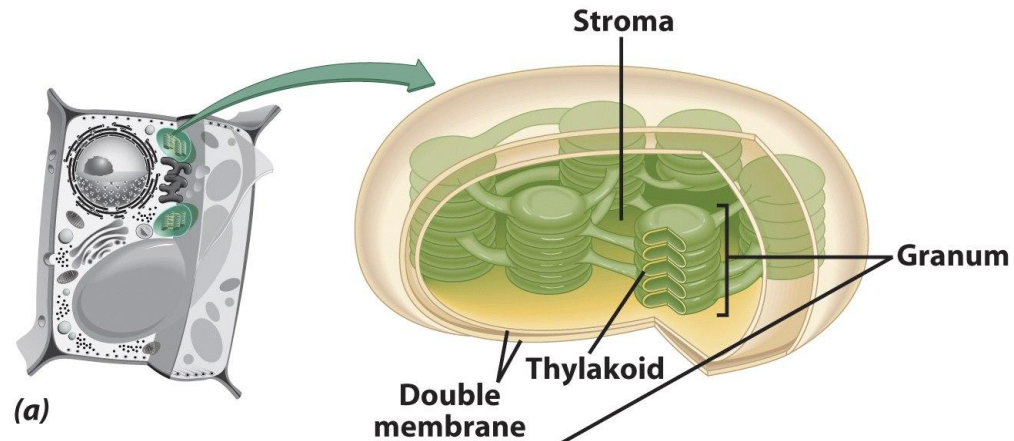
# Mitochondria

- Break down fuel molecules (cellular respiration)
  - Glucose
  - Fatty acids
- Release energy
  - ATP



# Chloroplasts

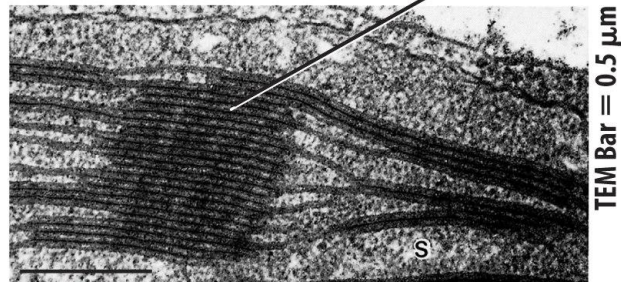
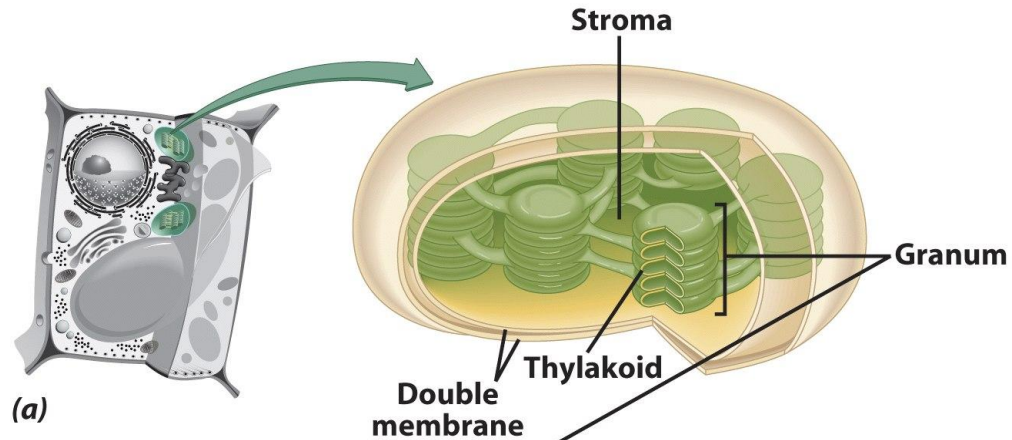
- Derived from photosynthetic bacteria
- Solar energy capturing organelle



(b)

# Photosynthesis

- Takes place in the chloroplast
- Makes cellular food – glucose



(b)

# Review of Eukaryotic Cells

**TABLE 5.1**

**Eukaryotic Cell Structures and Their Functions**

<b>Structure</b>	<b>Description</b>	<b>Function</b>
<b>Exterior Structures</b>		
<b>Cell wall</b>	<b>Outer layer of cellulose or chitin, or absent</b>	<b>Protection, support</b>
<b>Plasma membrane</b>	<b>Lipid bilayer in which proteins are embedded</b>	<b>Regulation of what passes in and out of cell, cell-to-cell recognition</b>
<b>Flagella (cilia)</b>	<b>Cellular extensions with 9 + 2 arrangement of pairs of microtubules</b>	<b>Motility or moving fluids over surfaces</b>



# Review of Eukaryotic Cells

**TABLE 5.1**

**Eukaryotic Cell Structures and Their Functions**

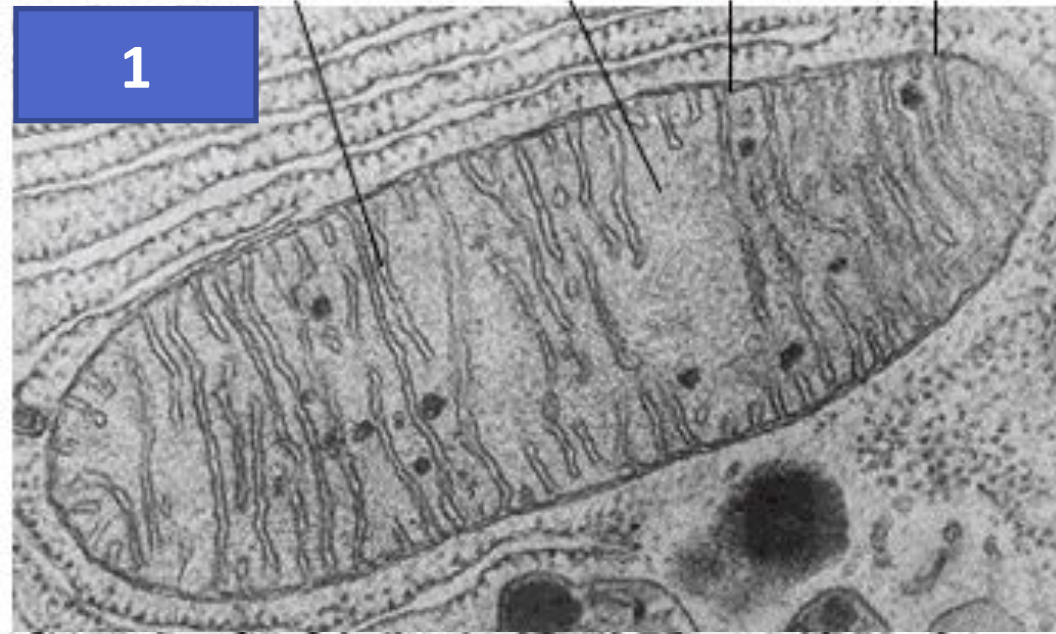
Structure	Description	Function
<b>Interior Structures and Organelles</b>		
Endoplasmic reticulum (ER)	Network of internal membranes	Formation of compartments and vesicles; modification and transport of proteins; synthesis of carbohydrates and lipids
Ribosomes	Small, complex assemblies of protein and RNA, often bound to ER	Sites of protein synthesis
Nucleus	Spherical structure bounded by a double membrane, site of chromosomes	Control center of cell
Chromosomes	Long threads of DNA associated with protein	Sites of hereditary information
Nucleolus	Site within nucleus of rRNA synthesis	Synthesis and assembly of ribosomes
Golgi apparatus	Stacks of flattened vesicles	Packaging of proteins for export from cell
Lysosomes	Membranous sacs containing digestive enzymes found in animal cells	Digestion of various molecules
Cytoskeleton	Network of protein filaments, fibers, and tubules	Structural support, cell movement
Mitochondria	Bacteria like elements with inner membrane highly folded	“Power plant” of the cell
Chloroplasts	Bacteria like elements with inner membrane forming sacs containing chlorophyll, found in plant cells and algae	Site of photosynthesis

**TABLE 5.2****A Comparison of Bacterial, Animal, and Plant Cells**

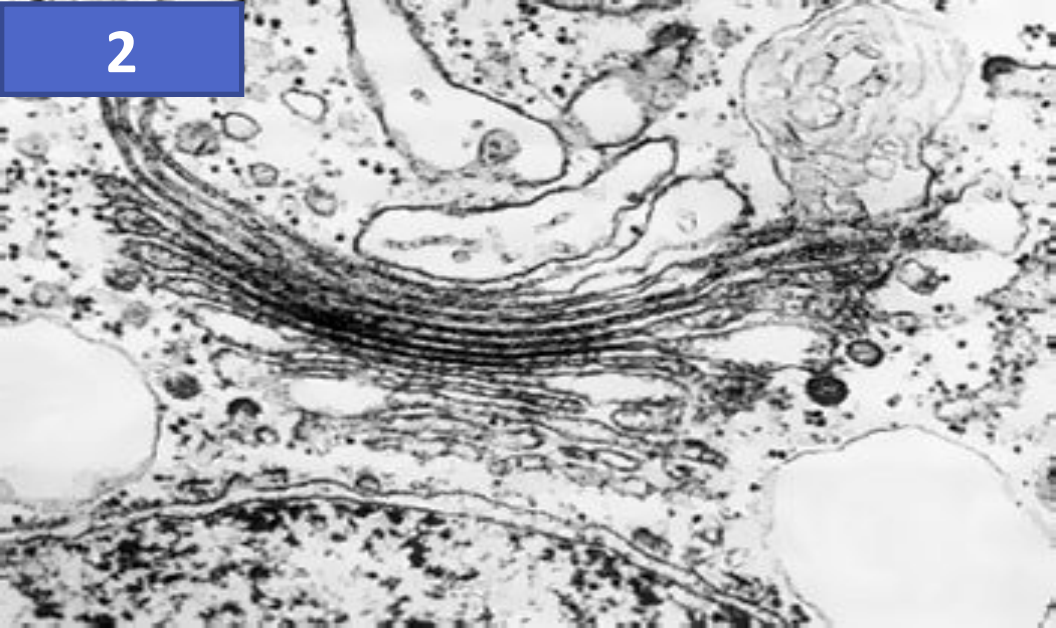
	<b>Bacterium</b>	<b>Animal</b>	<b>Plant</b>
<b>Exterior Structures</b>			
<b>Cell wall</b>	<b>Present (protein polysaccharide)</b>	<b><i>Absent</i></b>	<b>Present (cellulose)</b>
<b>Plasma membrane</b>	<b>Present</b>	<b>Present</b>	<b>Present</b>
<b>Flagella (cilia)</b>	<b>Sometimes present</b>	<b>Sometimes present</b>	<b>Sperm of a few species possess flagella</b>
<b>Interior Structures and Organelles</b>			
<b>Endoplasmic reticulum</b>	<b><i>Absent</i></b>	<b>Usually present</b>	<b>Usually present</b>
<b>Microtubules</b>	<b><i>Absent</i></b>	<b>Present</b>	<b>Present</b>
<b>Centrioles</b>	<b><i>Absent</i></b>	<b>Present</b>	<b><i>Absent</i></b>
<b>Golgi apparatus</b>	<b><i>Absent</i></b>	<b>Present</b>	<b>Present</b>
<b>Nucleus</b>	<b><i>Absent</i></b>	<b>Present</b>	<b>Present</b>
<b>Mitochondria</b>	<b><i>Absent</i></b>	<b>Present</b>	<b>Present</b>
<b>Chloroplasts</b>	<b><i>Absent</i></b>	<b><i>Absent</i></b>	<b>Present</b>
<b>Chromosomes</b>	<b>A single circle of naked DNA</b>	<b>Multiple units, DNA associated with protein</b>	<b>Multiple units, DNA associated with protein</b>
<b>Ribosomes</b>	<b>Present</b>	<b>Present</b>	<b>Present</b>
<b>Lysosomes</b>	<b><i>Absent</i></b>	<b>Present</b>	<b>Present</b>
<b>Vacuoles</b>	<b><i>Absent</i></b>	<b><i>Absent</i> or small</b>	<b>Usually a large single vacuole in mature cell</b>

# Практика

1

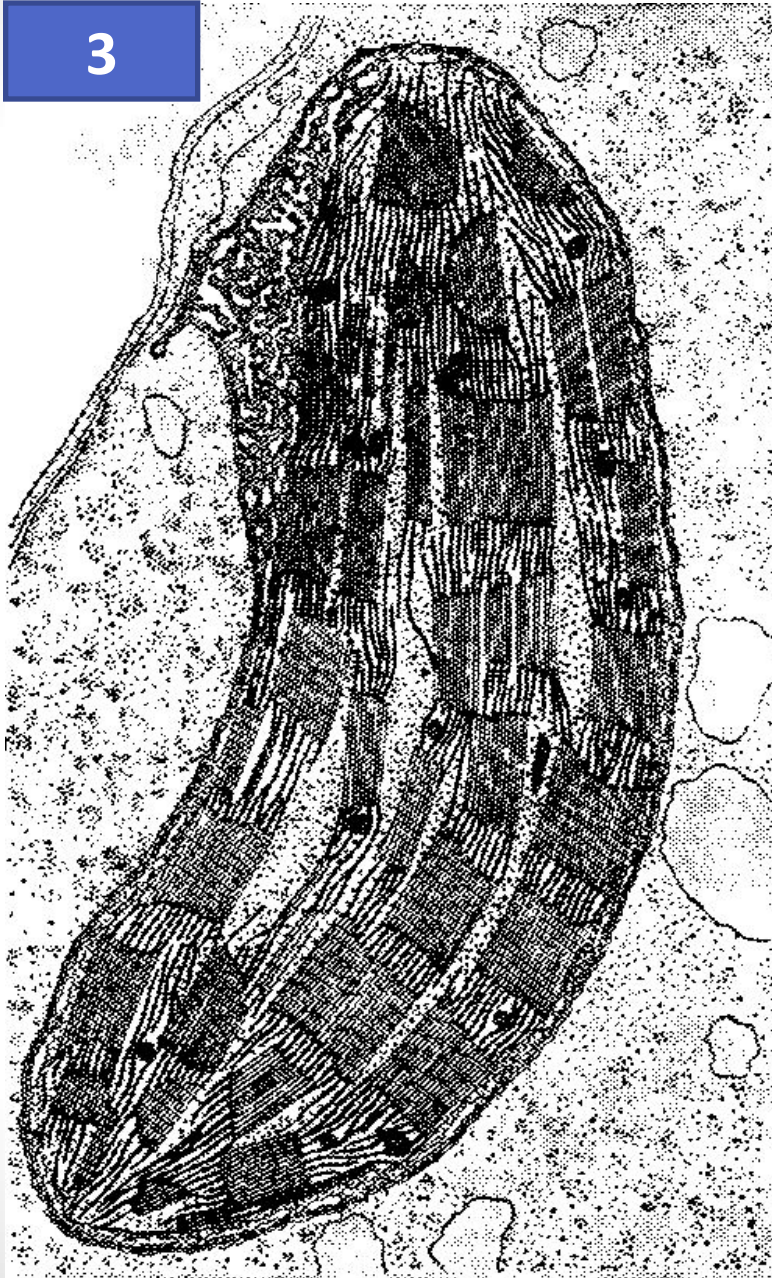


2

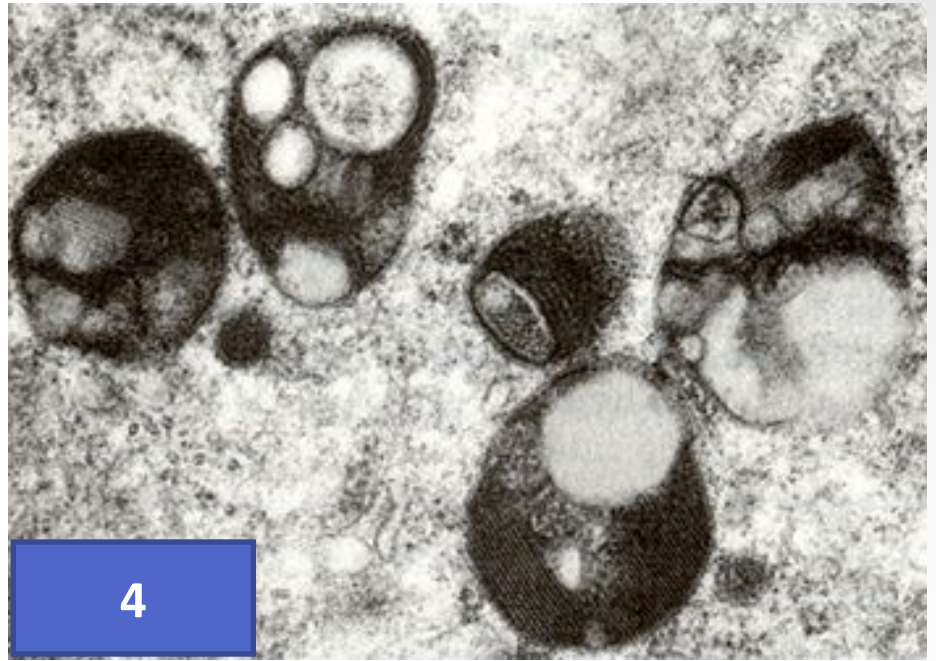




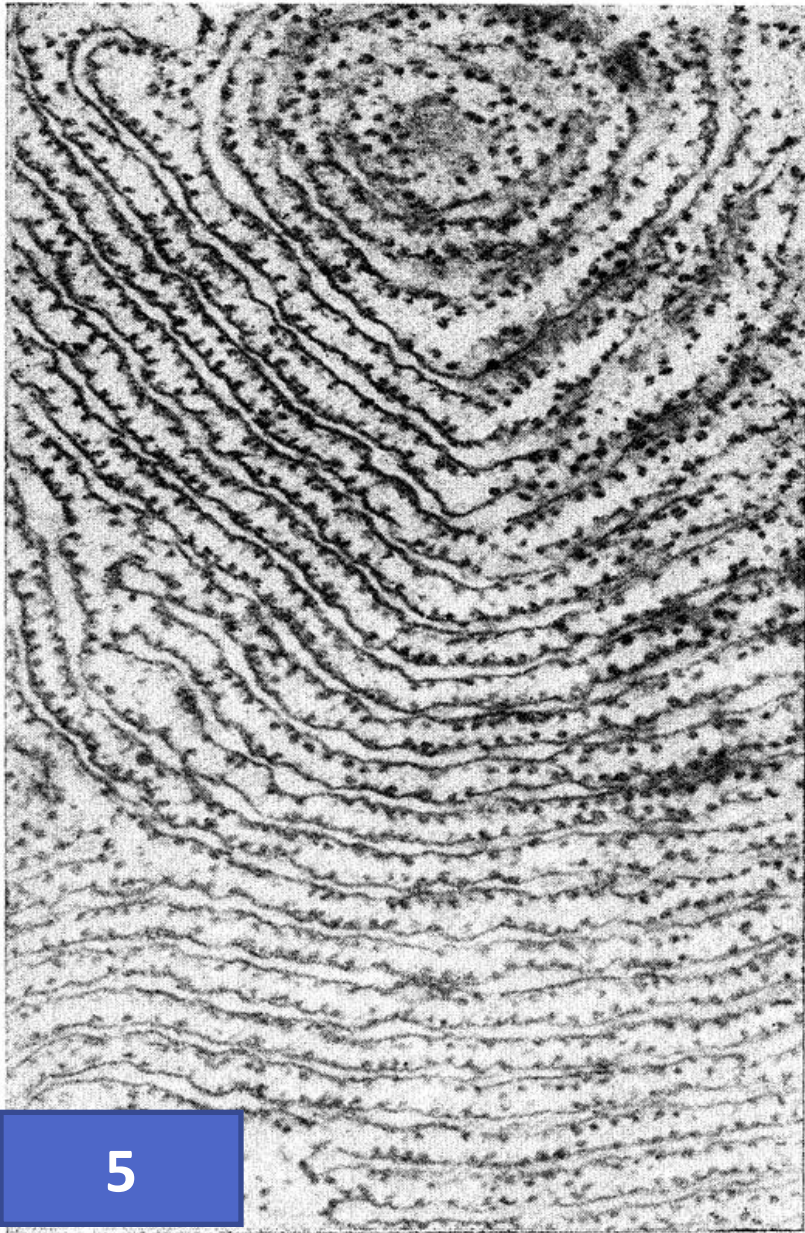
3



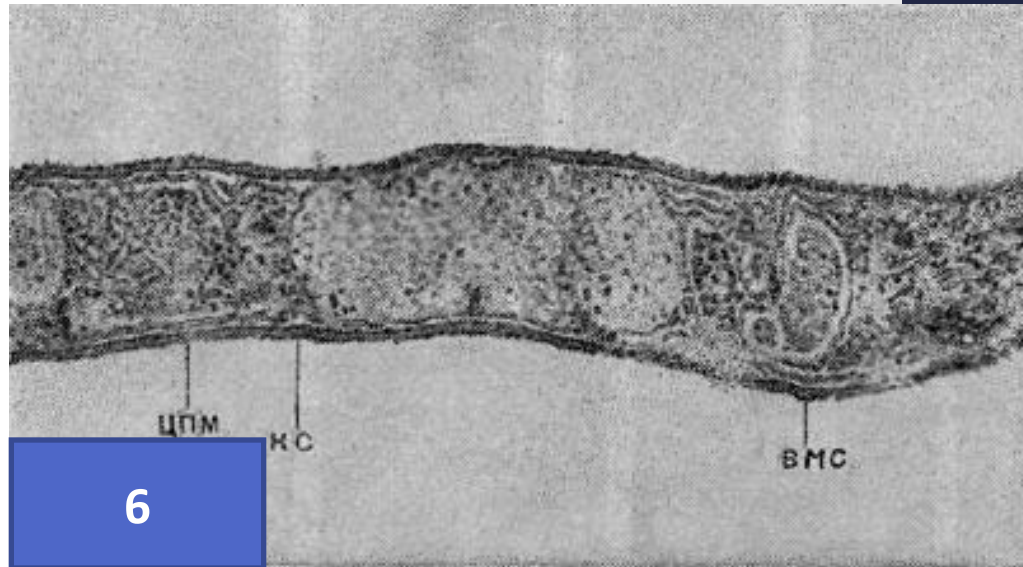
4



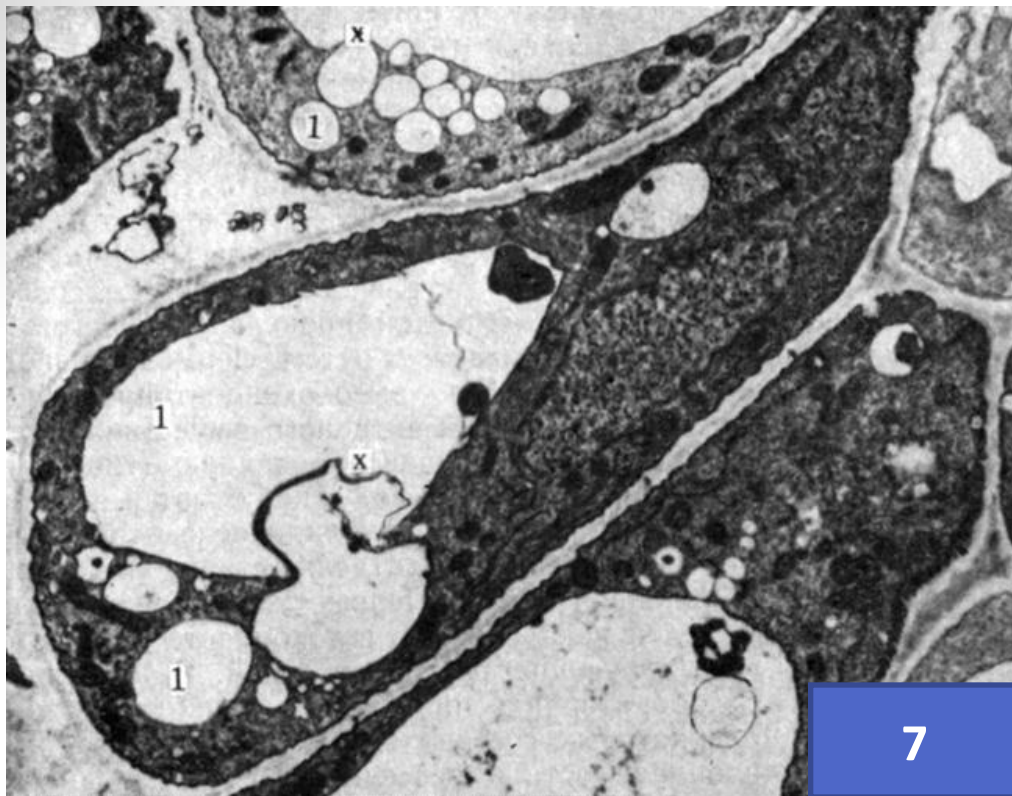




5



6



7



8



**Большое спасибо каждому  
из вас за урок**

**Вся последующая  
информация будет**

**Е**



# Molecule Movement & Cells

- Passive Transport
- Active Transport
- Endocytosis  
(phagocytosis & pinocytosis)
- Exocytosis



# Molecule Movement & Cells

- Passive Transport
- Active Transport
- Endocytosis  
(phagocytosis & pinocytosis)
- Exocytosis

# Passive Transport

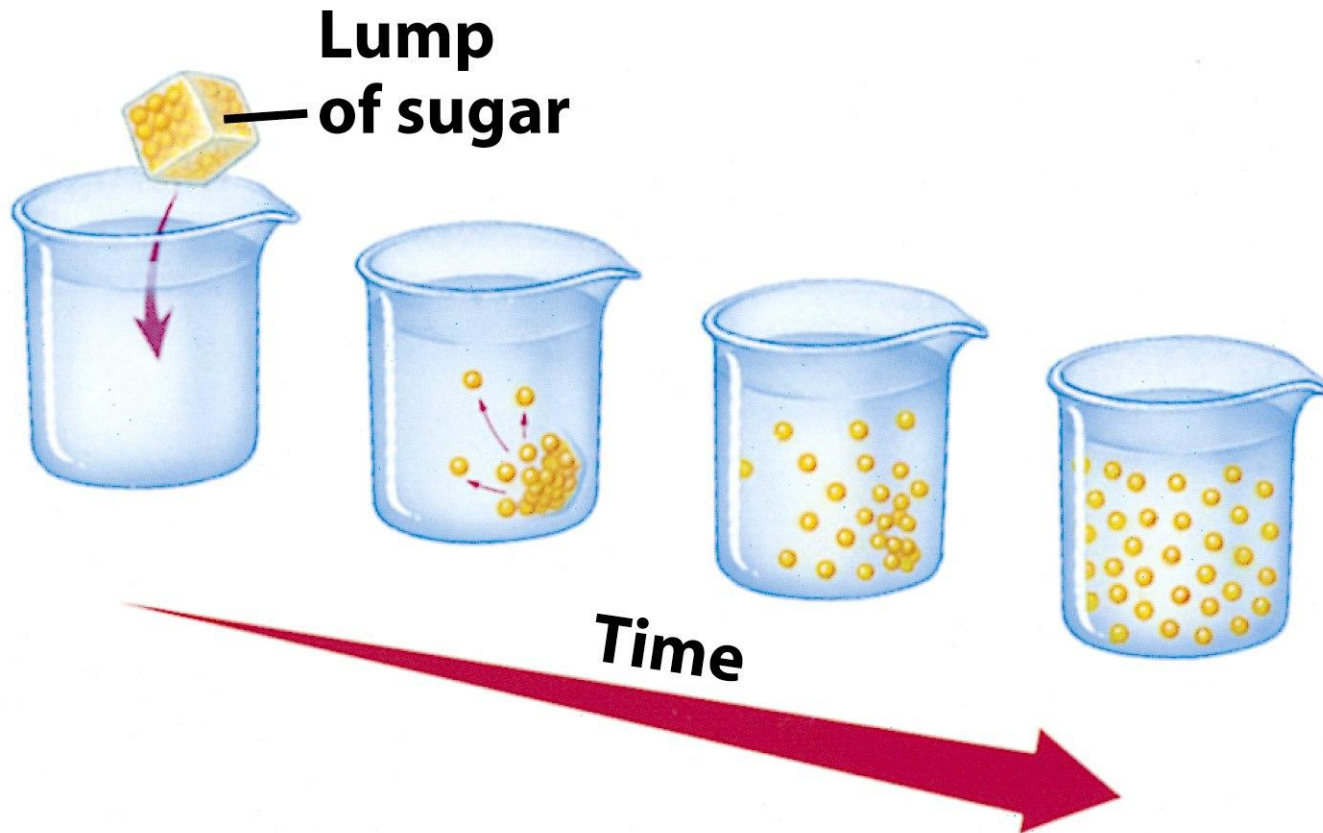
- No energy required
- Move due to gradient
  - differences in concentration, pressure, charge
- Move to equalize gradient
  - High moves toward low

# Types of Passive Transport

1. Diffusion
2. Osmosis
3. Facilitated diffusion

# Diffusion

- Molecules move to equalize concentration



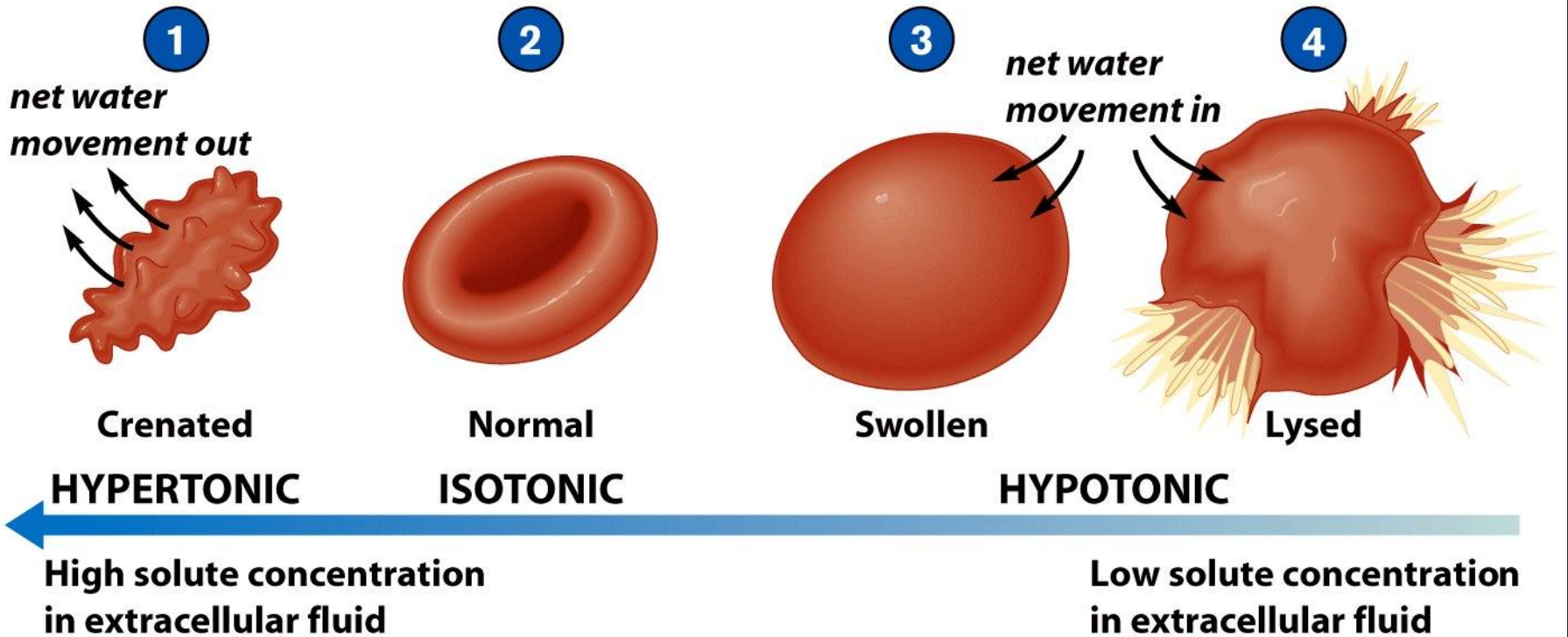


# Osmosis

- Special form of diffusion
- Fluid flows from lower solute concentration
- Often involves movement of water
  - Into cell
  - Out of cell

# Solution Differences & Cells

- solvent + solute = solution
- Hypotonic
  - Solutes in cell more than outside
  - Outside solvent will flow into cell
- Isotonic
  - Solutes equal inside & out of cell
- Hypertonic
  - Solutes greater outside cell
  - Fluid will flow out of cell



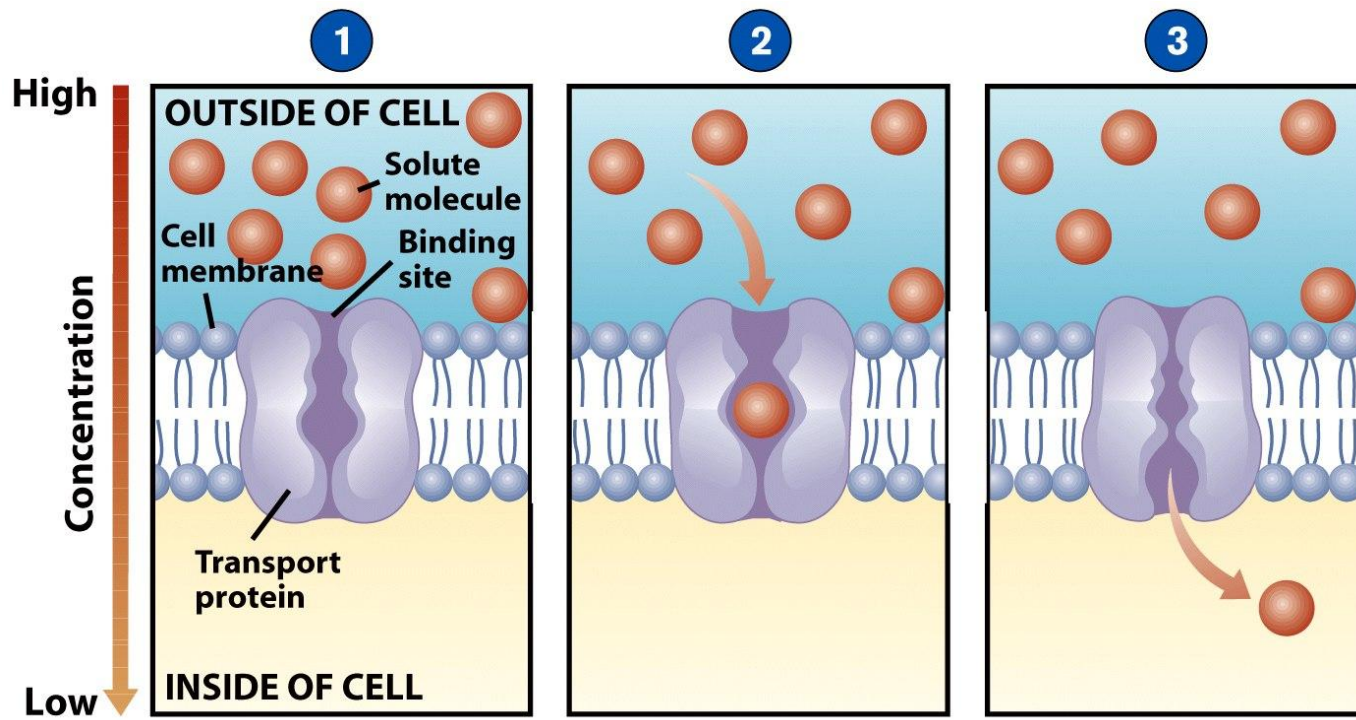
# Facilitated Diffusion

- Differentially permeable membrane
- Channels (are specific) help molecule or ions enter or leave the cell
- Channels usually are transport proteins (aquaporins facilitate the movement of water)
- No energy is used



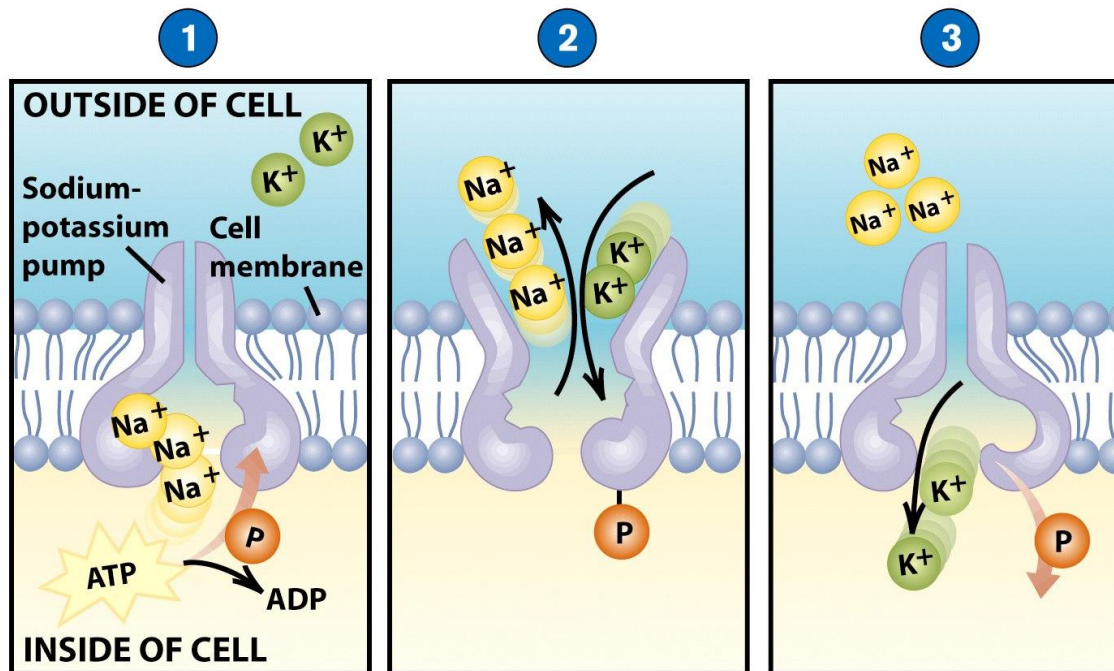
# Process of Facilitated Transport

- Protein binds with molecule
- Shape of protein changes
- Molecule moves across membrane



# Active Transport

- Molecular movement
- Requires energy (against gradient)
- Example is sodium-potassium pump

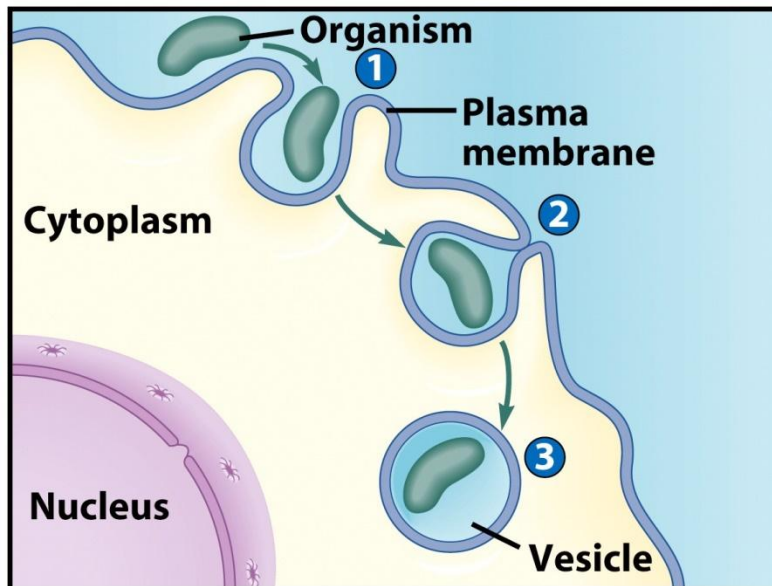


# Endocytosis

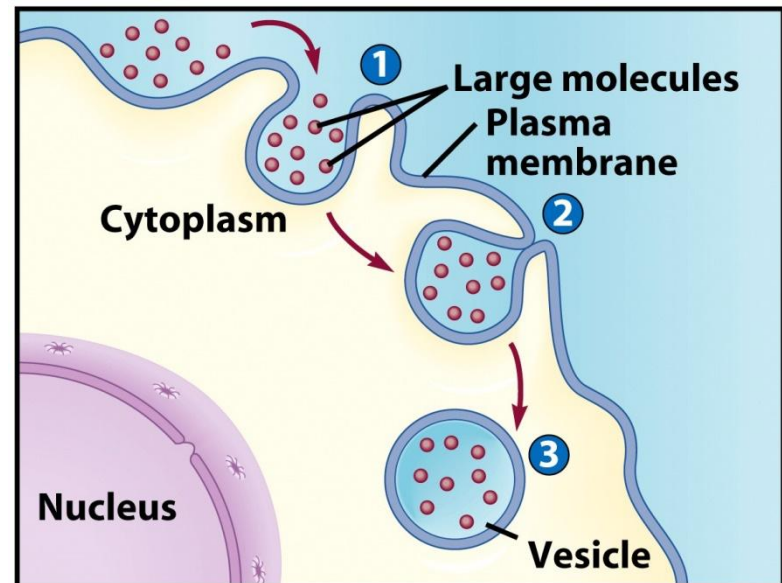
- Movement of large material
  - Particles
  - Organisms
  - Large molecules
- Movement is into cells
- Types of endocytosis
  - bulk-phase (nonspecific)
  - receptor-mediated (specific)

# Process of Endocytosis

- Plasma membrane surrounds material
- Edges of membrane meet
- Membranes fuse to form vesicle



**PHAGOCYTOSIS**

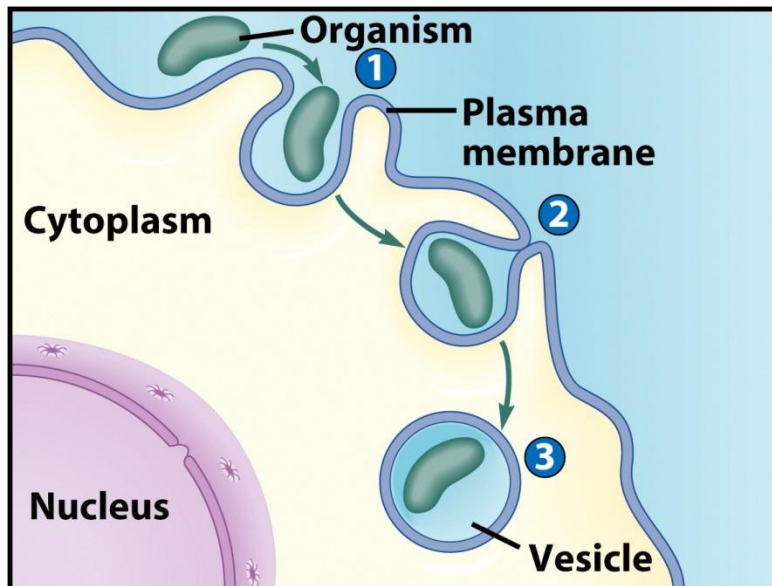


**PINOCYTOSIS**

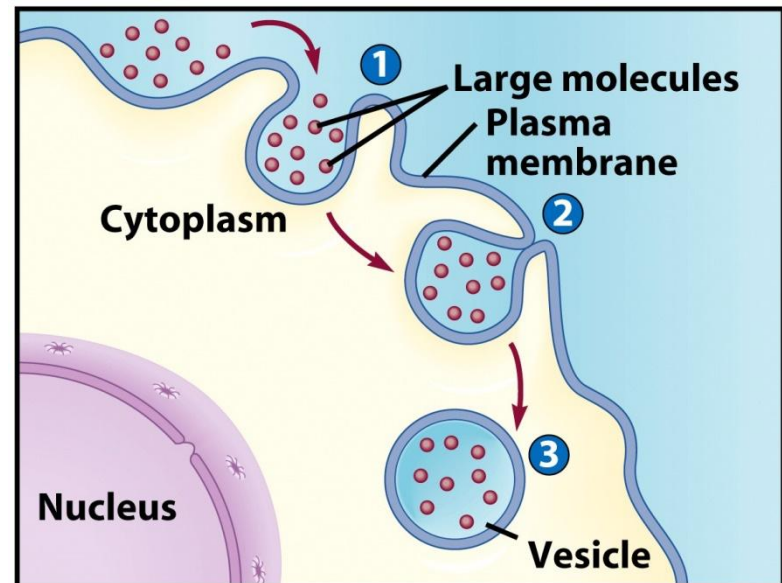


# Forms of Endocytosis

- Phagocytosis – cell eating
- Pinocytosis – cell drinking



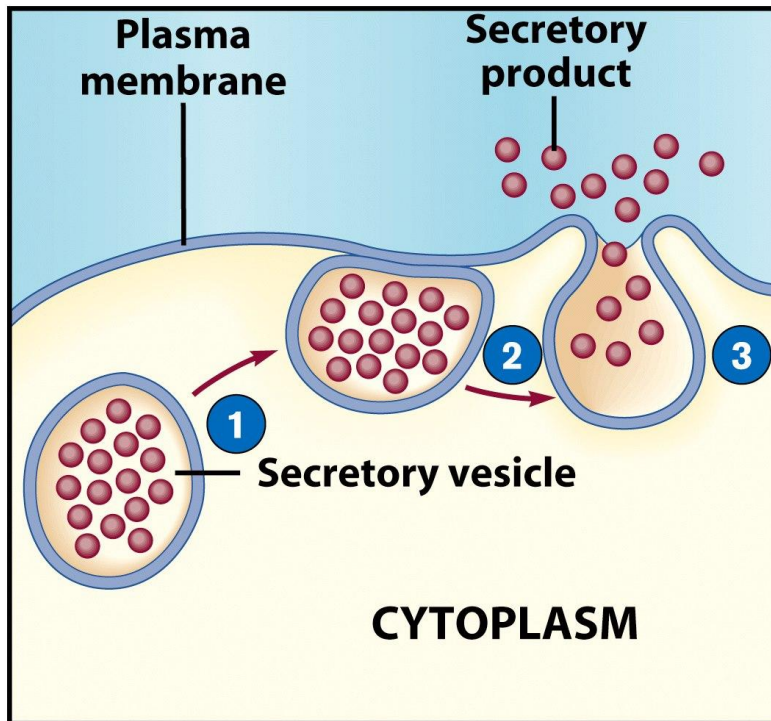
**PHAGOCYTOSIS**



**PINOCYTOSIS**

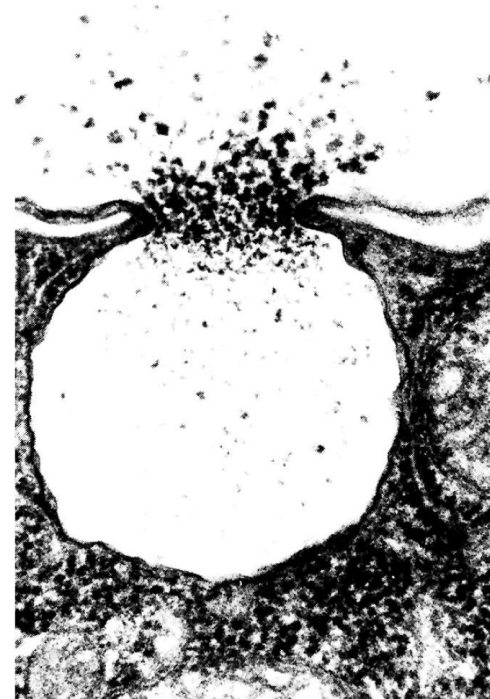
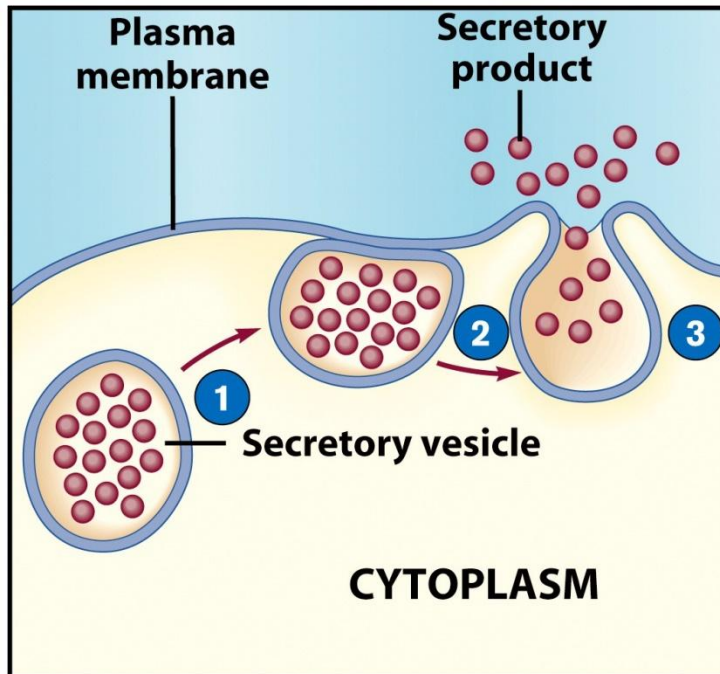
# Exocytosis

- Reverse of endocytosis
- Cell discharges material

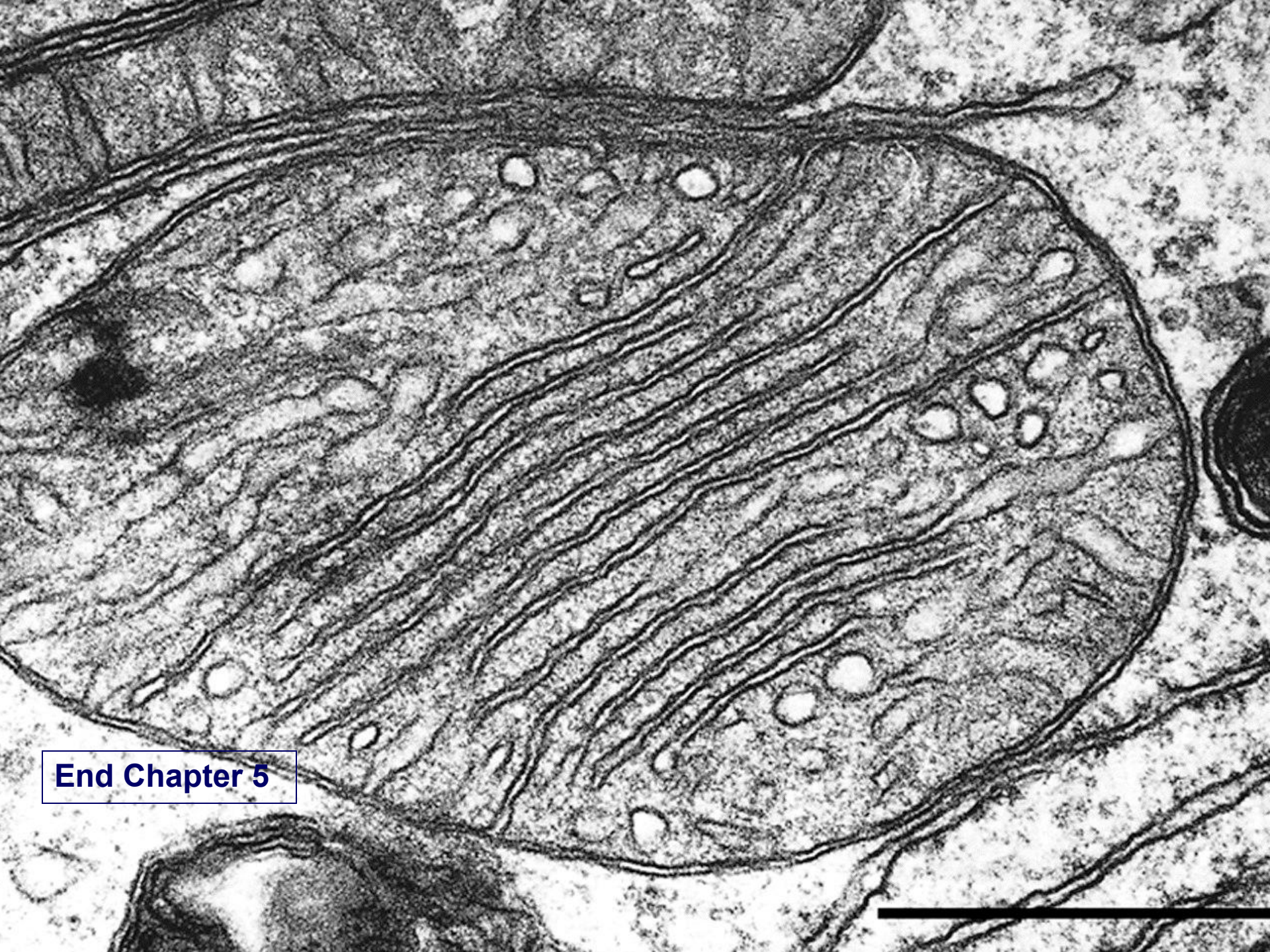


# Exocytosis

- Vesicle moves to cell surface
- Membrane of vesicle fuses
- Materials expelled







**End Chapter 5**

