

Lesson 1

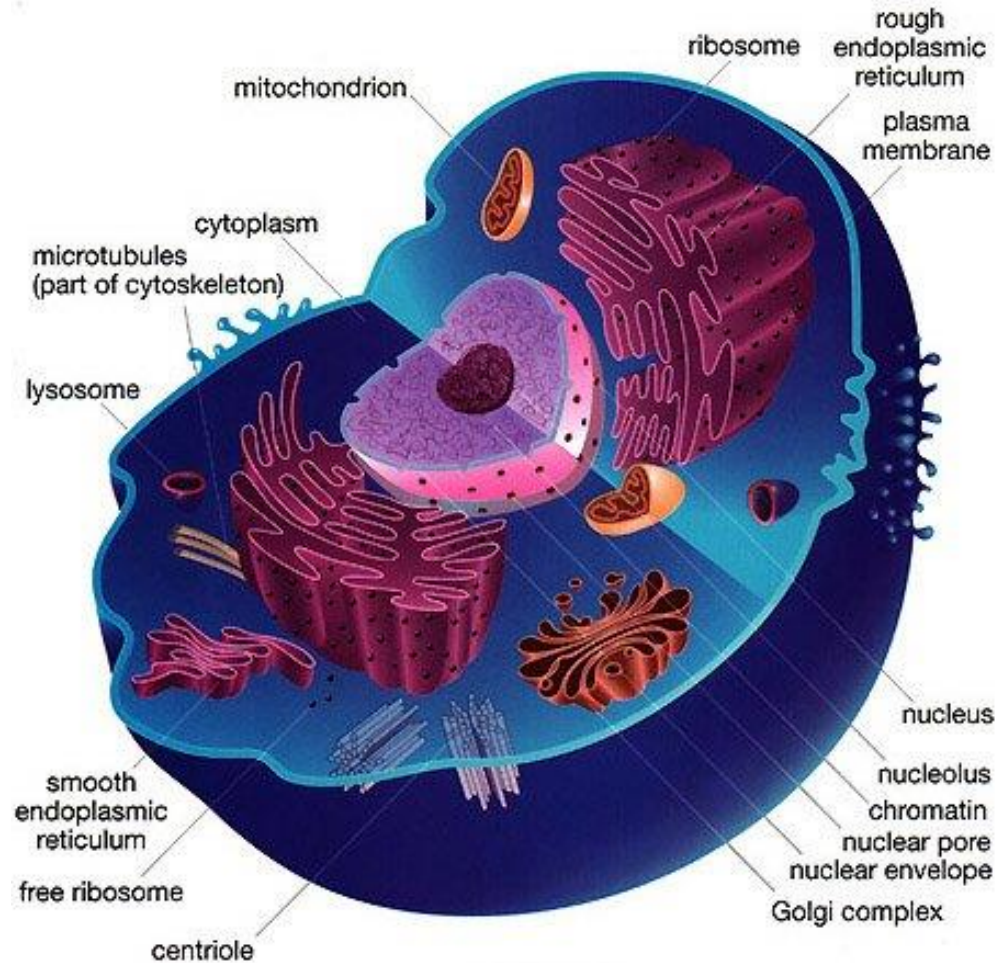
Cell Theory

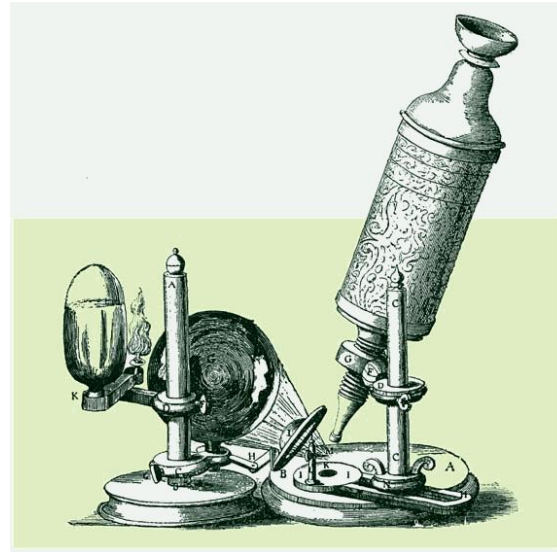
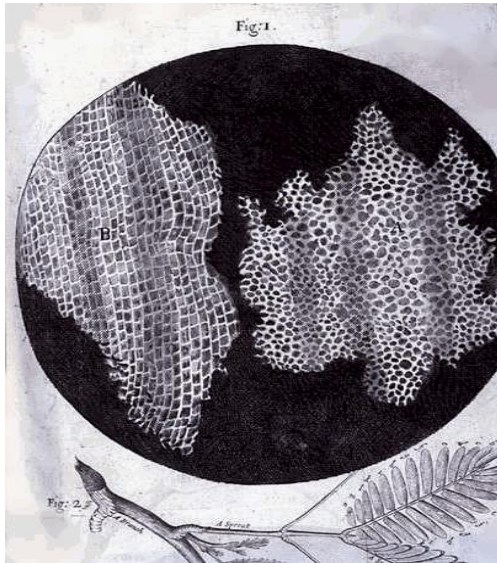
- Statements
- Exceptions

Categorizing Cells

- Prokaryotes vs Eukaryotes

The Cell Theory





Robert Hooke
(1635-1703)

- The discovery of cells and their structure is linked to the development of the magnifying lenses, particularly the microscope in the late 1600's
- Many scientists of the time recognized the importance of cells as building blocks of living tissue. But not until **1838-39** did the general statement of "**cell theory**" receive general acceptance

The Cell Theory States:

1. All living things are composed of cells.
2. Cells are the basic unit of structure and function in all living things.
3. Cells arise from pre-existing cells.

Exceptions to the Cell Theory:

1. Where did the first cell come from?

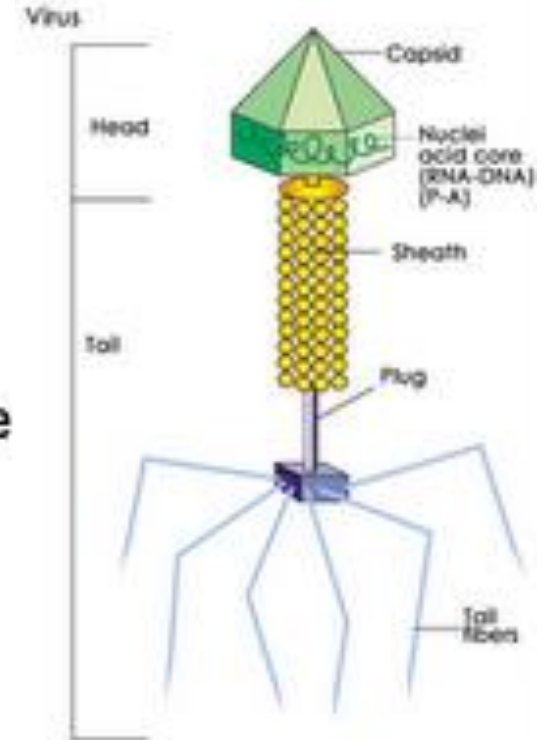
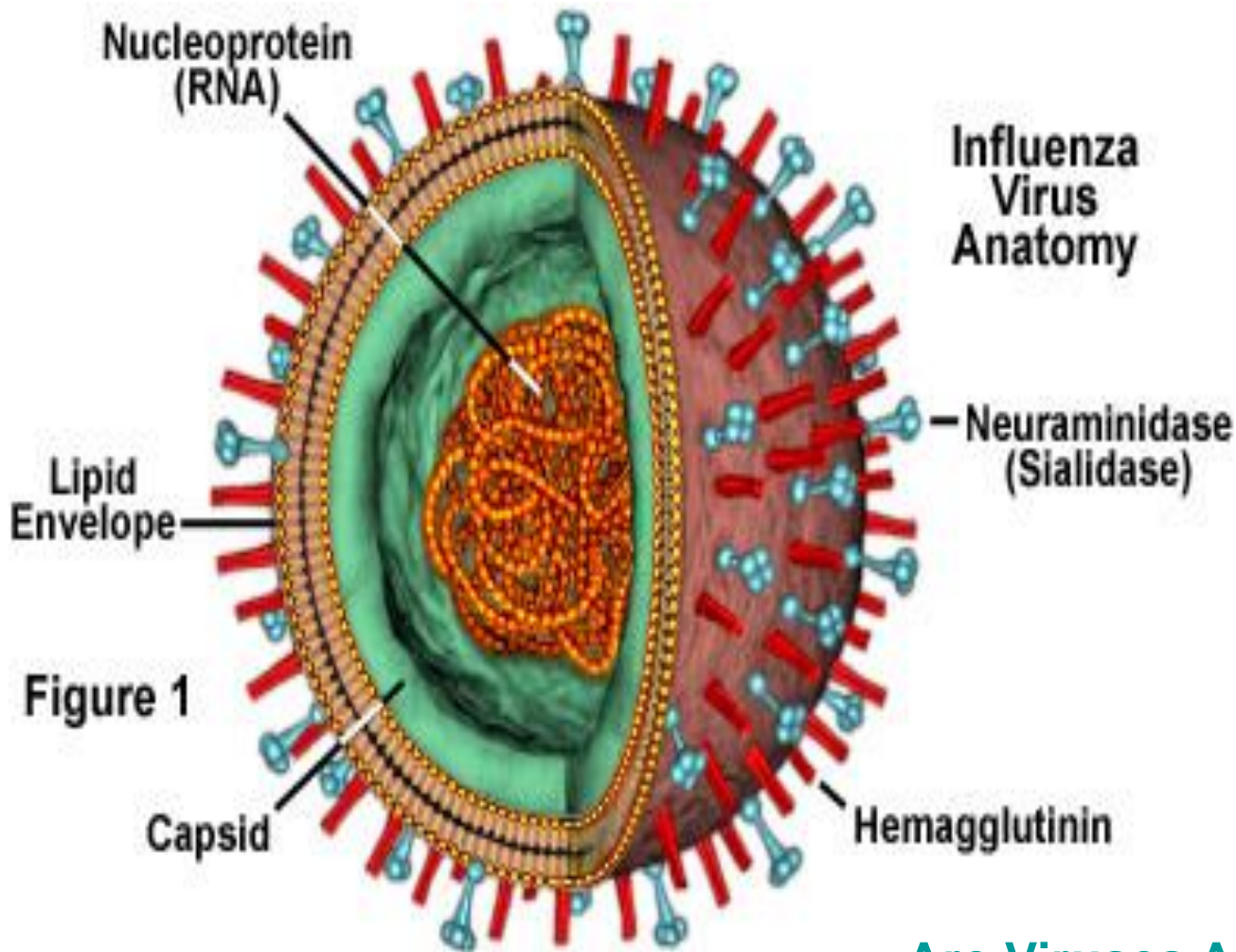
2. Viruses

- have a non-cellular structure and can only **REPRODUCE** within a host cell

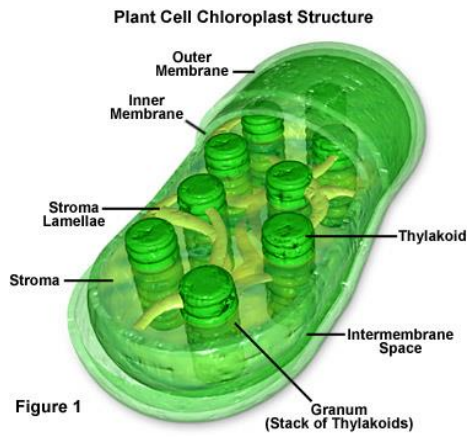
3. Mitochondria & Chloroplasts

- have their own DNA
- can reproduce within a cell

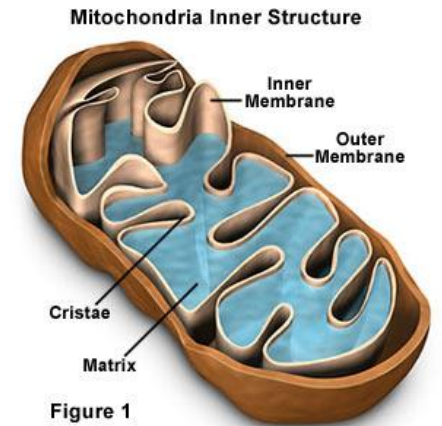
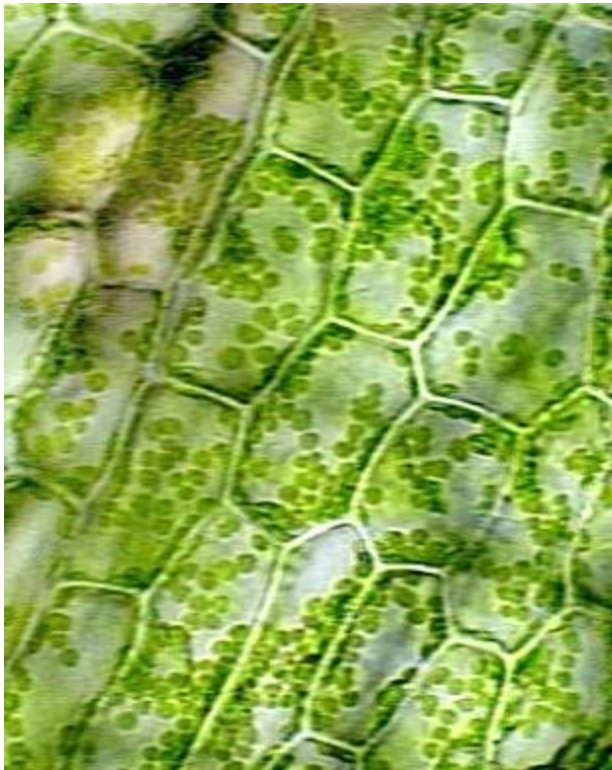
Viruses



[Are Viruses Alive? - YouTube](#)



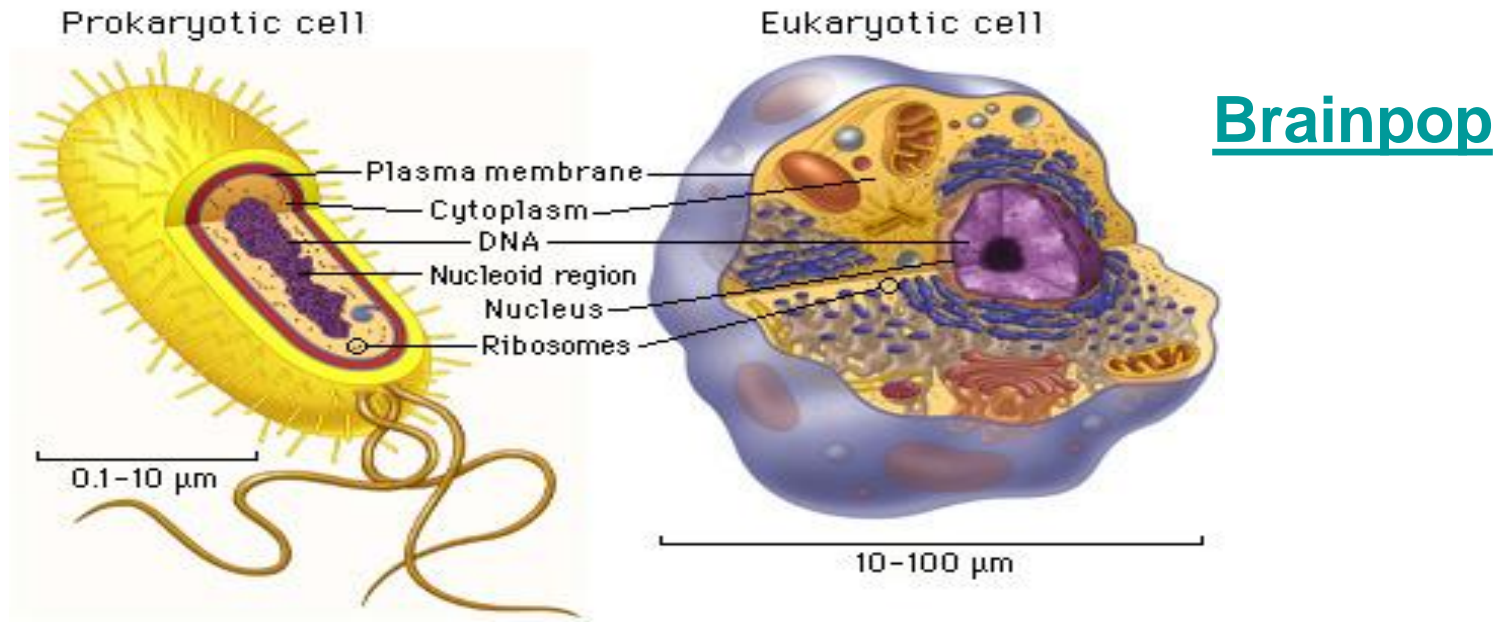
Chloroplast



Mitochondria



Categorizing Cells



- Eukaryotes: complex cells with nuclei and many cell organelles (Animals, plants, fungi and protists) **YOU are a Eukaryote!**
- Prokaryotes: simple cells with no nuclear membrane and few organelles (ex. bacteria)

Lesson 2

Cell Organelles – Structures

Label & color code diagrams

**Vacuole /
vesicle**

Cell Wall

Lysosome

Cytoplasm

Nucleus

Nucleolus

Mitochondria

Ribosomes

Chloroplast

**Golgi
Complex**

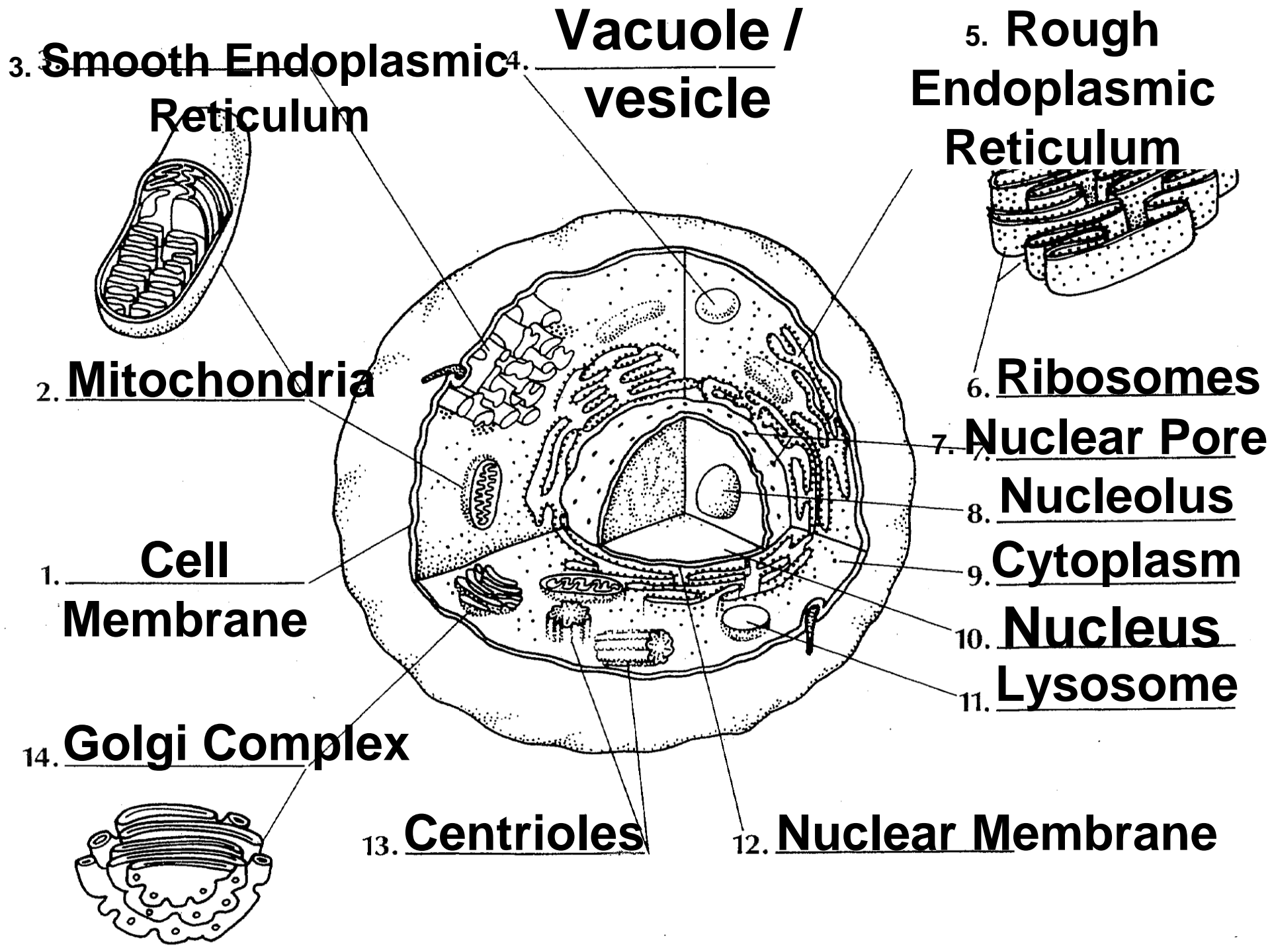
**Cell
Membrane**

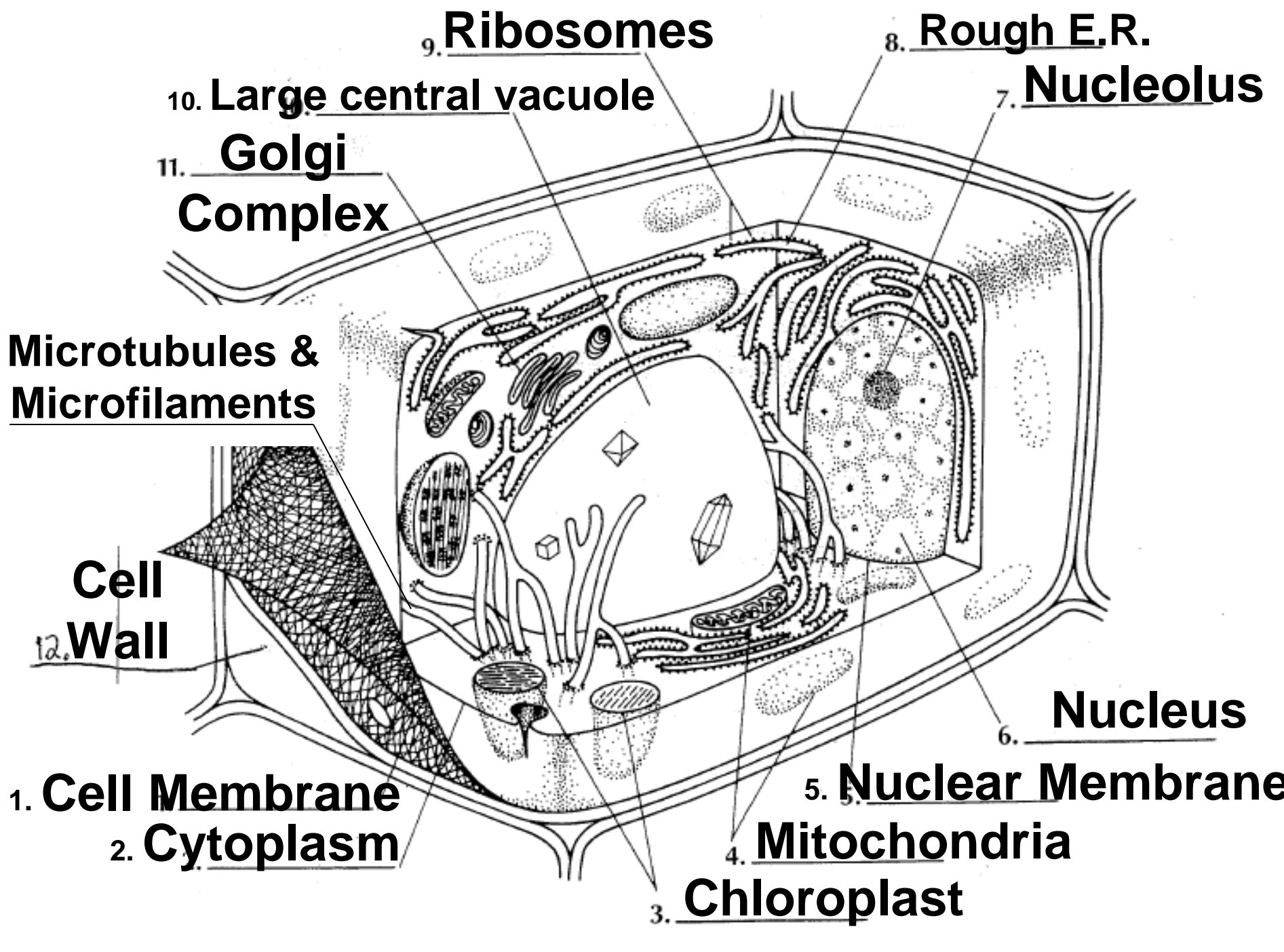
**Endoplasmic
Reticulum**

**Microtubules &
Microfilaments**

**Nuclear
Membrane**

Centrioles





Lesson 3

Cell Organelles – Functions

Matching notes sheet

**Vacuole /
vesicle**

Cell Wall

Lysosome

Cytoplasm

Nucleus

Nucleolus

Mitochondria

Ribosomes

Chloroplast

**Golgi
Complex**

**Cell
Membrane**

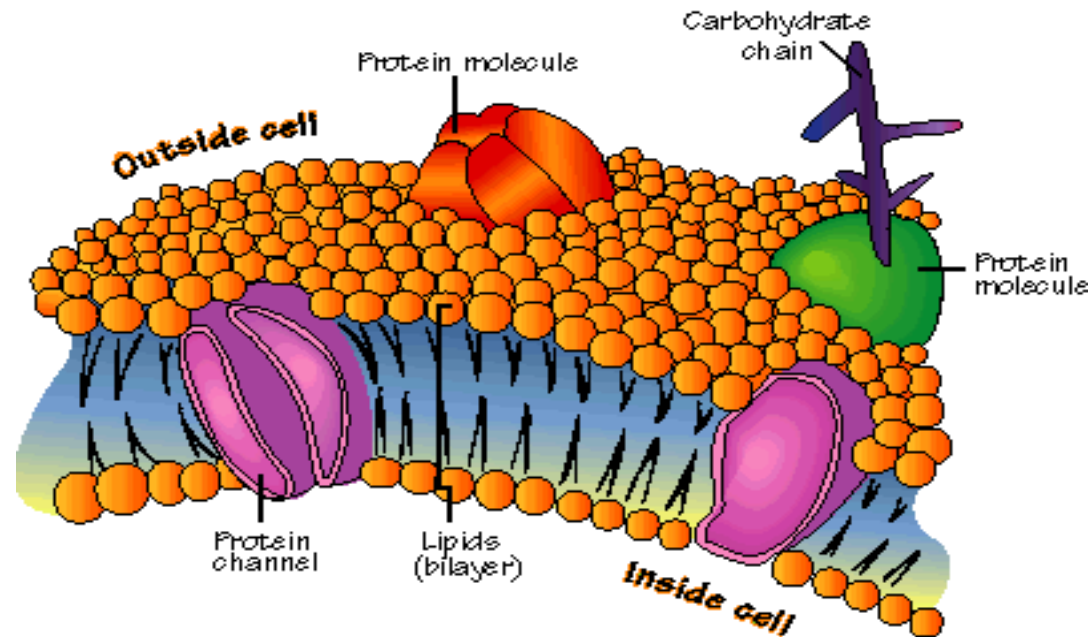
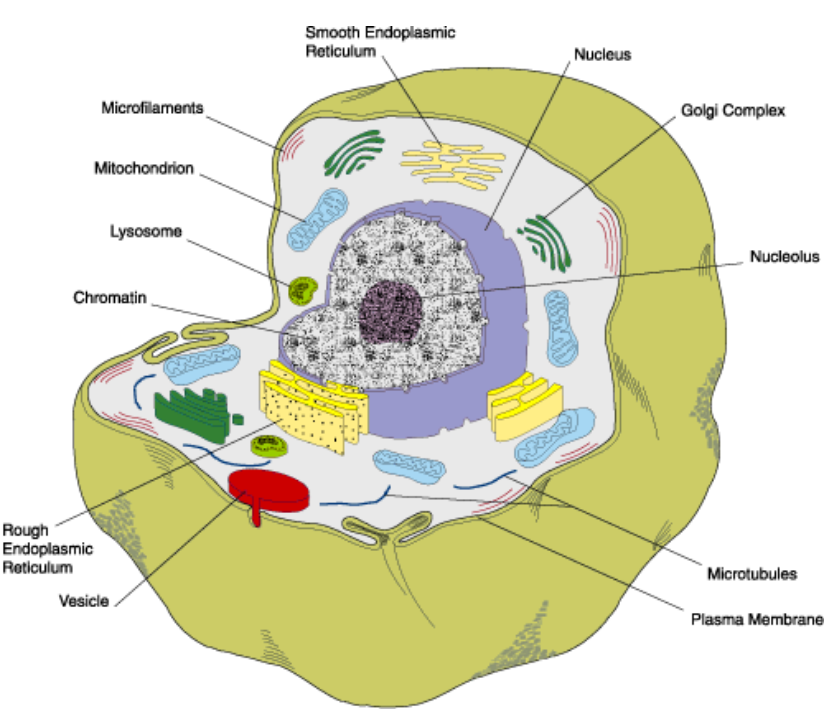
**Endoplasmic
Reticulum**

**Microtubules &
Microfilaments**

Centrioles

1. Cell (Plasma) Membrane

- Regulates the movement of materials into and out of the cell
- “selectively permeable”
- Contains Receptors for cellular communication



2. Nucleus

- Contains the genetic information (chromosomes, genes, DNA)
- Controls and directs the cell's activities
- Has a porous membrane

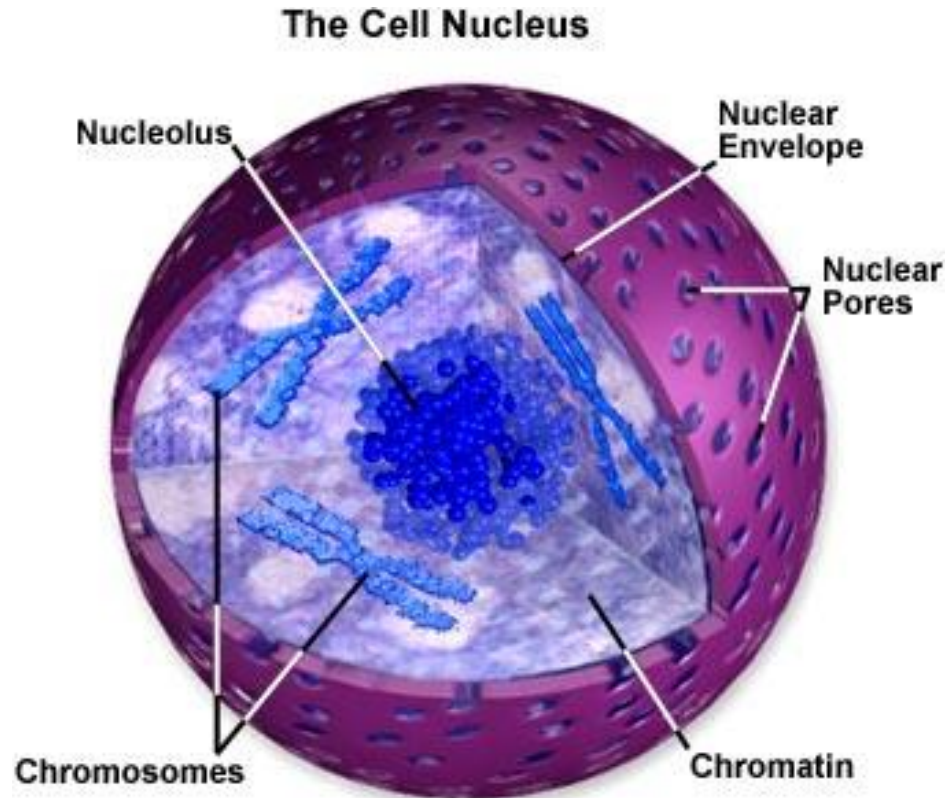
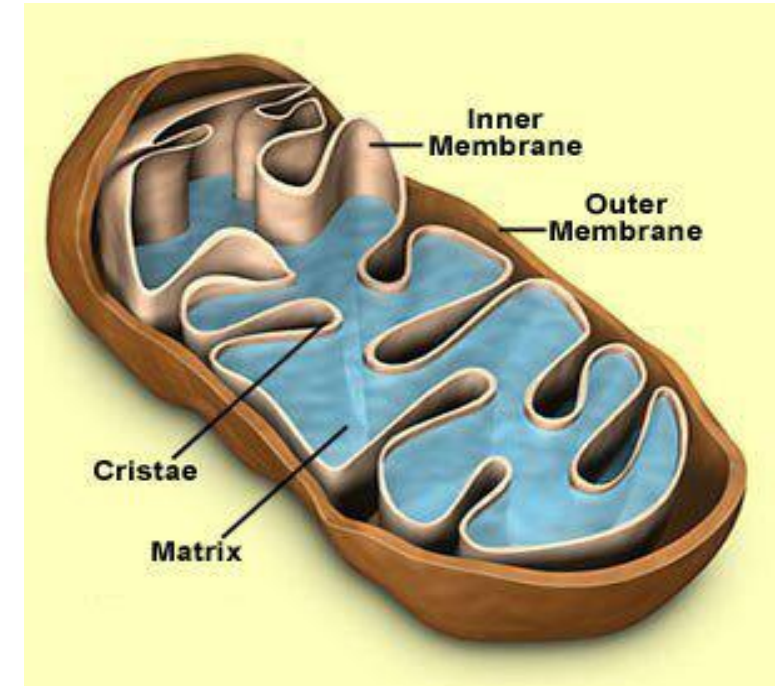
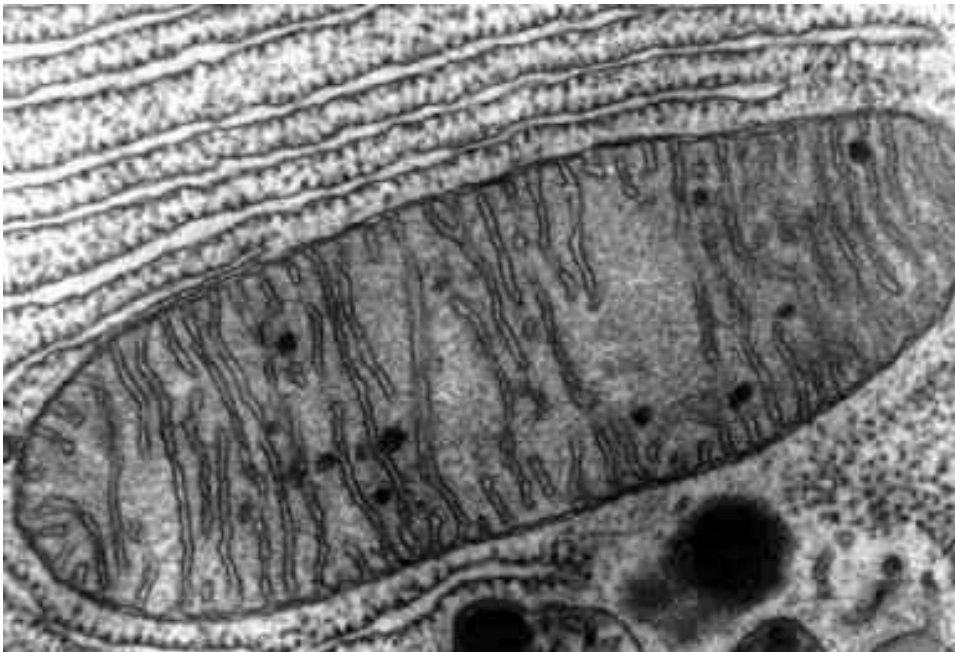


Figure 1

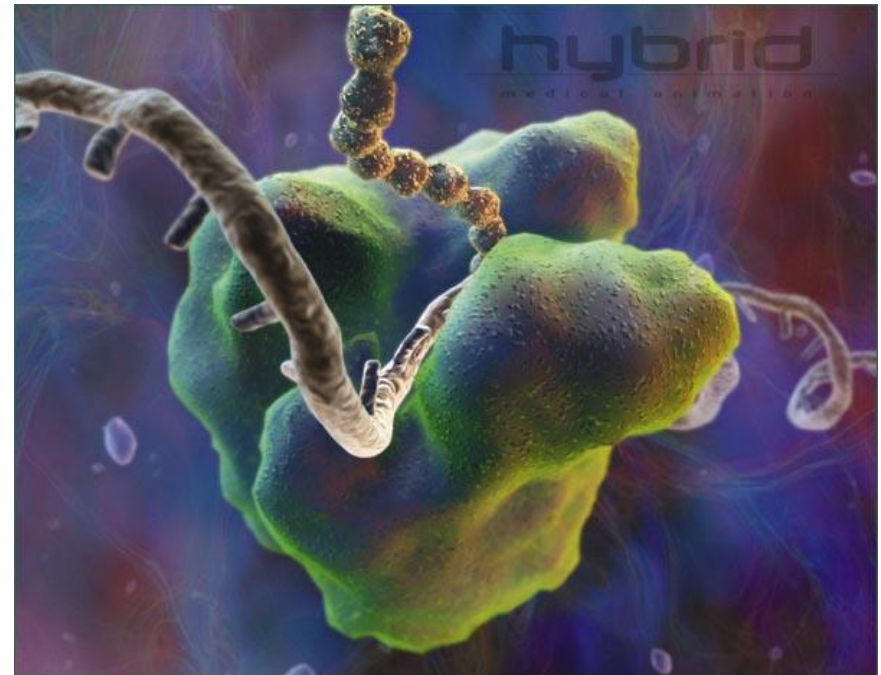
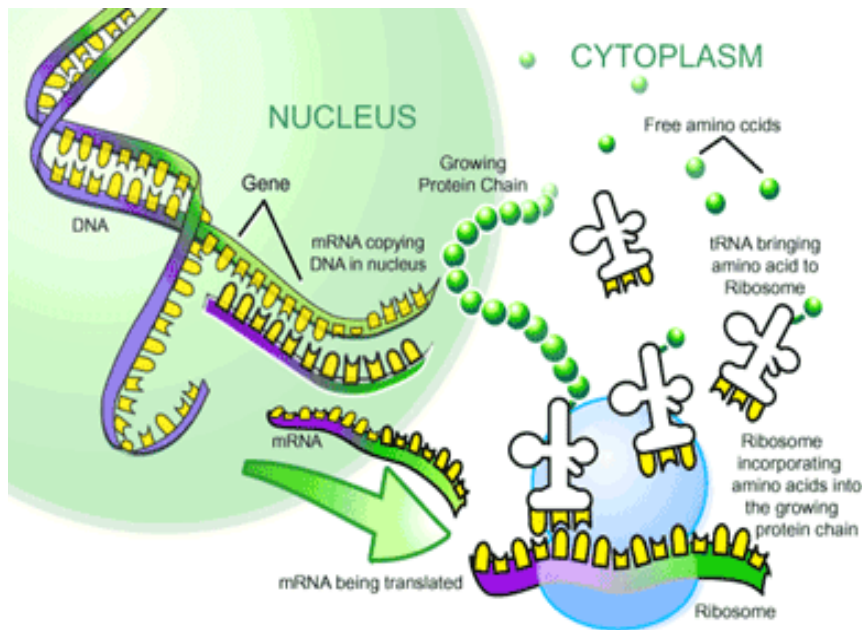
3. Mitochondria

- Site of cellular respiration
- Produces ENERGY (ATP!)



4. Ribosomes

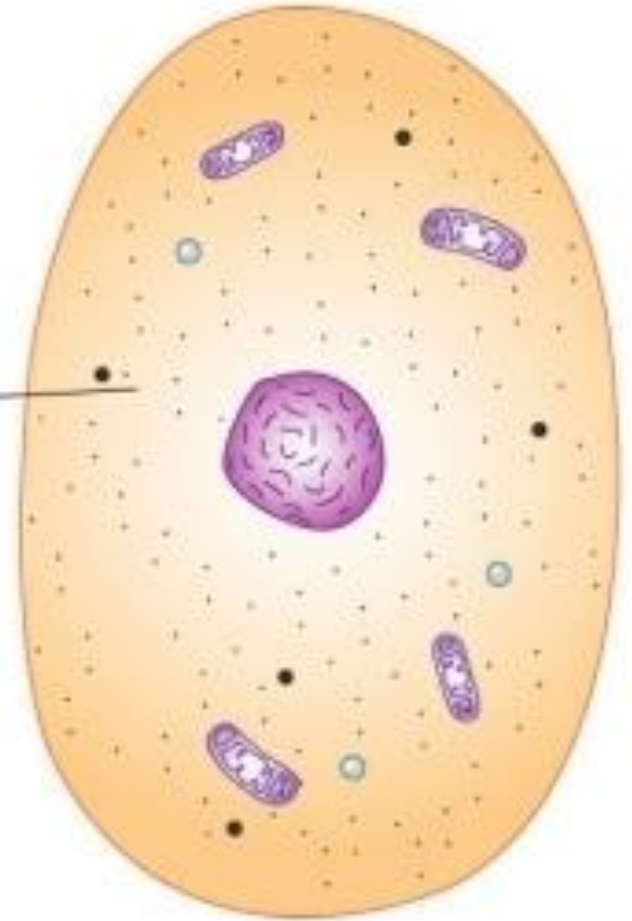
- Site of protein synthesis (the main job of the cell) - building proteins out of amino acids)



5. Cytoplasm

- Watery jelly-like medium
- Circulates materials around the cell (cyclosis)
- Site for many chemical reactions

cytoplasm



6. Nucleolus

- Builds
Ribosomes
which make
proteins
- Contains
messenger
RNA

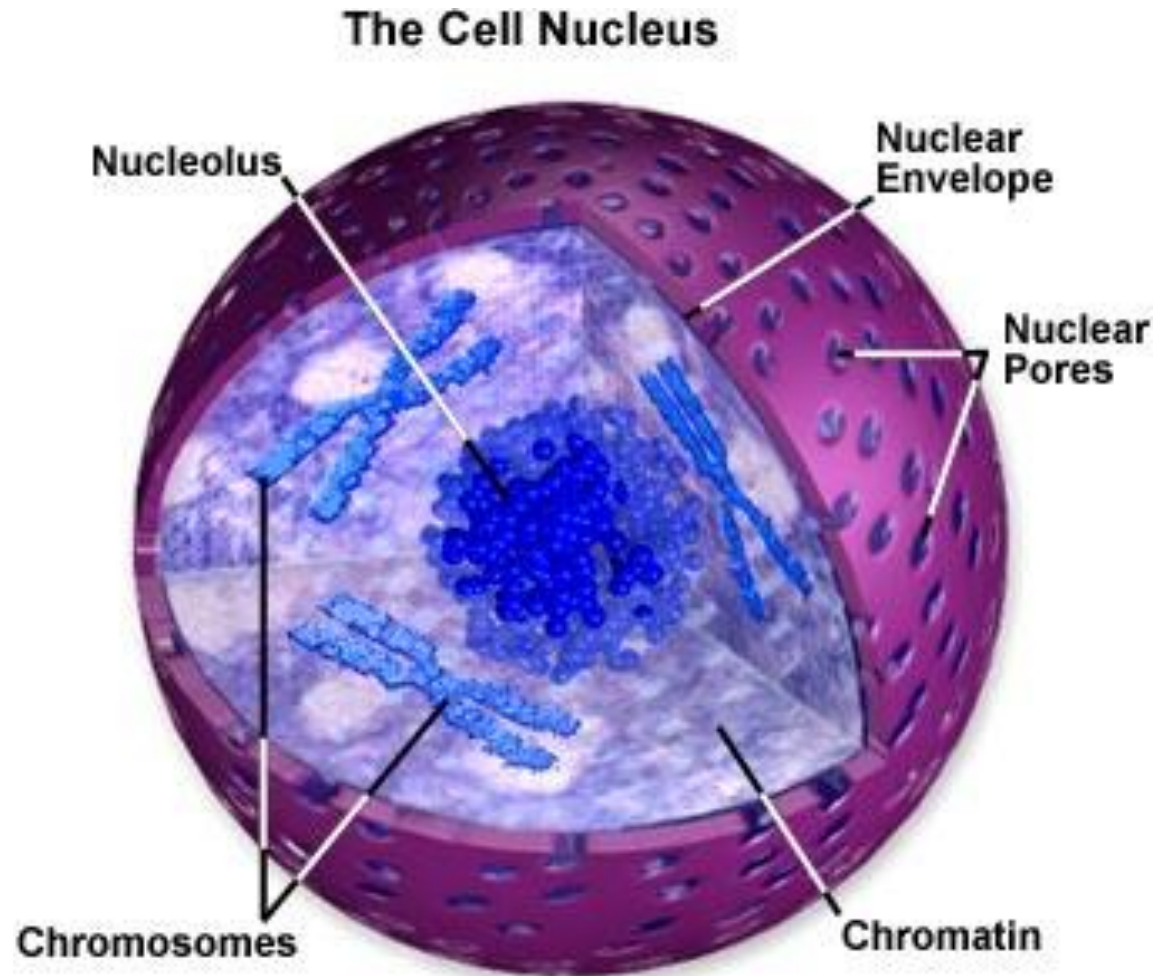
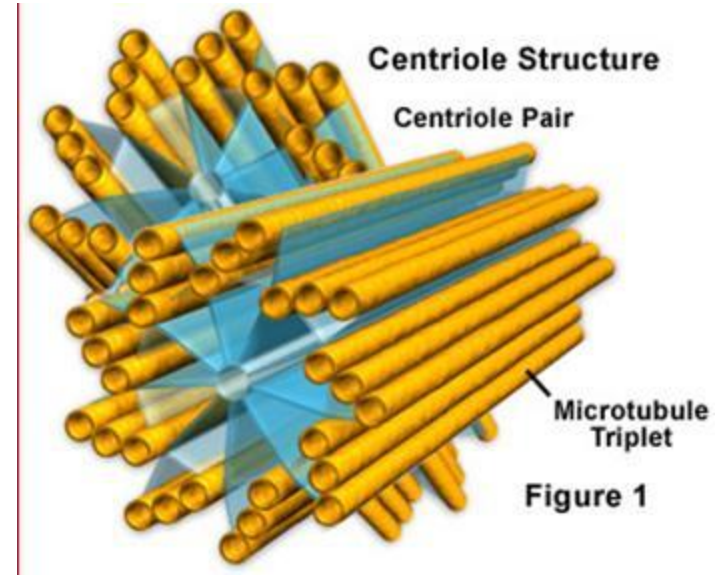
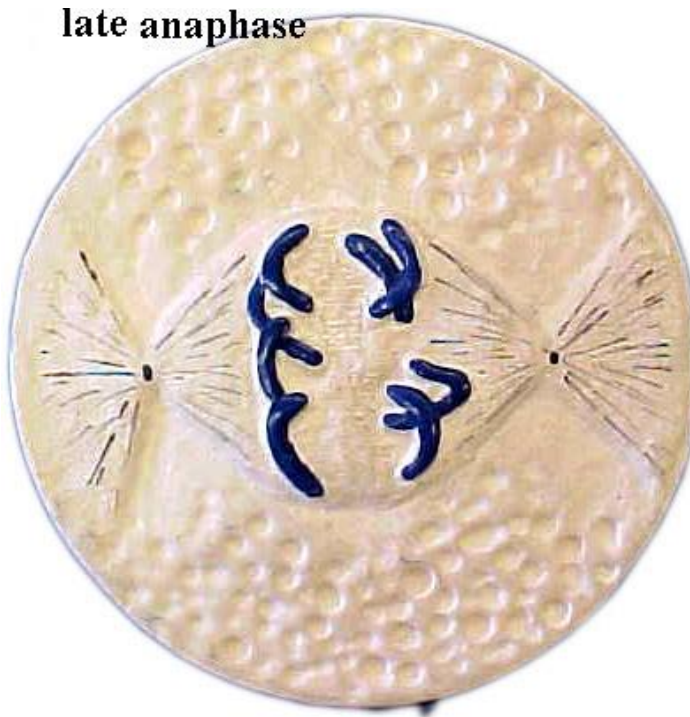


Figure 1

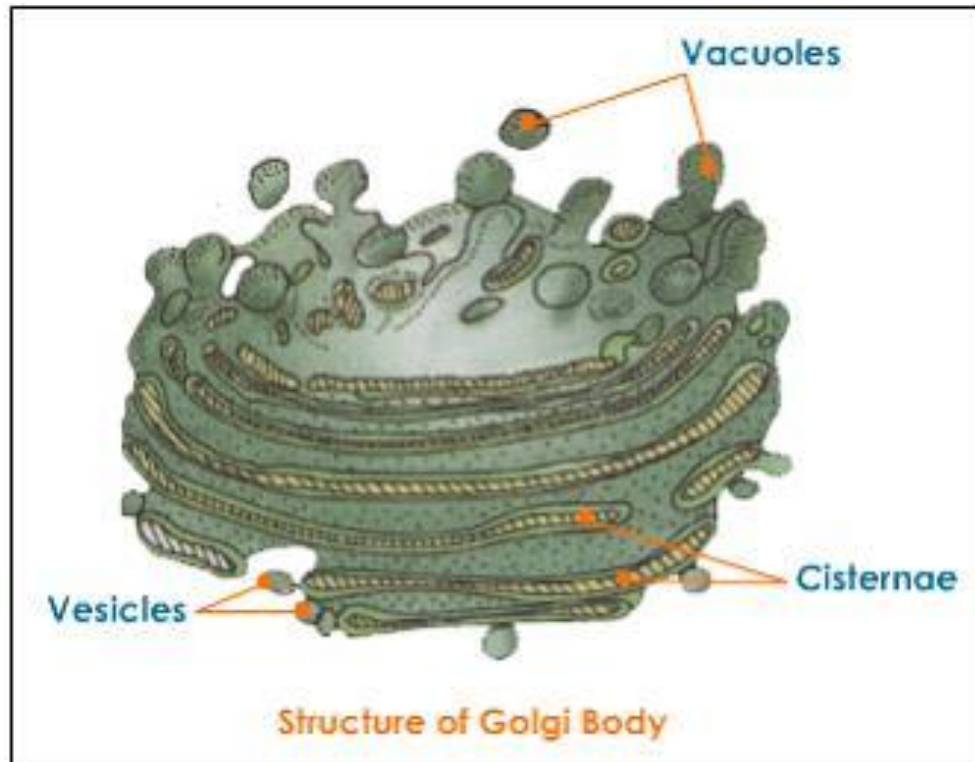
7. Centrioles

- Used in Cell division (mitosis)
- Only in animal cells



8. Golgi Complex (Apparatus)

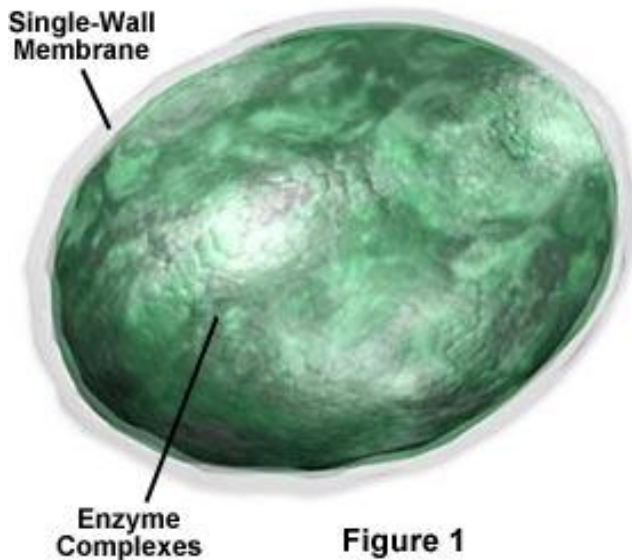
- Packages Proteins made by ribosomes
- Sends proteins to final destination either in the cell membrane or outside of the cell through secretory vesicles



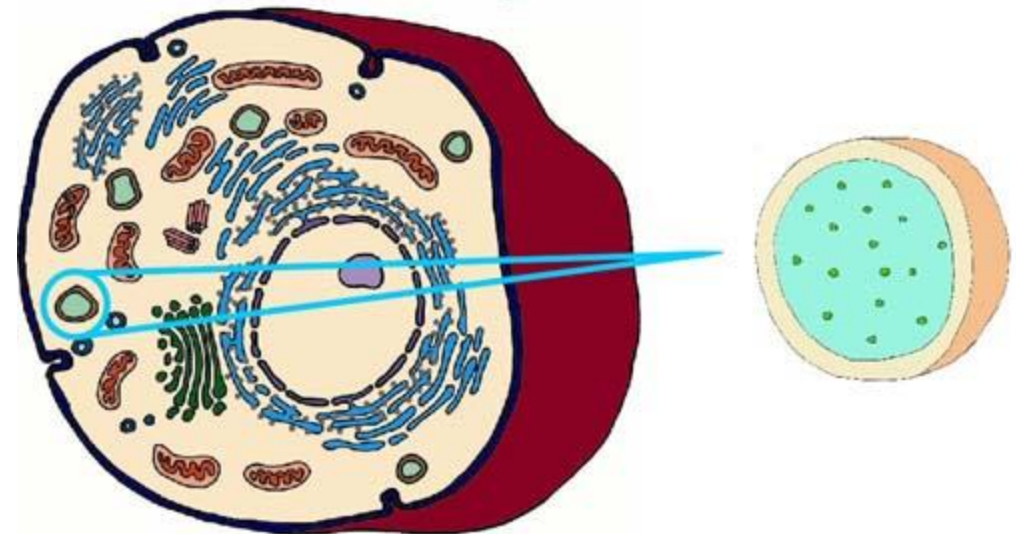
9. Lysosome

- Contain enzymes
- Fuse w/food vacuoles to help with digestion
- Break down worn out organelles
 - “Lyse” rhymes with “slice”

Lysosome Structure

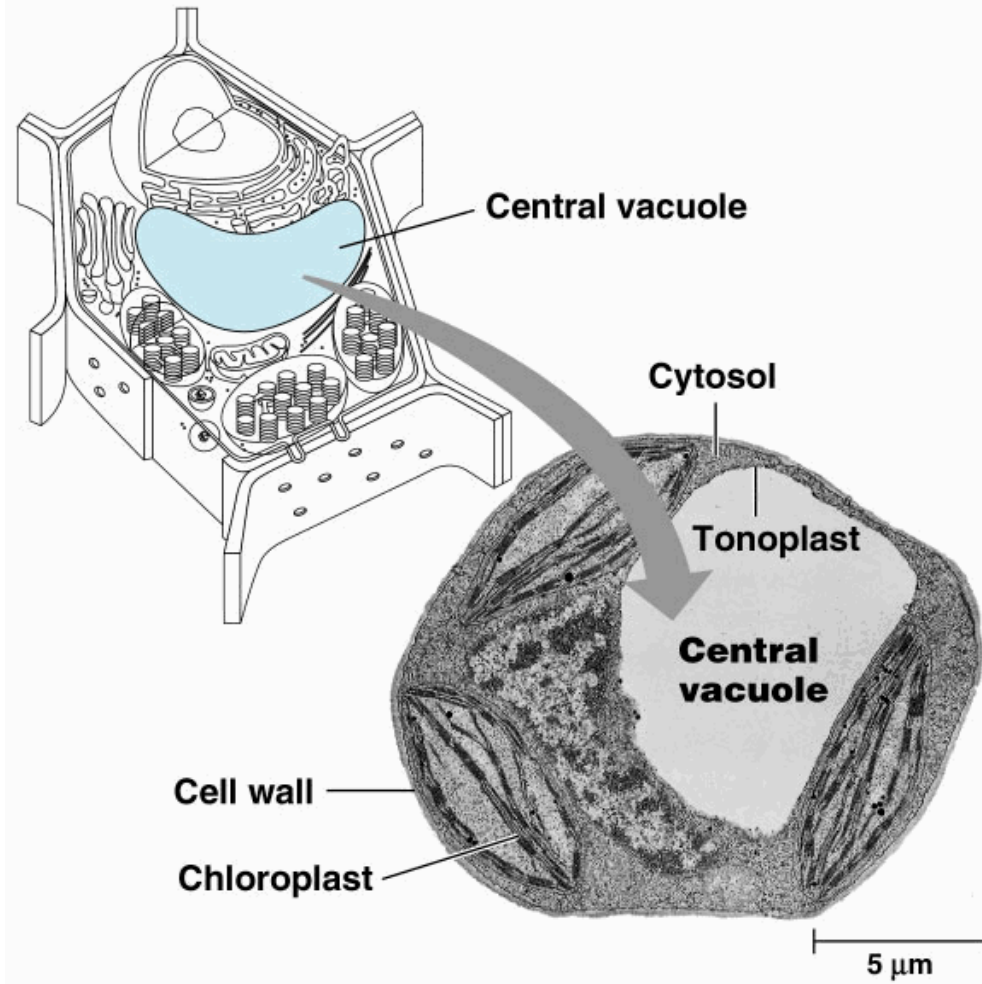


Lysosome



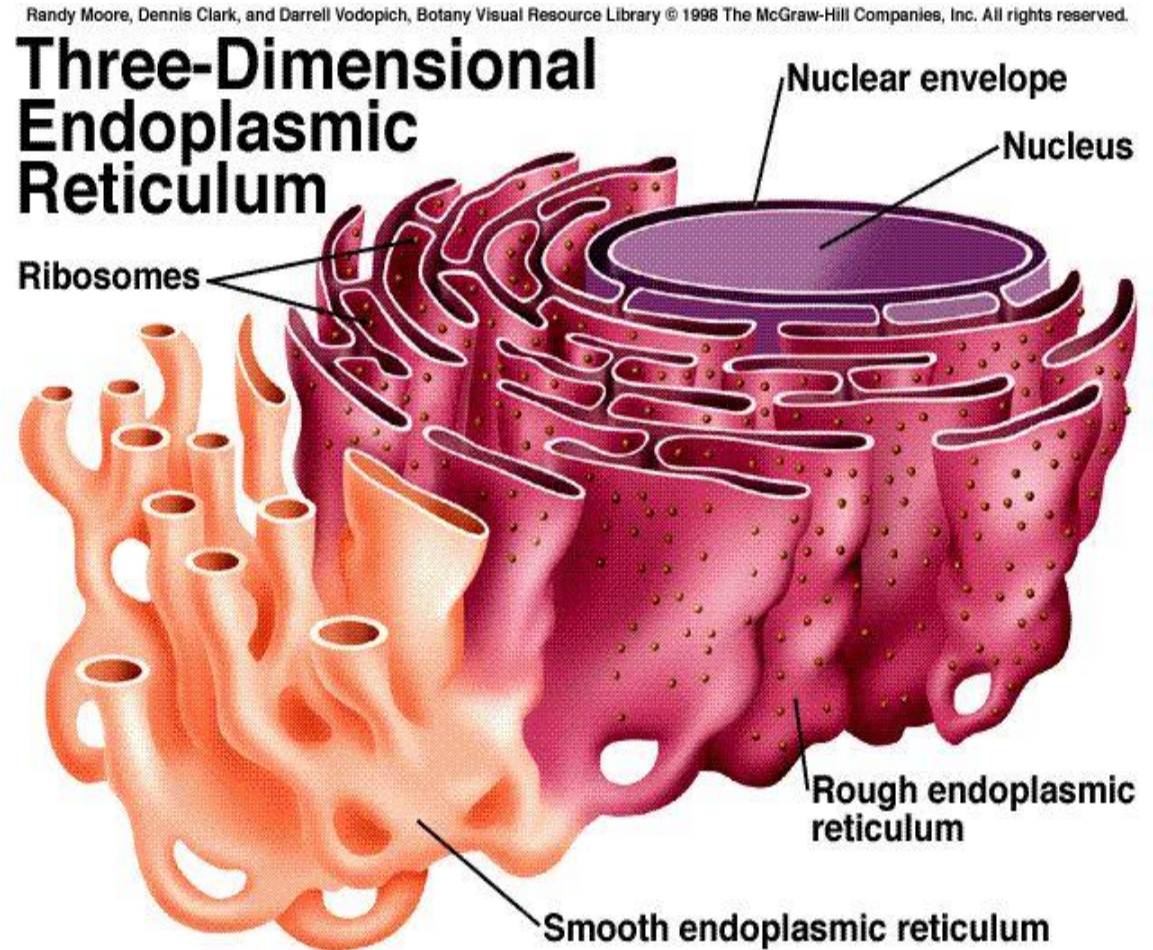
10. Vacuole / vesicle

- Storage of water, food, enzymes, waste
- **Contractile vacuole** helps maintain water balance unicellular protists



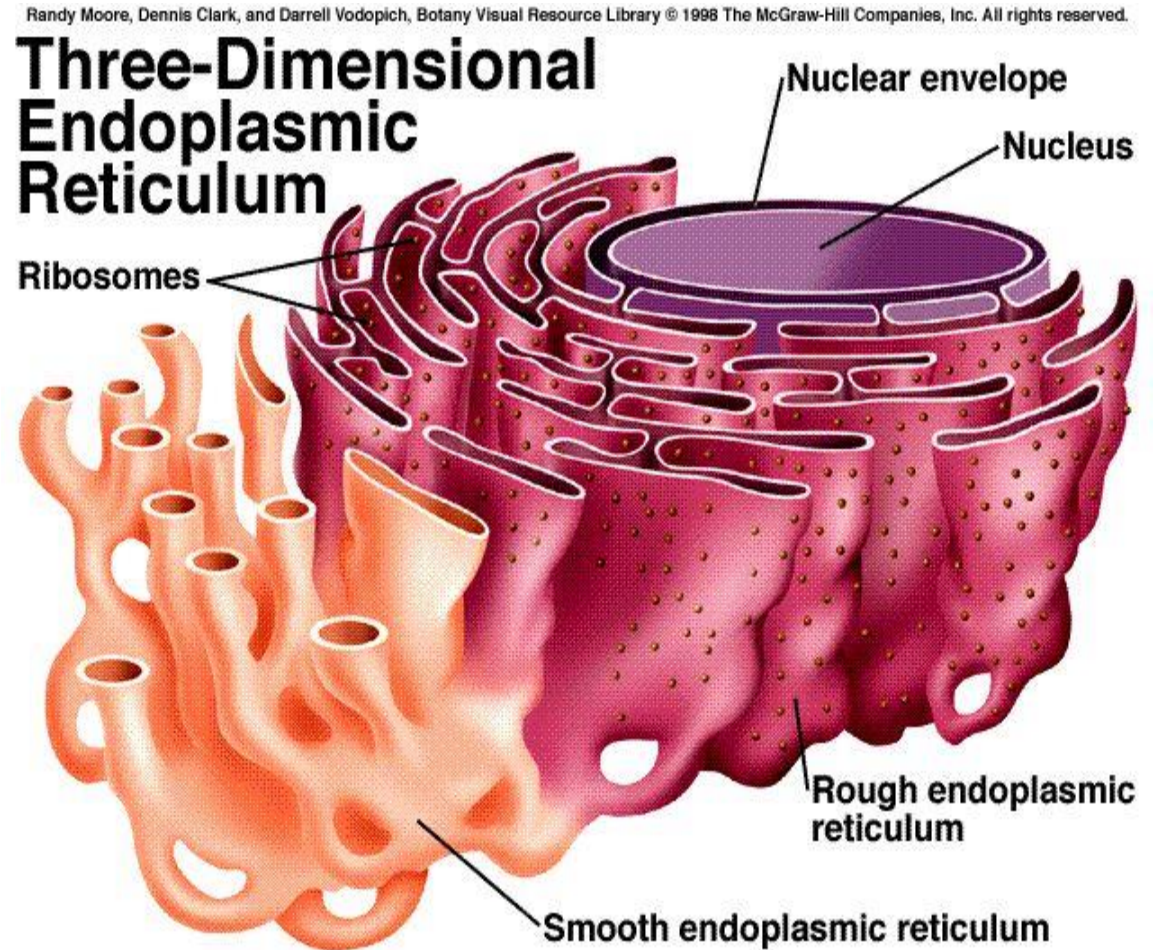
11. Endoplasmic Reticulum

- Transport, storage, and synthesis of substances (mainly proteins) within the cell



Rough Endoplasmic Reticulum

- Covered in ribosomes (rough)
- Takes the proteins and send them to the golgi complex

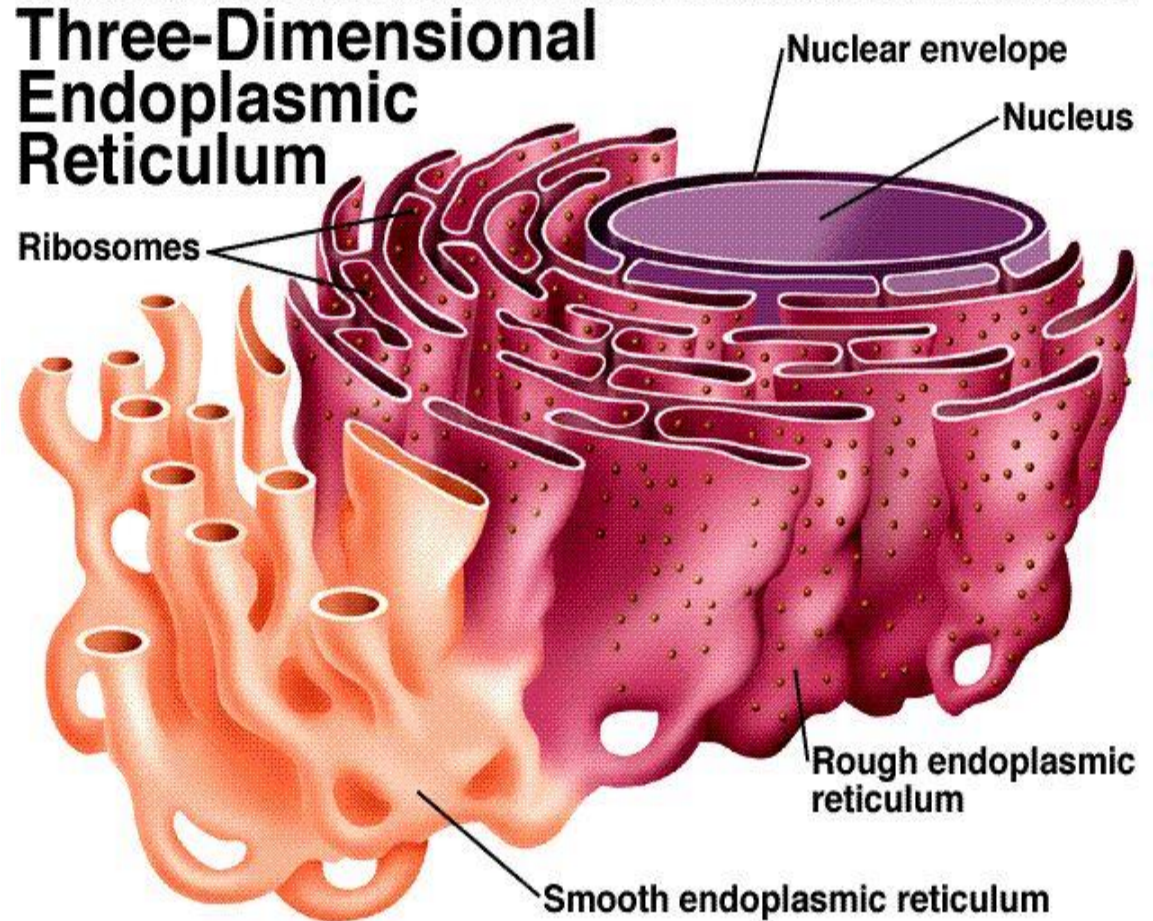


Smooth Endoplasmic Reticulum

- Not covered in ribosomes
- Storage and creation of steroids

Randy Moore, Dennis Clark, and Darrell Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.

Three-Dimensional Endoplasmic Reticulum



12. Chloroplast

- Contain chlorophyll (green pigment)
- Site for photosynthesis in autotrophs (ex. Plants & algae)

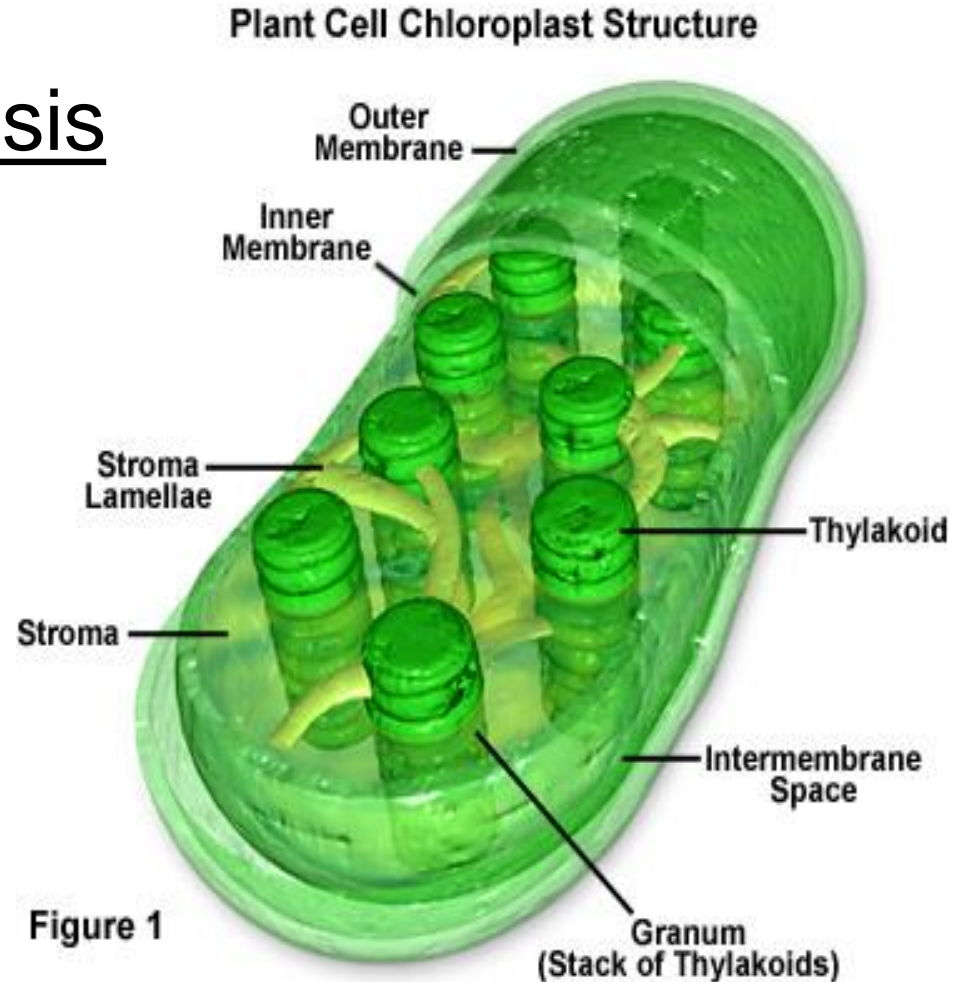
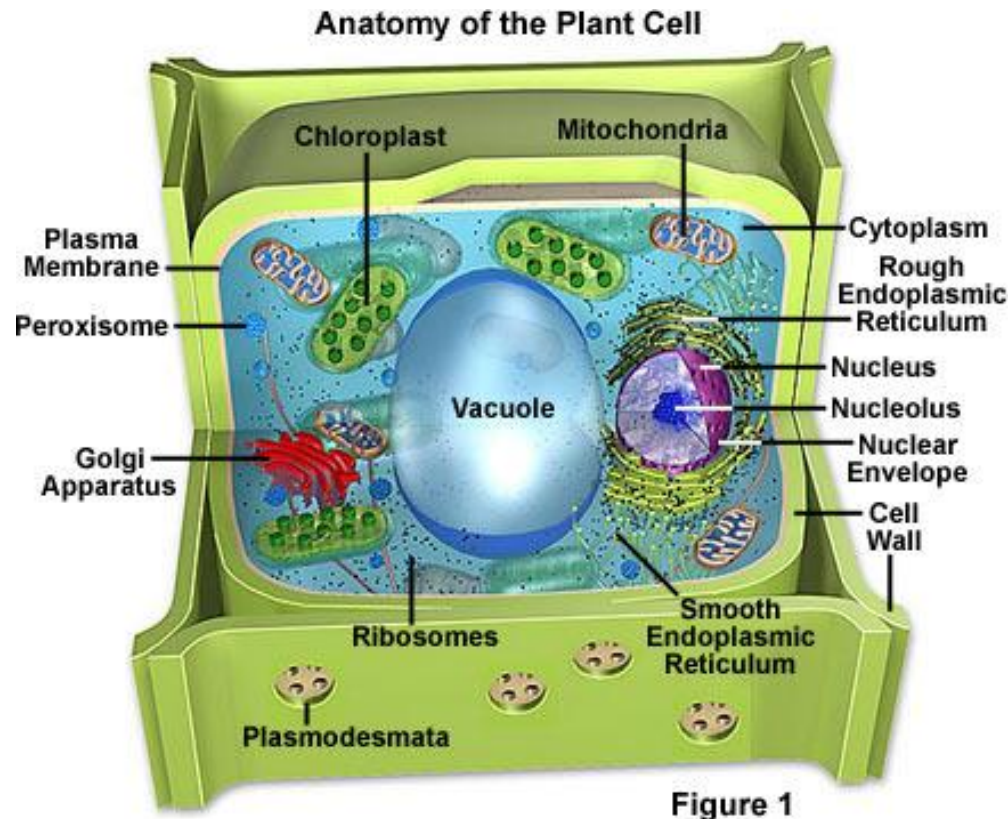


Figure 1

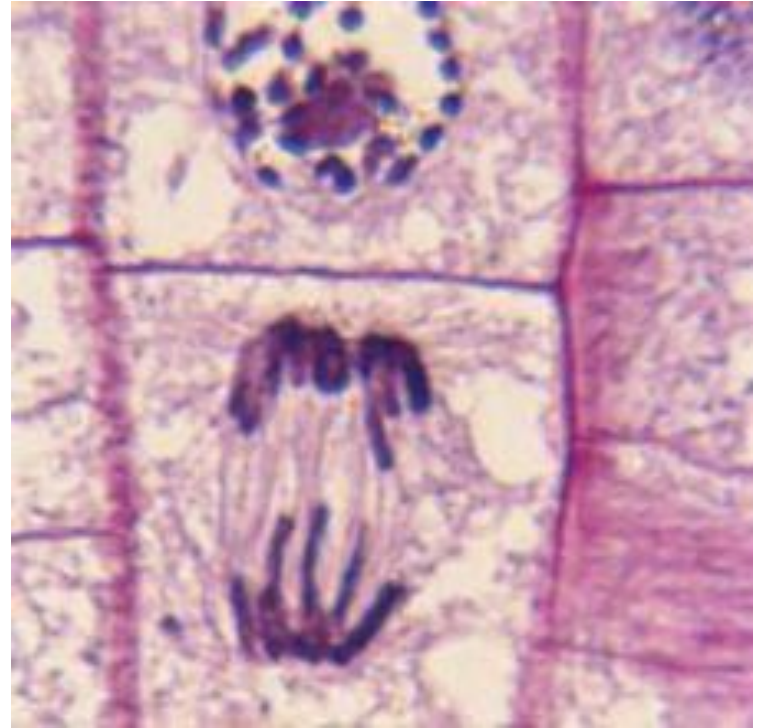
13. Cell Wall

- Provides structural support in plant and bacterial cells
- made of cellulose



14. Microtubules & Microfilaments

- Form the cytoskeleton
- Give cell its structure
- Allows movement of chromosomes and other organelles inside cell
- make up cilia & flagella (needed for locomotion)



Only plant cells have...

- **Cell Wall**

provides structure and support for plants and algae

- **Chloroplasts**

site for photosynthesis (nutrition in plants and algae)

- **Large Central Vacuole**

needed to maintain turgor pressure

- **They do NOT have centrioles!!!**

- _____ 1. holds nucleus together
- _____ 2. surface for chemical activity
- _____ 3. units of heredity
- _____ 4. digestion center
- _____ 5. where proteins are made
- _____ 6. structures involved in mitosis in animal cells only
- _____ 7. microscopic cylinders that support and give the cell shape
- _____ 8. shapes and supports a plant cell
- _____ 9. stores and releases chemicals
- _____ 10. food for plant cells is made here
- _____ 11. spherical body within nucleus
- _____ 12. controls entry into and out of cell
- _____ 13. traps light and is used to produce food for plants
- _____ 14. chromosomes are found here
- _____ 15. jellylike substance within cell
- _____ 16. contains code which guides all cell activities
- _____ 17. minute hole in nuclear membrane
- _____ 18. "powerhouse" of cell
- _____ 19. contains water and dissolved minerals
- _____ 20. stores food or contains pigment

- a. Golgi bodies
- b. nucleus
- c. chromosomes
- d. vacuole
- e. ribosomes
- f. endoplasmic reticulum
- g. nuclear membrane
- h. centrioles
- i. cytoplasm
- j. chlorophyll
- k. chloroplasts
- l. cell (plasma) membrane
- m. cell wall
- n. mitochondria
- o. lysosome
- p. genes
- q. nuclear pore
- r. nucleolus
- s. plastid
- t. microtubule

Lesson 4

Cell Analogies

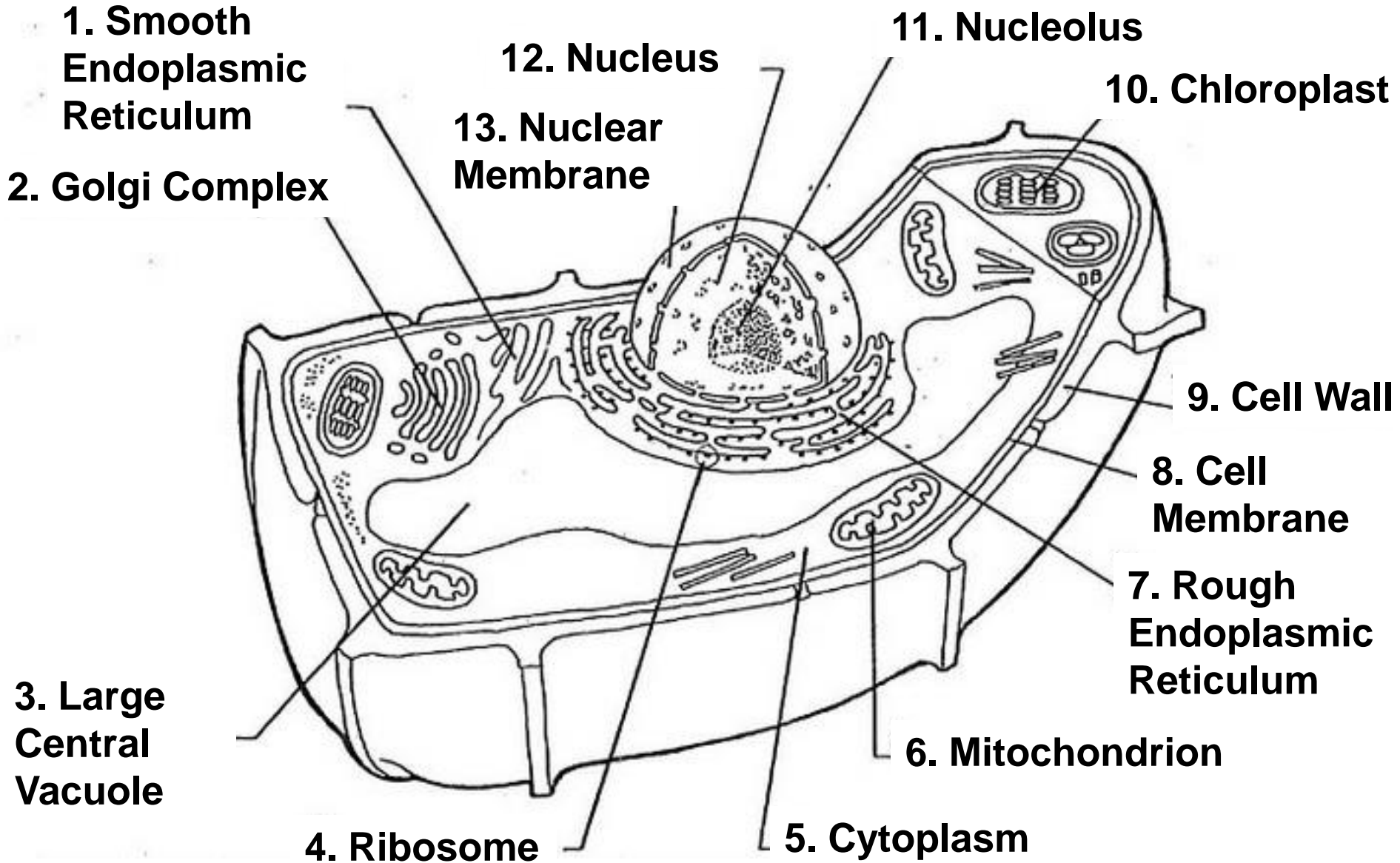
Aim: To reinforce my understanding of cell organelle functions by writing themed analogies.

Bellwork: 1) Take out HW
2) Cell City worksheet

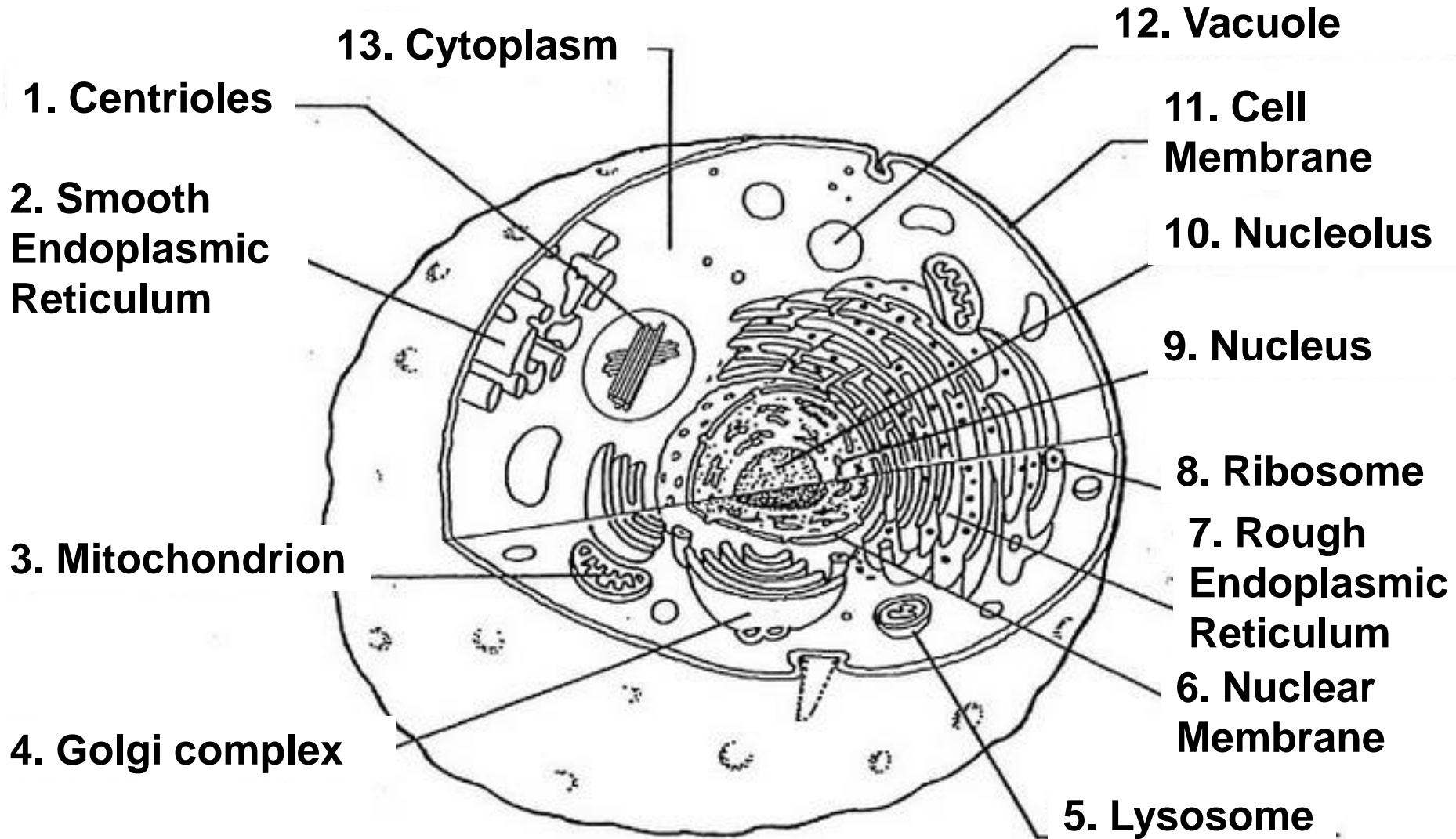
Homework:

1) Plan/work on your cell model
2) Study for quiz tomorrow

Plant Cell Structures



Animal Cell Structures



Cell City Analogy



In a far away city called Los Cellulous, the main export and production product is the steel widget. Everyone in the town has something to do with steel widget making and the entire town is designed to build and export widgets. The town hall has the instructions for widget making, widgets come in all shapes and sizes and any citizen of Los Cellulous can get the instructions and begin making their own widgets. Widgets are generally produced in small shops around the city; these small shops can be built by the carpenter's union (whose headquarters are in town hall).

After the widget is constructed, they are placed on special carts which can deliver the widget anywhere in the city. In order for a widget to be exported, the carts take the widget to the postal office, where the widgets are packaged and labeled for export. Sometimes widgets don't turn out right, and the "rejects" are sent to the scrap yard where they are broken down for parts or destroyed altogether. The town powers the widget shops and carts from a hydraulic dam that is in the city. The entire city is enclosed by a large wooden fence, only the postal trucks (and citizens with proper passports) are allowed outside the city.

Match the parts of the city (underlined) with the parts of the cell.

1. Mitochondria

2. Ribosomes

3. Nucleus

4. Endoplasmic
Reticulum

5. Golgi Body

6. Protein

7. Cell Membrane

8. Lysosomes

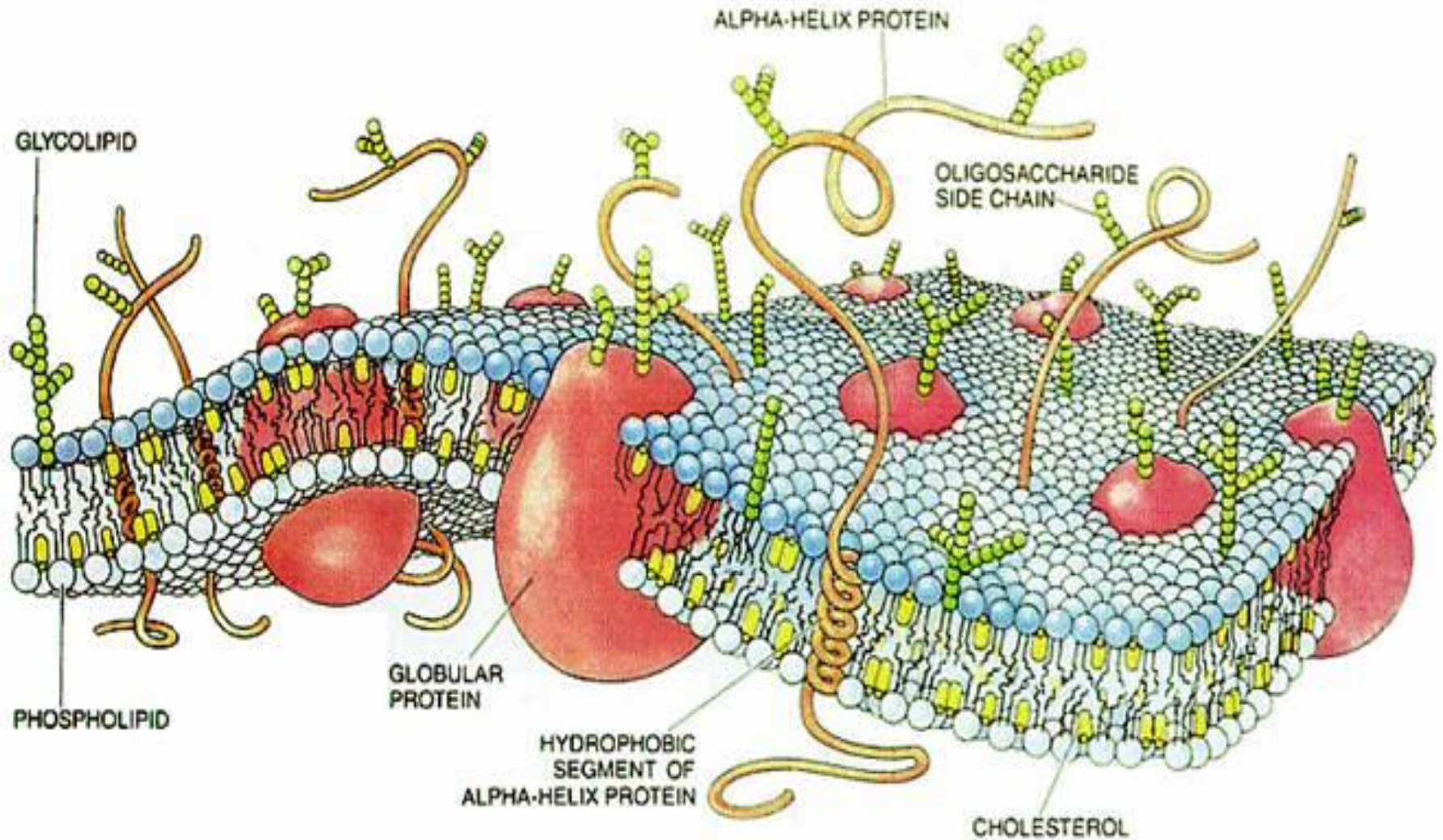
9. Nucleolus

**** Create your own analogy of the cell using a different model. Some ideas might be: a school, a house, a factory, or anything you can imagine****

Lesson 5

- Quiz
- Cell Membrane
 - Structure & Function

The Cell Membrane

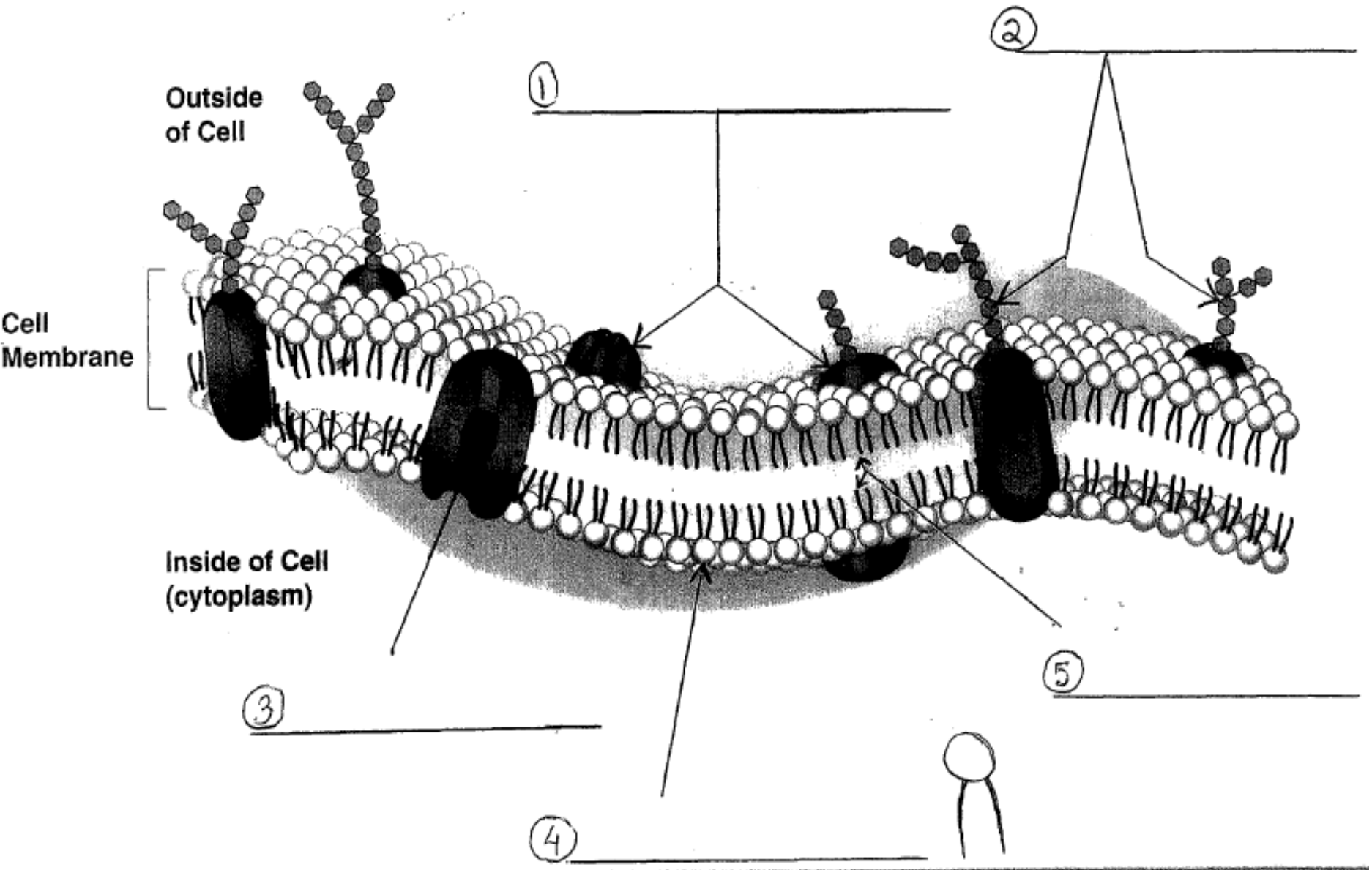


Cell Membrane

STRUCTURES

- “Fluid-Mosaic” model – parts always moving
- Lipid Bilayer - double layer of lipids (fats)
 - Lipid heads - hydrophilic (attracted to water)
 - Lipid tails - hydrophobic (repel from water)
- Carrier Proteins – imbedded in lipid bilayer, contain protein channels
- Receptors – on outer surface of membrane

The Cell Membrane

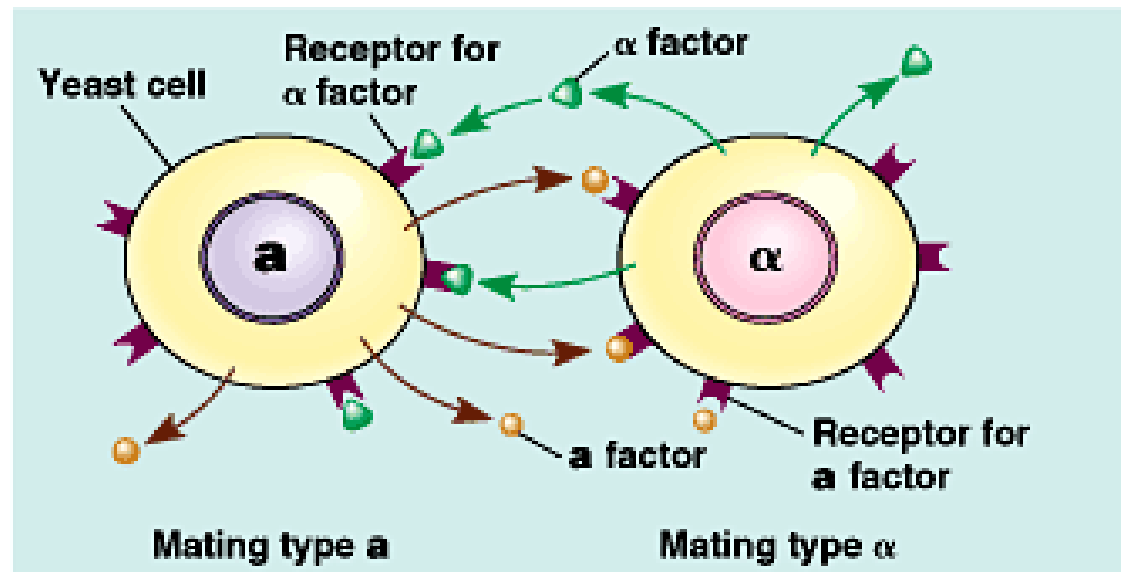


Cell Membrane

FUNCTIONS

- Separates cell from external environment
- **REGULATES** movement of molecules in and out of the cell
- recognizes chemical signals and **communicates with other cells** using

RECEPTORS



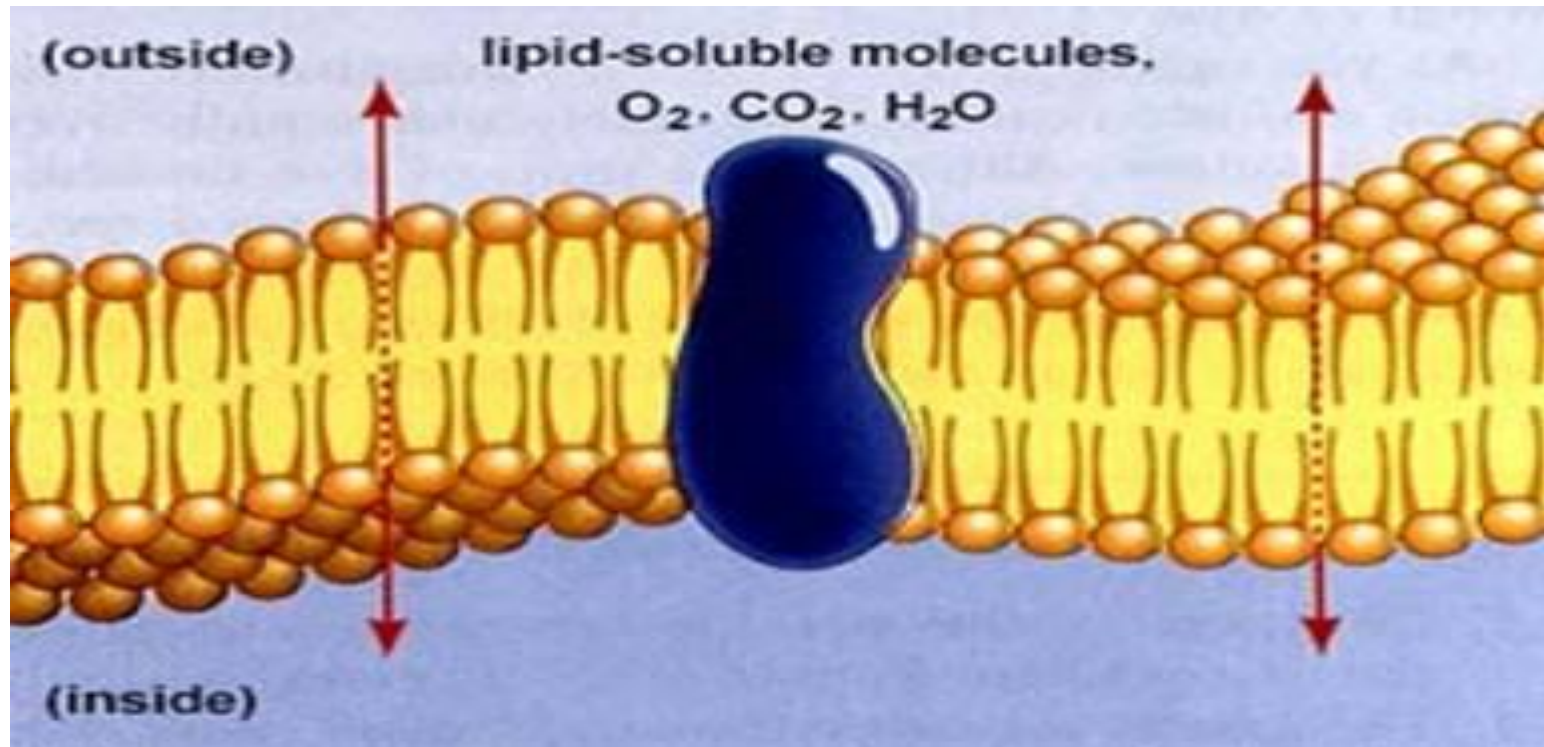
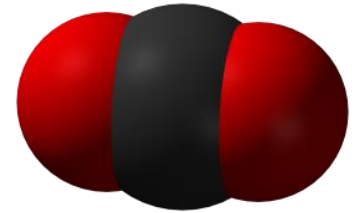
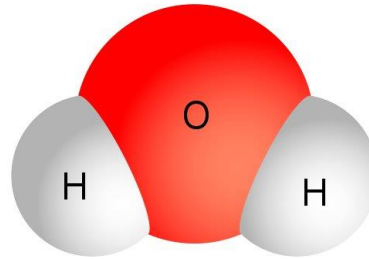
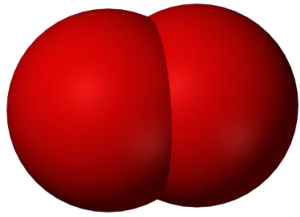
Materials that CAN pass through the membrane are **SMALL**:

- Move across the lipids (Simple Diffusion):
 - Carbon dioxide (CO_2)
 - Oxygen (O_2)
 - Water (H_2O)
- Move across the protein channels (Facilitated Diffusion):
 - Simple Sugars (ex. glucose – $\text{C}_6\text{H}_{12}\text{O}_6$)
 - Amino acids

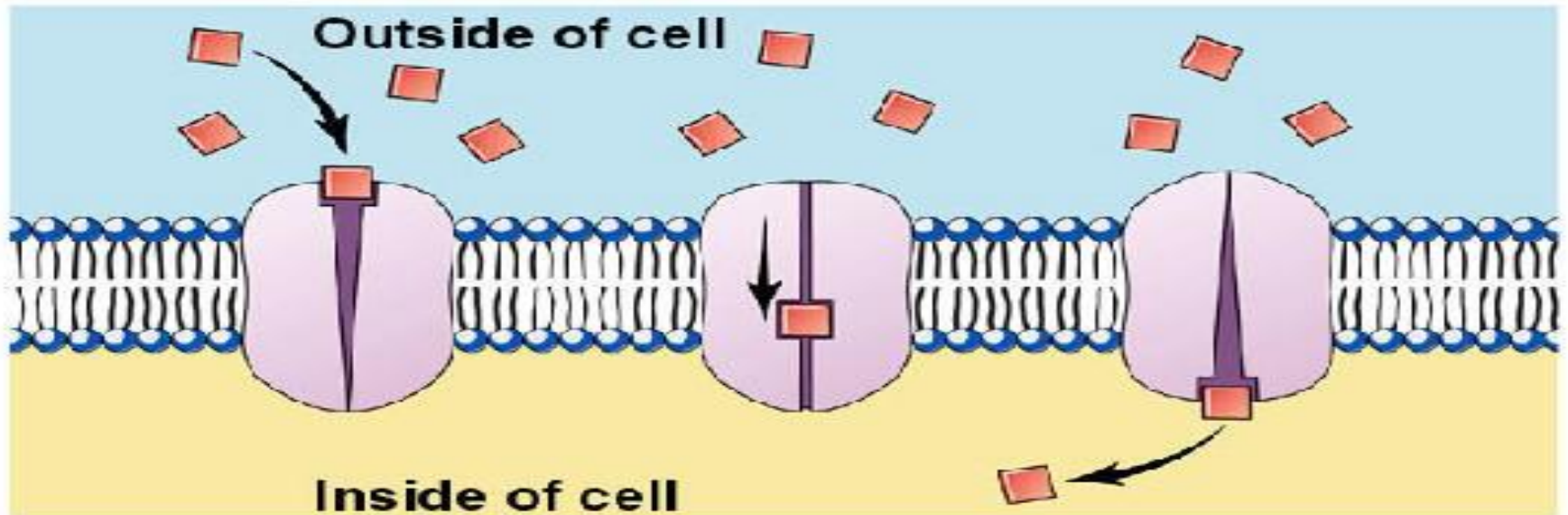
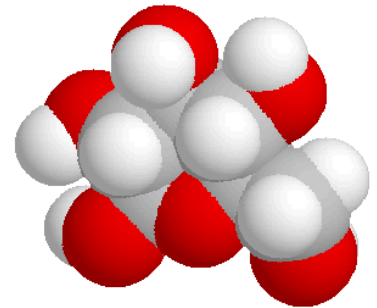
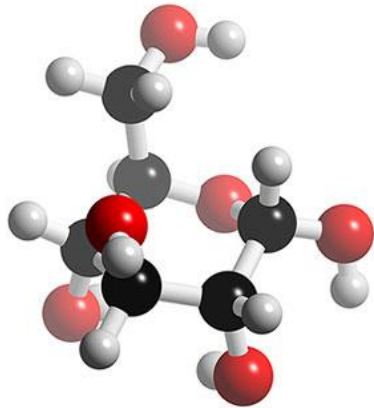
Lesson 6

- Movement Across the Membrane
 - Passive Transport
 - Active Transport
 - Role Play

Simple Diffusion



Facilitated Diffusion



Molecules that **CANNOT** pass through the membrane:

- **Large** molecules (polymers)
 - Ex. **starch** and **protein**



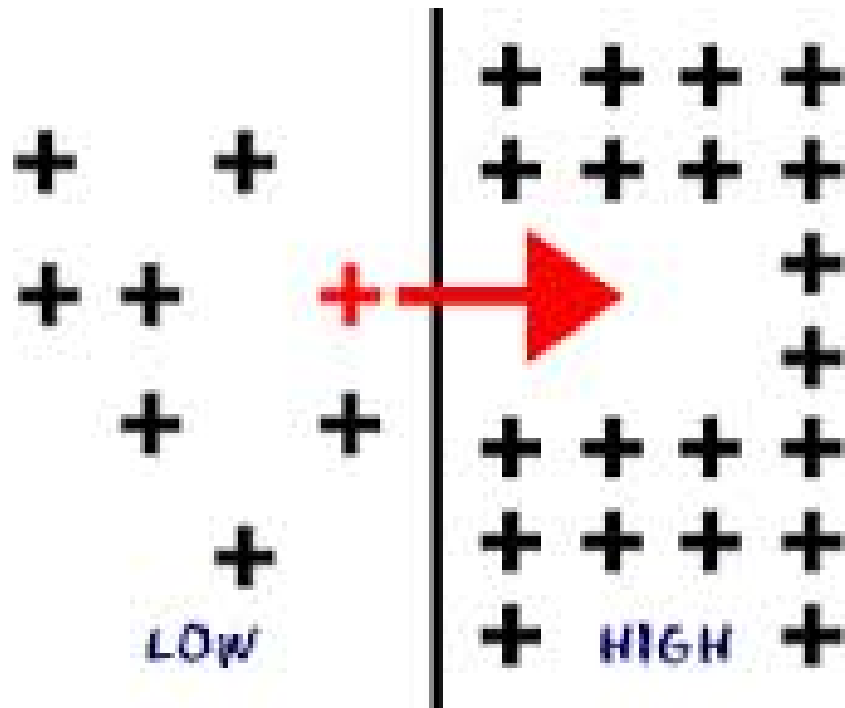
Types of Movement Across the Membrane

1) Passive Transport (Diffusion)

- DOES **NOT** require ENERGY
- Molecules move freely & evenly from **high to low** concentration (more to less); with the concentration gradient
 - Simple Diffusion: molecules cross the lipid bilayer
 - Facilitated Diffusion: molecules pass through the protein channels
 - Osmosis: diffusion of water molecules

2) **Active Transport**

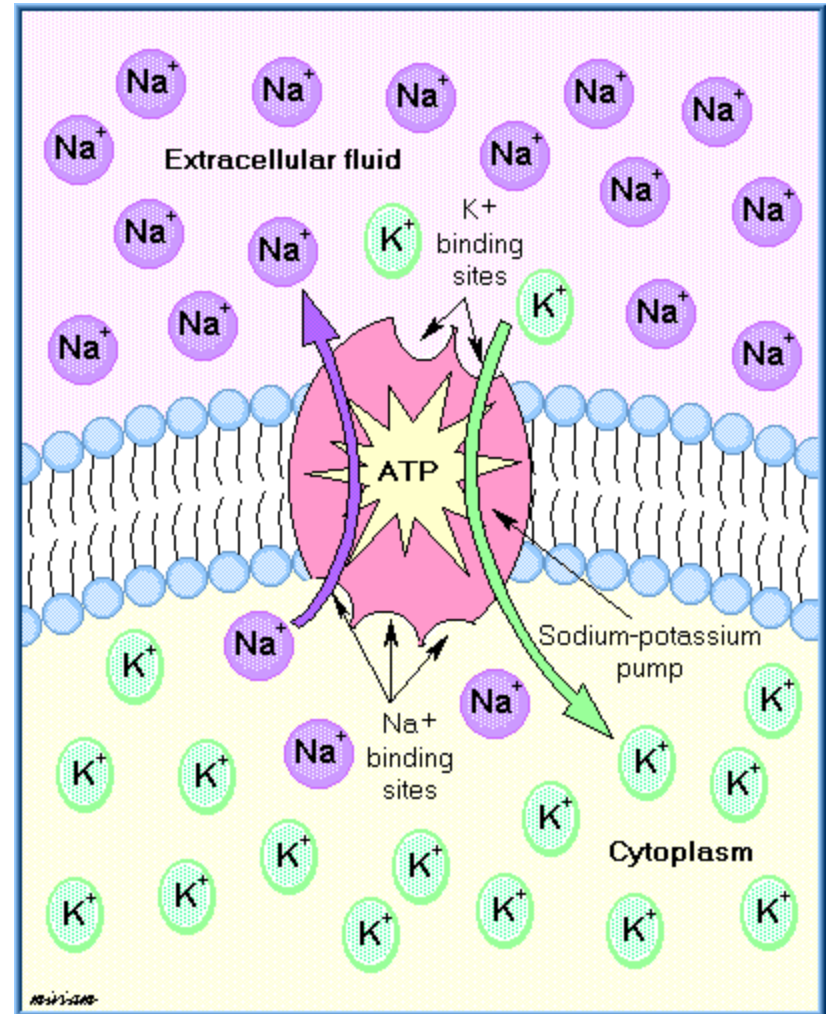
- Requires **ENERGY** (ATP)
- Moves molecules from **low to high** concentration (less to more); against the concentration gradient



Examples of Active Transport

1. Sodium Potassium Pump

- Nerve cells use energy to pump sodium ions (Na^+) out and pump potassium ions (K^+) in
- generates an electrical charge to send a nerve impulse



Examples of Active Transport

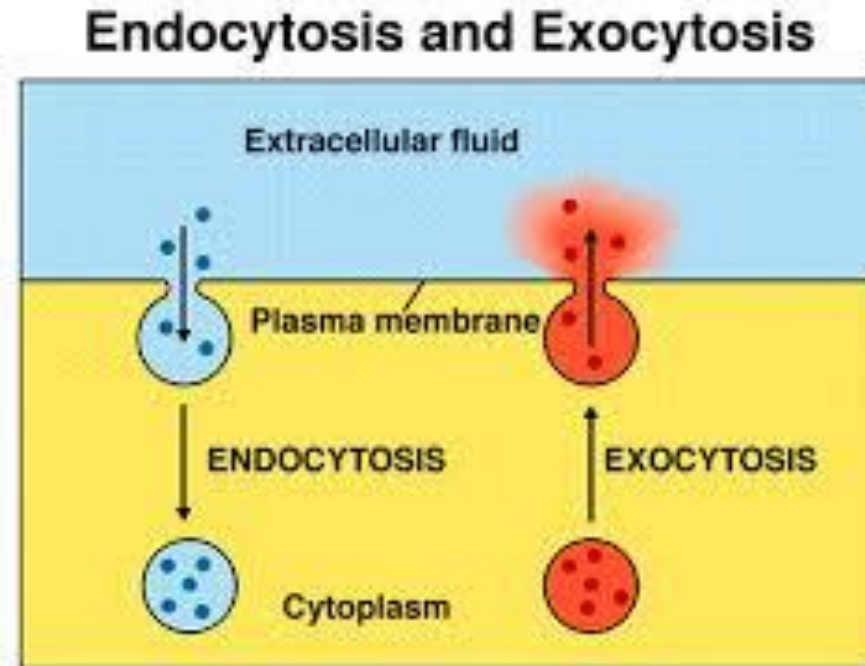
2. Endocytosis (taking materials into a cell)

- Ex. Pinocytosis:
 - » membrane pinches in to form a vacuole
- Ex. Phagocytosis:
 - » arm-like extensions called pseudopods surround & engulf food

3. Exocytosis

- Vacuole / vesicle fuses with cell membrane forcing contents out
- is how proteins made at ribosomes can exit the cell

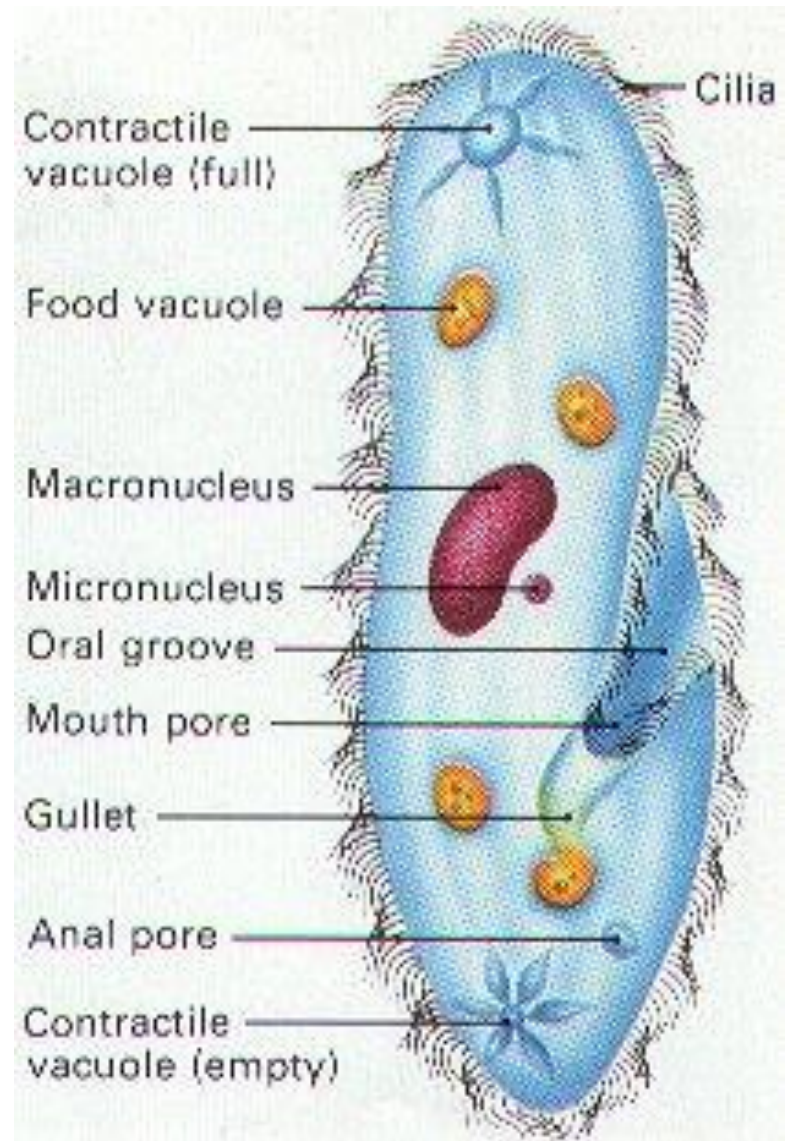
Yessierli, Sherma, Luciano Human Physiology, 7th edition, Copyright © 1998 McGraw-Hill Companies, Inc. All Rights Reserved.



Examples of Active Transport

4. Contractile Vacuoles

- A freshwater protist uses energy to pump out excess water that diffuses into its cell
 - Like a sump pump

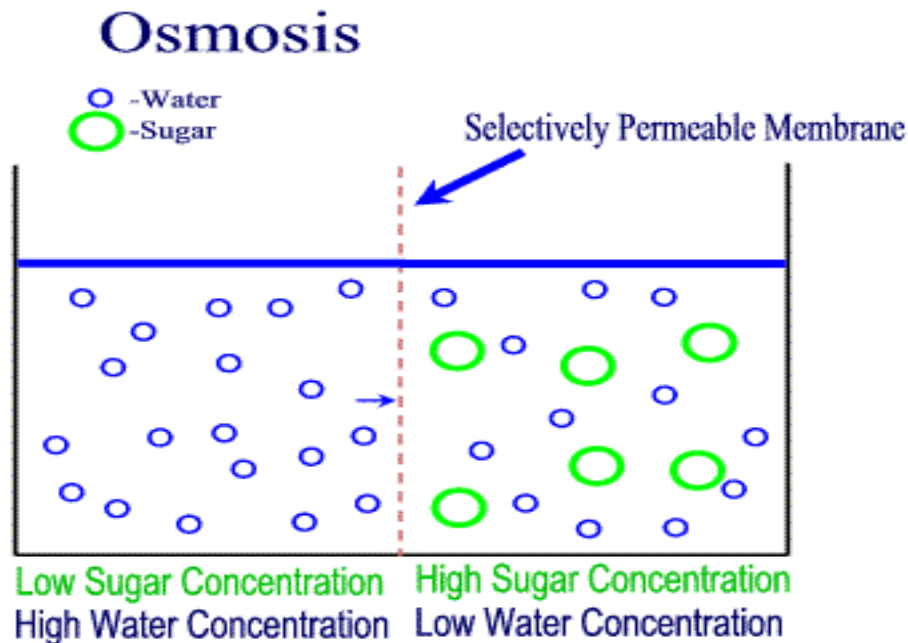


Lesson 7

- Types of Solutions
 - Isotonic
 - Hypertonic
 - Hypotonic

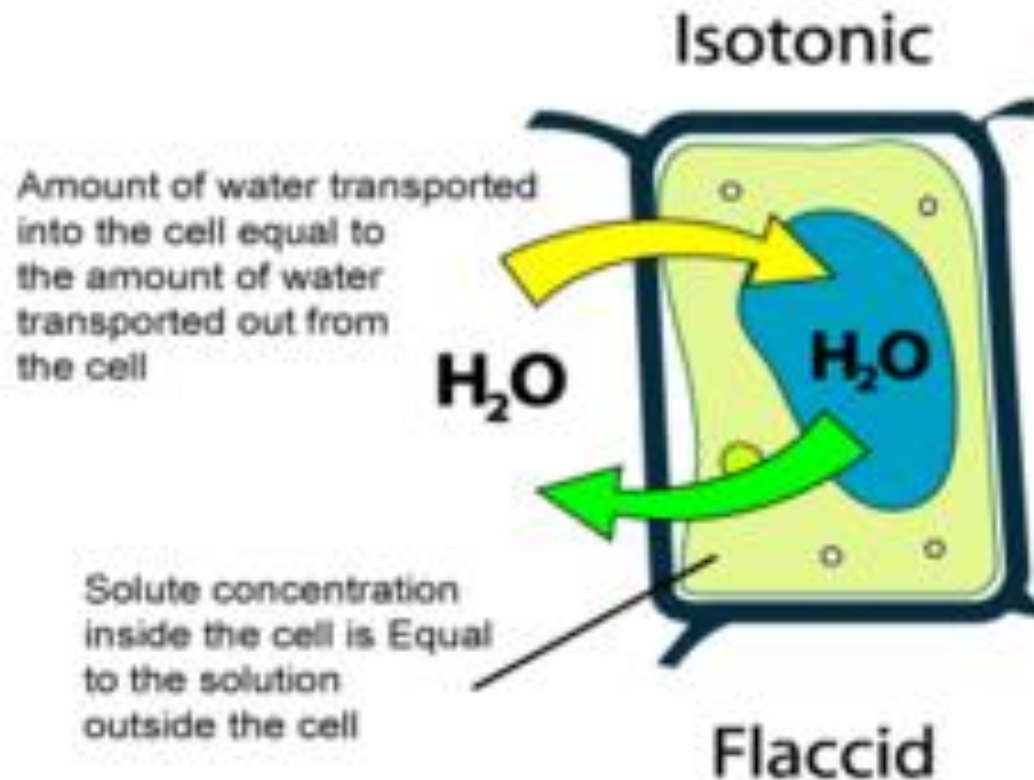
Movement Across the Membrane

- Molecules move when there is an unequal amount of solute and water on either side of a membrane
- Water will diffuse to where there is less water / more solute (such as salt or sugar)



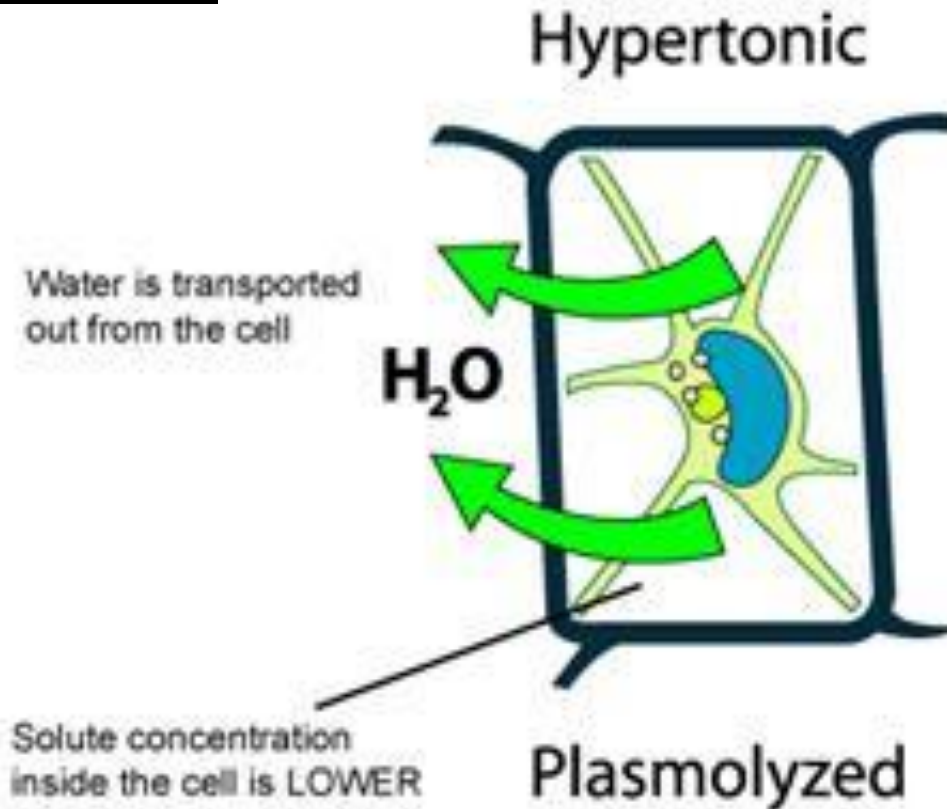
1) Isotonic Solution

- when concentration of water and solute are equal on both sides of the membrane
- Nothing moves!



2) Hypertonic Solution (high solute)

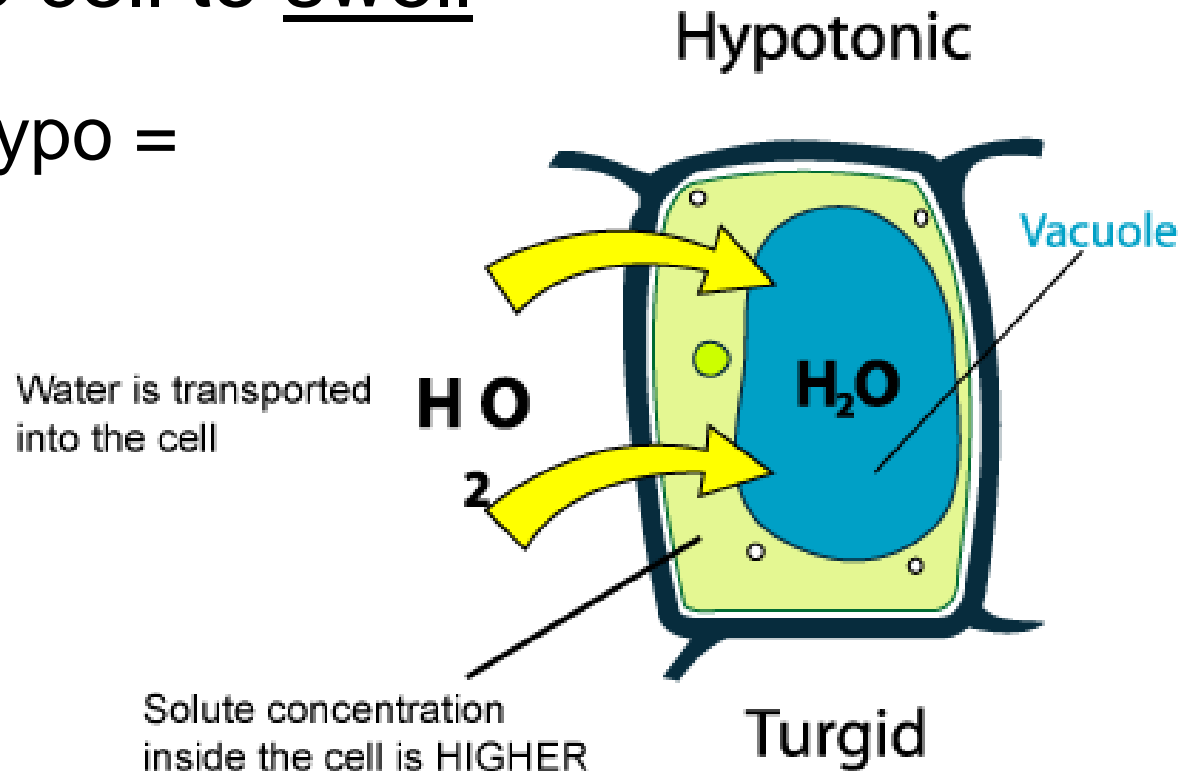
- There is more solute outside the cell, so water moves **OUT** of the cell, causing the cell to shrink



3) Hypotonic Solution (low solute)

- There is less solute outside the cell (more water), so water moves INTO the cell, causing the cell to swell

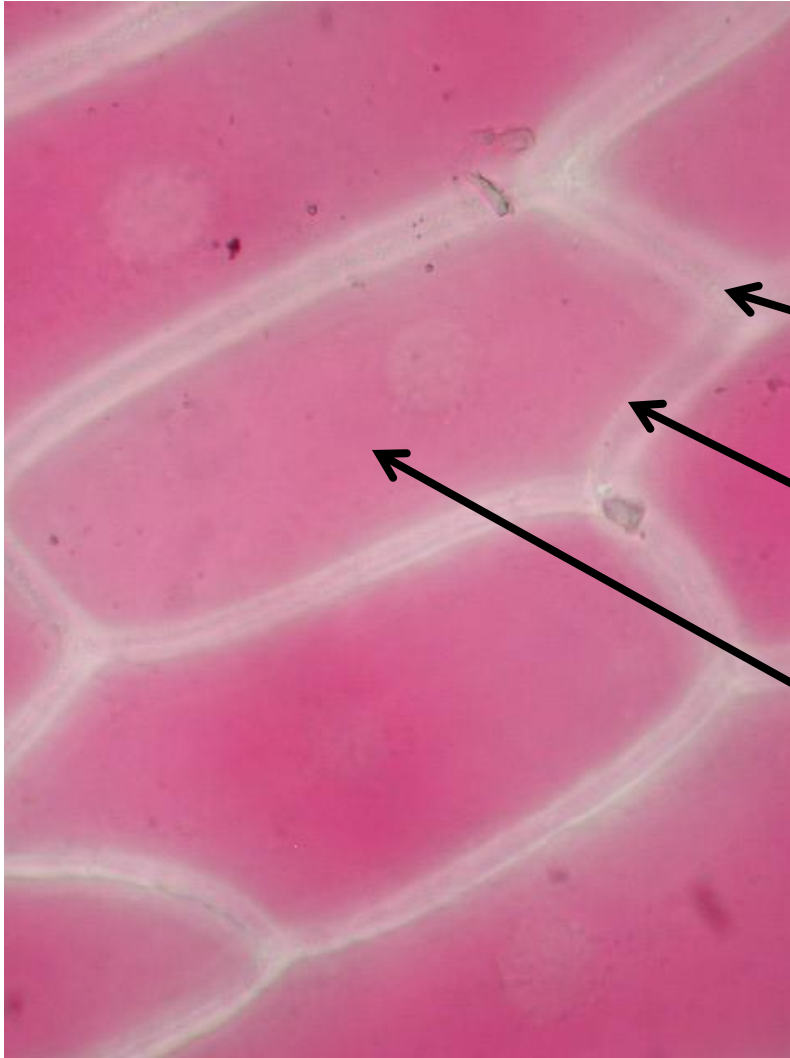
HINT: Think hypo =
hippo = fat



NYS Diffusion Lab Summary

- Red Onion Cells
 - Normal
 - Salt Solution
 - Distilled Water

Red Onion Cells



**Be able to
label:**

Cell Wall

**Cell
Membrane**

Cytoplasm

Red onion cells in SALT Solution (cell shrivels; water diffused OUT)



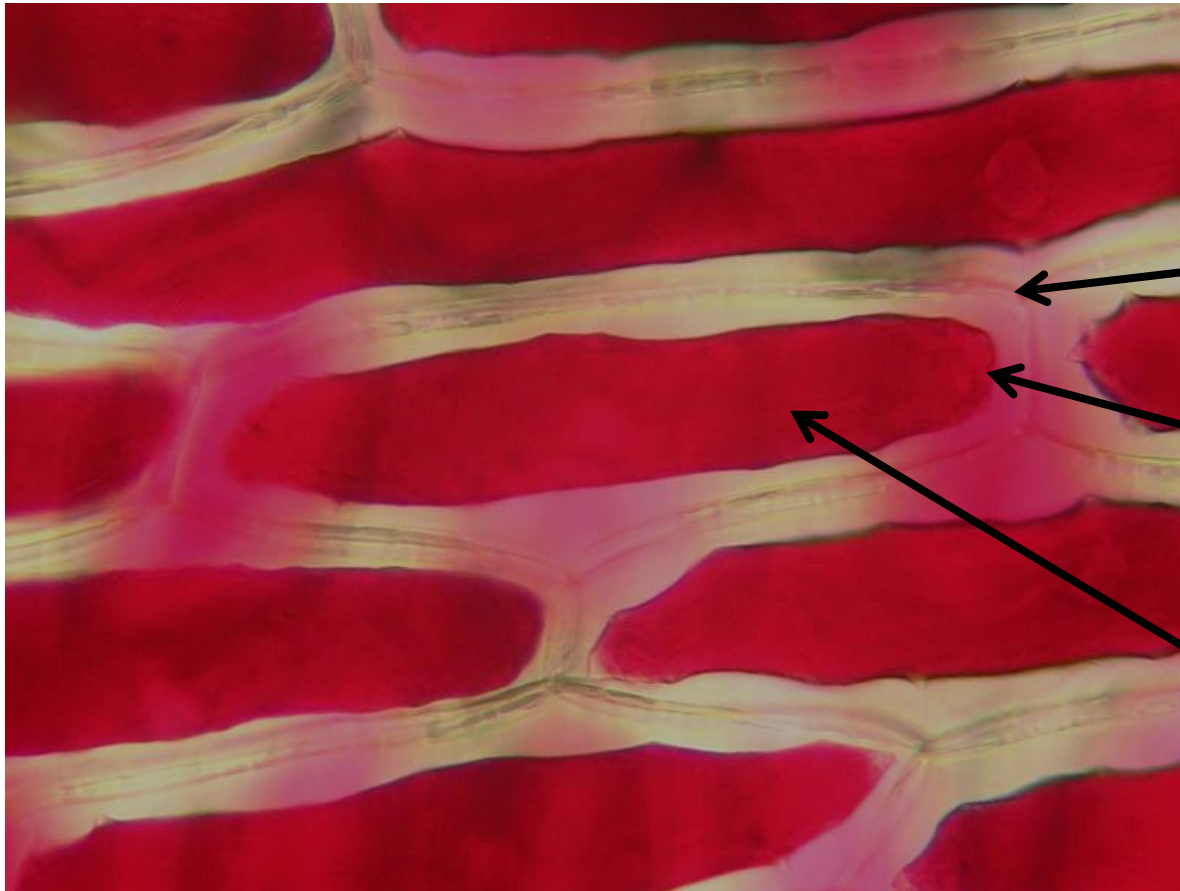
**Be able to
label:**

Cell Wall

**Cell
Membrane**

Cytoplasm

Red onion cells in Distilled Water (cell swells; water diffuses back IN)



**Be able to
label:**

Cell Wall

**Cell
Membrane**

Cytoplasm