The Cell

Learning Outcome B1

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- Analyze the functional inter-relationship of cell structures

Student Achievement Indicators

- Describe the following cell structures and their functions:
  - ✓Cell membrane
  - ✓Cell wall
  - ✓Chloroplast
  - ✓Cytoskeleton
  - ✓Cytoplasm
  - ✓Golgi bodies
  - ✓Lysosomes
  - ✓Mitochondria – including cristae and matrix
  - ✓Nucleus – including nuclear pore, nucleolus, chromatin, nuclear envelope and chromosomes
  - ✓Smooth and rough endoplasmic reticulum
  - ✓Ribosomes
  - ✓Vacuoles
  - ✓Vesicles

Student Achievement Indicators

- State a balanced chemical equation for cellular respiration
- Describe how the following organelles function to compartmentalize the cell and move material through it:
  - ✓Rough and smooth endoplasmic reticulum
  - ✓Vesicles
  - ✓Golgi bodies
  - ✓Cell membrane
- Identify cell structures depicted in diagrams and electron micrographs

How do we define "Living"?

- The following characteristics are used to define living things:

1. Living things are organized
   - Specialized for specific functions
   - Have various levels → organs/tissues/cells
   - Cells are the smallest structural unit of life
   - Cells are made up of molecules such as proteins, carbohydrates and fats

How do we define "Living"?

2. Living things need food or energy from the environment
   - Animals obtains materials and energy when they eat food
   - Plants use CO_2, water and solar energy to make their food, through the process of photosynthesis
   - Nutrient molecules can be broken down into parts and products through a series of chemical reactions. Some of these molecules will be broken down completely to provide energy for these chemical reactions.
   - *Metabolism* – is all the chemical reaction that happen within cells

How do we define "Living"?

3. Living things keep a steady internal environment despite changes in the external environment.
   - *Example* – blood pressure, body temperature
   - *Homeostasis* – helps maintain a constant internal environment despite changes in the external environment

How do we define "Living"?

4. Living things respond to stimuli, both internal and external.
   - An organism's behavior may be dictated by how it responds to its external environment
   - *Example* – movement towards light

How do we define "Living"?

5. Living things reproduce offspring, and offspring generally resemble parents.
   - Asexual – organisms divides, so offspring have the same genes as parents (identical)
   - Sexual – each parent contributes half of the genes (variation)

How do we define "Living"?

6. Living things grow and develop
   - Changes occur during the lifecycle
   - Different stages from fertilization to death
   - *Growth* – increase in size and number of cells
   - *Development* – stages that occur between fertilization and death.

How do we define "Living"?

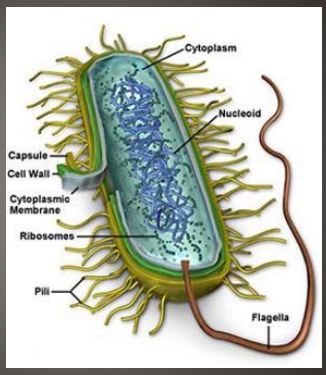
7. Living things adapt to different environments and conditions.
   - May adapt to become suited to a particular way of life

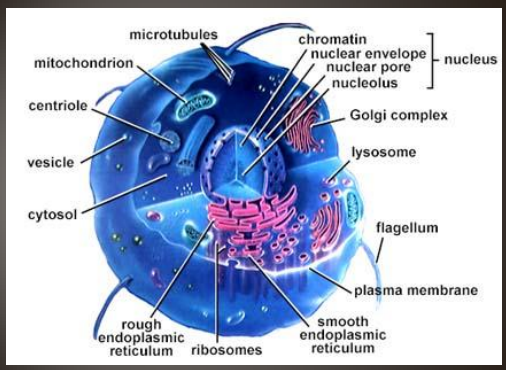
The Cell

- There are two types of cells:

1. Prokaryotic – no nucleus or membrane-bound organelles
   - Example – bacteria

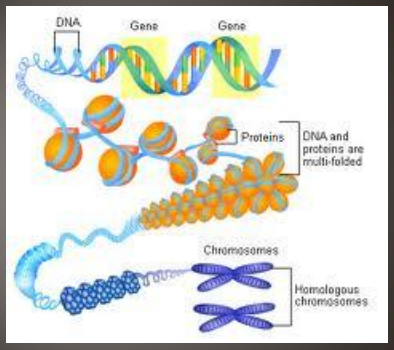
2. Eukaryotic – has a nucleus and membrane-bound organelles
   - Example – mammals

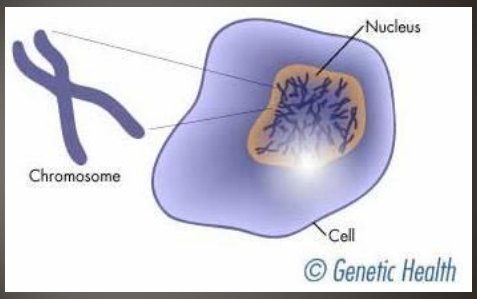




Chromosomes

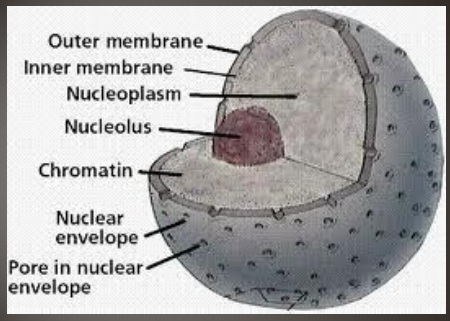
- Location in Cell
  - Nucleus
- Function
  - Contains genetic information that regulates cell function
  - Contains DNA and protein





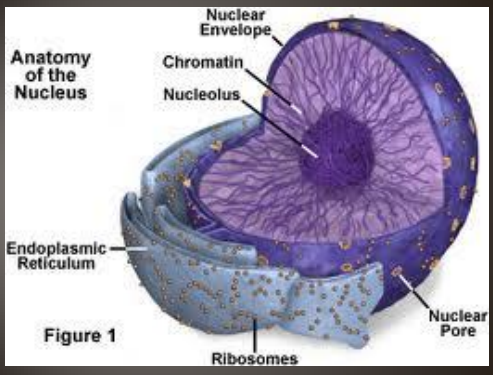
Nucleolus

- Location in Cell
  - Nucleus
- Function
  - Makes a chemical messenger, called mRNA.
  - Carries the genetic information from the nucleus to ribosomes



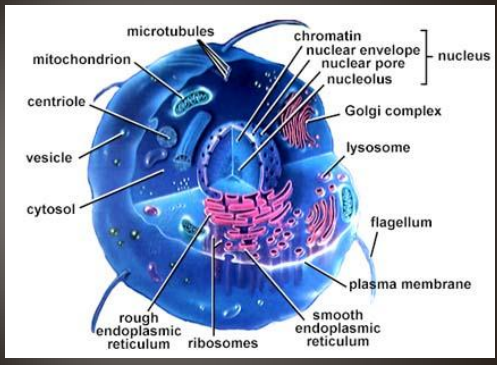
Nuclear Membrane (Envelope)

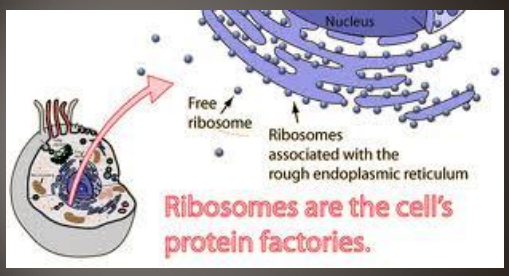
- Location in Cell
  - Nucleus
- Function
  - Separates the genetic information from the cytoplasm.
  - Functions as a barrier



Ribosomes

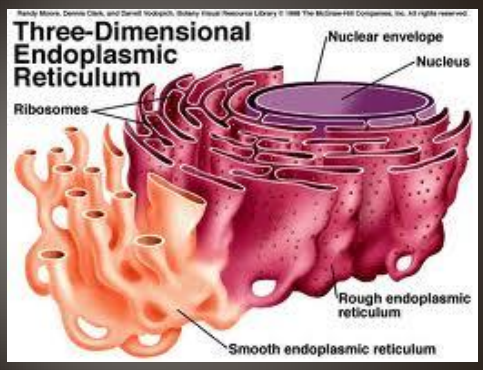
- Location in Cell
  - Cytoplasm
- Function
  - Site of protein synthesis
  - Receives information from the nucleus to order the joining of amino acids into proteins.





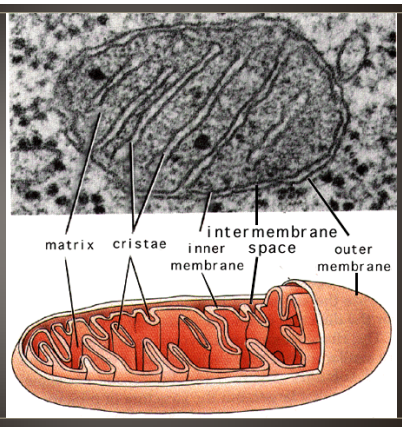
Endoplasmic Reticulum

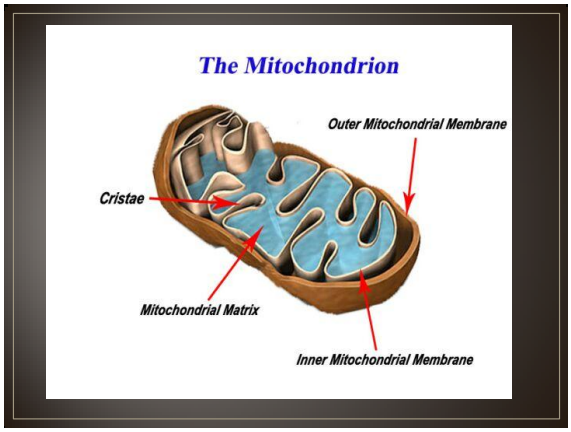
- Location in Cell
  - Cytoplasm
- Function
  - Transports various large molecules that are synthesized within the cytoplasm
  - Rough endoplasmic reticulum contains ribosomes that synthesize proteins.
  - While the smooth endoplasmic reticulum does not contain ribosomes.



Mitochondria

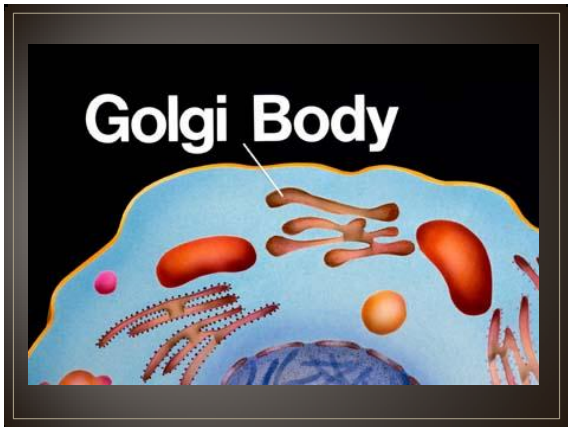
- Location in Cell
  - Cytoplasm
- Function
  - Converts energy
  - Is involved in aerobic cellular respiration
  - Formula for cellular respiration

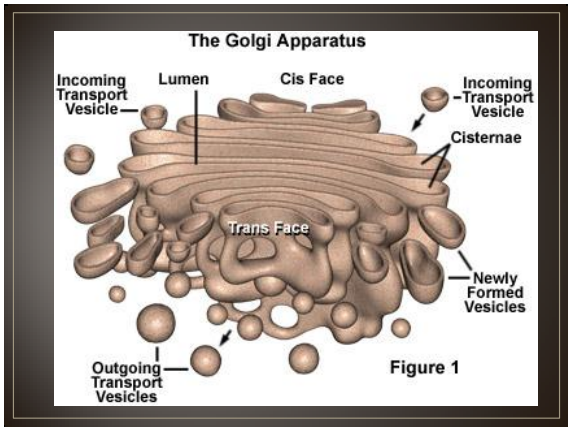




Golgi Body (Apparatus)

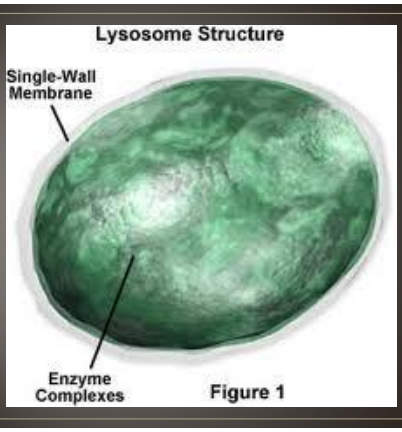
- Location in Cell
  - Cytoplasm
- Function
  - Processes, packages and secretes various proteins.
  - Releases fluids through cell membrane by exocytosis.

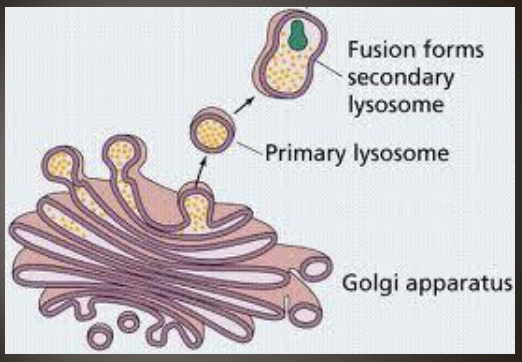




Lysosome

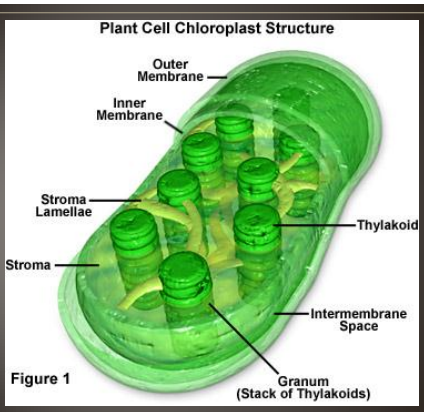
- Location in Cell
  - Cytoplasm
- Function
  - Contains enzymes that digest things taken into the cell.
  - Is capable of destroying the cell

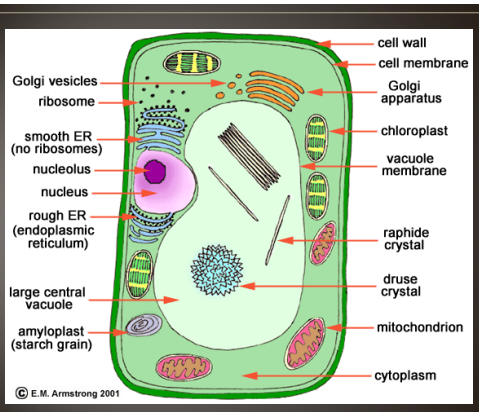




Chloroplasts

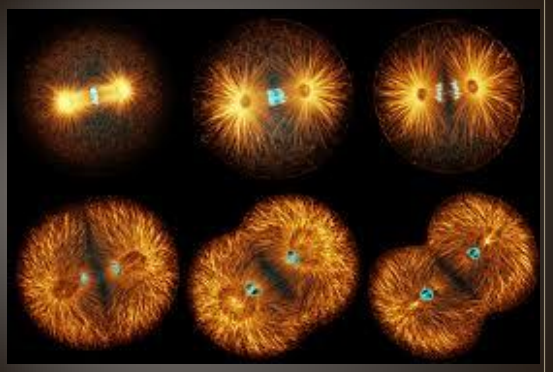
- Location in cell
  - Cytoplasm
- Function
  - Specializes in photosynthesis in plant cells





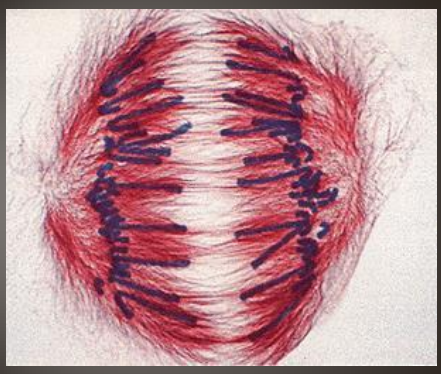
Microfilaments

- Location in cell
  - Cytoskeleton
- Function
  - Provides shape and movement for cells.
  - Are found in muscle cells



Microtubules

- Location in cell
  - Cytoskeleton
- Function
  - Are cylinders of protein found in cytoplasm, cilia and flagella
  - Help maintain shape and act as a track along which cell organelles can move.



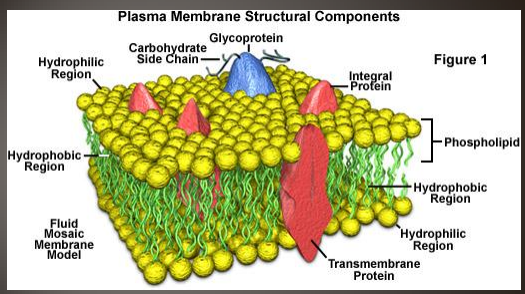
Cell Membrane

Location

- Outside the cell

Function

- Separates the cell from the external environment
- Allows the passage of molecule, wastes and proteins out of the cell.
- Double layer made up of phospholipids (fats)



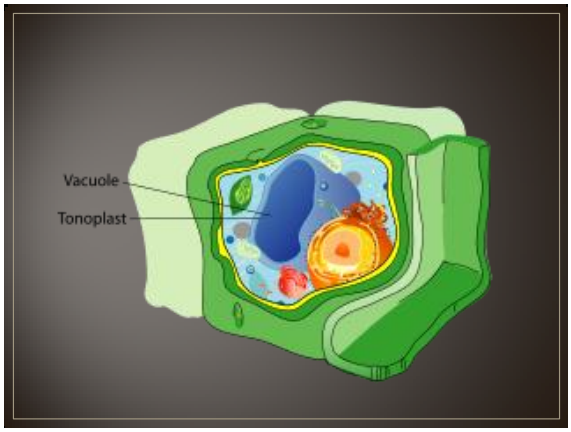
Vacuoles

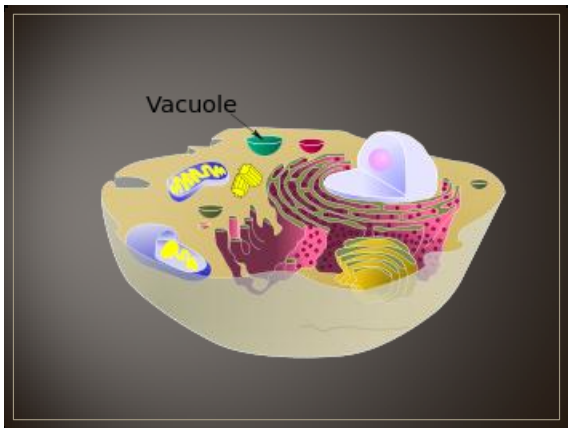
Location

- Cytoplasm

Function

- Transport and storage of nutrients, molecules and wastes in the cell until they can be exported out of the cell.
- Plant cells have a large central vacuole that helps plants remain upright.





Vesicles

Location

- Cytoplasm

Function

- Pinch off Golgi Body
- Take the manufactured and stored proteins and transport them around the cell.