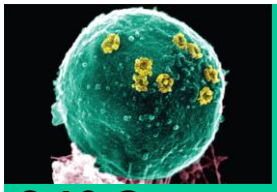
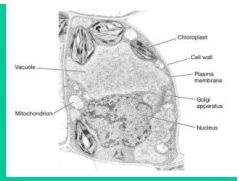
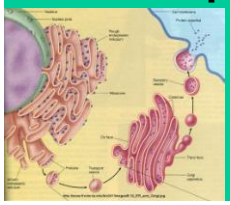
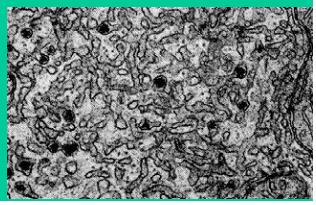




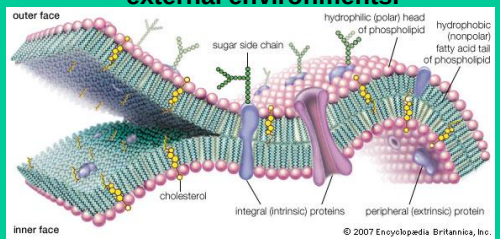
2.10 Compartmentalization





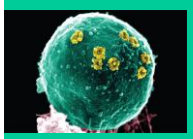
ENDURING UNDERSTANDING

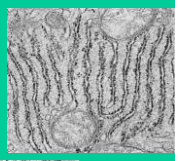
ENE-2 Cells have membranes that allow them to establish and maintain internal environments that are different from their external environments.



ENE-2.K Describe the membrane bound structures of the eukaryotic cell.

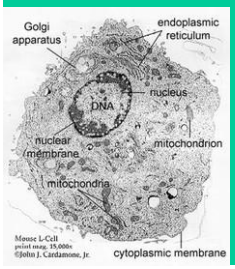
- Membranes and membrane-bound organelles in eukaryotic cells compartmentalize intracellular metabolic processes and specific enzymatic reactions.

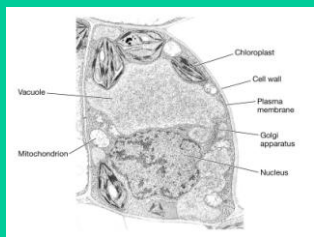




ENE-2.L Explain how internal membranes and membrane bound organelles contribute to compartmentalization of eukaryotic cell functions.

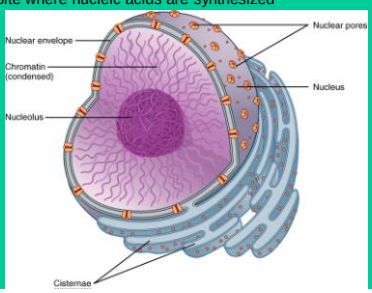
- Internal membranes facilitate cellular processes by minimizing competing interactions and by increasing surface areas where reactions can occur.





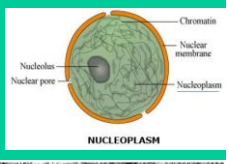
Nucleus

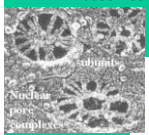
- Nuclear envelope is a double membrane that separates nucleoplasm from cytoplasm.
- Stores genetic information determining structure/function of cells
- Site where nucleic acids are synthesized

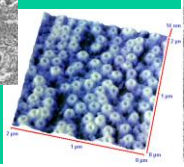


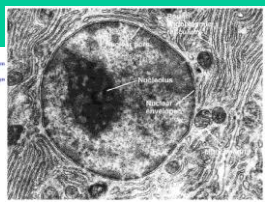
Nucleus

- Nucleoplasm
  - Semifluid medium of nucleus
  - Has a different pH from cytosol
- Nucleolus: sites where rRNA joins proteins to form ribosomes.
- Nuclear pores (100 nm)- permit passage of certain mRNA and ribosomes



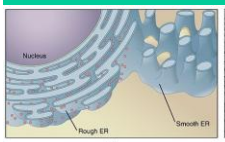


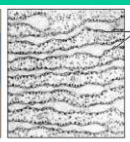


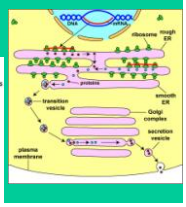


Endoplasmic Reticulum

- Continuous with outer membrane of the nuclear envelope.
- Rough endoplasmic reticulum
  - Makes secretory proteins (mainly glycoprotiens)
  - Intracellular transport of protein.
  - Packages proteins as transport vesicles.
  - Makes new membranes.
  - Rough ER- Provides site-specific protein synthesis with membrane-bound ribosomes

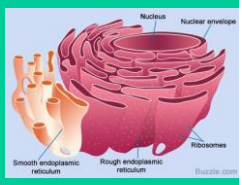


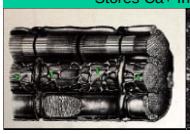


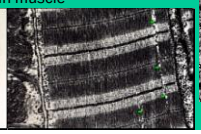


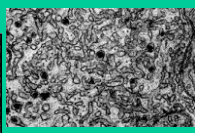
Endoplasmic Reticulum

- Smooth ER (no ribosomes)
  - Synthesizes lipids, phospholipids, and steroids
  - In Liver
    - Converts glycogen to glucose to regulate blood sugar.
    - Detoxifies drugs and poisons (adds hydroxyl groups making them water soluble).
  - Stores Ca+ in muscle



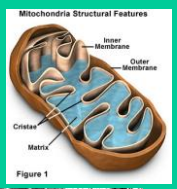


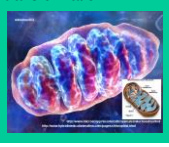




Mitochondria

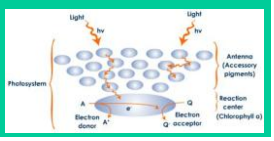
- Have a double membrane that allows compartmentalization
- Inner membrane is highly convoluted, forming folds called cristae.
  - Cristae contain enzymes important to ATP production
  - Cristae also increase the surface area for ATP production
- Sites of cellular respiration.
- Contain ribosomes and their own DNA
- Specialize in energy capture and transformation.





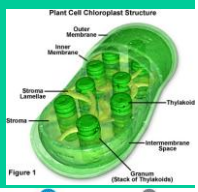
Chloroplasts

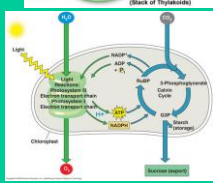
- Specialized organelles found in algae and higher plants that capture energy through photosynthesis.
- Capture the energy available in sunlight and convert it to chemical bond energy via photosynthesis.
- Contain Chlorophylls
  - Responsible for the green color of a plant
  - The key light-trapping molecules in photosynthesis.
  - There are several types of chlorophyll, but the predominant form in plants is chlorophyll a.



Chloroplasts

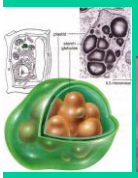
- Have a double outer membrane that creates a compartmentalized structure
- Contain membrane-bound structures called thylakoids.
- Thylakoids are organized in stacks, called grana
- Energy-capturing reactions
  - Produce ATP and NADPH
  - Which fuel carbon-fixing reactions in the Calvin-Benson cycle
  - Carbon fixation occurs in the stroma
  - Where molecules of CO_2 are converted to carbohydrates.

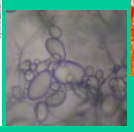


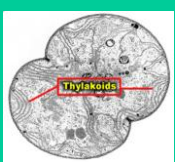


Chloroplasts

- Chloroplasts are a type of plastid.
  - Amyloplasts store starch (amylose, amylopectin)
  - Chromoplasts, which contain red and orange pigments.
- Only plants, algae, and cyanobacteria carry on photosynthesis.
- There are no chloroplasts in cyanobacteria; chlorophyll is bound to cytoplasmic thylakoids.







Golgi Complex

- Membrane-bound structure
- Consists of a series of flattened membrane sacs (cisternae).
- Synthesis and packaging of materials (small molecules) for transport (in vesicles)
  - Receives protein-filled vesicles that bud from the ER at cis face.
  - Proteins are modified and repackaged as new vesicles.
  - Vesicles leave from trans face.
  - At plasma membrane, they discharge their contents as secretions.
- Produces lysosomes.