Cells Unit Notes Name:_____

DO NOT LOSE!

New Area of Focus: What does it mean to be living?

- Organism – Any living thing

- Characteristics of living things
- Made of SPONCH Elements

SPONCH

25 of the elements are essential for life.
SPONCH elements are the most biologically important.

- Percentage of SPONCH elements in living things.

S.	Sulfur	Trace
P.	Phosphorus	1.0%
O.	Oxygen	65.0%
N.	Nitrogen	3.3%
C.	Carbon	18.5%
H.	Hydrogen	9.56%
	Other (Trace)	3.0%

- Made of cells.
- Moves.
- Responds to a stimulus.
- Uses Energy.
- Adjusts to Changes.
  - Maintains steady body conditions.
  - Maintains homeostasis.
- Reproduces.
- Grows and Develops.
  - Grow-To increase in size.

    - Develop-To change in ability.
- Adapts to Change.
    - Evolves / Inherits traits that promote survival.
- Has a life span.

- In Science theory
    - Abiogenesis explains the origin of life.
    - Evolution explains how life changes once it exists.
    - The two are different.

- Needs of Living Things
    - Energy – Supplied by the sun (most of the time) and stored in food. TINSTAAFL!
    - Oxygen – To burn the food in cells. (Respiration)
    - Water – To keep things moving in and out of cells. (Universal Solvent)
    - Minerals- For proper chemical balance.

NEW AREA OF FOCUS: CELLULAR BIOLOGY

- Form Follows Function: Parts of the cell are shaped to perform a particular job.

- Cells are the structural and functional units of all living organisms
  - Humans have 50-75 Trillion – Multicellular
  - Some Protista have 1 – Unicellular

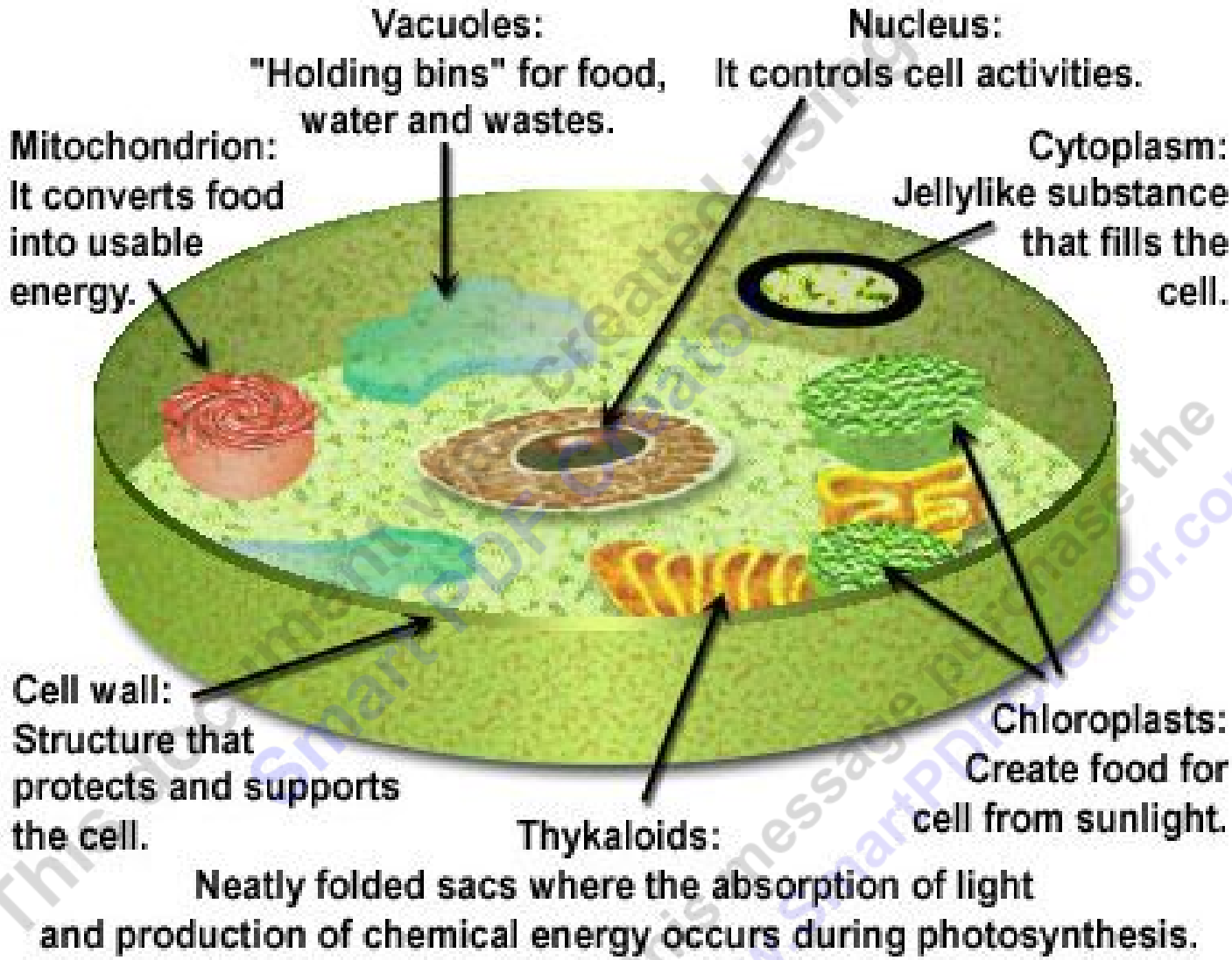
- Modern Cell Theory
  - -The cell is basic unit of structure and function
  - -Living things are made of cells
  - -All cells come from pre-existing cells.
  - -Cells contain genetic information
  - -All cells are similar in composition
  - -Energy flow of life occurs in cells

- There are two types of cells.
  - Prokaryotic
  - Eukaryotic

- Prokaryotic cells
  - - No nuclear membrane
  - - Genetic materials is free in cytoplasm
  - - No membrane-bound organelles
  - - Most primitive type of cell (appeared about 3.8 billion years ago)

- Eukaryotic Cells
  - - Nuclear membrane surrounding genetic material
  - - Numerous membrane-bound organelles
  - - Appeared approximately one billion years ago
  - - Complex internal structure

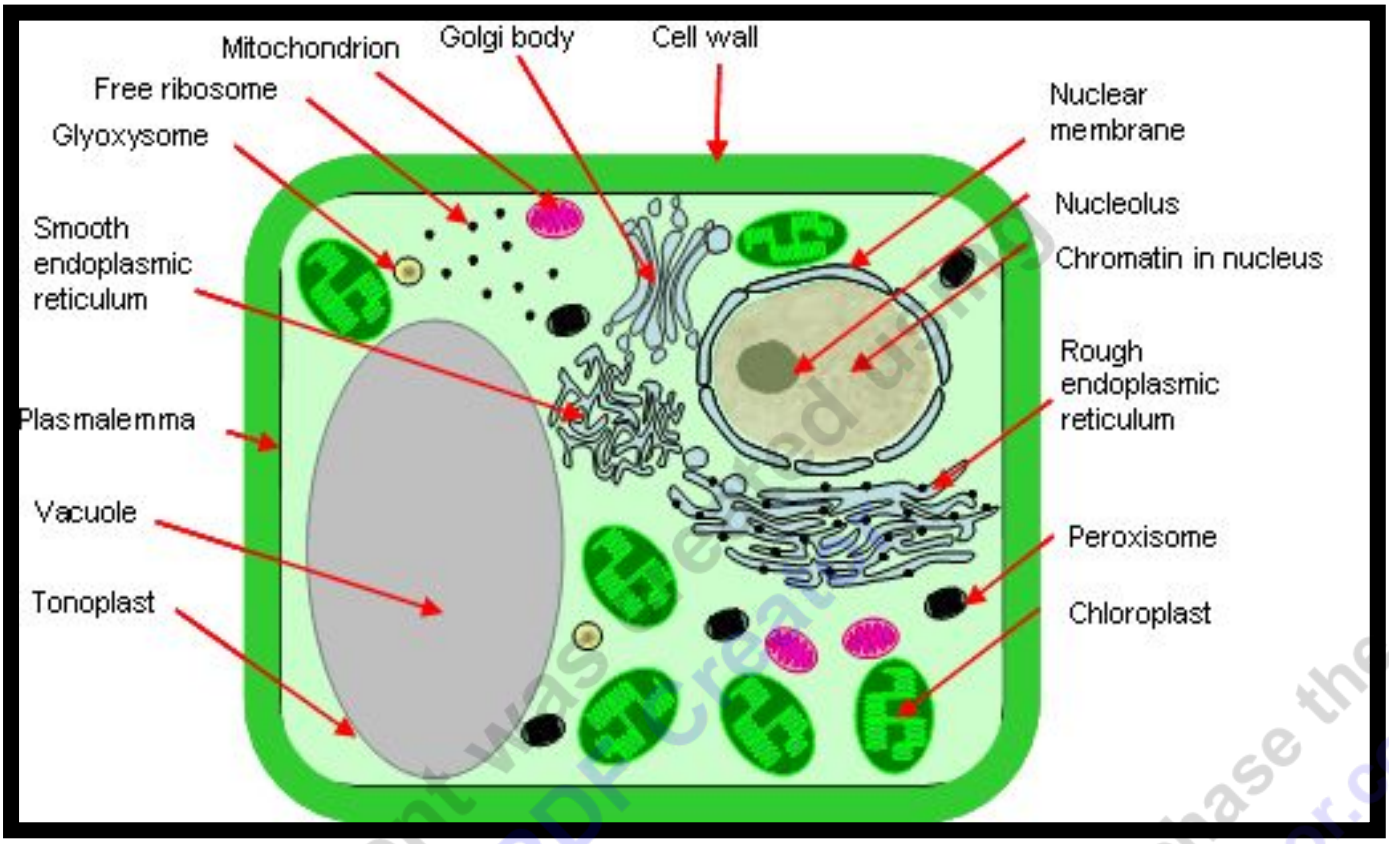
ORGANELLES IN A CELL
Aid for Cell City Project



Protoplasm – All contents of the cell

Cytoplasm

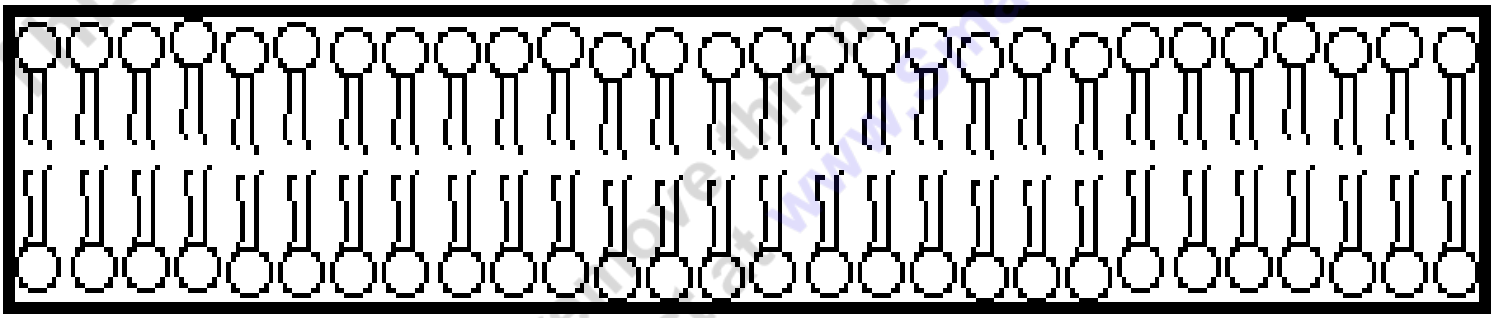
- All areas outside of nucleus.
- Area outside of organelles is called cytosol.
- Rich chemical fluid that helps breakdown molecules for use.
    - Moves materials through cell (food and waste)



CELL WALL

- Found in plants and bacteria
- Made of cellulose (permeable)
- Supports plant

Plasma Membrane



- - Made of a phospholipid bilayer
  - Phospholipids have two ends, one of which is hydrophilic, or attracted to water, and one of which is hydrophobic, or repelled by water.

- - The cell membrane is selectively permeable. Some things can enter some can't.

- - Cell Membrane controls movement (cellular traffic) in and out the cell.

Passive transport - movement of molecules from a more crowded to a less crowded area WITHOUT the use of energy.

Diffusion: Random movement of molecules.

- From high to low concentrations
- Molecules are trying to reach equilibrium.

Osmosis: the movement of water through a semi-permeable membrane.

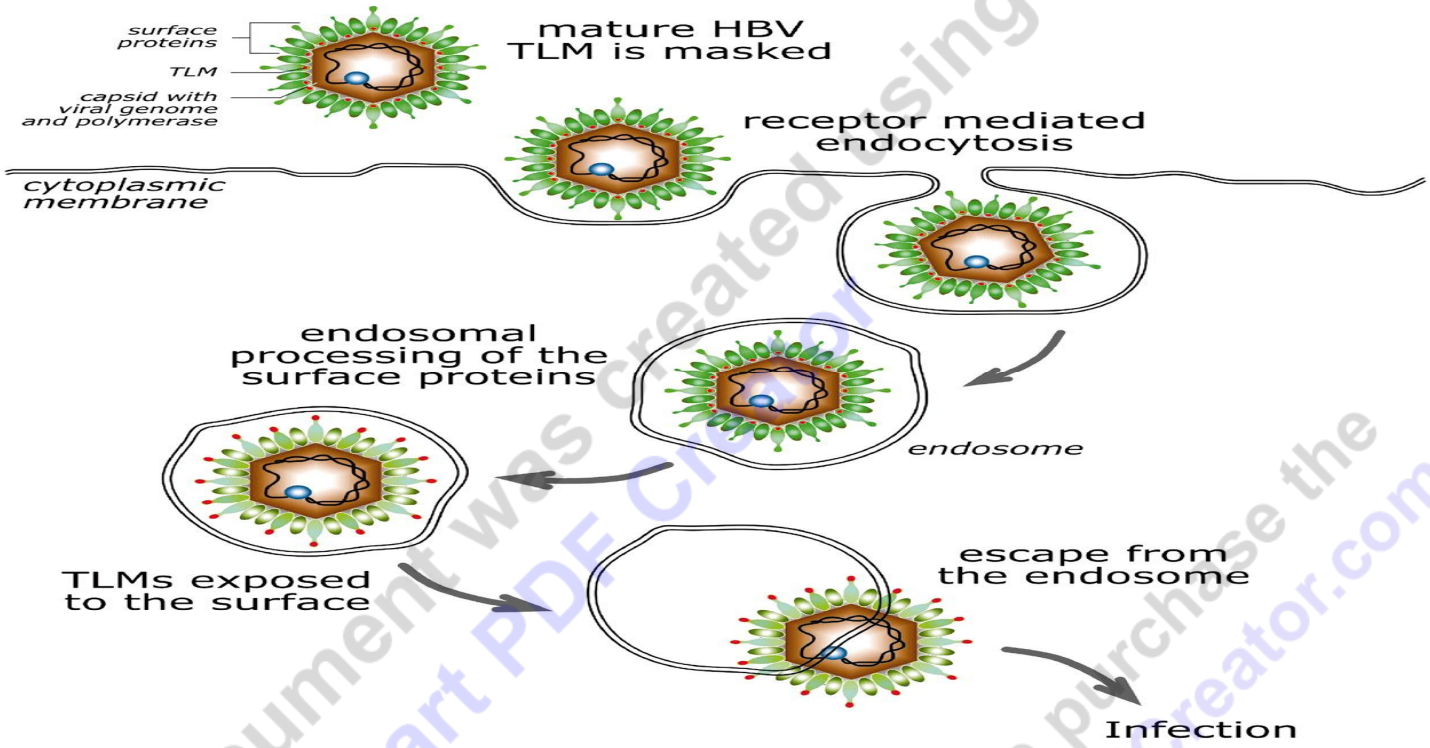
- **Permeable: Has large holes in it to let molecules pass through.**
  - Semi-permeable – Some things can enter
  - Impermeable – Nothing can enter

- Hypotonic Solution: A solution that contains less solute (more water) compared to the cytoplasm of the cell.
  - Water moves into the cell to equal out concentrations. The cell swells
- Hypertonic Solution: Concentration of the cell is less than outside of the cell.
  - Water moves out of the cell to try to even out the concentration. Cell Shrinks (Plasmolysis)
- Isotonic Solution: The cell has a equal proportion of concentration with the area surrounding.
  - Water continually flows in and out to keep concentration even.

- **Active transport** –
  - - Movement of molecules from a less crowded to a more crowded area
  - -Requires the use of energy
  - - Proteins can do this

- - Also called reverse osmosis

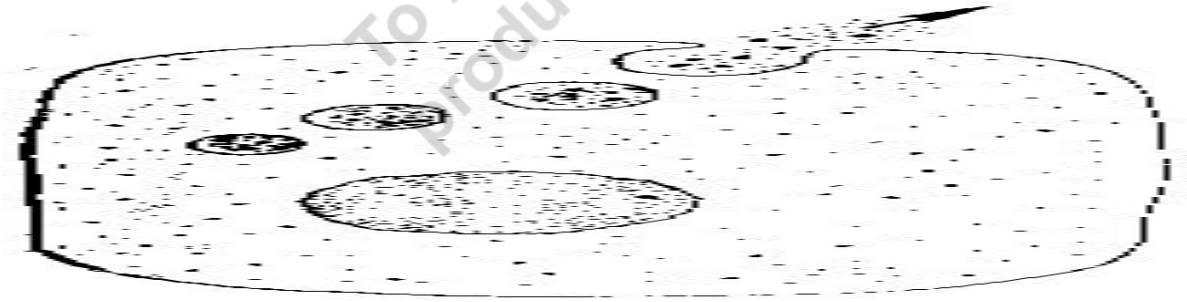
- **Endocytosis: (Endo - means to bring in) Energy requiring process where cell engulfs particle.**

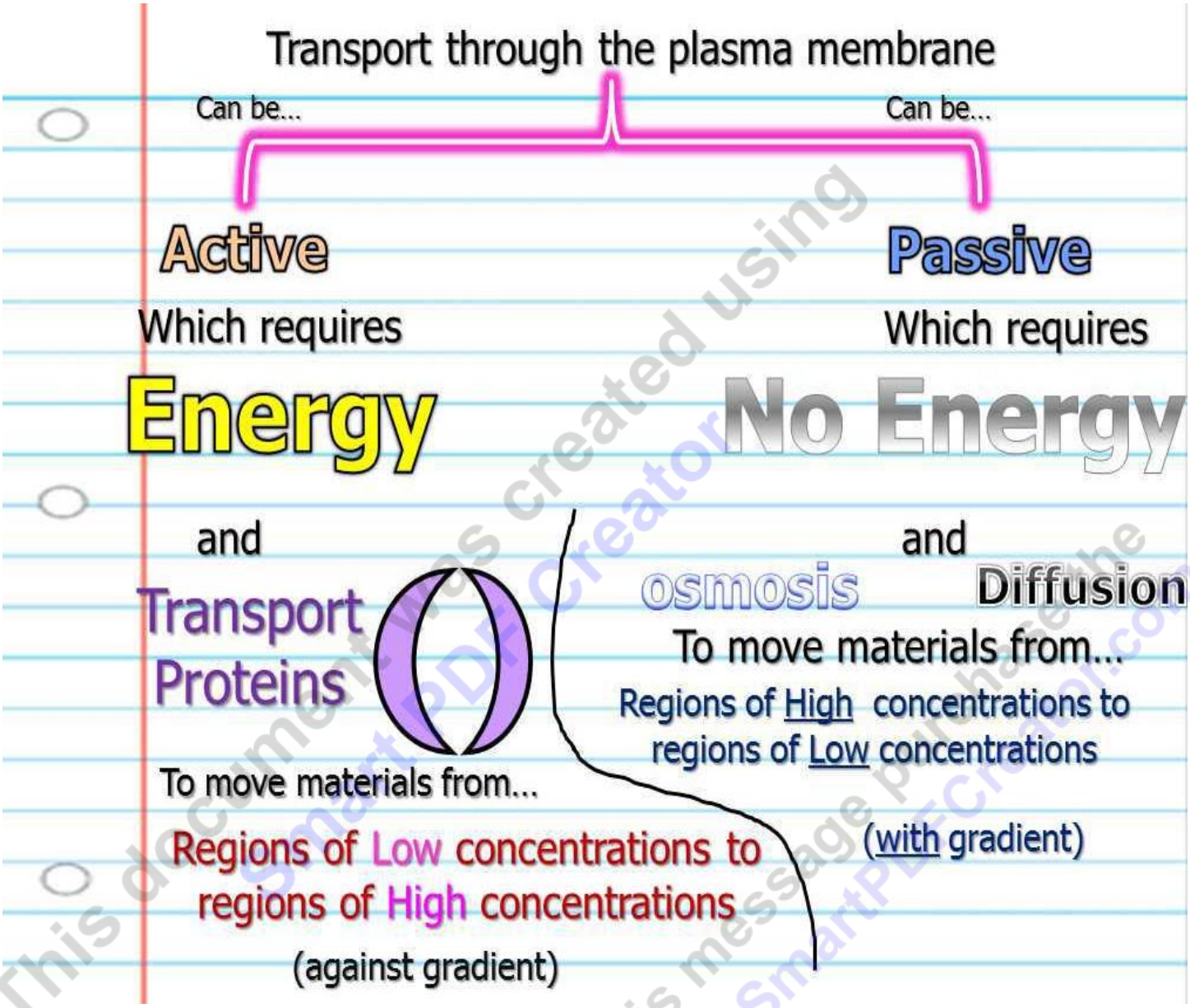


- **Phagocytosis: Type of endocytosis. Membrane surrounds large particles (solids)**
- **Pinocytosis: Membrane surrounds a liquid**

- **Transmembrane Protein Receptor Mediated Endocytosis: Proteins receptors facilitate endocytosis.**

- **Exocytosis: (Exo - means to take out) Cell releases particle. Uses energy.**





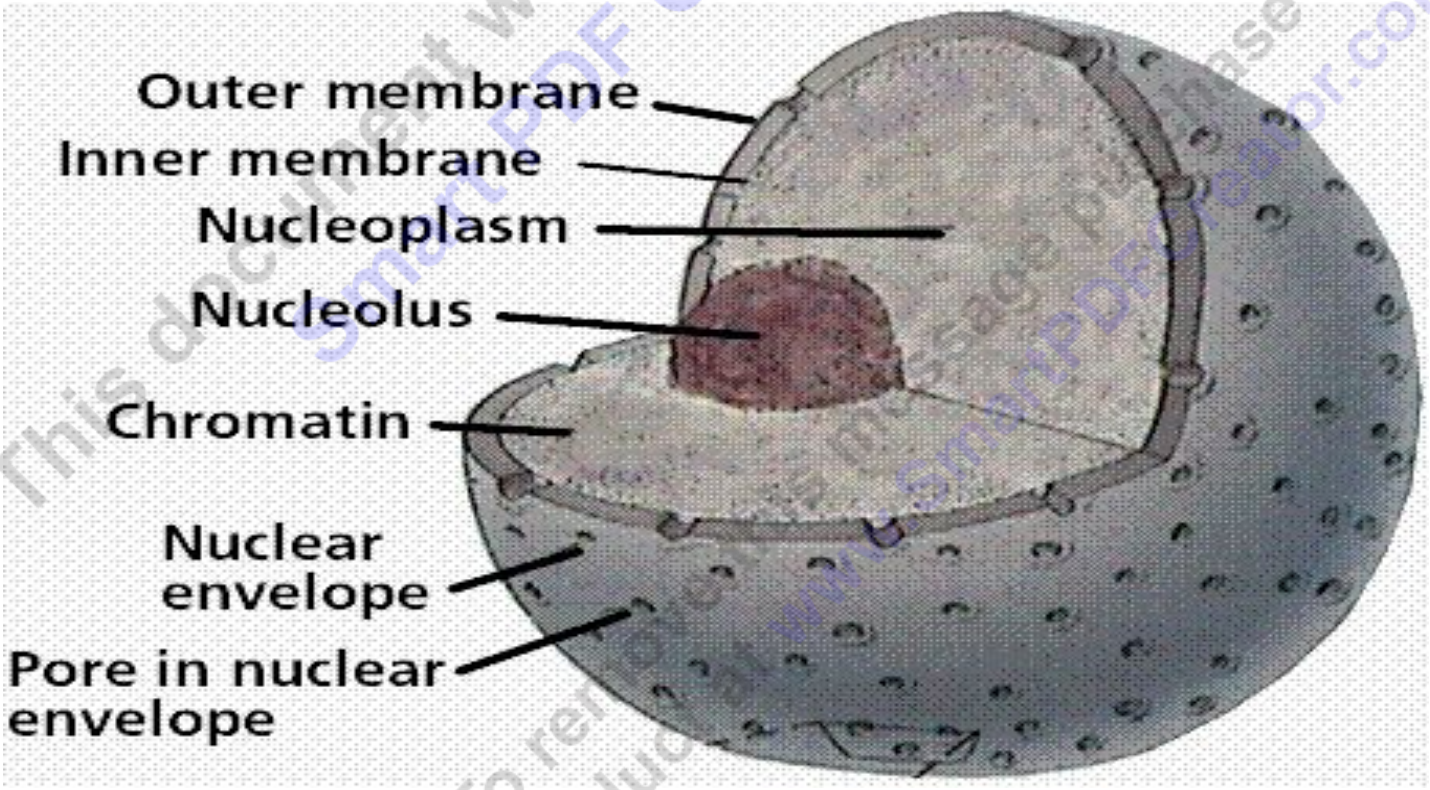
Cellular Organelles: A membrane-bound compartment or structure in a cell that performs a special function.

They… Support, manufacture (make materials), Breakdown material, communicate, and transport materials within the cell.

- **The Nucleus**
  - **Largest organelle in the cell (dark spot)**
  - **Contains genetic information (DNA)**
  - **DNA transcription to RNA Translation to Proteins**
    - **Chromosomes / Chromatin**
      - **Composed of DNA**

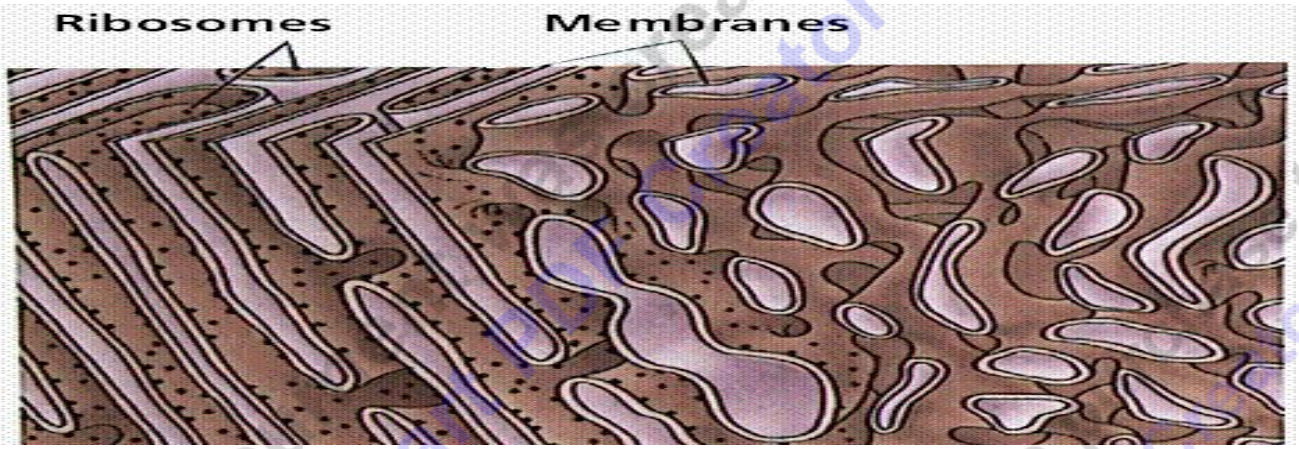
- Thicken for cellular division.
- Set number per species.
    - Humans have 46 chromosomes (23 pairs).

- Nucleolus
    - Round dark spot shape in nucleus.
    - Only visible when cell is not dividing.
    - Contains RNA for protein manufacturing.
    - Makes ribosomes that travel out of nucleus
- Nuclear Membrane
    - Surrounds nucleus.
    - Composed of two layers
    - Numerous openings for nuclear traffic.
    -

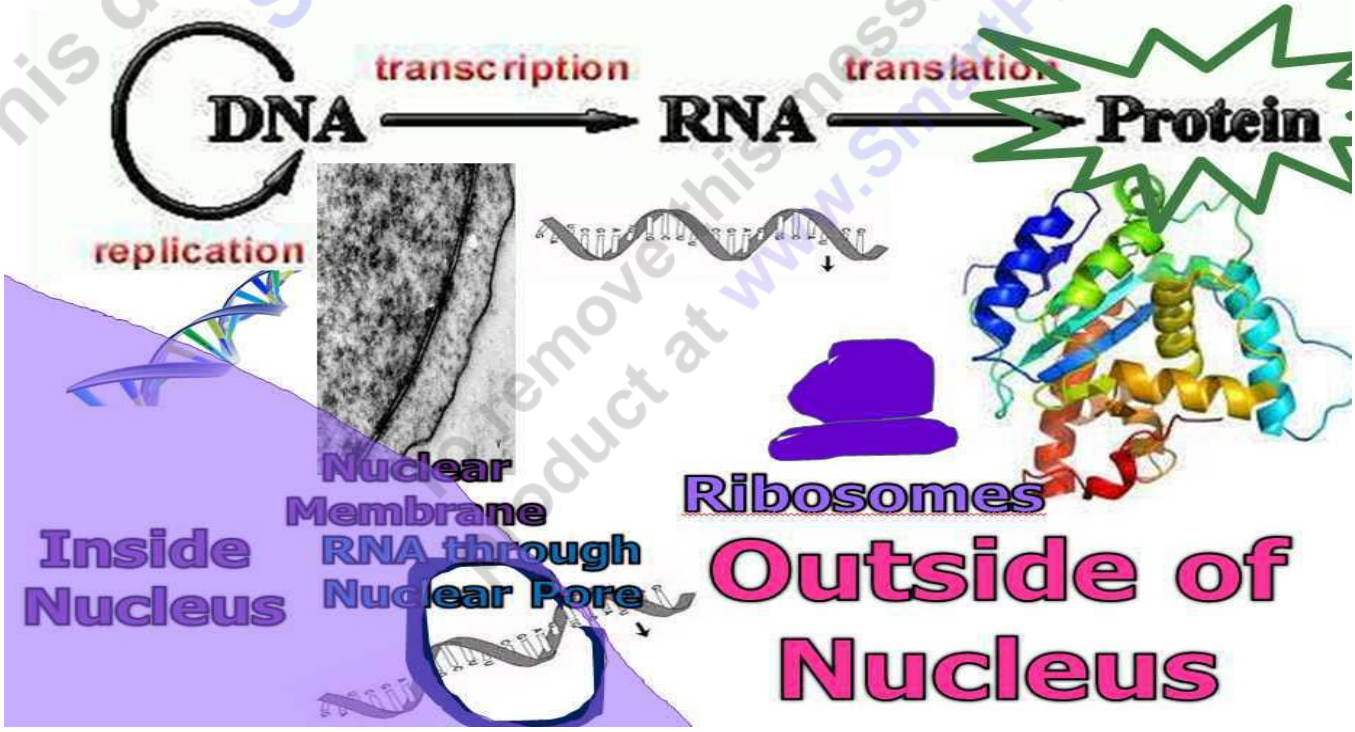


Rough Endoplasmic reticulum (E.R. for short)

- - Maze-like network fused to nuclear membrane.
- - Goes from nucleus to cell membrane.
- - Stores, separates, and serves as cell's transport system
- - Ribosomes attach to and make proteins.



Rough E.R. Smooth E.R.

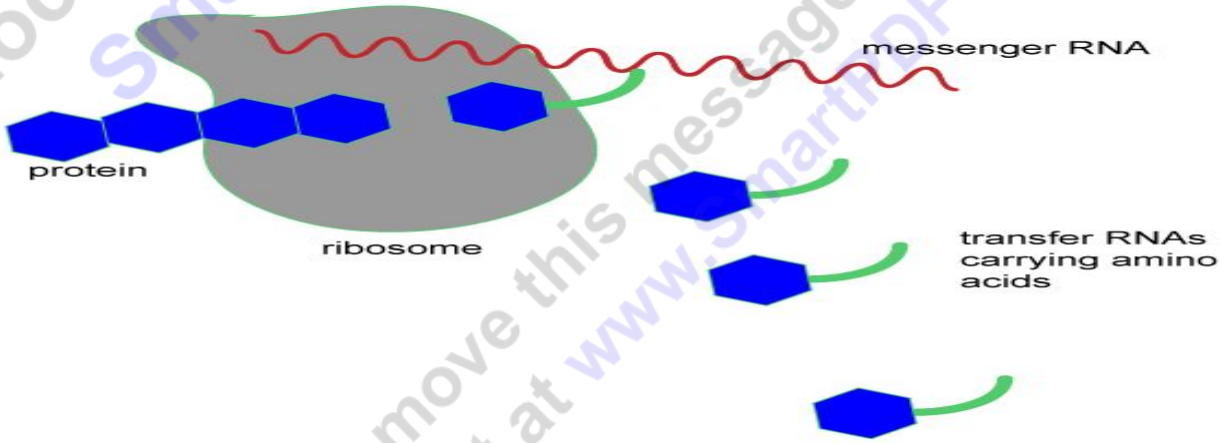


Smooth E.R.

- - Makes lipids (fats) and steroids.
- - Regulates Calcium production.
- - Synthesizes sugars "Gluconeogenesis"
- - Detoxifies drugs
- -Stores important enzymes

Ribosomes

- - Each cell contains thousands
- - Amino Acids: The building blocks of proteins. 20 variations
- - Composes 25% of cell's mass
- - Most are embedded in rough endoplasmic reticulum. Some free in cytoplasm.
- - Site of Protein Synthesis
- - Mini protein making factories
- - Proteins (ONCH) are very important to our cells and body.
- - DNA makes RNA, RNA has information to make proteins.
- - Ribosomes and mRNA



Protein Synthesis: The process in which the genetic code carried by messenger RNA directs cellular organelles called ribosomes to produce proteins from amino acids.

Proteins Synthesis Animation

- To make proteins
- Ribosomes are units that help read RNA
- RNA is the information code that tells the type of proteins to be made.
- Protein synthesis is the process of making

Golgi Apparatus

- Protein packaging plant and other macromolecules.
- Sends vesicles of macromolecules to destination in cell.
- Composed of numerous layers forming a sac.
- Enzymes and contents of lysosomes are made here.

Lysosomes

- Has Digestive acids / enzymes in a sac
- Digestive organelle, recycles old cell parts.
- Breaks down proteins, lipids, and carbohydrates, and bacteria.
- Transports undigested material to cell membrane for removal.
- Cell breaks down if lysosome explodes

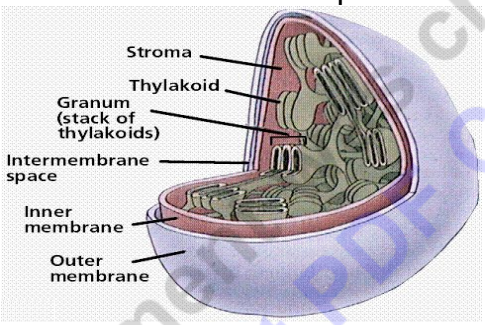
Cytoskeleton, microtubules, microfilaments

- Composed of microtubules
- Supports cell and provides shape
- Aids movement of materials in and out of cells
- Flagellum is made of microtubules

Centrioles

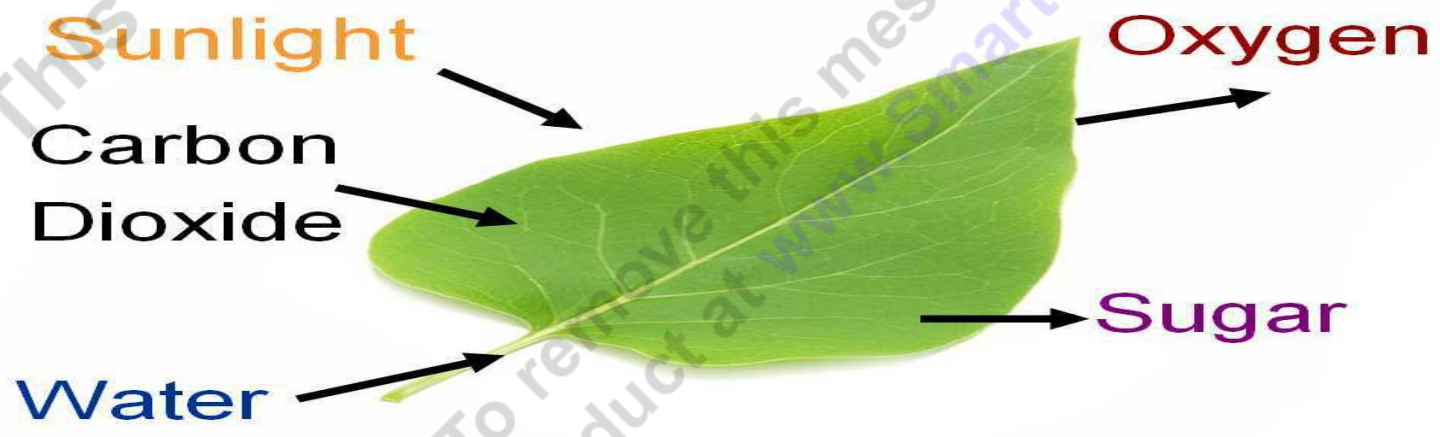
- Look like golden nuggets (Paired)
- Made of nine tubes
- Aid in cell division (Mitosis)

Plastids (AKA Chloroplast)

- Organelle in plants
- Contain the green pigment chlorophyll
- Has stacks called Thylakoids
- Do photosynthesis (Make the sugar)
- Has it's own unique DNA.
- 

Photosynthesis – Plants make sugar from sunlight. Light energy is turned into chemical energy (sugars – carbon based).

$6CO_2 + 6H_2O + \text{light energy} = C_6H_{12}O6 + 6O_2$



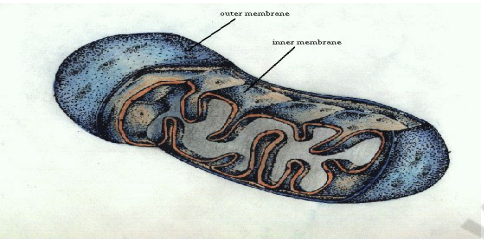
Photosynthesis

- Produces sugars from energy.
- Occurs only in cells with chloroplasts.
- Oxygen is produced.

- Water is used.
- Carbon dioxide is used.
- Occurs in light.

Mitochondria

- Large organelle that makes energy for the cell. (ATP)
- Has folds (surface area) called cristae
- Two membranes
- Recycles wastes, produces urea
- Has its own DNA. Reproduce independently from cell.



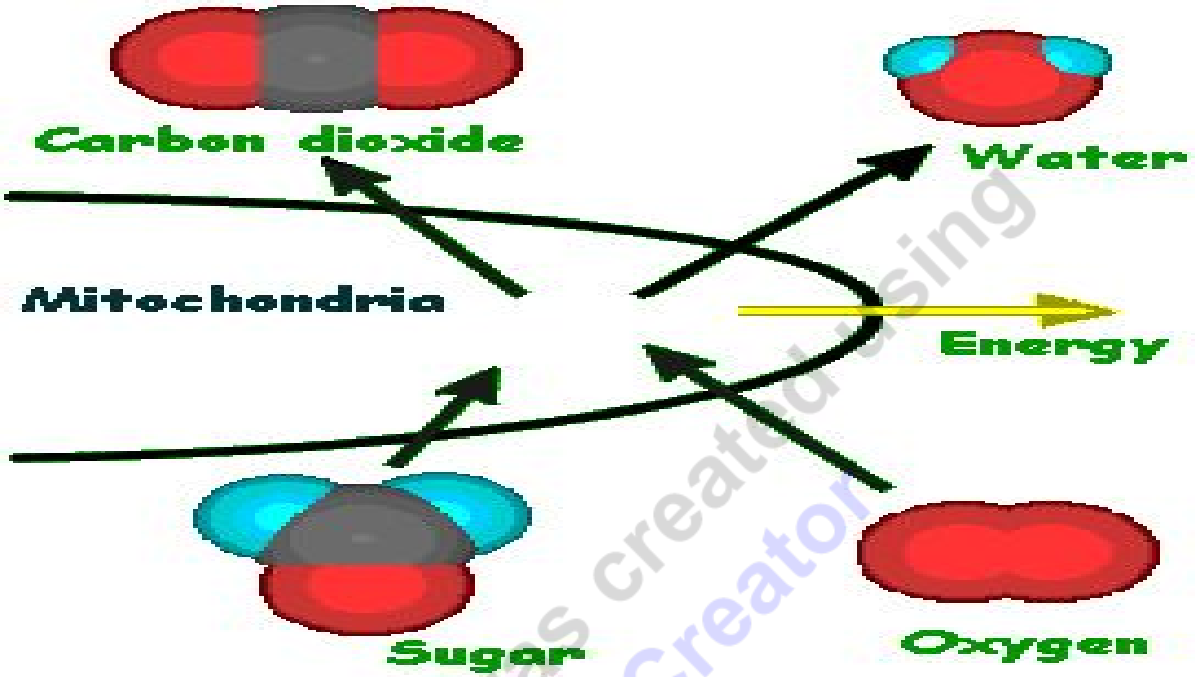
Cellular Respiration: Processes whereby certain organisms obtain energy from organic molecules.

Cellular Respiration

- $C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O$ + released energy.

Respiration

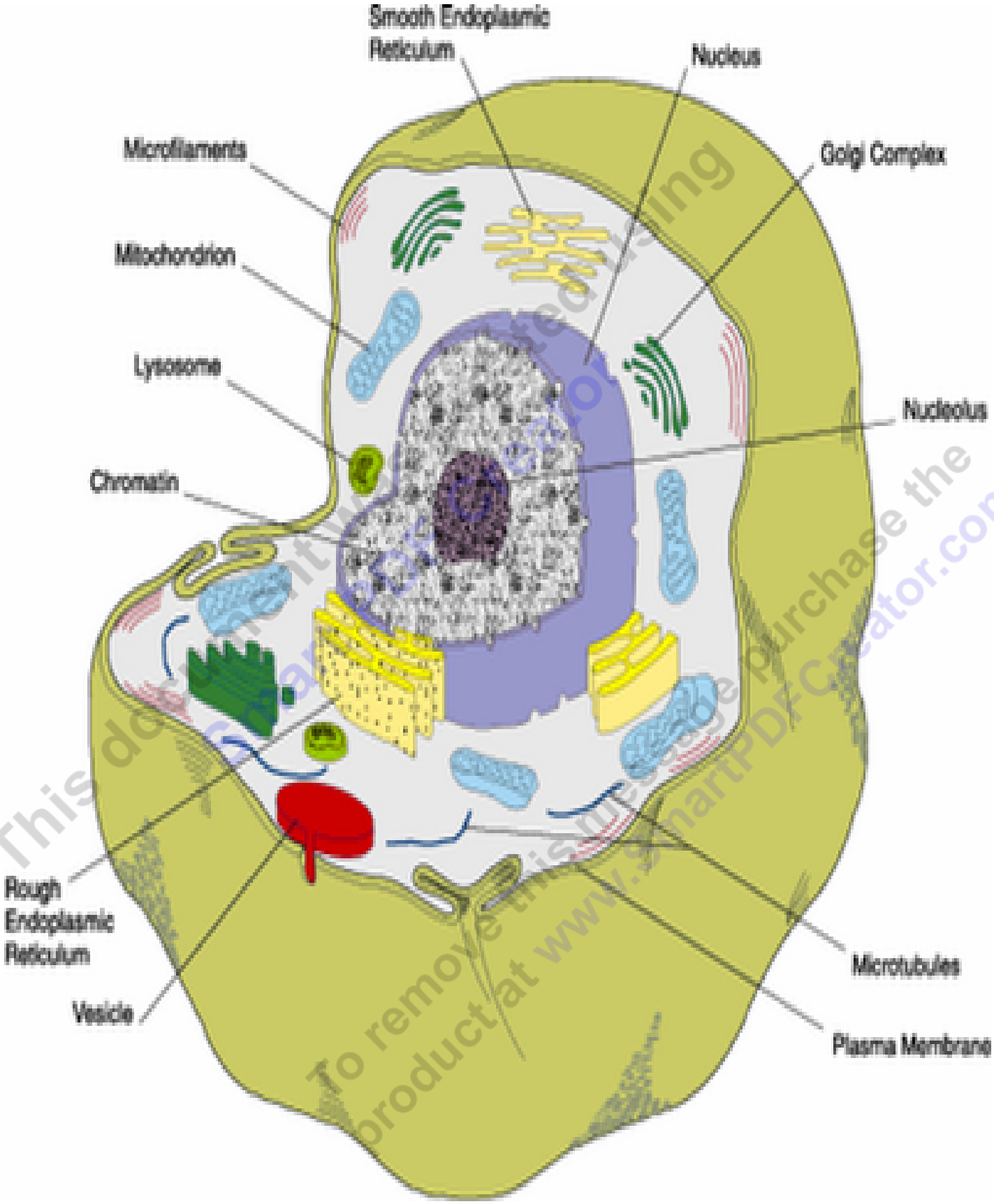
- Burns sugars for energy.
- Energy is released.
- Occurs in most cells.
- Oxygen is used.
- Water is produced.
- Carbon dioxide produced.
- Occurs in dark and light.



The carbon dioxide oxygen balance.

- Plant uses carbon dioxide and produces oxygen (photosynthesis).
- Animal uses oxygen and produces carbon dioxide (respiration).

- Vacuoles
  - Membrane-bound sacs for storage, digestion, and waste removal
  - Very large in plant cell
  - Create turgid pressure in plants
  - Contains food and water solution
  - Contractile vacuoles for water removal (in unicellular organisms) + locomotion.



SAVE THESE NOTES FOR THE HOMEWORK WHICH IS DUE SHORTLY!