ODM EDUCATIONAL GROUP
Changing your Tomorrow

THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Discovery of cell and cell theory

PERIOD-1

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LEARNING OBJECTIVE

- Student will be able to sequence the timeline associated with the discovery of Microscope, parts of microscope and their function.
- Student will be able to sequence the timeline associated with the discovery of cell
- Student will be familiarized with the cell theory
- They will be able to understand all the postulates of cell theory
- Learners will be sensitized about the difference between unicellular and multicellular organisms.

WARM UP QUESTIONS

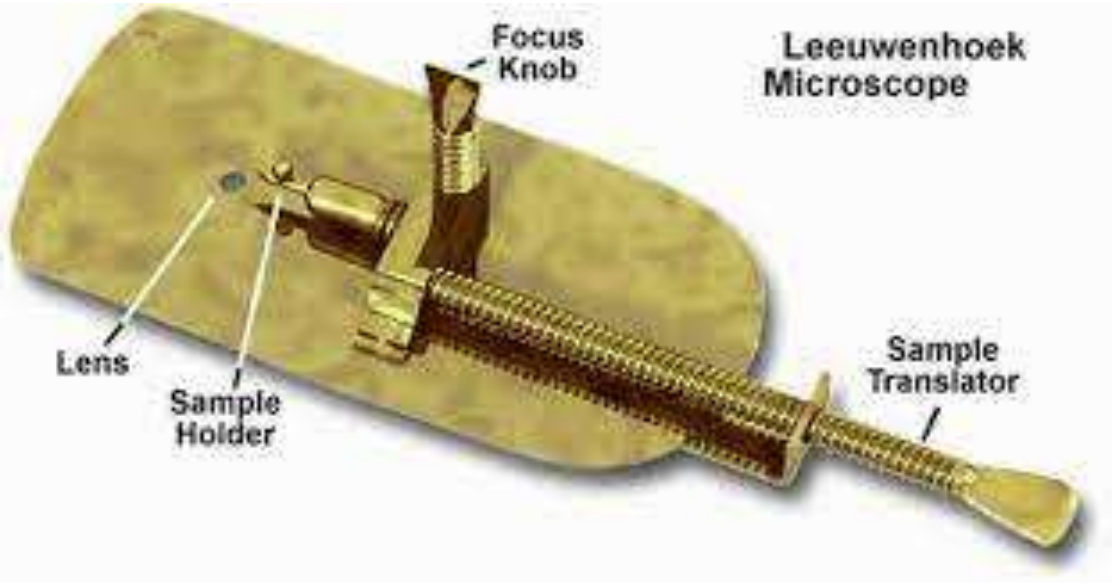
- Is cork cell living or non living?
- Amoeba and Paramecium are not visible through naked eye. Why?
- Can you differentiate between simple and compound microscope?
- Can you differentiate between plant and animal cell?

DISCOVERY OF CELL

- Cell is derived from a Latin term which means – ‘a little room’
- Basic structural and functional unit of life
- Discovery of cell- First discovered by Robert Hooke from dead cork cells (1665)
- obtained from bark of a tree by a self designed microscope

SELF DESIGNED MICROSCOPE BY ROBERT HOOKE

LEEUWENHOEK MICROSCOPE



MICROSCOPES

- A **microscope** is an instrument that makes an enlarged image of a small object, thus revealing details of the object which cannot be seen by our naked eyes.
- Simple microscope
- Compound microscope
- Electron microscope

COMPOUND MICROSCOPE

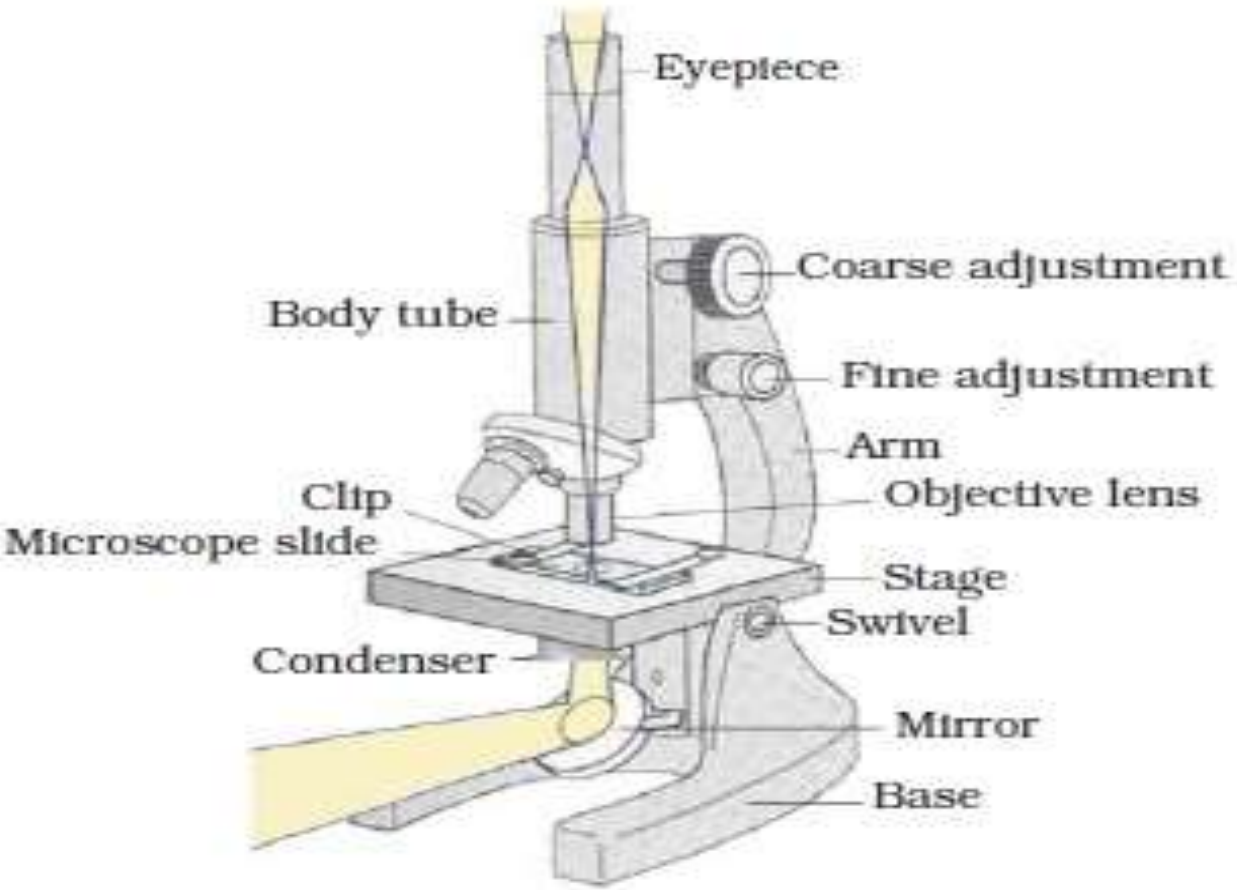
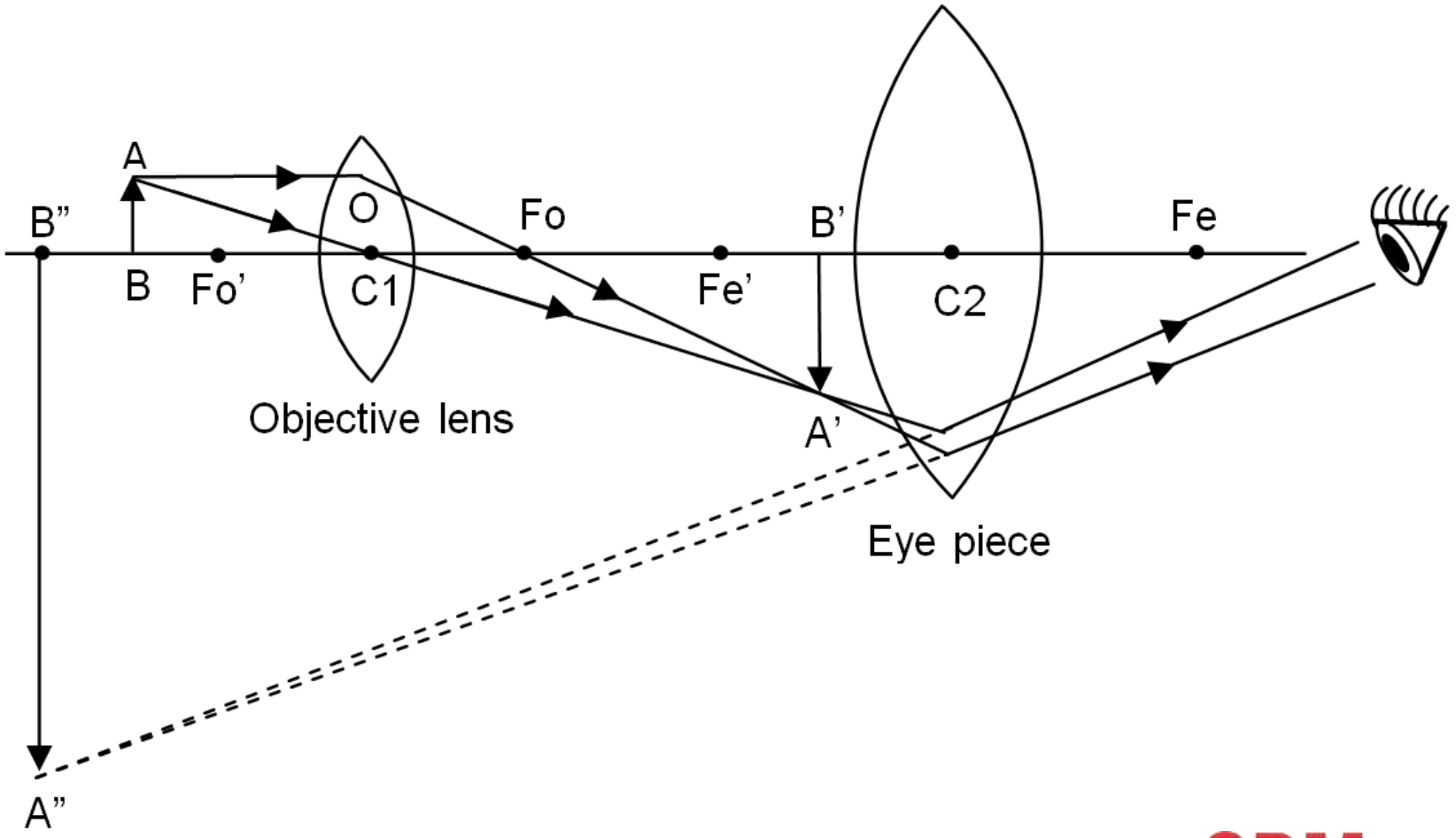


Fig. 5.1: *Compound microscope*

IMAGE FORMED BY A COMPOUND MICROSCOPE



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Cell Theory

Matthias Schleiden

all plants are made of cells

Theodore Schwann

all animals are made of cells

Rudolf Virchow

all cells came from pre-existing cells

Cell Theory

CELL THEORY

Cell Theory was formulated by M J Schleiden (1838) and Theodore Schwann (1839). The main principles of the theory are

- All living organisms are composed of cells .
- Cell is the basic unit of life
- Further modified by Rudolf Virchow (1855) - that all cells arise from pre-existing cells.
- In Latin term ‘ omnis cellula e cellula’

All living beings are composed of cells

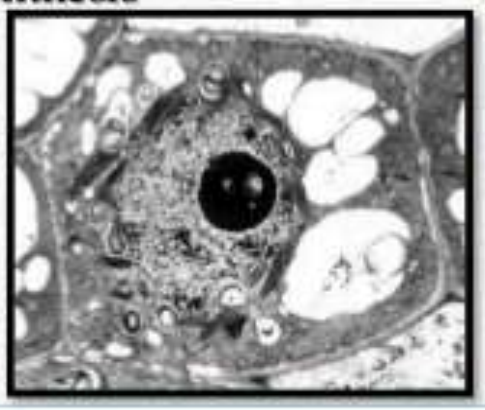
A paramecium is an example of a single-celled organism (**unicellular**)

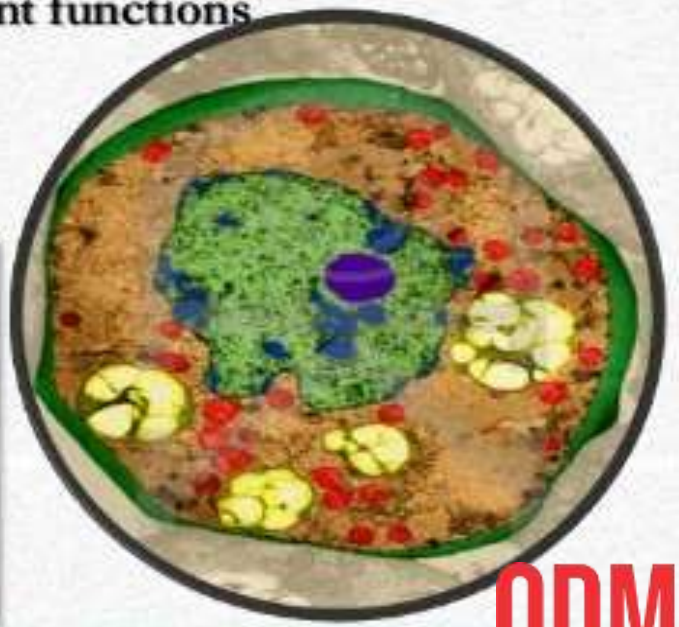
A monkey is an example of a **multicellular** organism

A cactus is an example of a **multicellular** organism

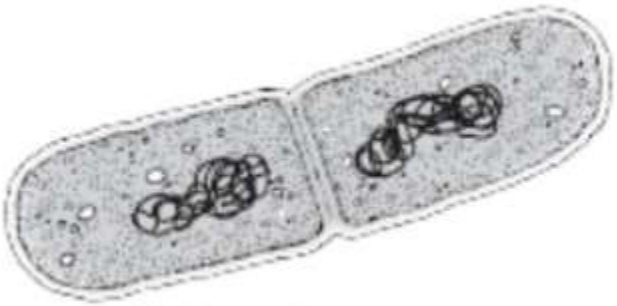
Cell is the basic unit of life

- It performs all life function like intake of food materials, excretion, metabolism, respiration, irritability, etc.,
- Division of Labour – Cell usually possesses a number of components called cell organelles.
- Each cell organelle performs different functions
  - Clearing waste material
  - Protein synthesis
  - Lipid synthesis



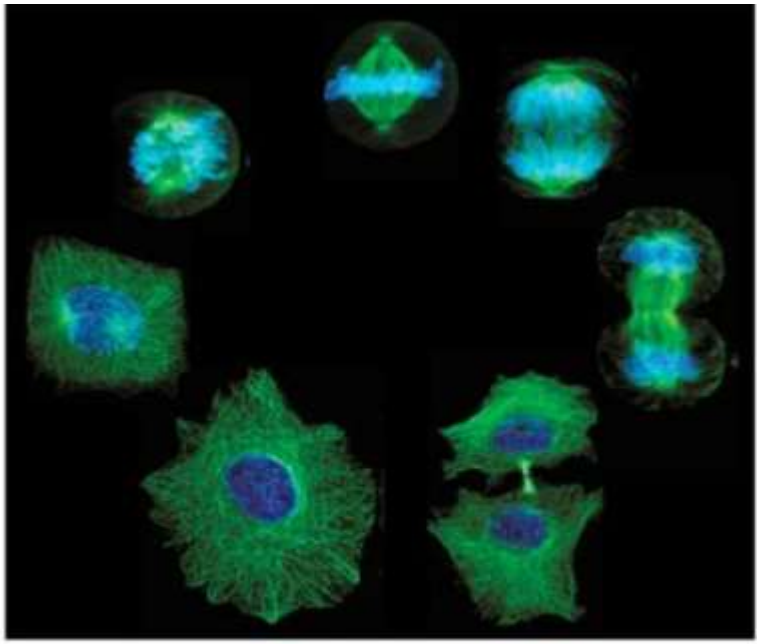


Cells arise from pre-existing cells



Eubacteria

A prokaryotic cell splits into two identical cells by the process of ***binary fission.***



A eukaryotic cell splits into two identical daughter cells by the process of ***mitosis.***

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HOME ASSIGNMENT

Following questions to be worked out

Q. Who discovered cell and in which year?

Q. Name the scientists who proposed cell theory and give the postulates.

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Shape , Size and types of cell

PERIOD-2

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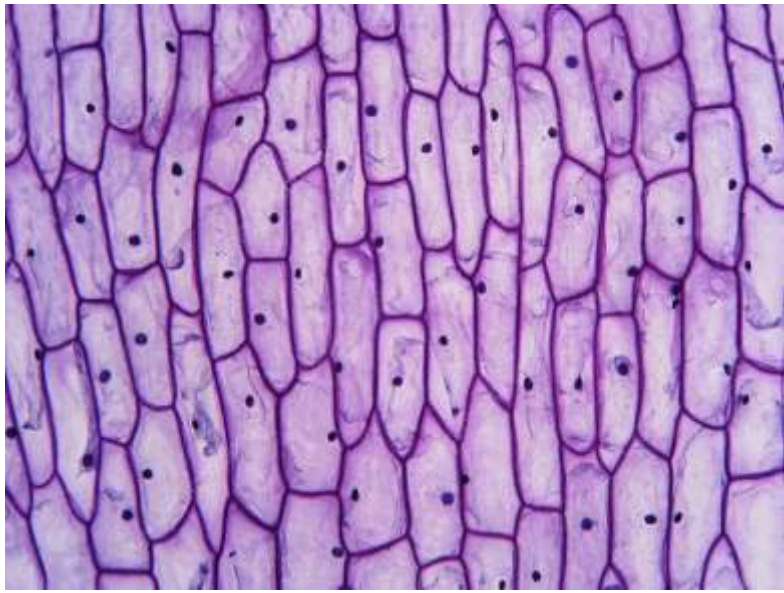
LEARNING OBJECTIVE

- Student will be familiarized with different shape of cells based on their functions.
- Student will be able to categorised cell based on the organization, cell complexity and existence as living and non living
- They will be able to analyze the difference between prokaryotic and eukaryotic cells.
- Learners will be sensitized about level of organization in living organisms.

LETS RECAPITULATE

- Differentiate between unicellular and multicellular organisms
- What are the postulates of cell theory?
- What are the constituents of a cell?

CAN YOU IDENTIFY?



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SHAPE & SIZE OF CELLS

Smallest cell- Mycoplasma or **pleuropneumonia-like organisms** (PPLO)(0.1 µm-0.3µm)

Largest cell - Egg cell of Ostrich (15 cm)
Longest cell – Human nerve cell (90 cm)

The shape and size of cells are related to Specific functions they perform.

Some cells have changing shapes.

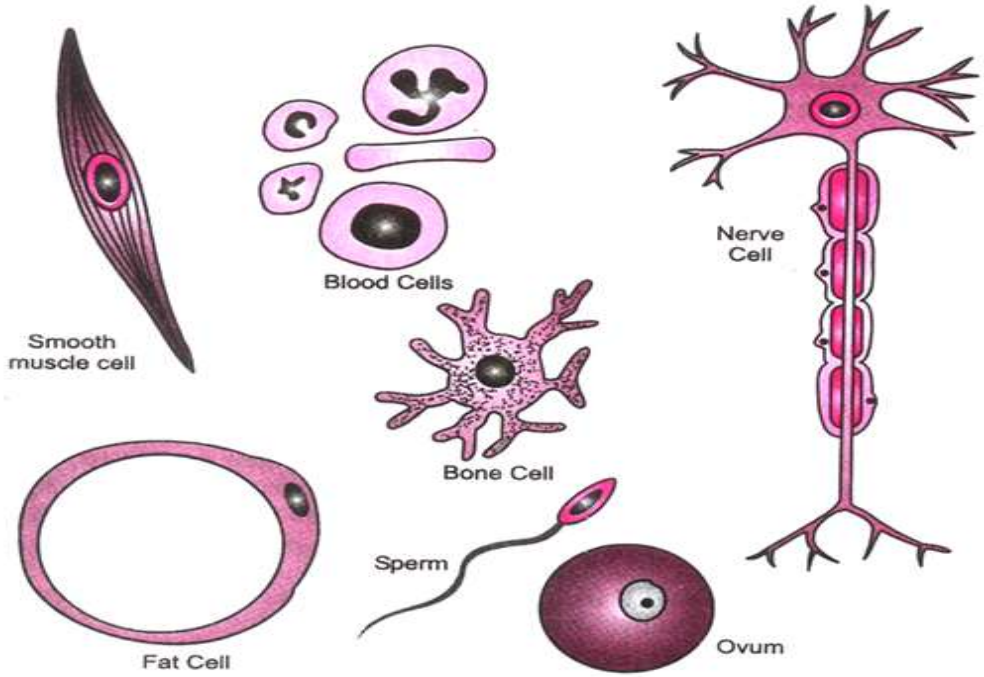


Figure : VARIOUS CELLS FROM THE HUMAN BODY

Level of Organization	Explanation	Example
 Atomic Level	Atoms are defined as the smallest unit of an element that still maintains the property of that element.	Carbon, Hydrogen, Oxygen
 Molecular Level	Atoms combine to form molecules which can have entirely different properties than the atoms they contain.	Water, DNA, Carbohydrates
 Cellular Level	Cells are the smallest unit of life. Cells are enclosed by a membrane or cell wall and in multicellular organisms often perform specific functions.	Muscle cell, Skin cell, Neuron
 Tissue Level	Tissues are groups of cells with similar functions	Muscle, Epithelial, Connective
 Organ Level	Organs are two or more types of tissues that work together to complete a specific task.	Heart, Liver, Stomach
 Organ System Level	An organ system is group of organs that carries out more generalized set of functions.	Digestive System, Circulatory System
 Organismal Level	An organism has several organ systems that function together.	Huma

Activity- To observe onion peel cells under microscope

1

An onion is cut into quarters.

2

One of the fleshy scale leaves is removed.

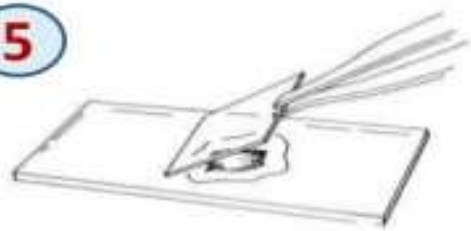
3

Snapping leaf backwards exposes the epidermis.

4

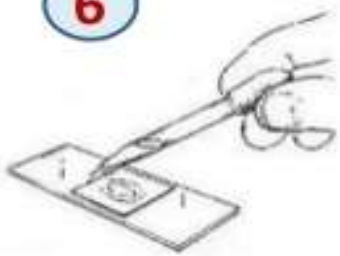
A thin inner layer of epidermis is peeled off.

5



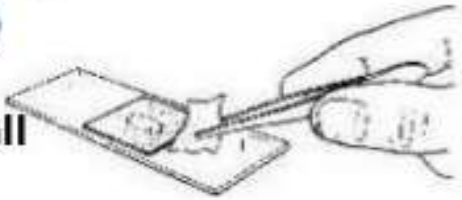
Epidermis is placed on slide & covered with 2-3 drops of distilled water . Coverslip is lowered.

6



A drop of stain is put at one end of slide.

7



Stain is drawn over specimen using a small piece of filter paper.

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Observation of the activity

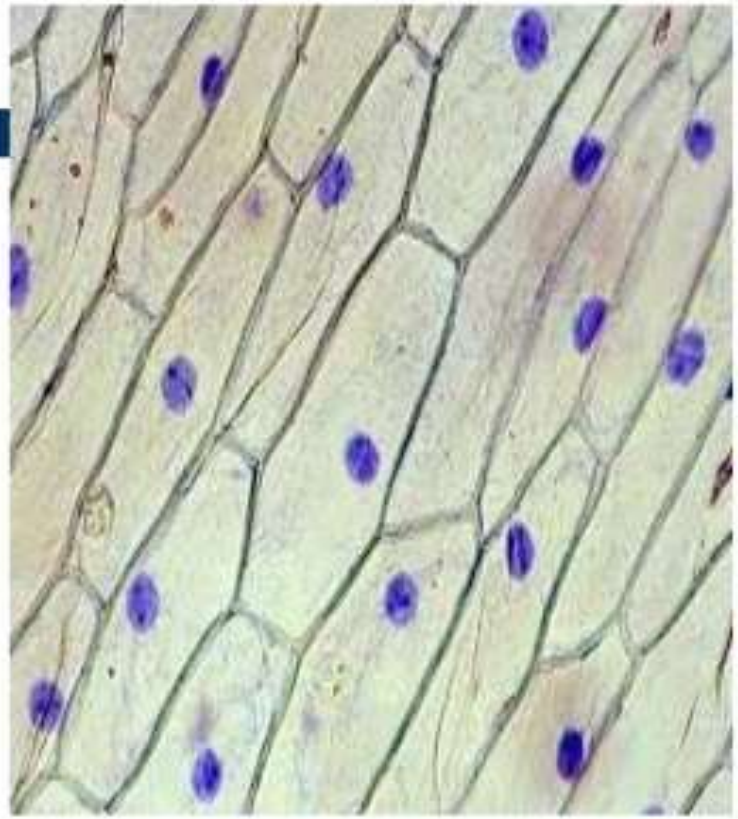
ONION PEEL

1)THESE STRUCTURES LOOK SIMILAR TO EACH OTHER.

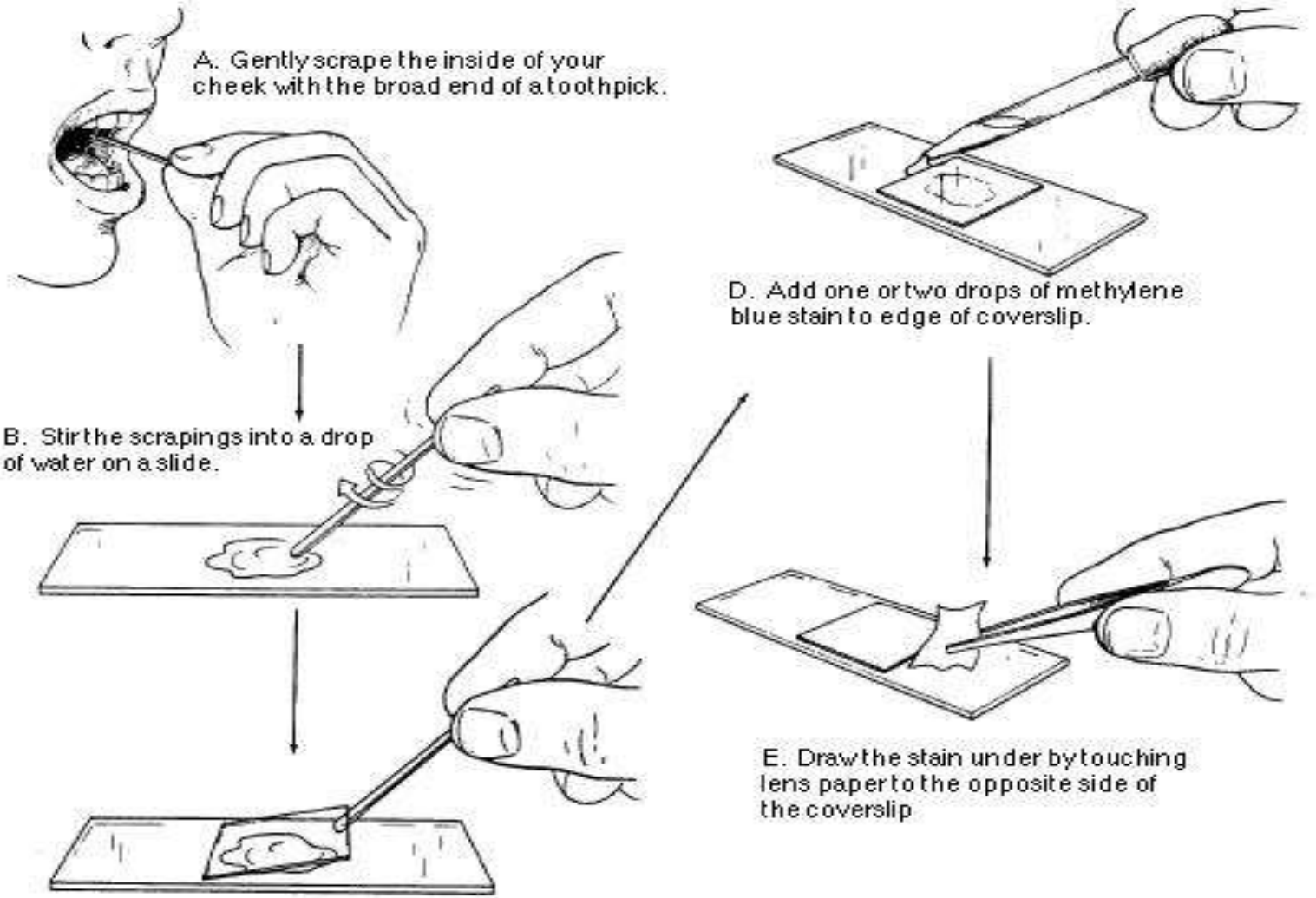
2) TOGETHER THEY FORM A BIG STRUCTURE LIKE AN ONION BULB.

3) THE CELLS OF AN ONION PEEL WILL ALL LOOK SAME,REGARDLESS OF THE SIZE OF THE ONION.

4) THESE SMALL STRUCTURES ARE THE BASIC BUILDING UNITS OF THE ONION BULB AND ARE CALLED CELLS.



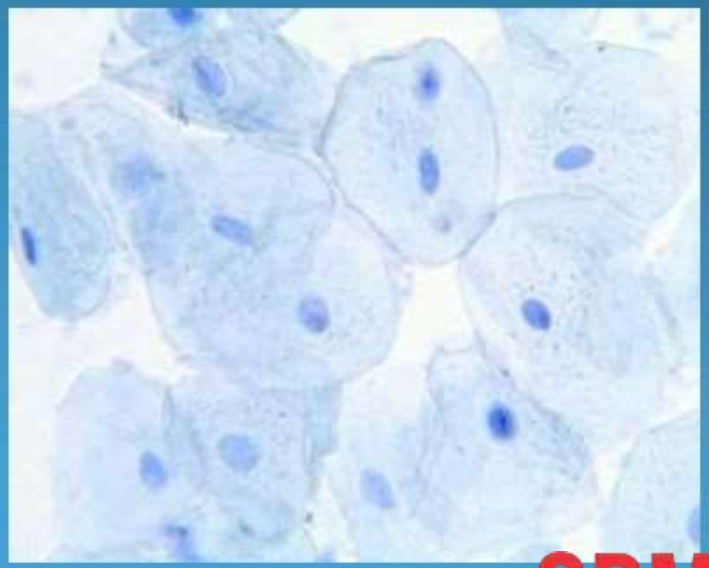
ACTIVITY- CHEEK CELL SLIDE PREPARATION



OBSERVATION OF CHEEK CELL UNDER MICROSCOPE

Onion vs. Cheek Cell

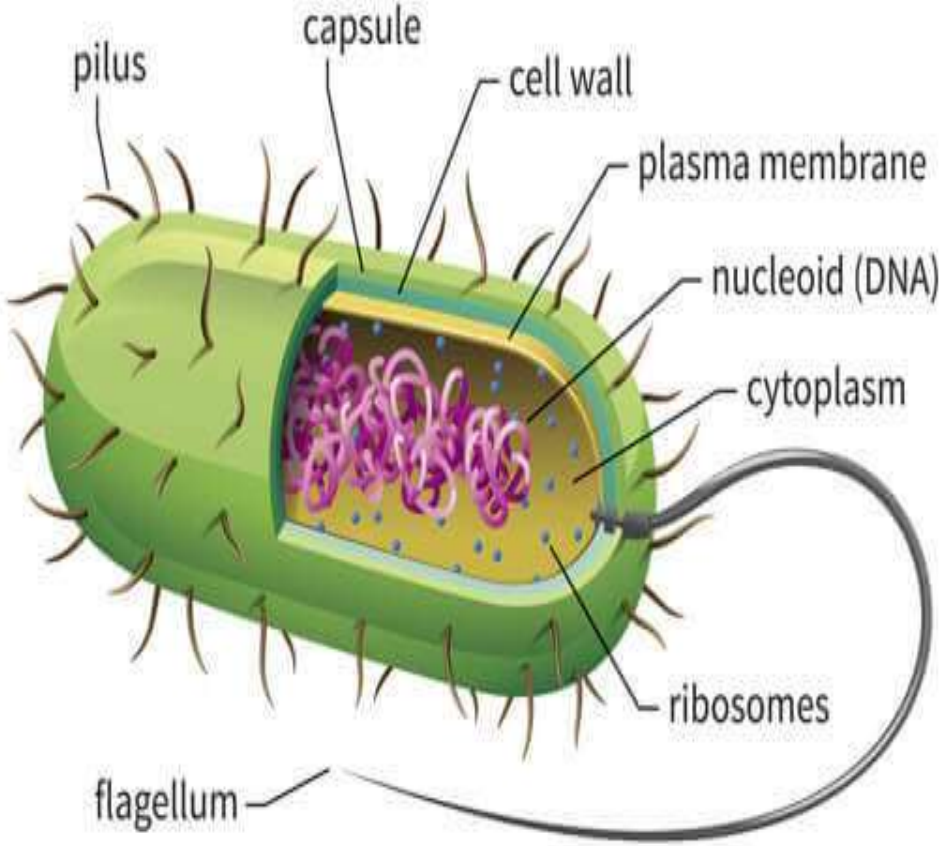
Comparing and contrasting onion and cheek cells

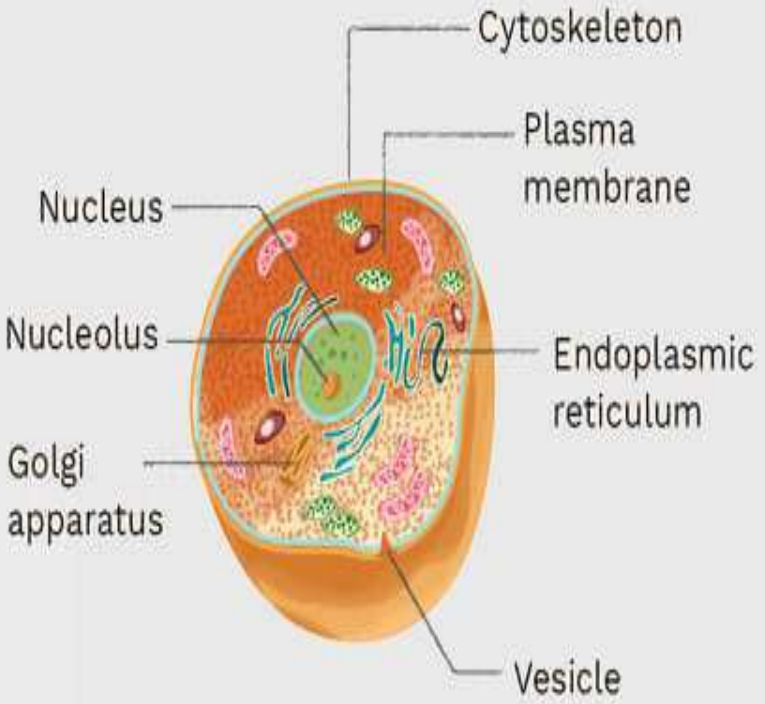


Prokaryotic Cell

VS

Eukaryotic Cell





Prokaryotic cell	Eukaryotic cell
'Pro' means primitive and 'karyon' means nucleus. Cells having primitive nucleus	'Eu' means true and 'karyon' means nucleus. Cells having true nucleus.
Prokaryotes are always unicellular organisms.	Unicellular and multicellular
Nucleus is not well defined and known as nucleoid	Well defined nucleus is present
Membrane bound organelles such as Mitochondria, Golgi complex etc. are absent.	Membrane bound organelles, such as Mitochondria, Golgi complex etc. are also present.
Ribosomes are smaller and scattered randomly in the cytoplasm.	Ribosomes are bigger. They are either attached to endoplasmic reticulum or are found free.
The prokaryotes include archaebacteria, bacteria and cyanobacteria (blue green algae).	Eukaryotes include all living organisms, except bacteria and blue-green algae

HOME ASSIGNMENT

Following questions to be worked out

Q1. Differentiate between prokaryotic and eukaryotic cell

Q2. Cells vary in shape according to their functions. Justify the statement.

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Structural organization of cell - Plasma membrane- structure, composition and functions

PERIOD-3

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LEARNING OBJECTIVE

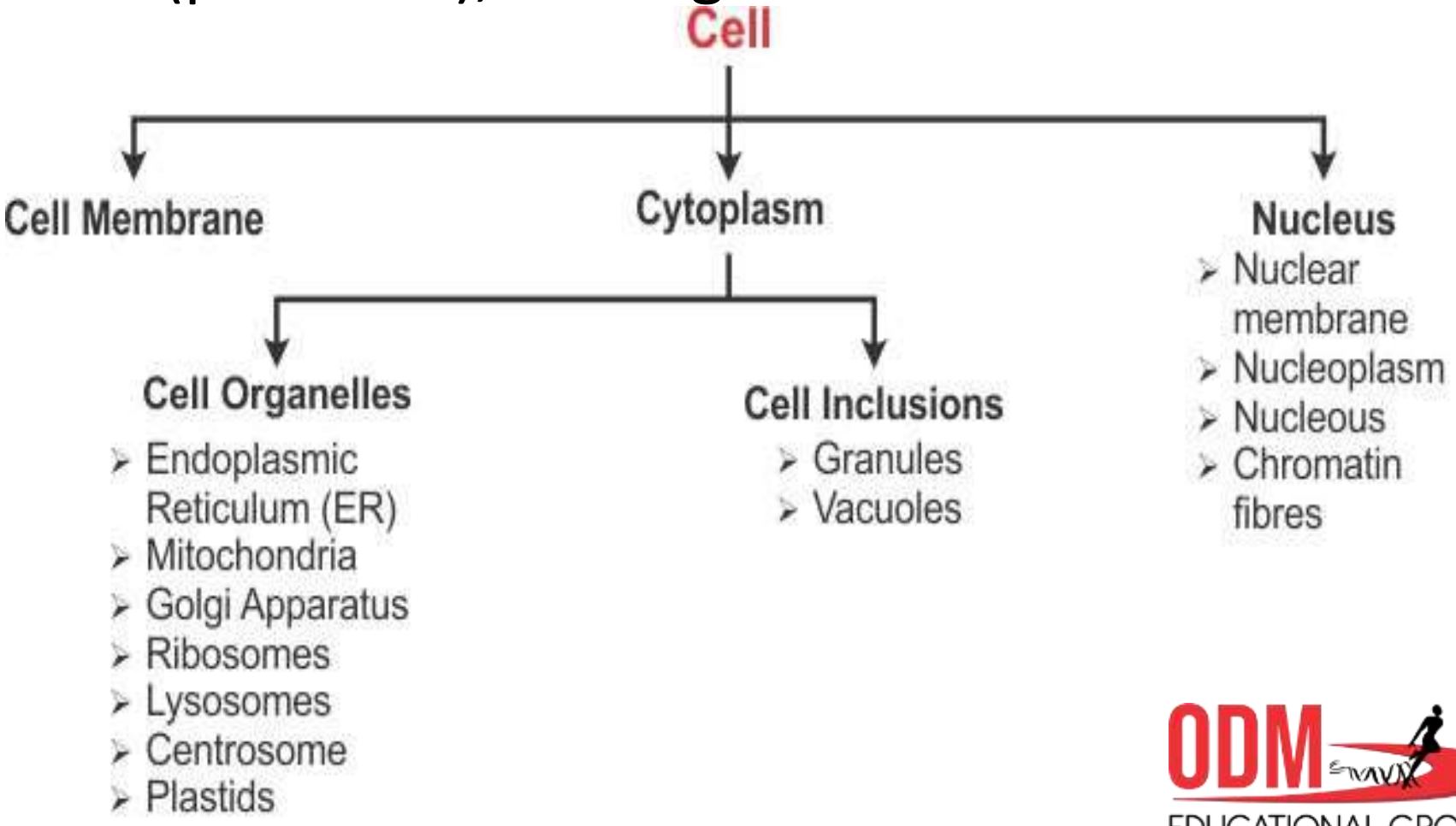
- Student will be able to understand the structural organization of cell.
- Student will be familiarized with the structure and composition of plasma membrane.
- They will be able to analyze various functions of plasma membrane in both plant and animal cell
- Student will understand that why plasma membrane is called as selectively permeable.

WARM UP QUESTIONS

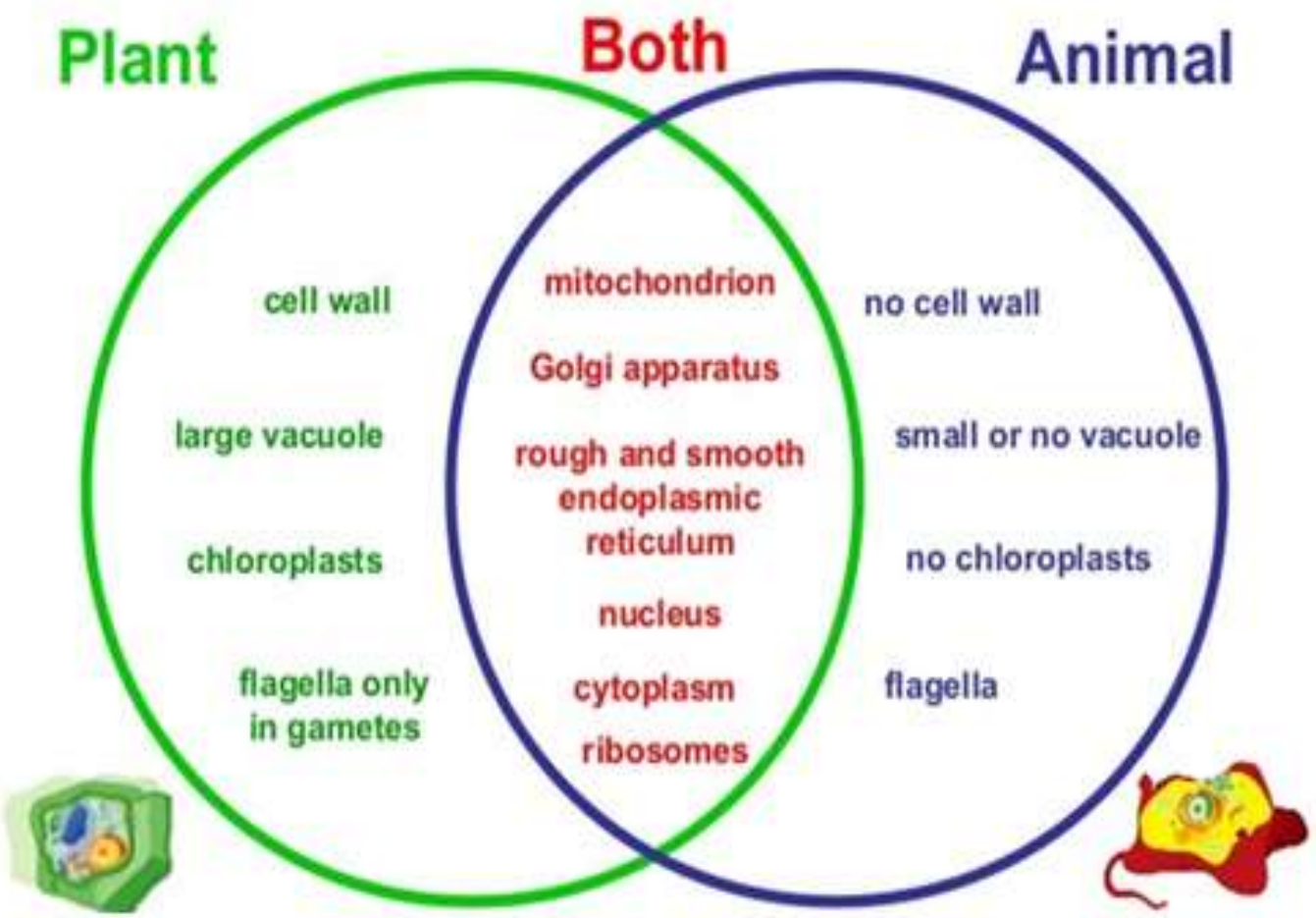
- What are the different parts, which you have learnt from onion peel and cheek cell?
- Which is the outermost covering of human cheek cell?
- What do you mean by structural organization of cell?
- What is the outermost covering of animal cell?

Structural organization of a cell

- Plasma membrane , nucleus ,cytoplasm, cell wall(plant cell), cell organelles



DIFFERENCE BETWEEN A PLANT CELL AND ANIMAL CELL



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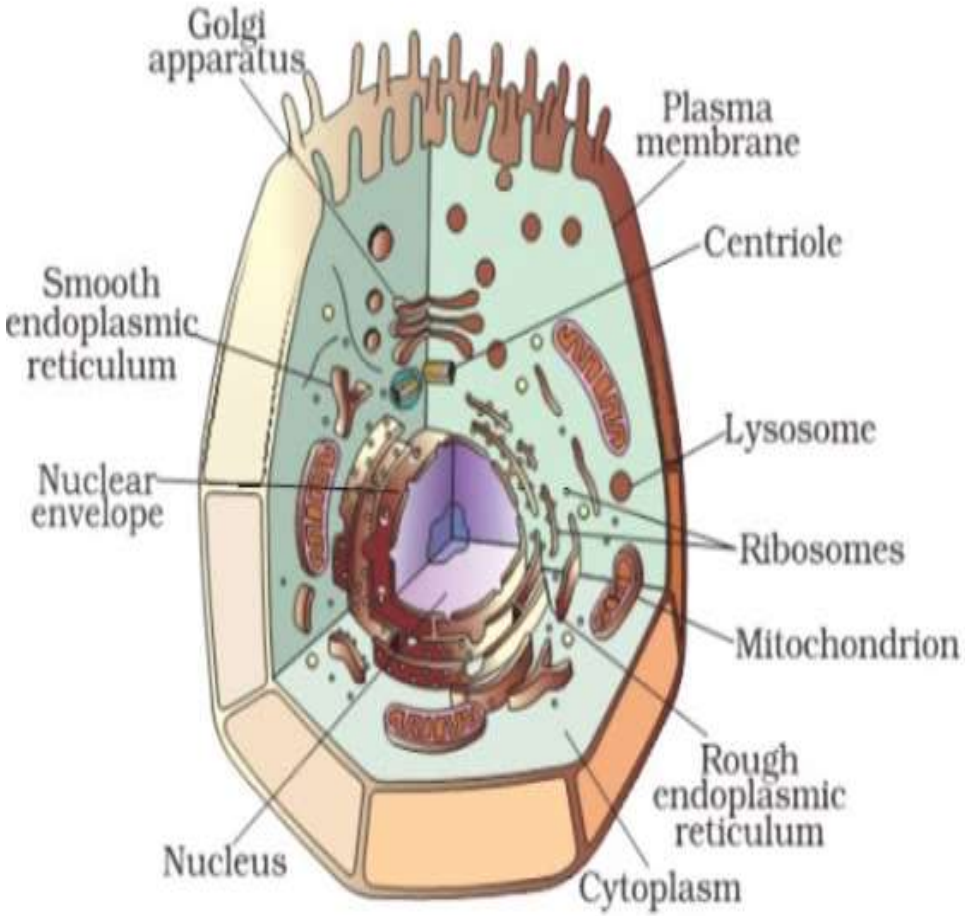


Fig. 5.5: *Animal cell*

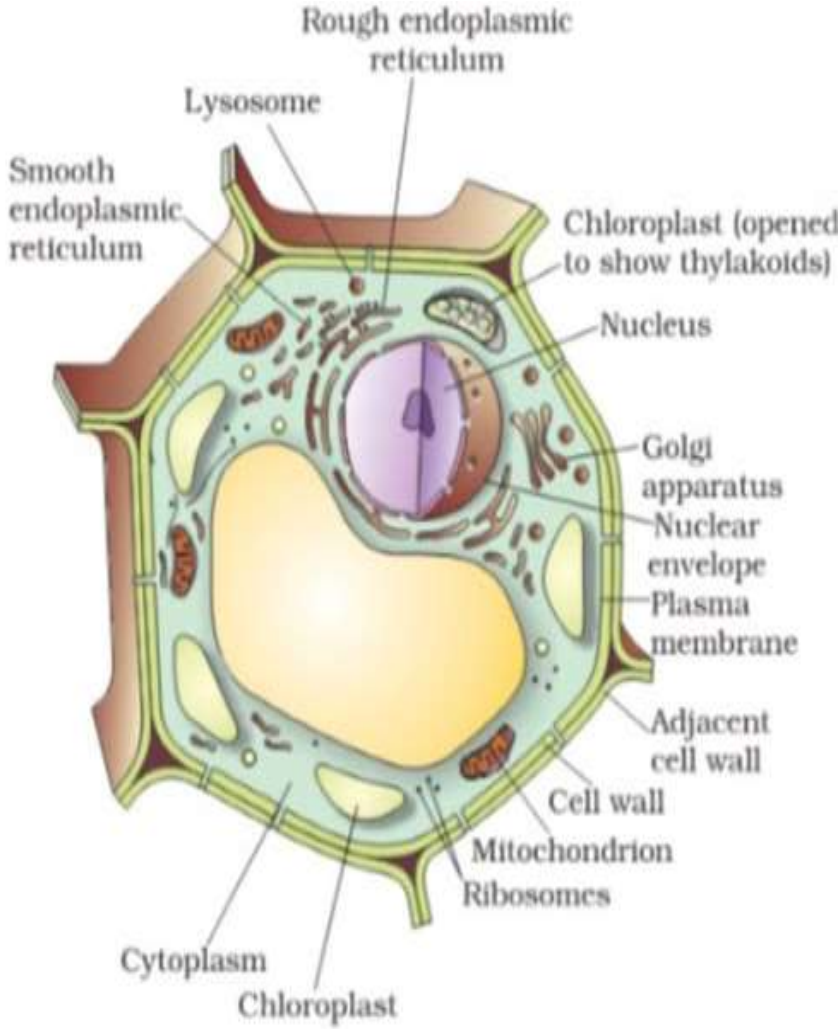


Fig. 5.6: *Plant cell*

DIFFERENT MODELS OF PLASMA MEMBRANE

The models are:

1. **Lipid and Lipid Bilayer Model-** was given by Overton, Gorion and Grendel
2. **Unit Membrane Model** (Protein-Lipid Bilayer-Protein)- By Danielli and Davson in 1935
3. **Fluid Mosaic Model**- SJ Singer and G. L. Nicolson in 1972

PLASMA MEMBRANE

❖ All cell membranes have a similar basic structure

✓ Proteins suspended in a double layer of phospholipids

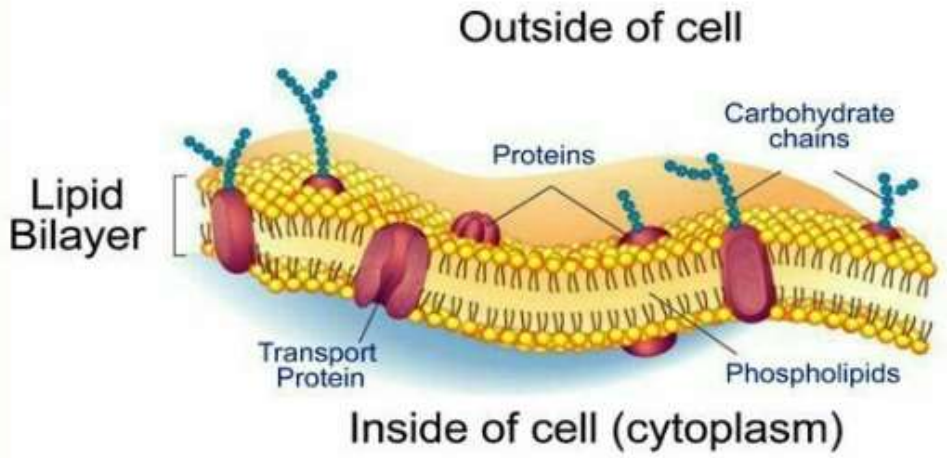
<u>Responsible for:</u>

1. selectively exchanging substances
2. Communicating with environment
3. Controlling biochemica reactions
4. Forming connections btwn cells

<u>Responsible for:</u>

1. Isolating cells contents

Structure of the Cell Membrane



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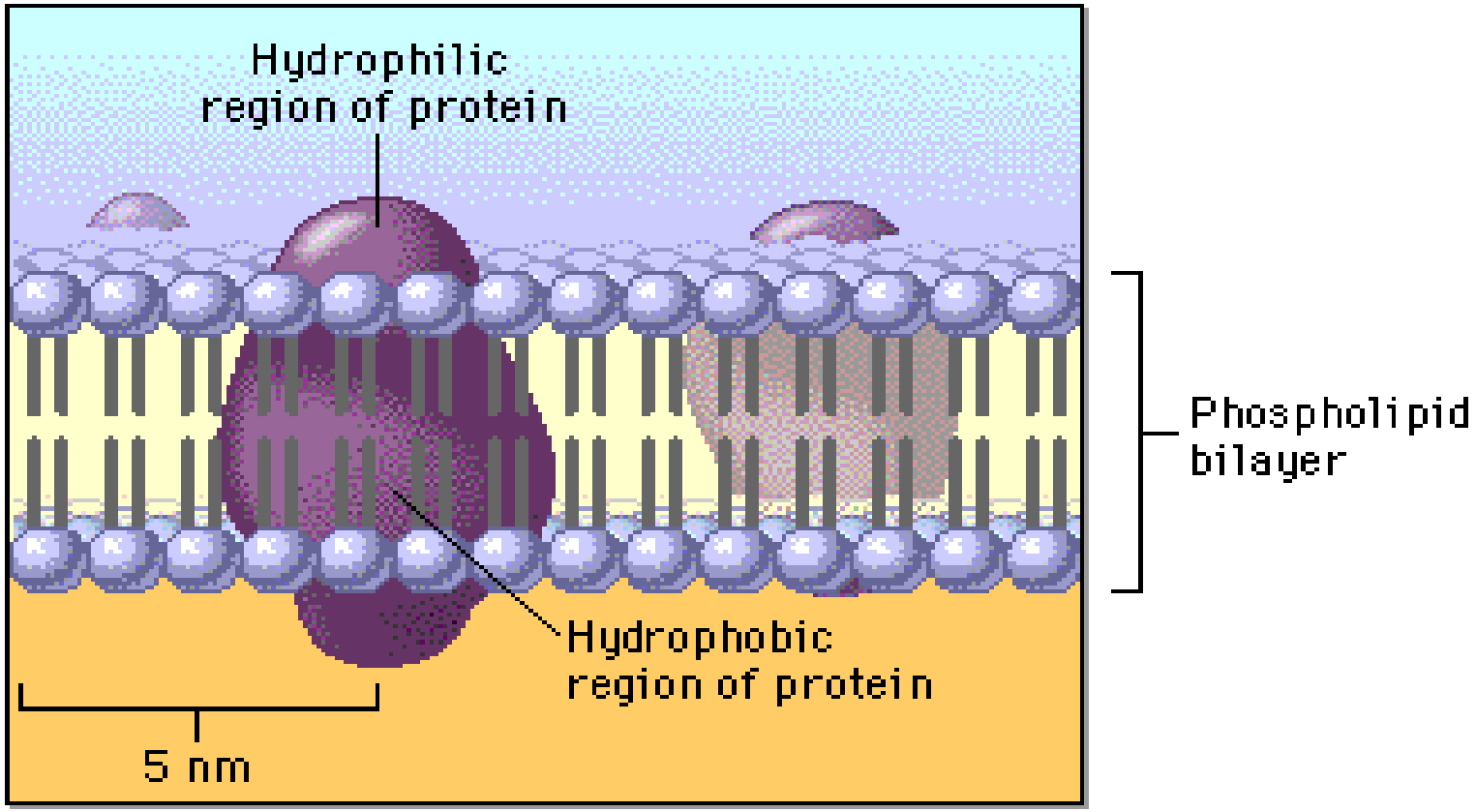
STRUCTURE OF PLASMA MEMBRANE



STRUCTURE AND FUNCTION OF PLASMAMEMBRANE

https://youtu.be/CNbZDcibegY

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HOME ASSIGNMENT

Q1. What is the other name for cell membrane?

Q2. Explain the structure and function of plasma membrane

Q3. Which component of plasma membrane maintains the flexibility of an animal cell?

Q4. What is the role of lipid bilayer in a plasma membrane?

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

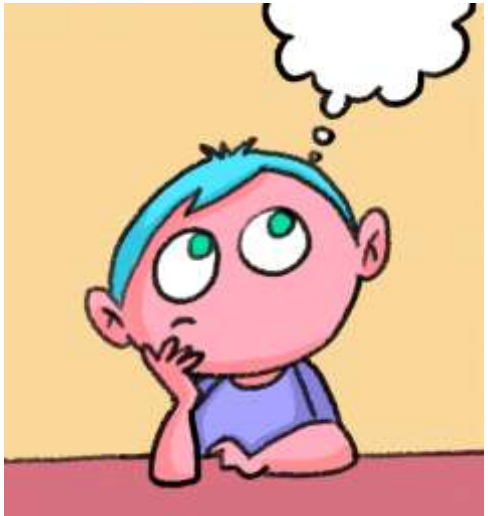
CHAPTER NO- 5

Transport across cell membrane- Diffusion and Osmosis

PERIOD-4

LEARNING OBJECTIVE

- Student will be able to understand the meaning of diffusion and osmosis.
- Student will be familiarized with the mechanism of transportation of selective materials through plasma membrane.
- They will be able to analyze various types of solutions depending on the concentration of both solute and solvent.
- Learners will be sensitized about the difference between osmosis and diffusion.



Activity

After burning an incense stick outside the classroom

Answer the following questions

- can you smell the fragrance of incense sticks?
- Guess how you are able to smell the fragrance?

Diffusion, Osmosis, Active Transport, and Passive Transport

How molecules move through the membrane.

Diffusion is the movement of molecules from an area where the molecule is in high concentration to an area where the molecule is in lower concentration. An example would be the food coloring in water. The food coloring (high concentration) will diffuse throughout the water (low concentration).

Osmosis is the diffusion of water through a semi-permeable membrane. Water moves from an area of high water molecule concentration (and lower solute concentration) to an area of lower water molecule concentration (and higher solute concentration). Example, in the cell, water molecules can be transported through a channel, but can also diffuse directly through the membrane lipid bilayer.

Active transport is the movement of molecules from areas of low concentration to areas where the molecule is found in higher concentration. This movement is not spontaneous and requires ATP energy and a protein carrier because it is moving *against* the concentration gradient. This process occurs continuously in nerve cell membranes with sodium-potassium pumps.

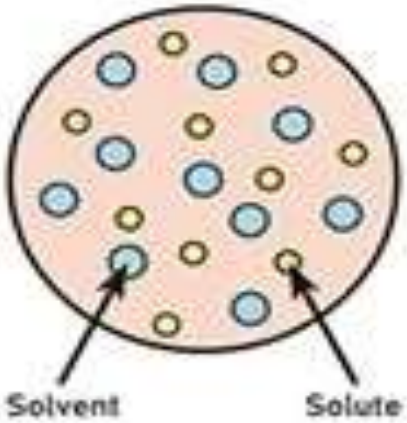
Facilitated diffusion/Passive transport is the movement of a molecule from an area of high concentration to an area of lower concentration to maintain equilibrium within the cell. This type of transport requires no energy since the molecules are moving *with* the concentration gradient. Small molecules such as glucose or some amino acids that our cells need do this regularly.

TYPES OF SOLUTION

Types of Solutions

Isotonic

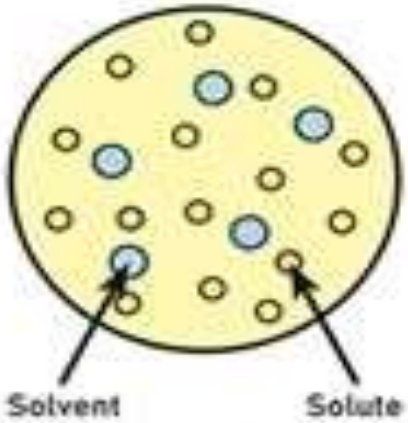
Iso = Same
Tonic = Strength



Same concentration of solutes and solvent

Hypertonic

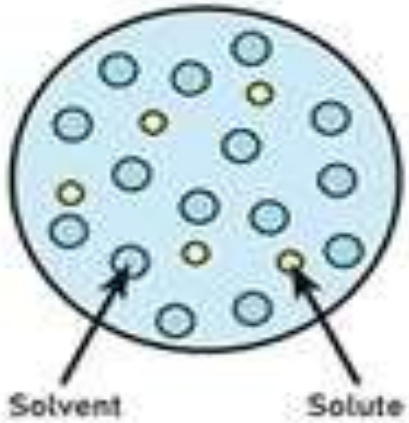
Hyper = More
Tonic = Strength



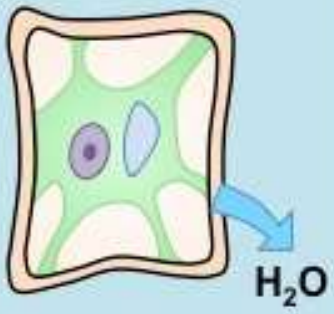
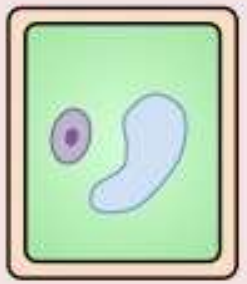
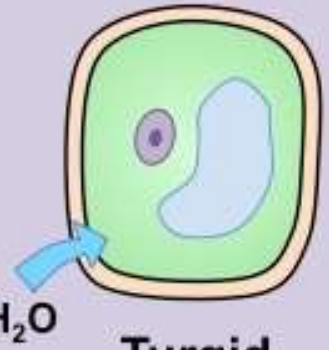
More solutes and Less solvent

Hypotonic

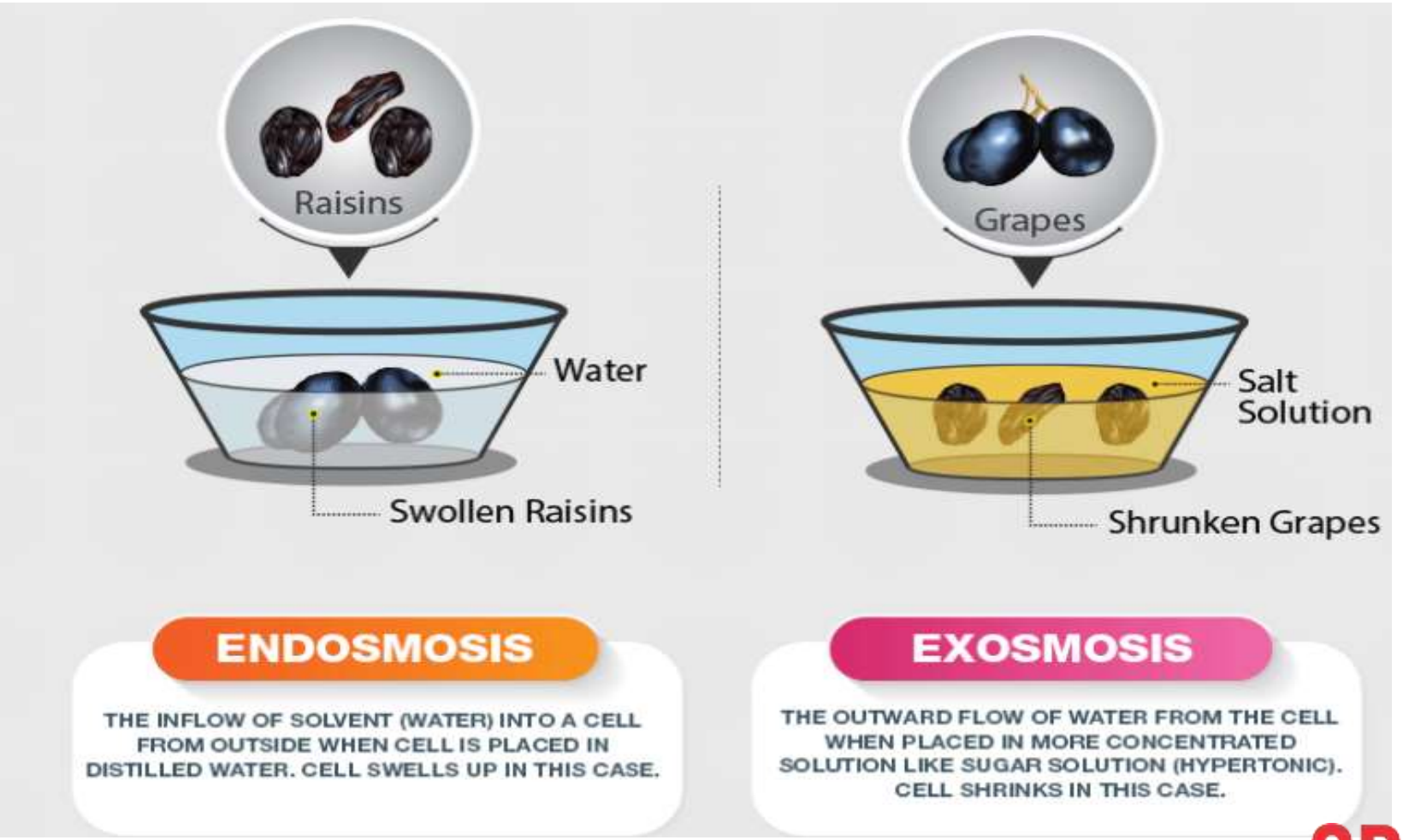
Hypo = Less
Tonic = Strength



Fewer solutes and More solvent

	Hypertonic	Isotonic	Hypotonic
Animal Cell	 Shriveled	 Normal	 Lysed
Plant Cell	 Plasmolysed	 Flaccid	 Turgid

Activity- To observe the process of osmosis



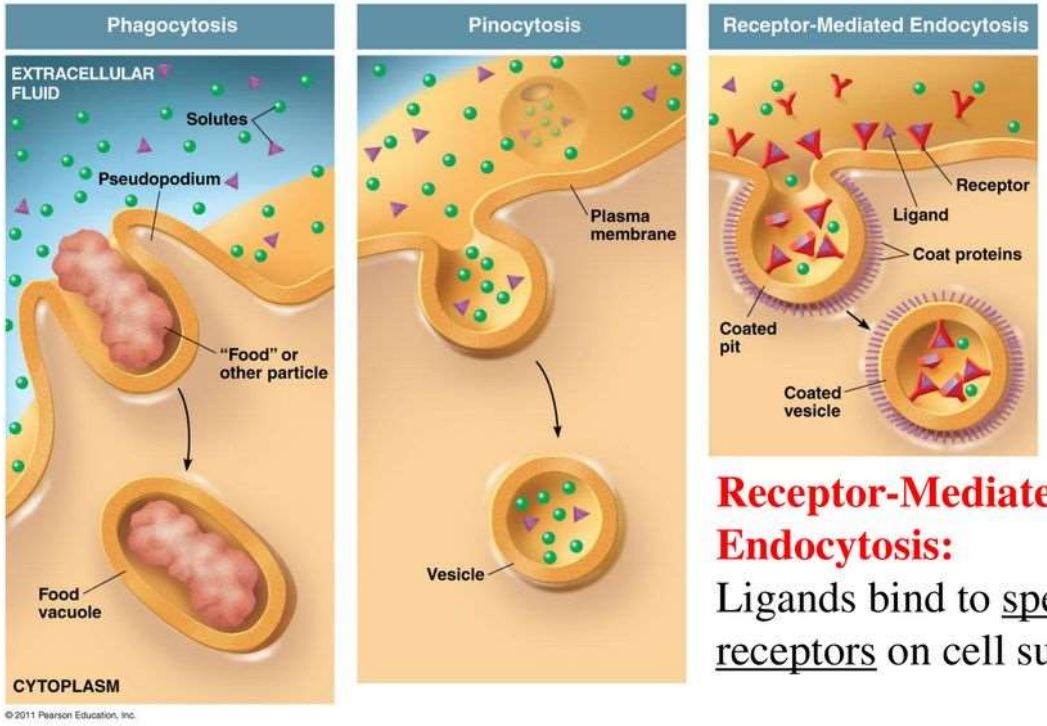
Endocytosis -The flexibility of plasma membrane enables cell to obtain food & other material from external environment.

Types of Endocytosis

Phagocytosis:
"cellular eating" - solids

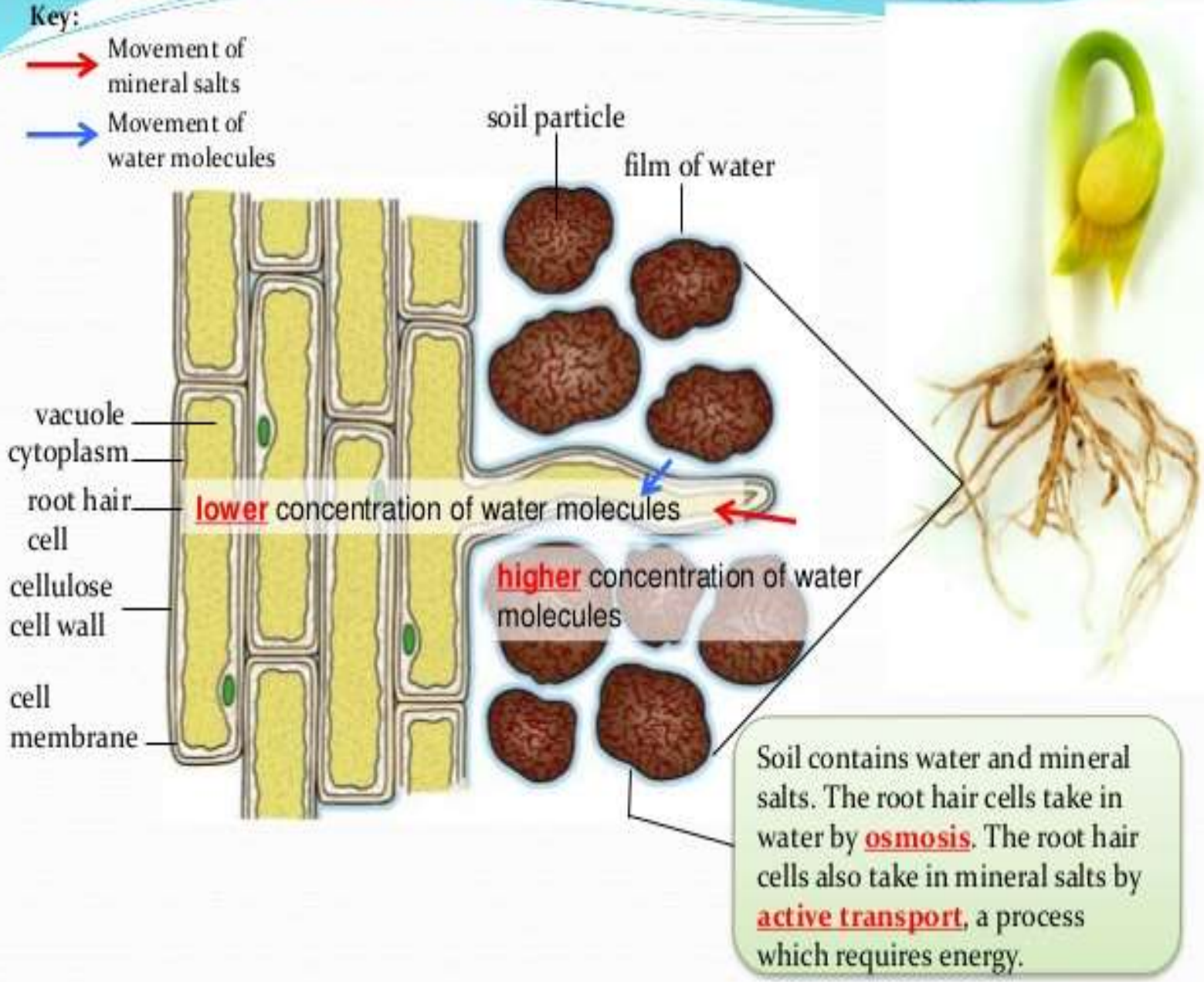
Pinocytosis:
"cellular drinking" - fluids

Active Transport



Receptor-Mediated Endocytosis:
Ligands bind to specific receptors on cell surface

Absorption of Water and Mineral Salts by Roots



Detailed explanation on osmosis and diffusion

https://youtu.be/SD1AKWUazPU

https://youtu.be/MCvbfqz7ASs

HOME ASSIGNMENT

Q1. How do substances like carbon dioxide and water move in & out of the cells?

Q2.Why is the plasma membrane called a selectively permeable membrane?

Q3. Define isotonic, hypotonic and hypertonic solution.

Q4. Explain what happens when

a plant cell is kept in hypertonic solution

an animal cell is kept in hypotonic solution

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Cell Wall-structure, composition and functions
PERIOD-5

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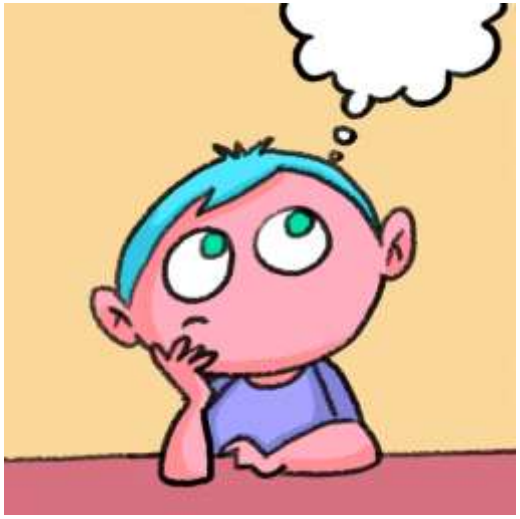
LEARNING OBJECTIVE

- Student will be able to know the structure of cell wall
- Student will be familiarized with the function of cell wall in plant cells.
- They will be able to analyze the effect of hypertonic, hypotonic and isotonic solution on the plant cell.
- Learners will be sensitized about the constituents of the cell wall which makes it rigid.



QUESTIONS

Recapitulation of the following

Q. What is the role of plasma membrane in transportation of various substances across cell.

Q. Which is the outermost Covering of cells of onion peel.

Q. Do you find this in human cheek cell?

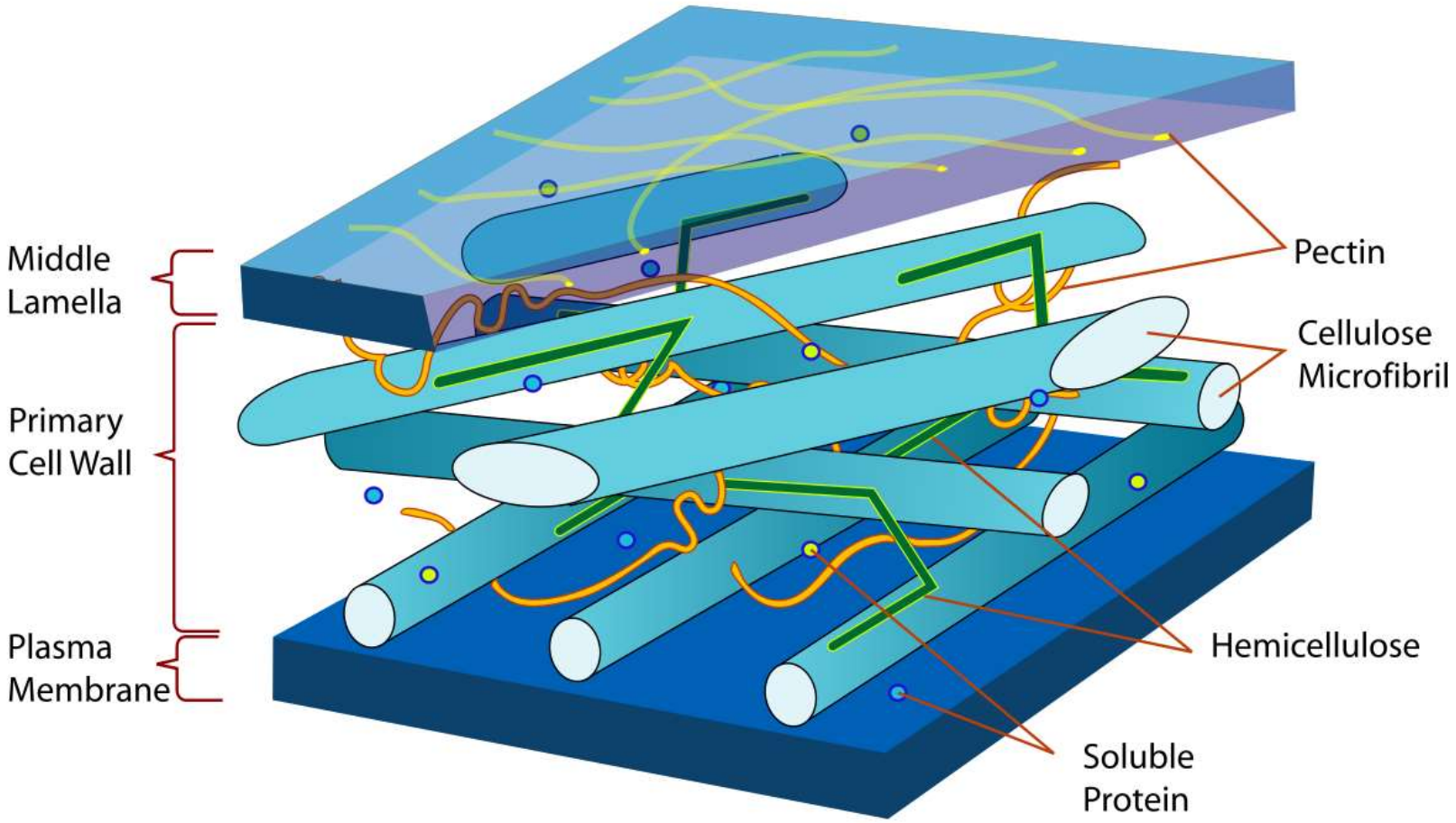
CAN YOU GUESS ?

Q. Why do plant cells have cell wall whereas animal cells do not have?

What is a Cell Wall?

- A cell wall is defined as the non-living component, covering the outmost layer of a cell.
- Its composition varies according to the organism and is permeable in nature.
- The cell wall separates the interior contents of the cell from the exterior environment.
- It also provides shape, support, and protection to the cell and its organelles.
- However, this cellular component is present exclusively in eukaryotic plants, fungi, and few prokaryotic organisms.

CELL WALL



STRUCURE & FUNCTION OF CELL WALL

- Primary cell wall of land plants is composed of polysaccharides- cellulose , hemi cellulose and pectin along with other polymers like lignin , suberin or cutin.
- Algae cell walls are made up of glycoproteins and polysaccharides like carrageenan and agar.
- Bacterial cell wall is composed of peptido glycan.
- Fungi possess cell wall made up of N- acetyl glucosamine polymer –chitin

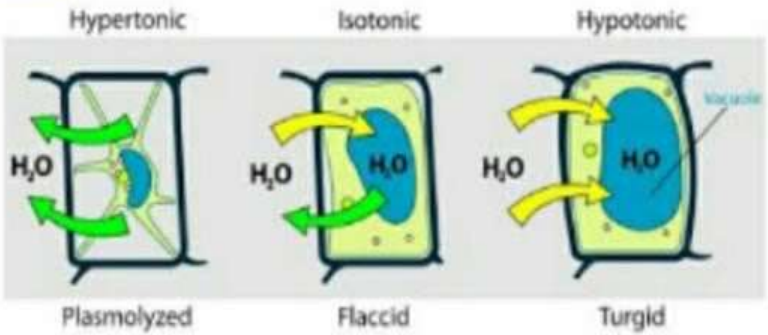
What is the Function of the Cell Wall

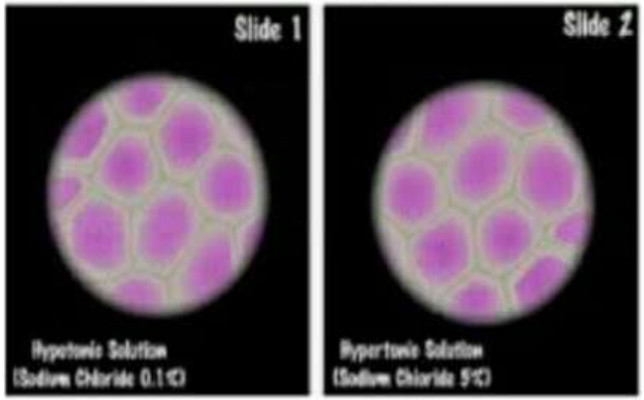
- The cell wall is an integral component of the plant cell and it performs many essential functions. Following are some of the major cell wall functions observed:
- The plant cell wall provides definite shape, strength, rigidity
- It also provides protection against mechanical stress and physical shocks
- It helps to control cell expansion due to the intake of water
- Also helps in preventing water loss from the cell
- It is responsible for transporting substances between and across the cell
- It acts as a barrier between the interior cellular components and the external environment

PLASMOLYSIS IN PLANT CELLS

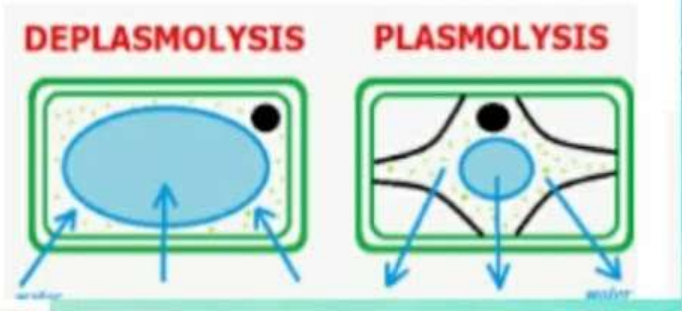
PLASMOLYSIS

- **Plasmolysis** is the process in plant cells where the plasma membrane pulls away from the cell wall due to the loss of water through osmosis.





Study of Plasmolysis - MeitY ...
youtube.com



EXPLANATION OF PLASMOLYSIS

https://youtu.be/mq41V_mUWHc

HOME ASSIGNMENT

Q1. Why do the animal cells not have cell wall?

Q2. Explain what happens in plasmolysis and in which condition it occurs in plant cell?

Q2. Cell wall is rigid. Give reason.

THANKING YOU

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Nucleus – structure, composition and functions

PERIOD-6

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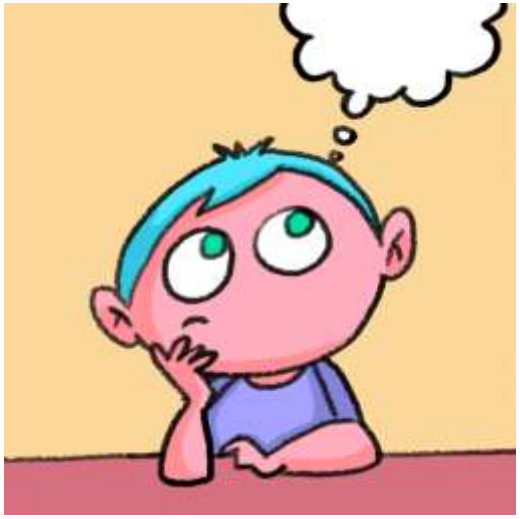
LEARNING OBJECTIVE

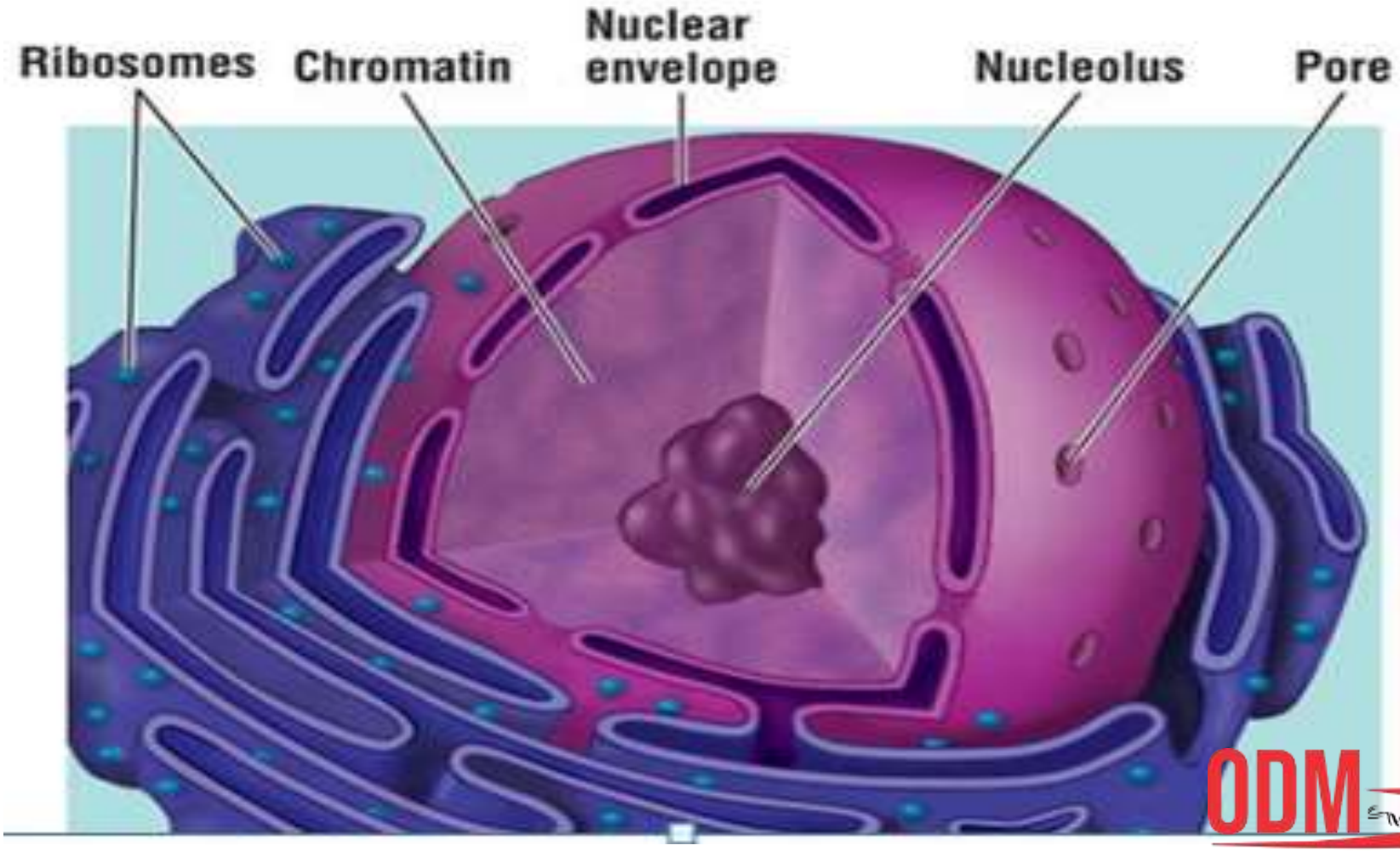
- Student will be able to apprise the importance of nucleus in a cell.
- Student will be able to analyze the detailed structure of a nucleus
- They will be able to analyze various compositions of nucleus
- Learners will be sensitized about different functions of nucleus



WARM UP QUESTIONS BASED ON PREVIOUS KNOWLEDGE

- Look into onion peel slide and identify the nucleus.
- How can you differentiate between a living and a dead cell?
- You have some resemblance with either of your parent. How?
- Who decides that up to what size a cell has to grow?
- Recapitulate the difference in nuclear material of prokaryotes and eukaryotes.

NUCLEUS



STRUCTURE AND FUNCTION OF NUCLEUS

Nuclear Envelope

- Location: The nuclear envelope, also known as the nuclear membrane, encloses the nucleus and nucleolus.
  Structure: The nuclear envelope is composed of a phospho lipid bilayer with many pores (small holes) that allow RNA and other materials to enter and exit the nucleus.
  Function: The many pores in the nuclear envelope allow it to decide what enters and exits the nucleus.

Role of nuclear pore in a cell

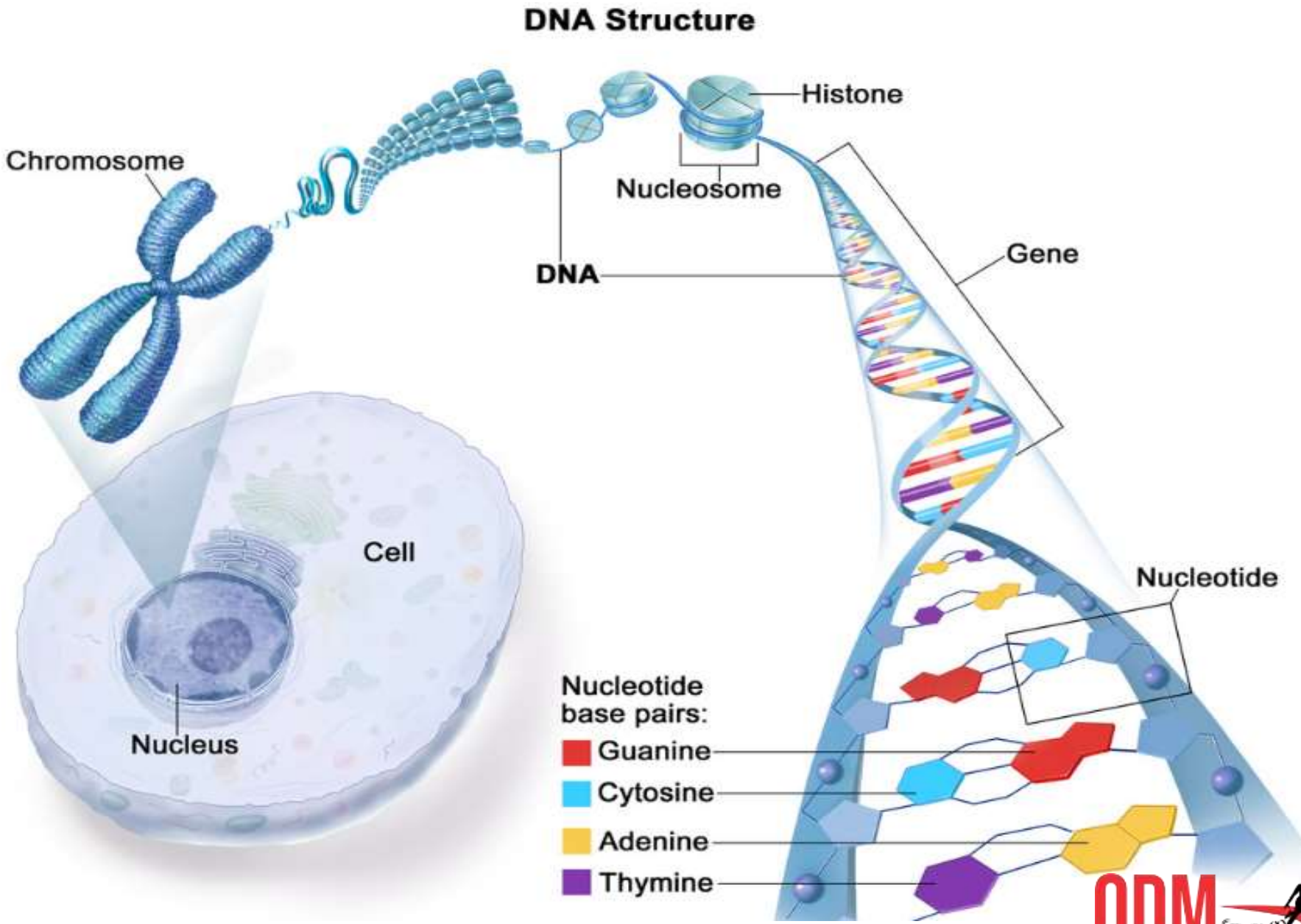
Proteins containing **nuclear** localization signals are actively transported inward through the **nuclear pore** complexes, while RNA molecules and newly made ribosomal subunits contain **nuclear** export signals that direct their active transport outward through the **pore** complexes.

Nucleolus

- **Location:** The nucleolus is located inside of the nucleus.
- It is surrounded by the **nuclear envelope.** It is not membrane-bound.

  Structure: The nucleolus is a dense region in the nucleus composed of DNA,RNA, and proteins**.**

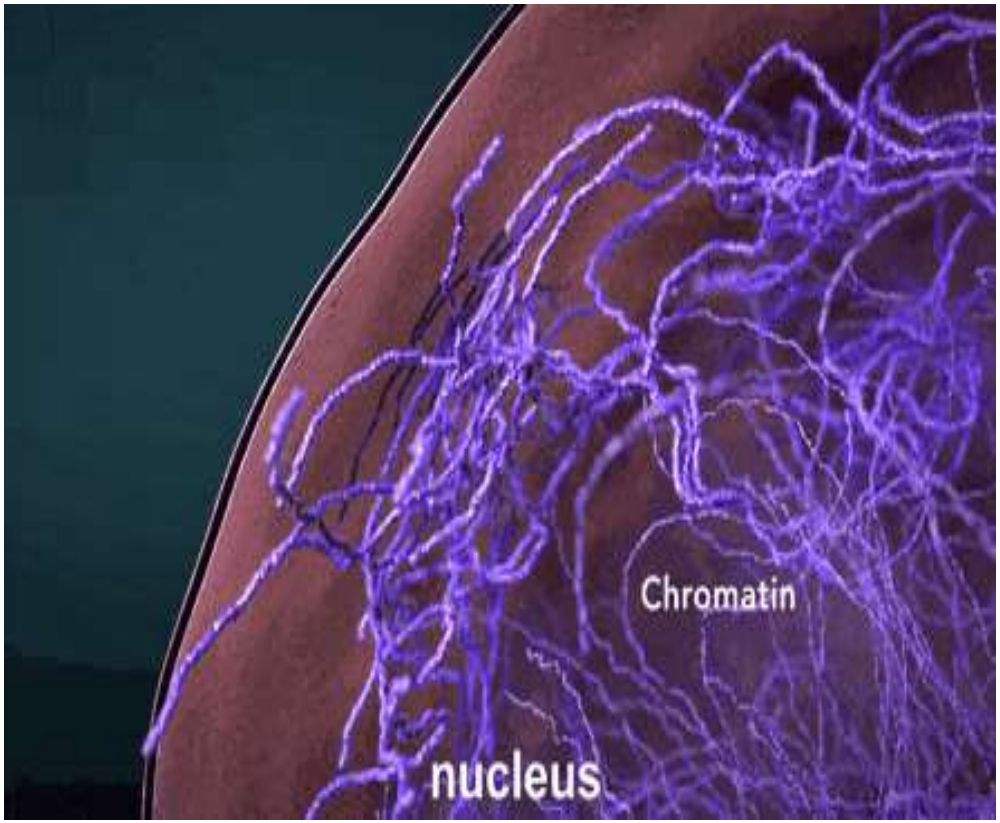
  Function: The nucleolus helps **in ribosome biogenesis**

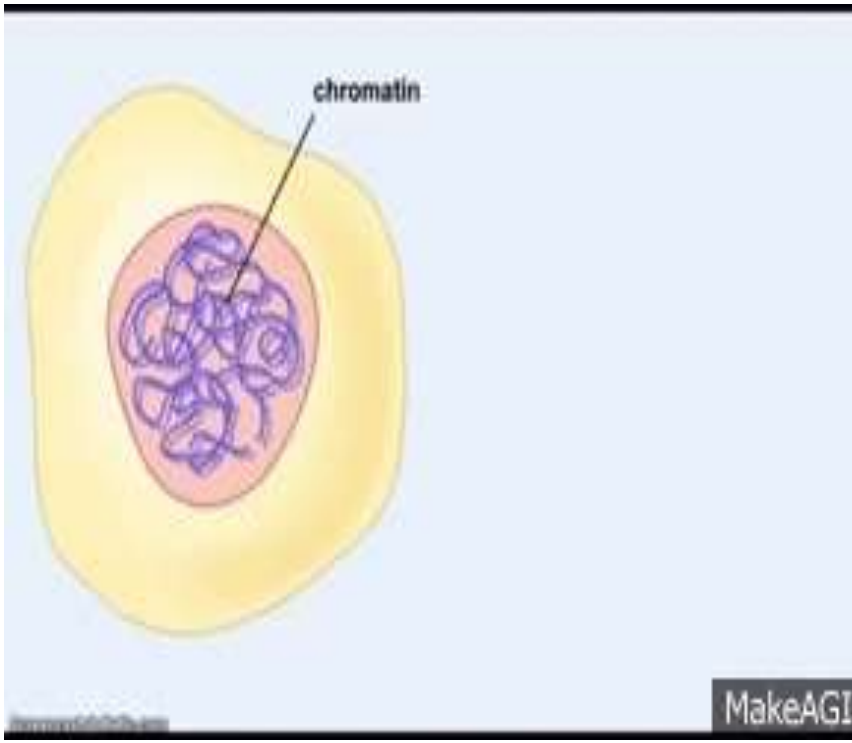


Chromosomes

- **Location**: The chromosomes are located inside of the nucleus.
  Structure: Chromosomes are composed of nucleotides, which bond together to form a double helix. This double helix is tightly wrap around a protein to form a chromosome. The unraveled material from a chromosome that floats around in the nucleus is known as chromatin.
  Function: Chromosomes contain the genetic information (DNA) of the cell. The chromosomes are the code for all of the functions that occur in a cell.

Difference between chromosome and chromatin





The DNA is packaged by special proteins called histones to form **chromatin**. The **chromatin** further condenses to form **chromosomes**. This means **chromatin** is lower order of DNA organization whereas **chromosomes** are higher order of DNA organization.

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HOME ASSIGNMENT

Q. What is the role of nuclear pore of the cell?

Q. What are genes? Where are they located?

Q. Why is nuclear region in prokaryotes poorly defined?

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Cytoplasm, Cell Organelles-Endoplasmic Reticulum- structure, composition and function

PERIOD-7

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LEARNING OBJECTIVE

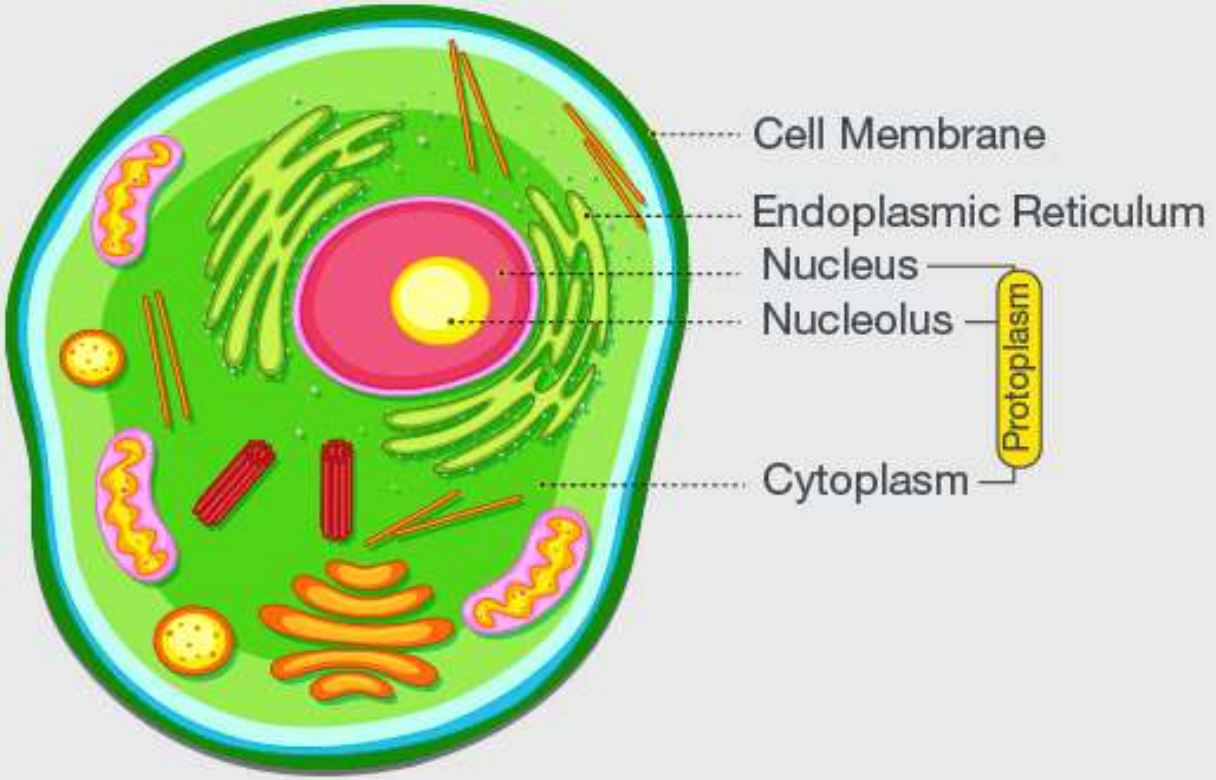
- Student will be able to apprise the importance of cytoplasm in a living cell.
- Student will be familiarized all the components and structure of cytoplasm
- They will be able to analyze the location and structure of endoplasmic reticulum.
- Learners will be sensitized about the composition and function of endoplasmic reticulum.
- They will also understand the interrelationship between nucleus and endoplasmic reticulum.
- Student will be able to analyze the role of endoplasmic reticulum in membrane biogenesis.

WARM UP QUESTIONS BASED ON PREVIOUS KNOWLEDGE

Recapitulation of the following before going into the topic by asking questions to the students.

- Role of nuclear pore in a cell.
- What is the function of ribosome
- What are the components of plasma membrane?
- Which forms the outer of an animal cell?

CYTOPLASM



CYTOPLASM

CYTOPLASM IS THE PROTOPLASM ENCLOSED BY THE PLASMA MEMBRANE OF CELL, EXCLUDING THE NUCLEUS IN EUKARYOTIC CELLS AND CELLULAR DNA IN PROKARYOTIC CELLS.

PROTOPLASM

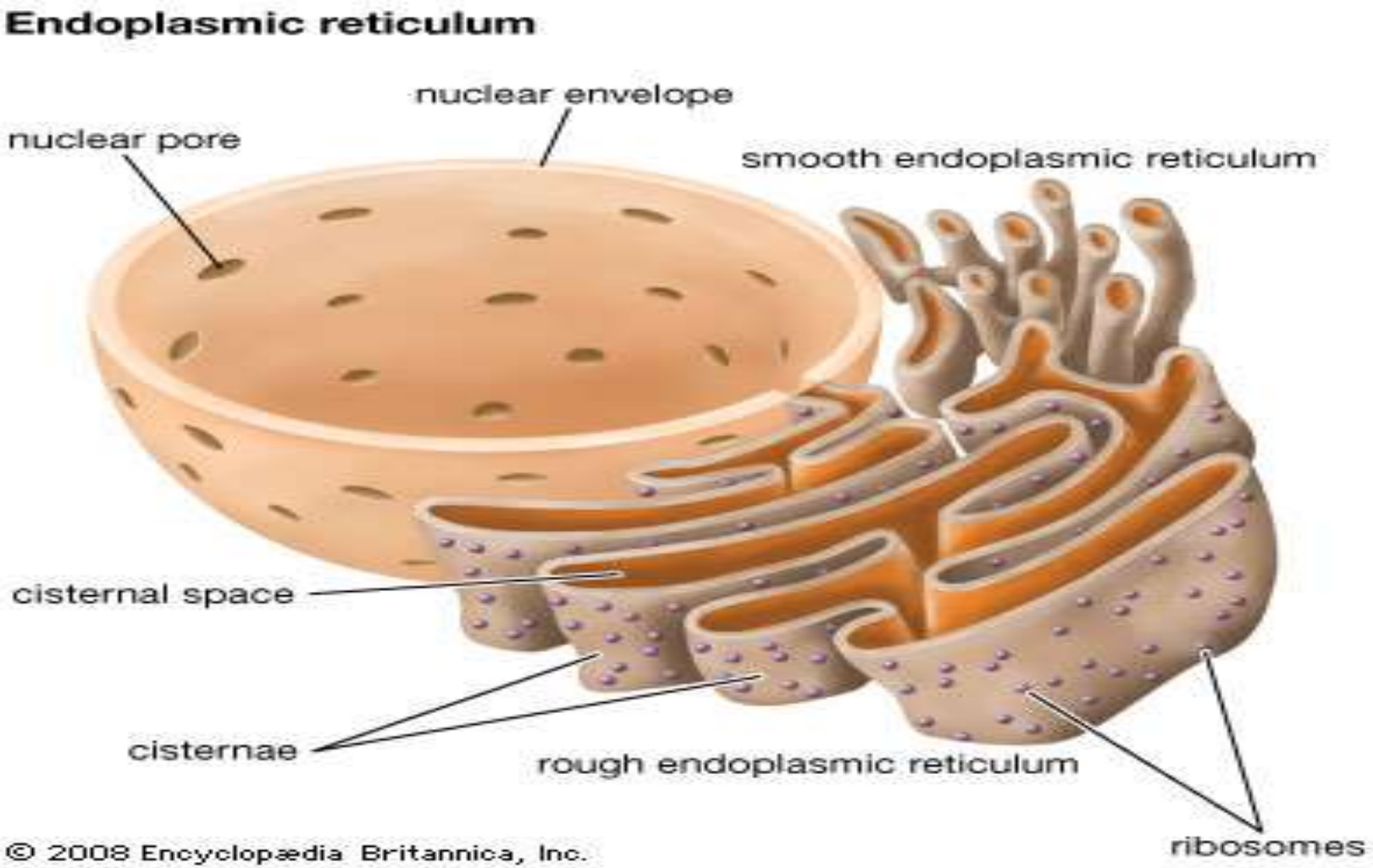
PROTOPLASM IS THE COLOURLESS MATERIAL COMPRISING THE LIVING PART OF A CELL, INCLUDING THE CYTOPLASM, NUCLEUS, AND OTHER ORGANELLES.

Cytoplasm

Detailed structure and function of cytoplasm

https://youtu.be/MdGWGBBRyEw

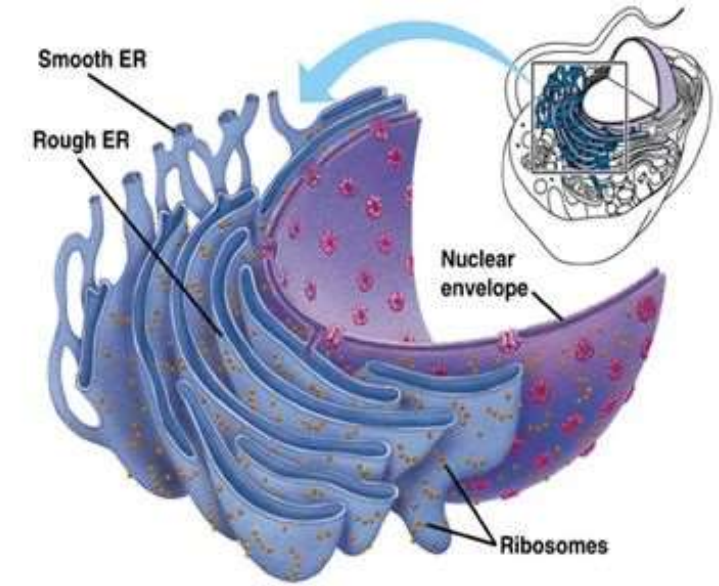
Cell organelles

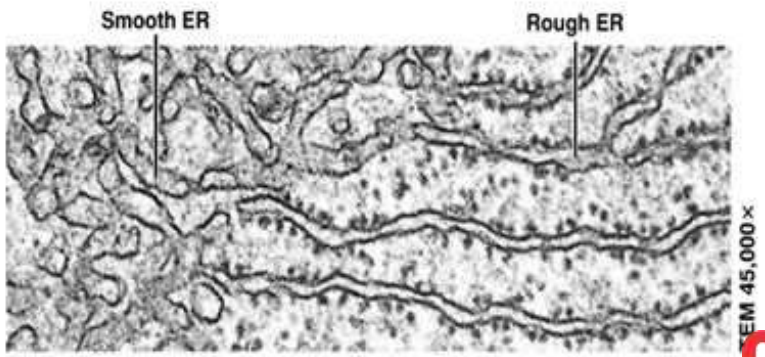


TYPES OF ENDOPLASMIC RETICULUM

Two Types of Endoplasmic Reticulum

- RER is the Rough Endoplasmic Reticulum, which has ribosomes.
  Within the RER proteins are modified into functional proteins and packed into transport vesicles.
- SER is the Smooth Endoplasmic Reticulum, which has no ribosomes. Within the SER lipids are synthesized. It also detoxifies substances. It stores Calcium ions for muscle contractions





The composition, structure and functions of endoplasmic reticulum(ER)

https://youtu.be/an7tpWR16mo

WHAT DO YOU MEAN BY MEMBRANE BIOGENESIS?

- The ribosomes , which are present in all active cells(RER), are the sites of protein manufacture.
- The manufactured proteins are then sent to various places in the cell depending on need, using the ER. The SER helps in the manufacture of fat molecules, or lipids, important for cell function. Some of these proteins and lipids help in building the cell membrane. This process is known as membrane biogenesis.
- Some other proteins and lipids function as enzymes and hormones.

HOME ASSIGNMENT

1. Explain membrane biogenesis
2. Differentiate between RER and SER
3. Explain the structure of endoplasmic reticulum and mention its function.
4. Differentiate between protoplasm and cytoplasm.

THANKING YOU

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Cell Organelles-Golgi Apparatus ,Lysozome

PERIOD-8

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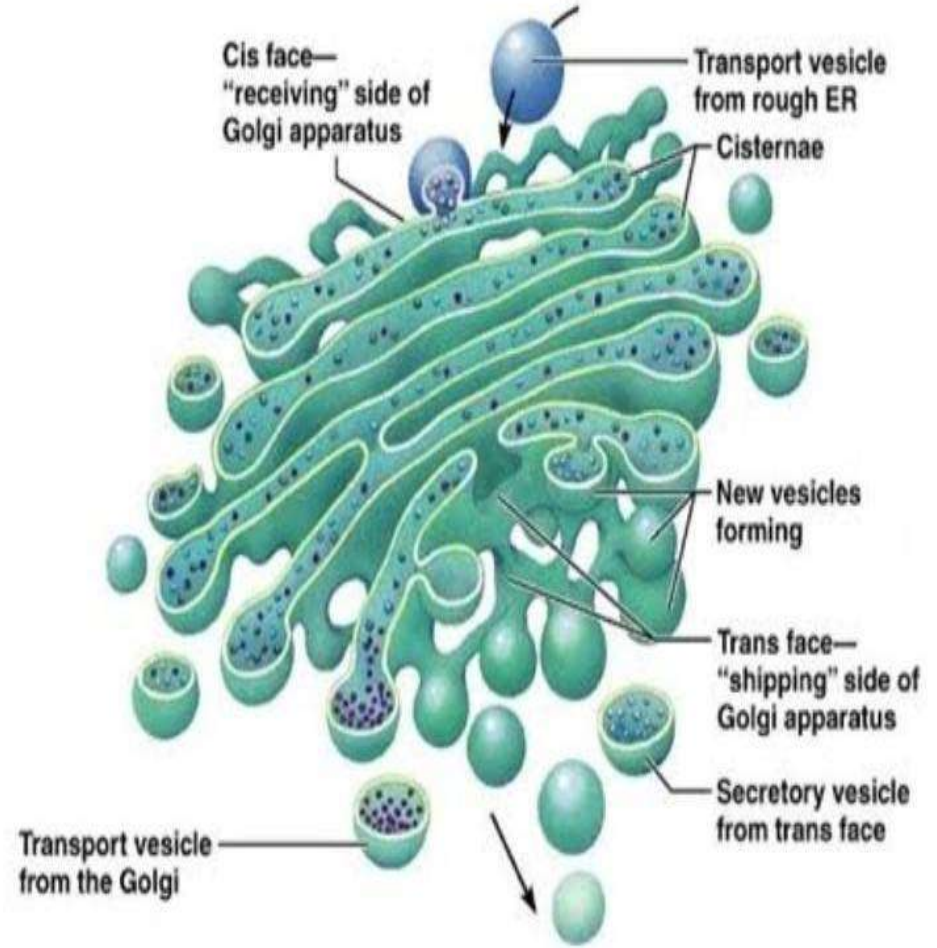
LEARNING OBJECTIVE

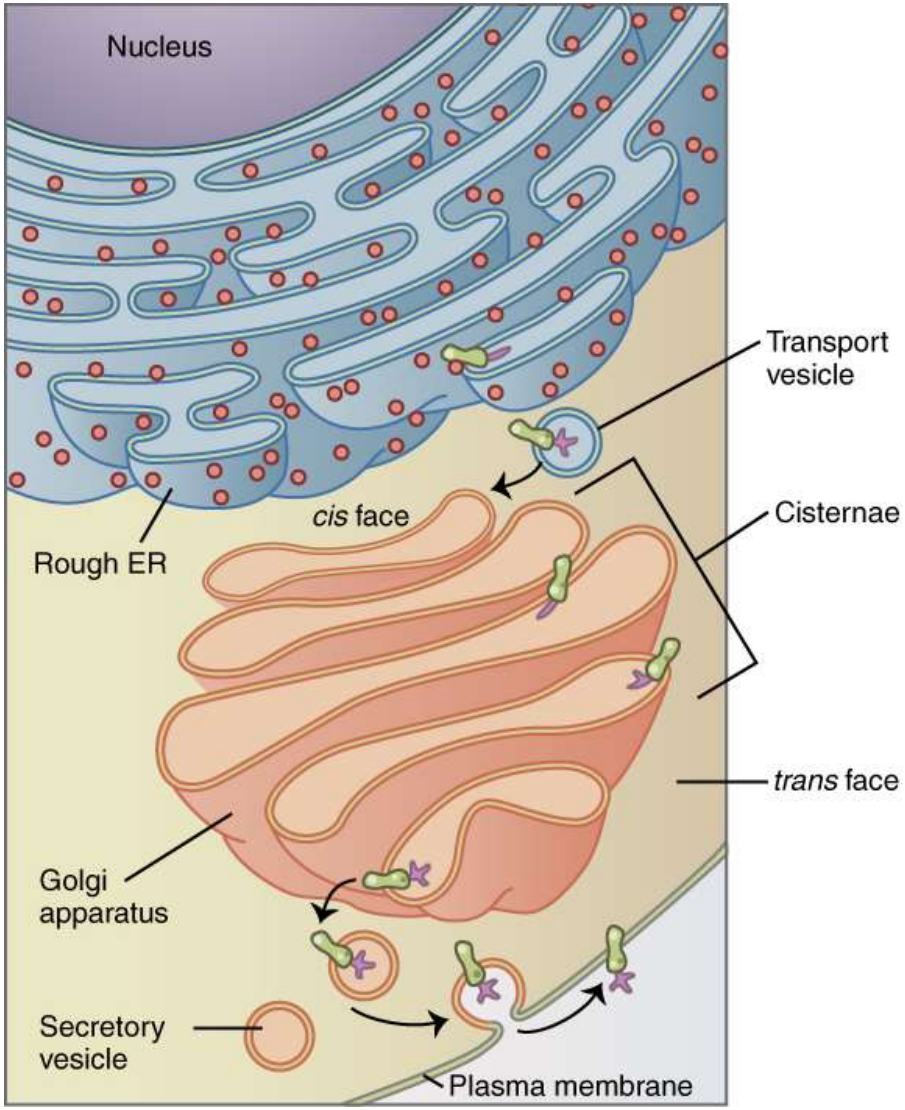
- Students will be able to define cell organelles and the division of labour of the organelles inside a single cell.
- Student will be able to understand the structure and location of Golgi Apparatus and lysosome in a living cell
- Student will be familiarized with the functions of Golgi apparatus and lysosomes in a cell
- Learners will be sensitized about the interrelationship between endoplasmic reticulum, Golgi body and lysosomes

WARM UP QUESTIONS BASED ON PREVIOUS KNOWLEDGE

- Recapitulation of the structure, location and functions of ER.
- Guess the reason why it is located close to some other organelle?
- **Initiate a group discussion** for at least 5 minutes and appreciate their views.

GOLGI APPARATUS





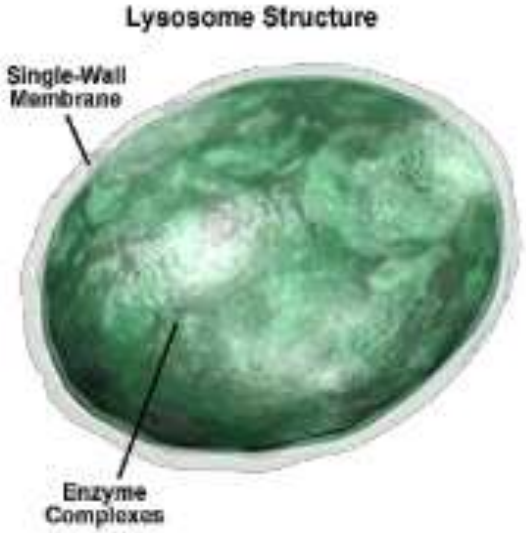
STRUCTURE & FUNCTION OF GOLGI APPARATUS

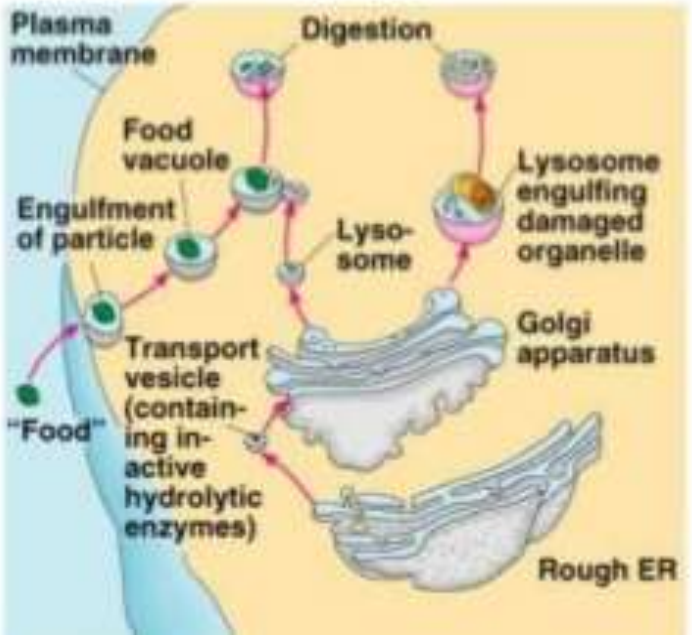
- It was named after Camillo Golgi, an Italian biologist.
- It is made up of a series of flattened, stacked pouches called cisternae.
- The Golgi apparatus is responsible for transporting, modifying, and packaging proteins and lipids into vesicles for delivery to targeted destinations.
- It is located in the cytoplasm next to the endoplasmic reticulum and therefore constitute another portion of a complex cellular membrane system.
- Golgi apparatus is also involved in the formation of lysosomes

Detailed structure and function of Golgi Apparatus

https://youtu.be/TYyo9VwOnlg

Lysosomes and Recycling





- **Lysosomes** are organelles that contain digestive enzymes. They digest excess or worn out organelles, food particles, and engulfed viruses or bacteria. The membrane surrounding a lysosome prevents the digestive enzymes inside from destroying the cell.

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Detailed structure and function of lysosome

https://youtu.be/cA-Ou_t2sag

WHY LYSOSOME IS CALLED AS THE SUICIDAL BAG OF THE CELL?

- During the disturbance in cellular metabolism, for example, when the cell gets damaged, lysosomes may burst and the enzymes digest their own cell. Therefore, lysosomes are also known as the ‘suicide bags’ of a cell

- Structurally, lysosomes are membrane-bound sacs filled with digestive enzymes. These enzymes are made by RER

HOME ASSIGNMENT

Q. Explain the role of lysosomes in protecting the cell

Q. Lysosome is the suicidal bag of the cell. Justify the statement

Q. List the functions of Golgi apparatus

Q. Who discovered Golgi body?

THANKING YOU

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Cell Organelles-Mitochondria ,Ribosome

PERIOD-9

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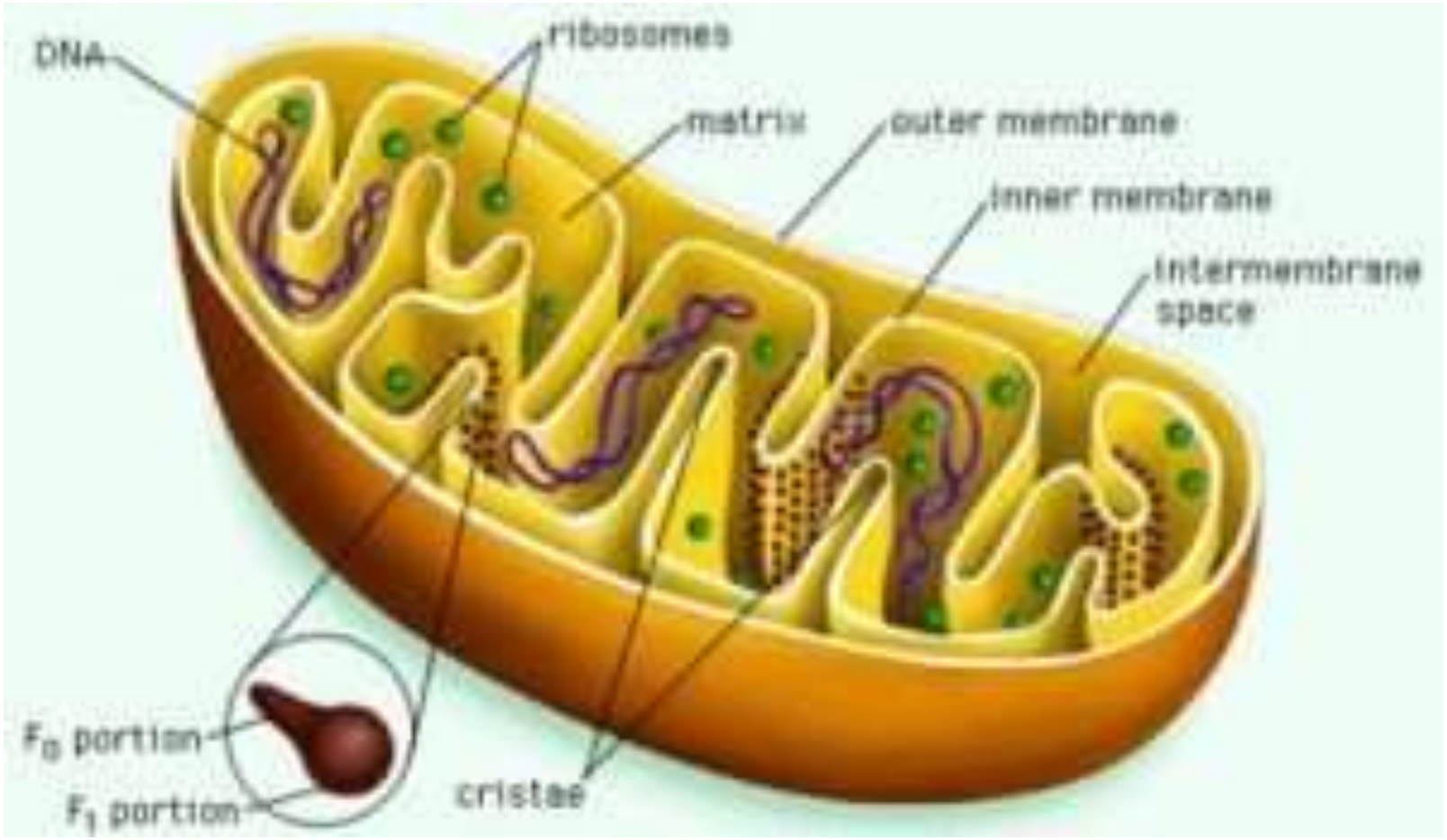
LEARNING OBJECTIVE

- Student will be able to understand the structure and location of mitochondria and ribosome in a living cell
- Student will be familiarized with the functions of mitochondria and ribosome in a cell
- Learners will be sensitized about the importance of mitochondria in generating energy in the form of ATP.
- Student will be able to understand that why mitochondria is semiautonomous in nature.

WARM UP QUESTIONS BASED ON PREVIOUS KNOWLEDGE

- What do you mean by Cellular respiration (class viii concept recapitulation)
- Location where cellular respiration takes place inside a living cell?
- How ribosome is synthesised, transported and what is the main function of ribosome?

Mitochondria



STRUCTURE & FUNCTION OF MITOCHONDRIA

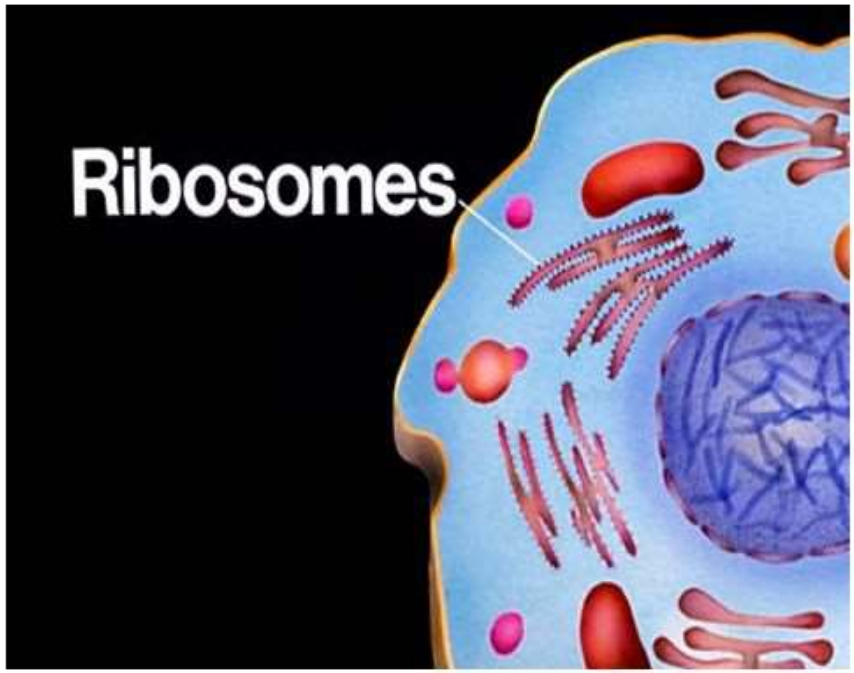
- They are made of two membranes. The **outer membrane** covers the organelle . The **inner membrane** folds over many times and creates layered structures called **cristae**.
- The fluid contained in the mitochondria is called the **matrix**. The folding of the inner membrane increases the surface area inside the organelle.
- Known as **powerhouse of cells** as they produce energy during respiration
- It is **a semi autonomous organelle**. Has it's own DNA and ribosomes.

Detailed structure and function of Mitochondria

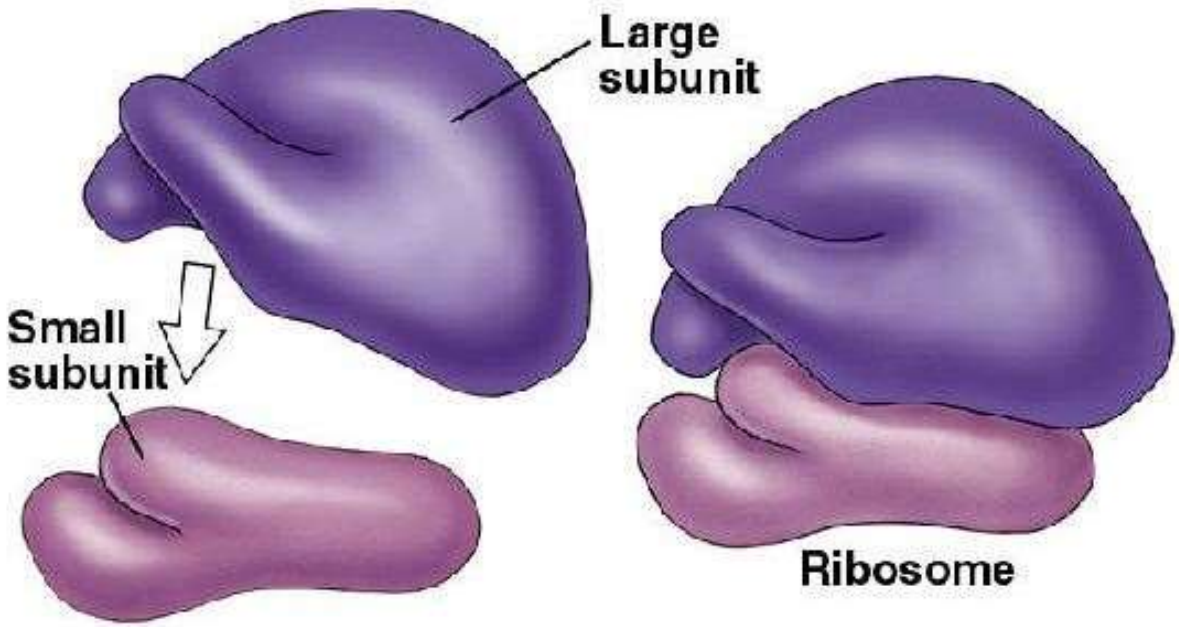
https://youtu.be/r6C54HHFTwE

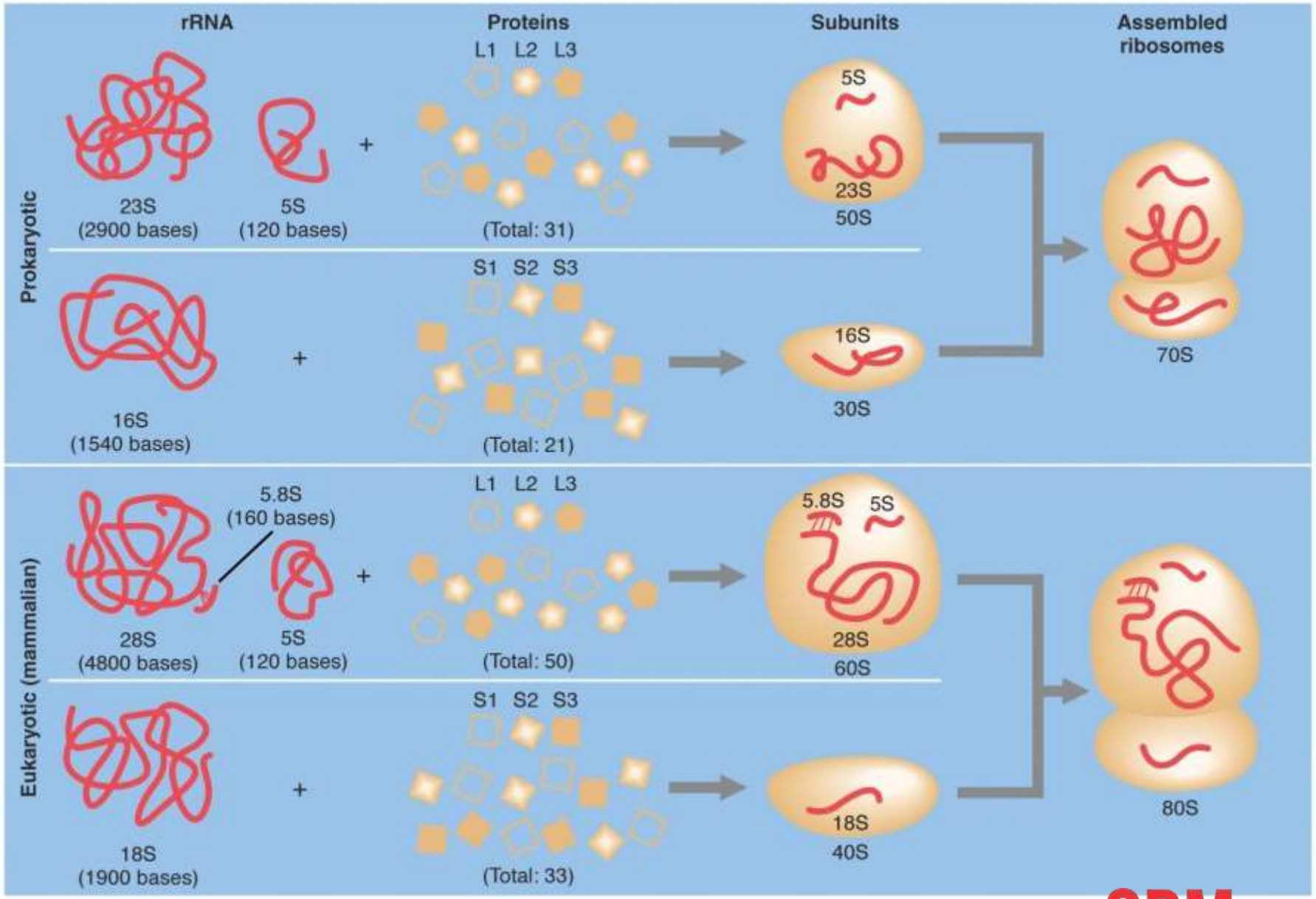
RIBOSOMES

- Structure
  - Made of proteins and RNA
  - No membrane
  - Most numerous organelle
  - Made in nucleus (specifically in nucleolus)
- Function
  - Aids in protein synthesis
  - Free ribosomes make proteins used by the cell
  - Ribosomes on rER make proteins for export to other cells
- Cell Type
  - Prokaryotic and Eukaryotic Cells
  - Plant and Animal Cells



Ribosome





Detailed structure and function of ribsome

https://youtu.be/WjnUJusSYAo

HOME ASSIGNMENT

Q. Why mitochondria are called as powerhouse of cells?

Q. Mitochondria is semi autonomous in nature. Justify your answer

Q. Discuss the place where ribosome is synthesized. Write the function of ribosome.

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Plastids, Vacuoles and Centrosomes

PERIOD-10

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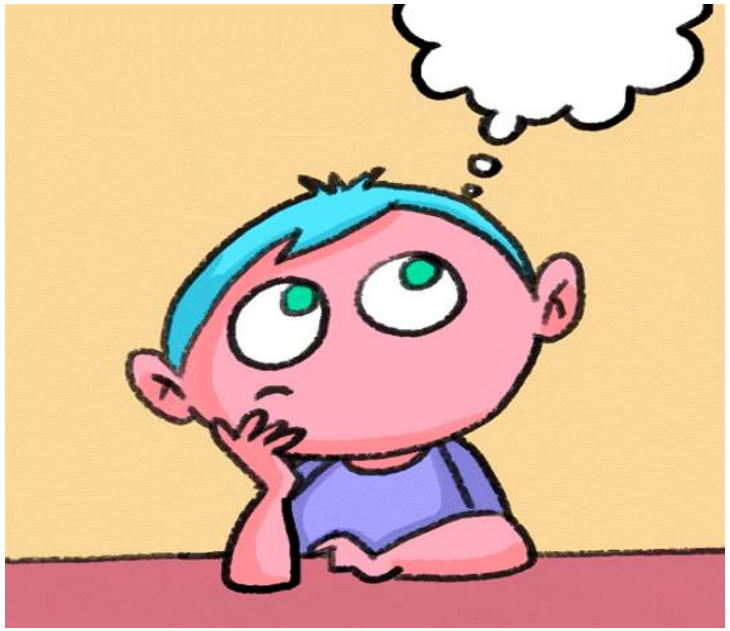
LEARNING OBJECTIVE

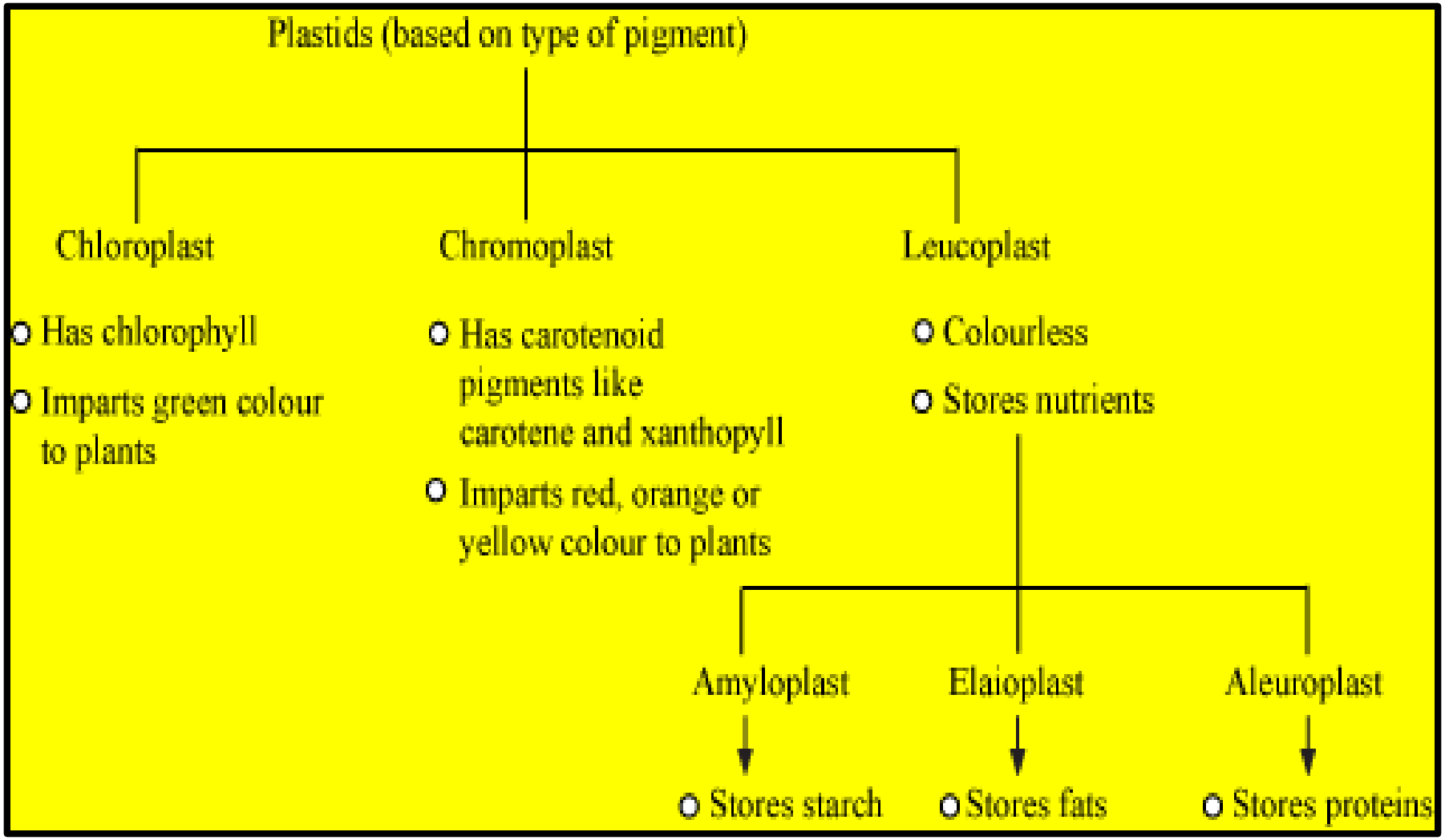
- Student will be able to understand the structure and location of plastids, vacuoles and centrosome in a living cell
- Student will be familiarized with the functions of plastids, vacuoles and centrosome in a living cell.
- Learners will be sensitized about the types and importance of plastids in plants.



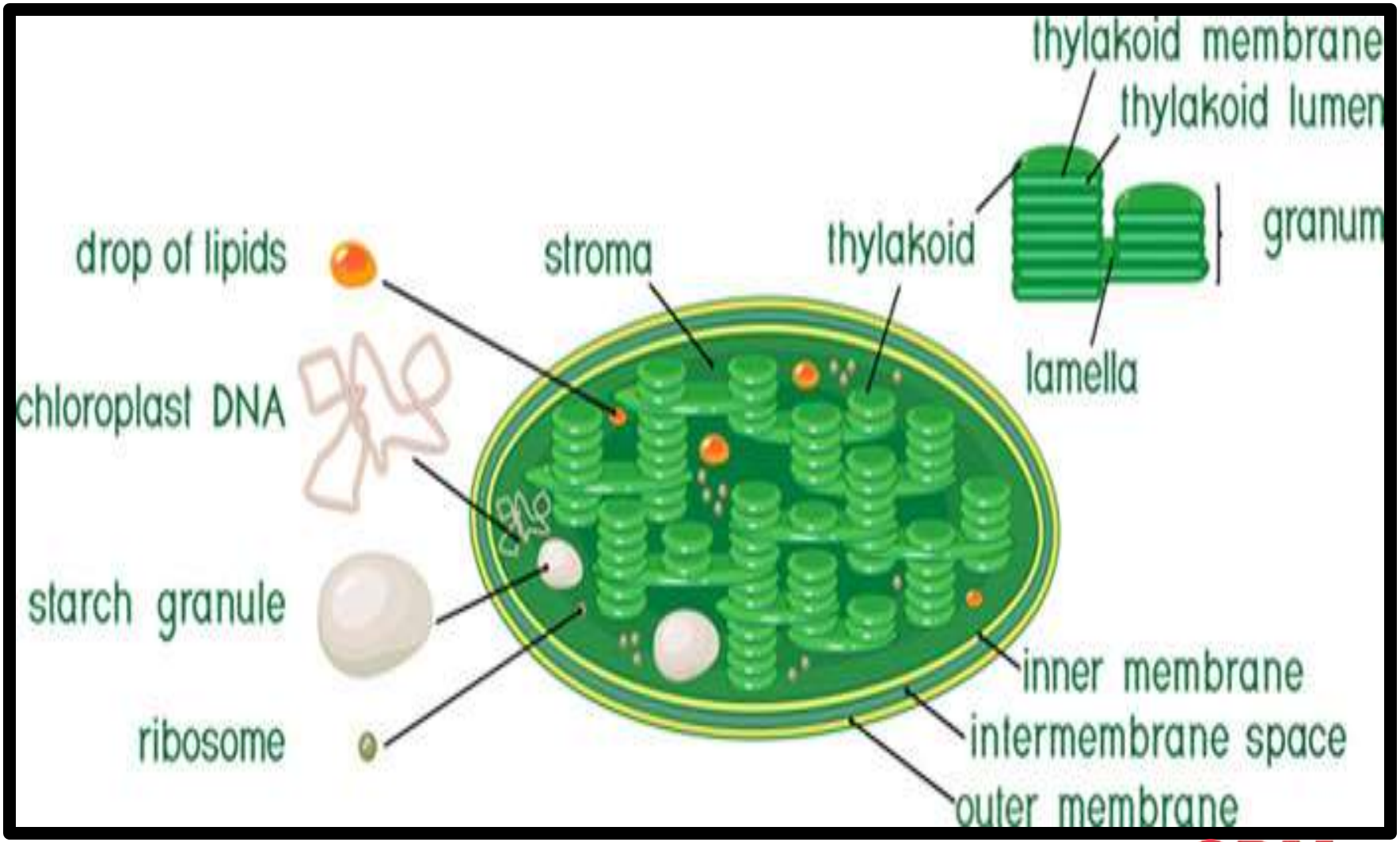
WARM UP QUESTIONS BASED ON PREVIOUS KNOWLEDGE

- By looking into the chart/ image of both plant and animal cells, what differences do you observe?
- Recapitulation of the previous portions
- Ask students about previous knowledge on cell organelles
- What is the role of chlorophyll in plants?
- Why chlorophyll is only present in plants?

PLASTIDS



Chloroplast(Kitchen of the cell)

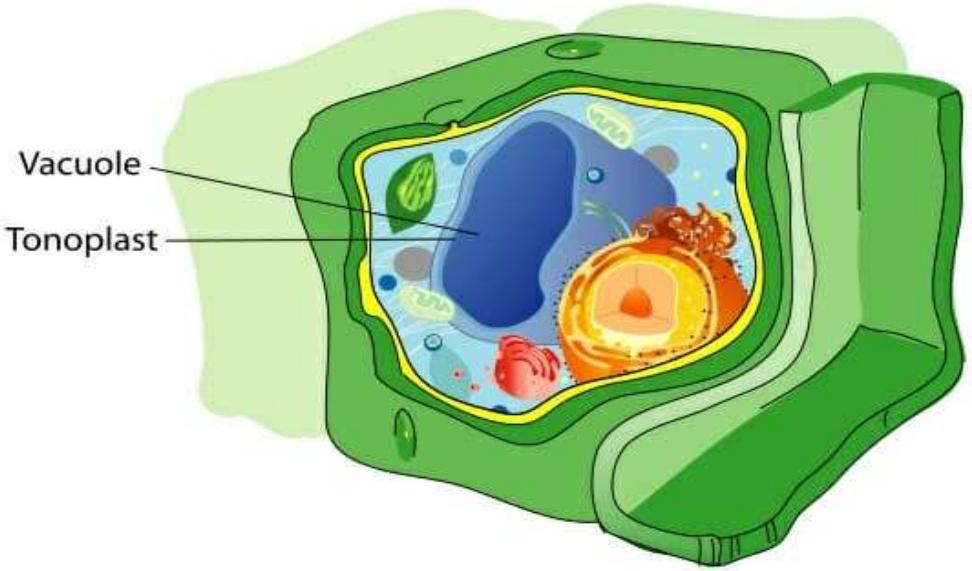


Detailed types and functions of each type of plastids in a plant cell

https://youtu.be/yyvfBFtyF8c

VACUOLES

- Vacuole discovered by **Dujardin.** It is unit membrane-bound structure which is selectively permeable. Approx.90% of the volume of many plant cells is occupied by it.
  It Is surrounding membrane is known as **Tonoplast**
- Below is a plant cell showing vacuole-



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Types of vacuoles

- **(1) Sap vacuoles (central vacuoles):** – Fluid filled vacuoles. Solute presents is sap maintain a proper osmotic pressure in the cell for its turgidity and water absorption. They play role in cell enlargement. They store and concentrate waste products.
- **(2) Contractive vacuole:** Found in some protozoans and algal cells found cells mostly in fresh water. They help in osmoregulation. They contain a large number of mitochondria which provide energy for their contraction.
- **(3) Food Vacuoles: –** found in cells of protozoan, protest. They are formed at the time of ingestion and eliminated at the time of egestion. It contains digestive enzymes which cause digestion of ingested food.
- **(4)Air vacuoles (Pseudo vacuoles, or Gas Vacuoles):** found in prokaryotes and helps in floating

Detailed structure and function of vacuoles

https://youtu.be/AqNkXA8dog8

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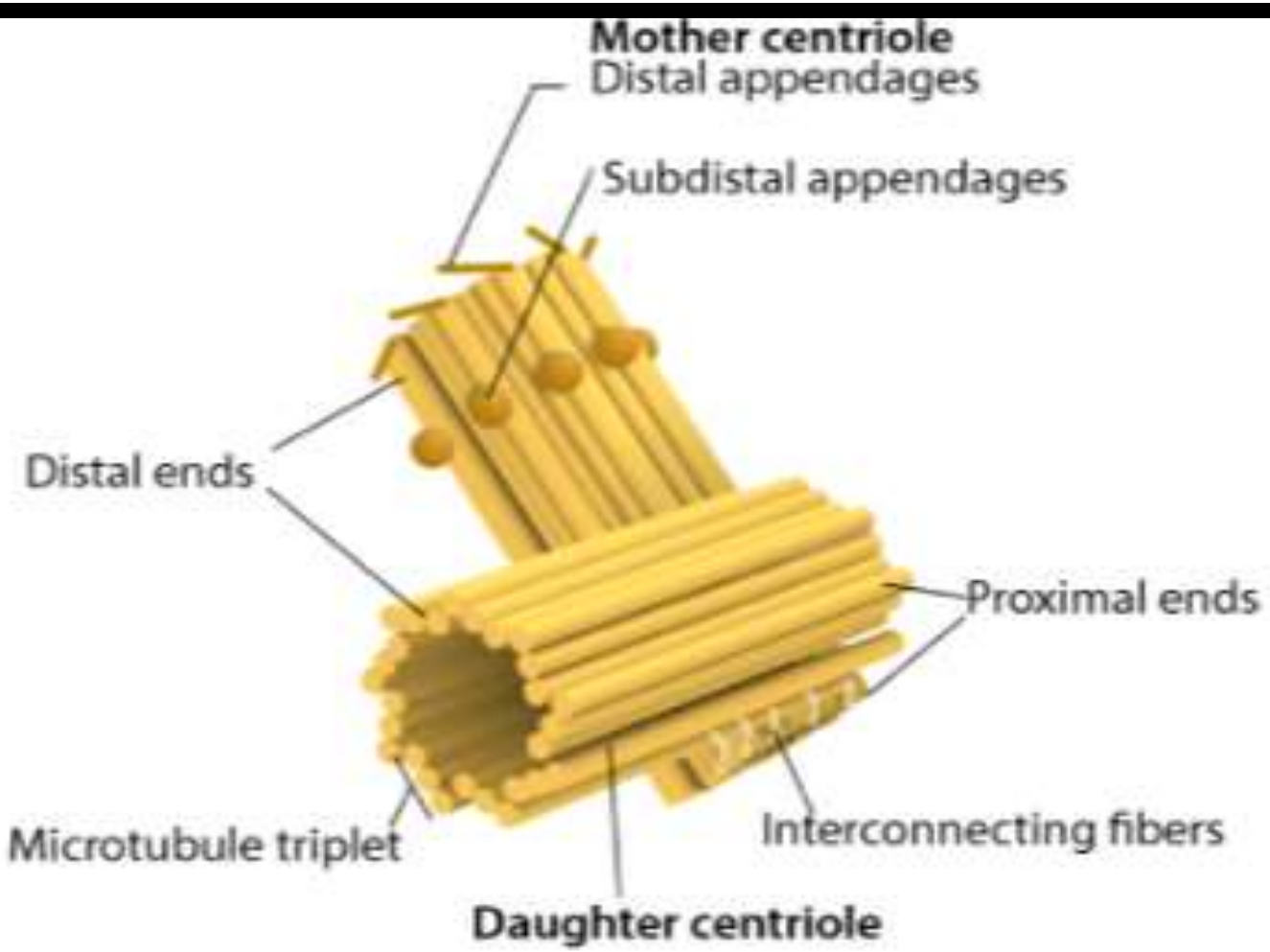
CENTROSOME



Centrosome Structure

Centrosome Function

The major functions of centrosome are listed below:

- The centrosomes help in cell division.
- They maintain the chromosome number during cell division.
- They also stimulate the changes in the shape of the cell membrane by phagocytosis.
- In mitosis, it helps in organizing the microtubules ensuring that the centrosomes are distributed to each daughter cell.
- They regulate the movement of microtubules and cytoskeletal structures, thereby, facilitating changes in the shapes of the membranes of the animal cell.

Detailed structure and functions of centrosome

https://youtu.be/yyvfBFtyF8c

HOME ASSIGNMENT

Q. Discuss the type of plastids and their respective functions.

Q. Explain the role of centrosome in cell division of an animal cell.

Q. Elaborate the role of vacuole in plant cell.

THANKING YOU

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THE FUNDAMENTAL UNIT OF LIFE

SUBJECT- BIOLOGY

CHAPTER NO- 5

Comparison between plant cell and animal cell, Cell cycle- mitosis and meiosis

PERIOD-11

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LEARNING OBJECTIVE

- They will be able to analyze and compare plant and animal cells
- Learners will be sensitized about some of the organelles which are absent in plant cells but present in an animal cell and vice versa.
- Students will be able to understand and explain why some of the differences are seen when they are comparing a plant and an animal cell.
- Students will be able to write the differences and similarities.
- Learners will be sensitized about cell cycle- mitosis and meiosis
- Students will be able to understand the cells where mitotic and meiotic division takes place.

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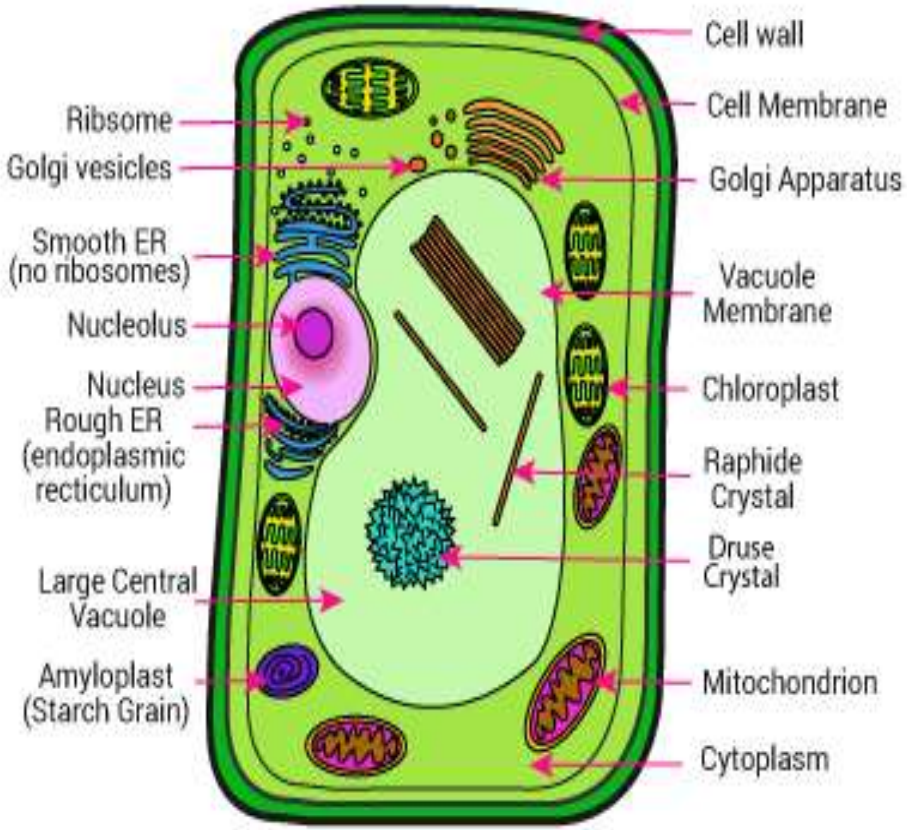
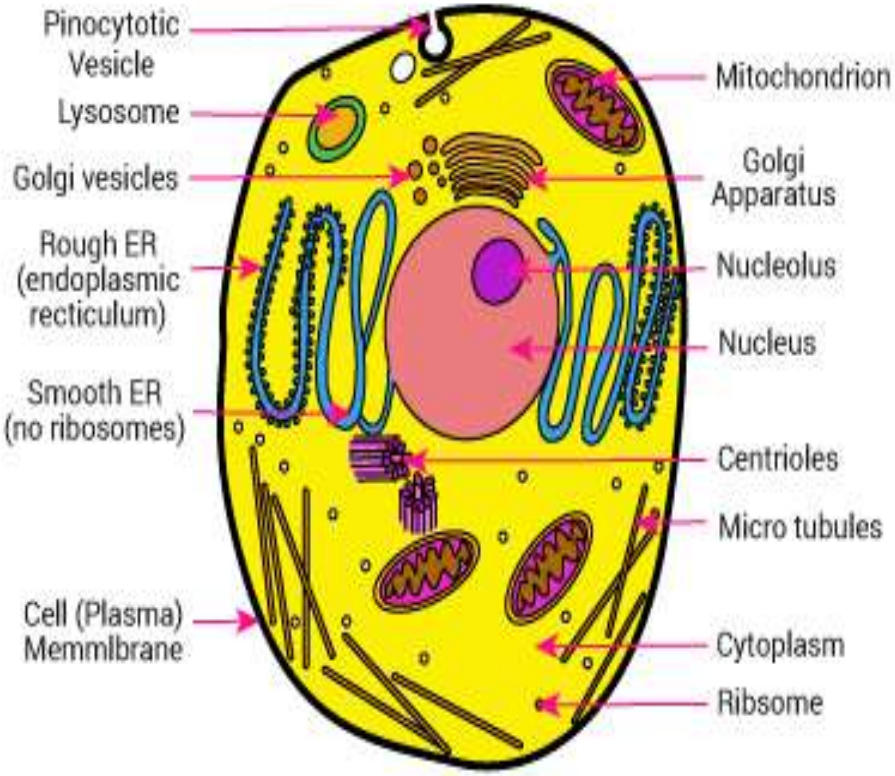
Introduction

- Recapitulation of previous topics by the teacher by conducting a **Group activity** by segregating students into 2 groups- one group representing plant cell and other group representing animal cell.
- Both the groups will be given their respective cell chart and will identify different organelles and draw and label it in note copy.
- Followed by sharing of ideas between 2 groups.

Plant Cell



Animal Cell



Comparison between plant cell and animal cell

Plant cell	Animal cell
Cell wall present.	Cell wall absent.
Nucleus usually lies near periphery due to vacuole.	Nucleus present near the centre.
Centrosome is usually absent from higher plant cells, except lower motile cells.	Usually centrosome is present that helps in formation of spindle fibres.
Plastids are present, except fungi.	Plastids are absent.

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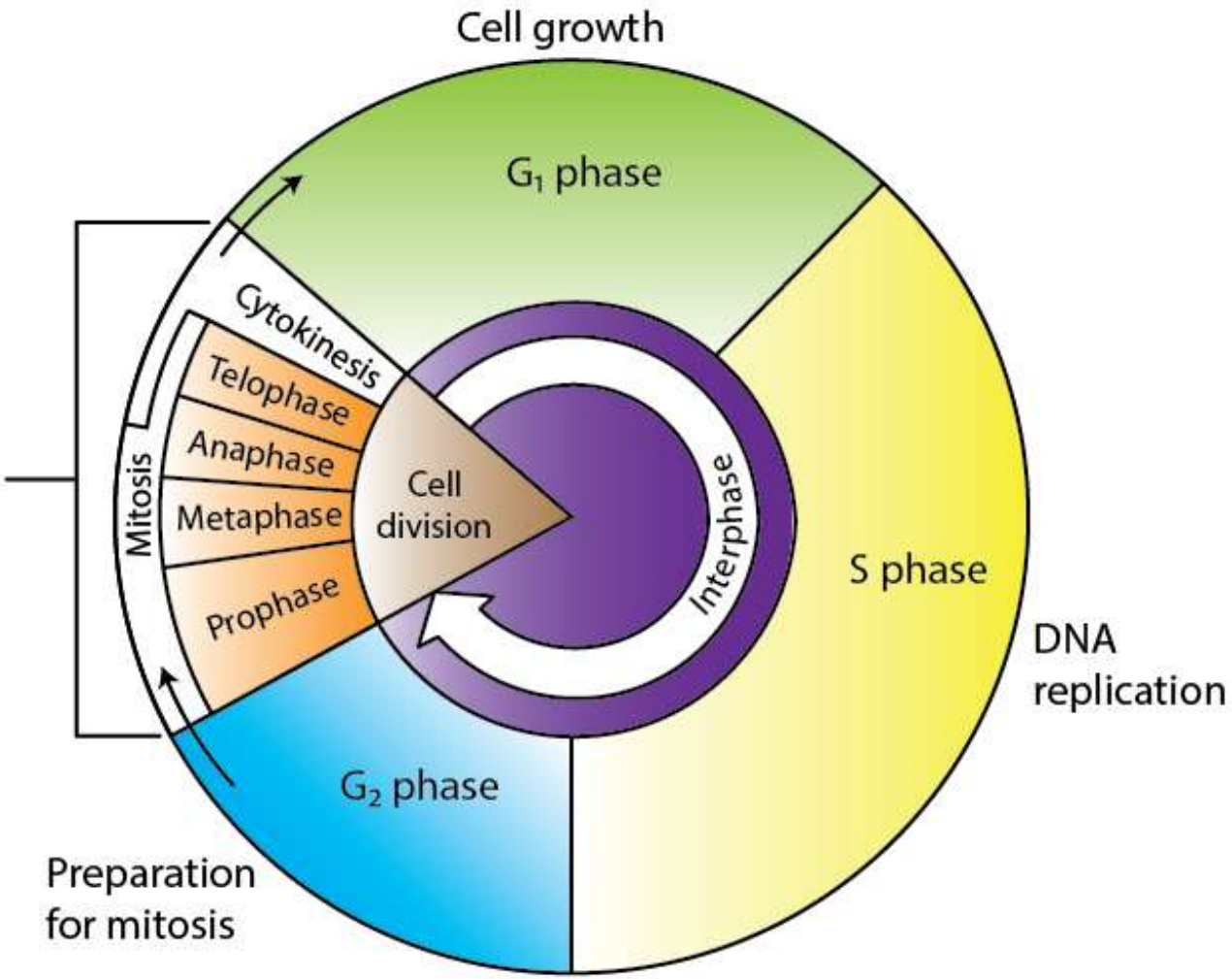
Cell cycle



Detailed explanation of cell cycle

https://youtu.be/g7iAVCLZWuM

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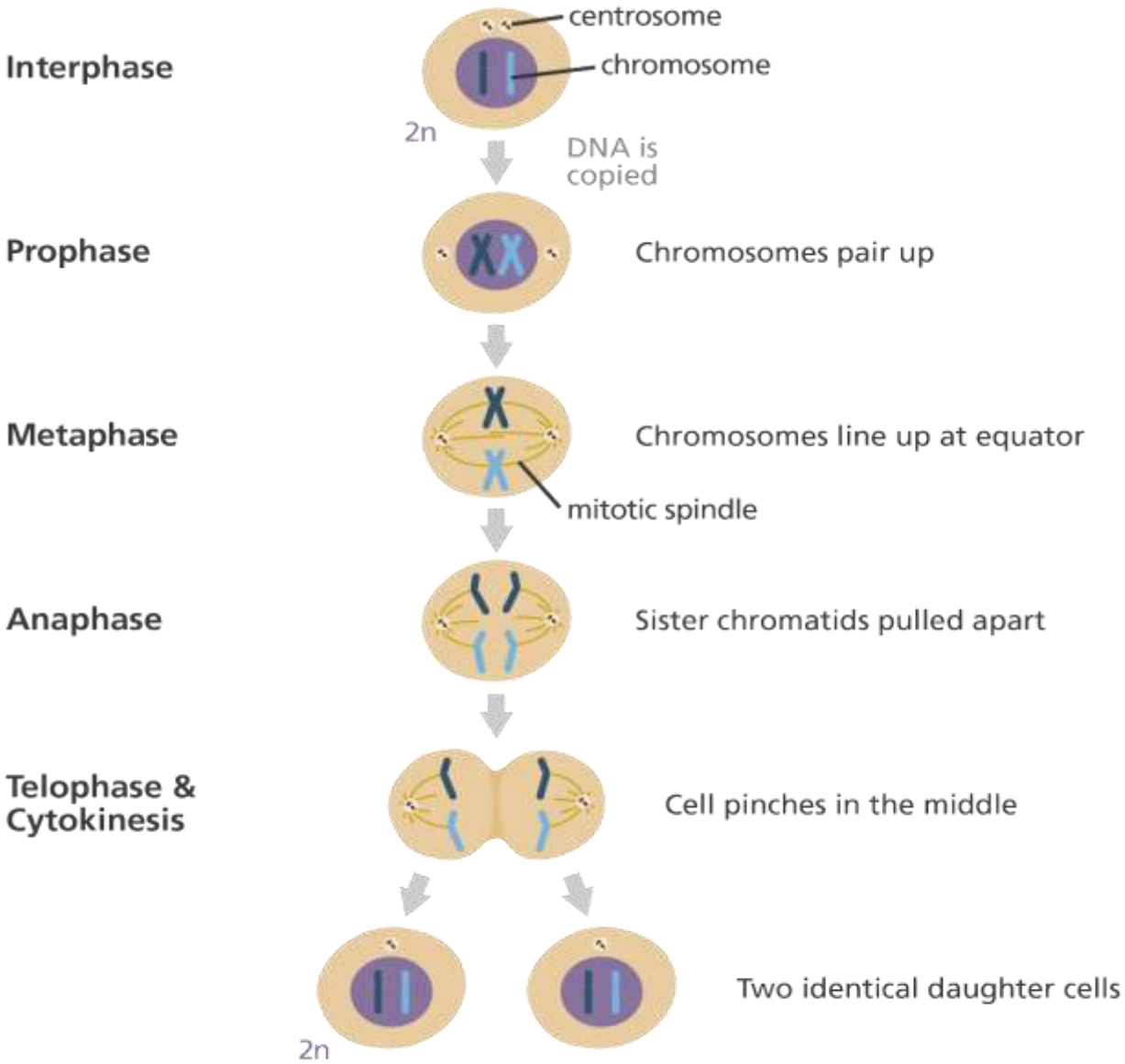
MITOSIS

Mitosis is that step in the cell cycle where the newly formed DNA is separated and two new cells are formed with the same number and kind of chromosomes as the parent nucleus.

https://youtu.be/ofjyw7ARP1c

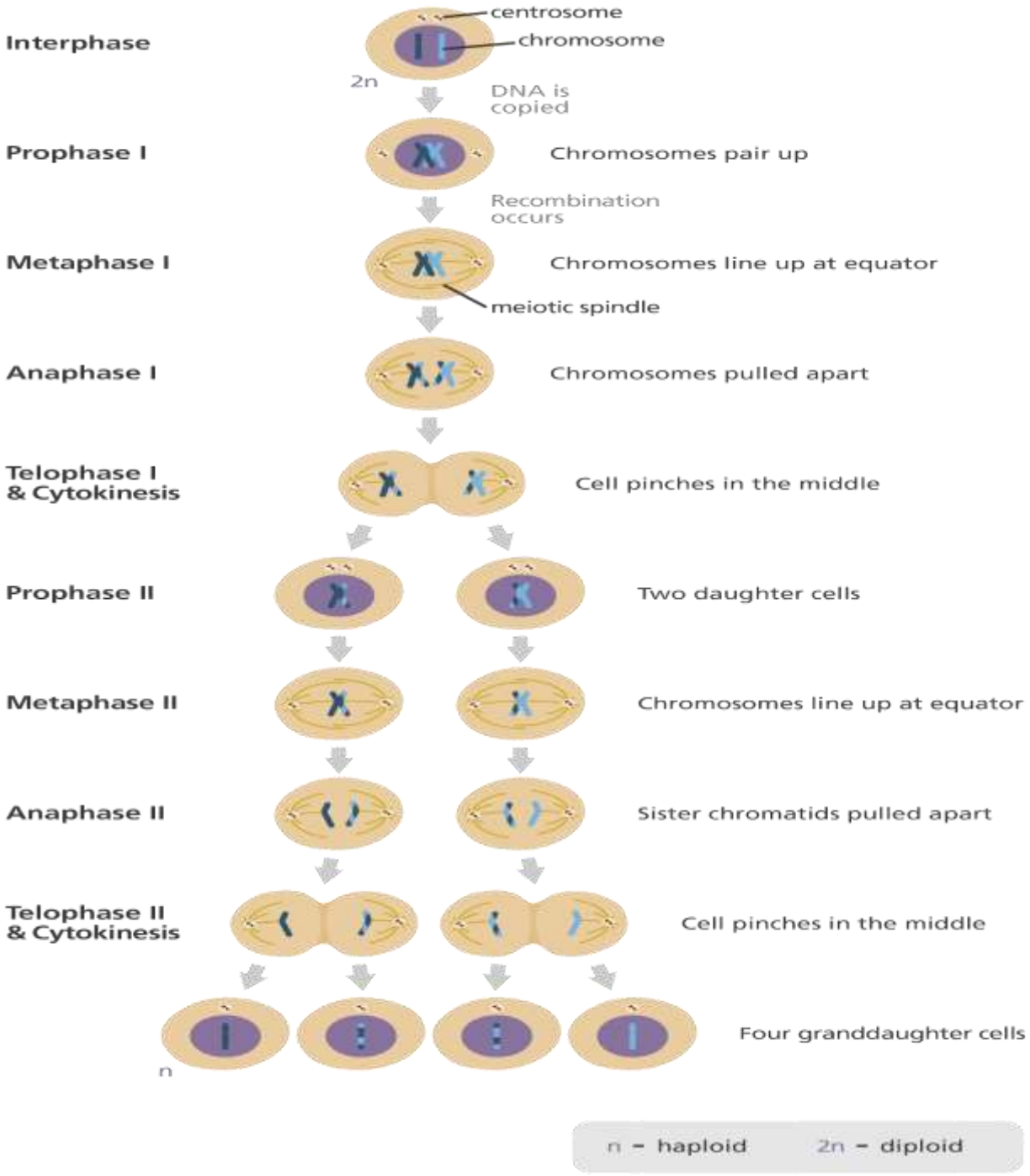


2n – diploid

MEIOSIS

Meiosis is the type of cell division that results in four daughter cells, each with half the number of chromosomes of the parent cell.

https://youtu.be/nMEyeKQClqI


Interphase
centrosome
chromosome
2n
DNA is copied
Prophase I
Chromosomes pair up
Recombination occurs
Metaphase I
Chromosomes line up at equator
meiotic spindle
Anaphase I
Chromosomes pulled apart
Telophase I & Cytokinesis
Cell pinches in the middle
Prophase II
Two daughter cells
Metaphase II
Chromosomes line up at equator
Anaphase II
Sister chromatids pulled apart
Telophase II & Cytokinesis
Cell pinches in the middle
n
Four granddaughter cells
n = haploid
2n = diploid

HOME ASSIGNMENT

Q. List some of the similarities between plant and animal cell

Q. List some of the differences between plant and animal cell

Q. Draw labelled diagram comparing plant cell and animal cell

Q. Differentiate between mitosis and meiosis

THANKING YOU

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