

15. Cilia and flagella share a common structure.
16. Flagella are long elongated structures and Cilia are short cellular projections that are often organized in rows.
17. Cilia are more numerous than flagella on the cell surface.
18. They are made of microtubules, with a 9+2 structure (Nine doublets of microtubules are arranged in a ring, with two single microtubules in its center).
19. They are covered by plasma membrane and bound to a basal body which anchors the cilium or flagellum to the cell.
20. The Basal body has 9 + 0 arrangement (no microtubules in its center)
21. Act as locomotor appendages.
22. Cilia can move fluid over the surface of the tissue.
23. Cilia lining in oviducts help move an egg toward the uterus.
24. Centriole is made up of cylindrically arranged microtubules which are non membrane bounded subcellular component present only in animal cells.
25. Each centriole composed of nine sets of triplet microtubules arranged in a ring (9+0).
26. A pair of centrioles which arranged perpendicular to each other are located in a region called centrosome near the nucleus.
27. Produce aster and spindle in cell division

5. **Describe the structure and function of plant cell wall.**

**Answer**

1. Cell wall is an extracellular structure of plant cells.
2. The chemical composition of the wall greatly varies from species to species and even from one cell type to another even in the same plant.
3. cell wall is generally made up of cellulose, pectin, hemicellulose, lignin and suberin.
4. Plants generate two types of cell walls:
5. primary and
6. secondary walls.
7. Young cells first secrete primary cell wall:
8. it is the wall laid down during plant cell division.
9. Just outside the primary wall there is a thin layer (middle lamella) which is rich in sticky polysaccharides called pectins (magnesium and calcium pectate).
10. Middle lamella glues adjacent cells together.
11. Due to the deposition of hardening substances on the primary wall a secondary cell wall is generated secondarily.
12. Primary cell wall is permeable, relatively thin, flexible,
13. composed mainly of cellulose fibers which are laid unevenly running through the extracellular matrix (middle lamella)
14. Water can move freely through the free spaces of cell wall
15. Secondary cell wall lies between plasma membrane and primary cell wall.
16. It contains several layers of hard materials, forming a rigid structure.
17. In addition to cellulose, impermeable substances such as lignin and suberin are also incorporated in to the secondary wall.
18. Lignin cement anchors cellulose fibers together providing hard and rigid matrix, giving the cell wall an extra support.
19. Cell wall has pits through which cytoplasm of adjoining cells join through plasmodesmata.
20. **Cell wall** protection and support cells.
21. Allows development of turgidity when water enters the cell
22. Prevents bursting during turgidity
23. Limits and control cell growth
24. Component of apoplast pathway
25. Maintaining cell shape
26. hold the plant up against the force of gravity

Visit : <https://advanceonlineclass.com>



**SAMPATH  
LANKADHEERA**  
B.Sc. (Hons), M.Sc.

f sampath lankadheera  
0777 211 384  
0779 925 362

TRULY  
AMAZING  
BIO  
CLASS  
IN

EM

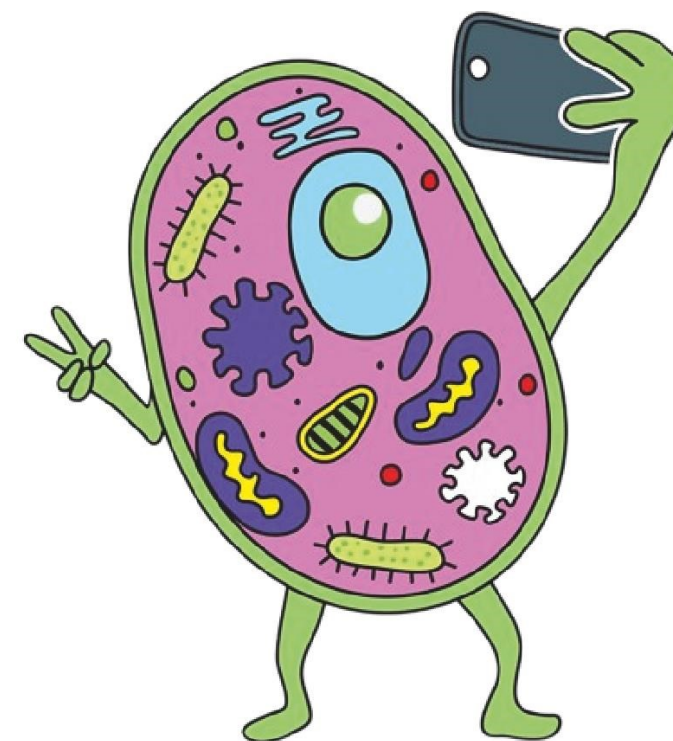
Live **Biology**  
ADVANCED LEVEL  
ENGLISH MEDIUM

Memo Max



MEMORY  
MAXIMIZING  
PROGRAM

We offer premium  
learning experience



UNIT  
02

**Cell Structure and Function**  
**Cell Organelles**

**SAMPATH  
LANKADHEERA**  
B.Sc. (Hons), M.Sc.

Visit : <https://advanceonlineclass.com>



Live Biology  
**Biology**  
 New Syllabus

**SAMPATH LANKADHEERA**

Unit 02 Cell Structure and Function  
 Cell Organelles

ADVANCED LEVEL

**Biology**

Unit - 02

Cell Structure and Function

Cell Organelles

Print 2024 August

**SAMPATH LANKADHEERA**

Published by



59/4 Muruthalawa Rd.  
 Gannoruwa

www.facebook.com/sampathlankadheera  
 www.youtube.com/c/Sampathlankadheera

sampath lankadheera

0777 211 384  
 0779 925 362

sampath lankadheera

0777 211 384  
 0779 925 362



Join Sampathbiology  
 Official Channel

https://advanceonlineclass.com  
 sampath lankadheera  
 0777 211 384  
 0779 925 362



Join Your Class  
 Discord Sever

**2. Describe the fine structure of a mitochondrion using a fully labeled diagram**

**Essay : Answer**

1. Double membrane structure/ is bounded by two membranes/ envelopes
2. Rod/sausage/tubular shaped.
3. Outer membrane is smooth,
4. Inner membrane is folded inwards forming a number of cristae.
5. Stalked particles are
6. attached on cristae/ are found on the matrix side of the inner membrane
7. The cristae of the inner membrane effectively increase its surface areal and
8. contain enzymes of electron transport system.
9. Inter membranal space is present (between membrane).
10. Internal area is called matrix
11. which contains circular DNA,
12. 70s ribosomes and
13. Enzymes of the Krebs cycle.

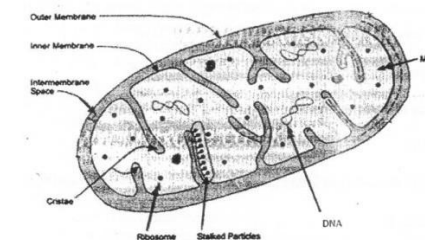


Diagram 1x 8 = 08

**3. Describe the typical structure of a chloroplast**

**Answer**

1. Chloroplast is a cell organelle
2. Surrounded by two membranes/outer membrane and inner membrane
3. It has an internal membrane system
4. running through ground substance/stroma (a which is called stroma)
5. forming thylokoides
6. which are stacked to form grana.
7. Grana connected through lamella.
8. Contains chlorophyll pigments and carotenoid pigments,
9. enzymes
10. and electron carriers.
11. Stroma contains enzymes for CO<sub>2</sub> fixation,
12. starch grains,
13. ribosomes,
14. DNA and
15. RNA

**Diagram**

1. Double membrane/inner and outer membrane
2. Starch grains
3. Stroma
4. Grana/ thylakoids
5. Inter granal lamellae

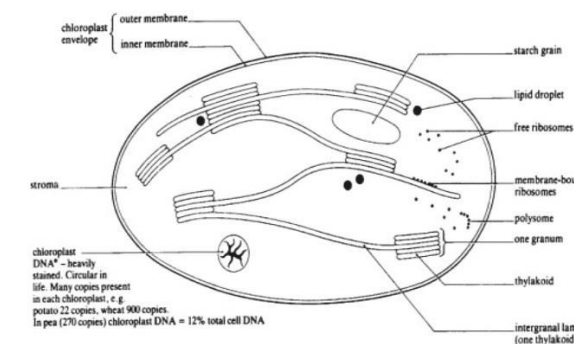
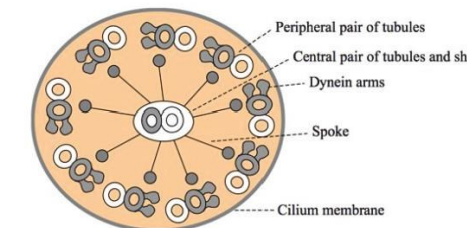


Diagram 5 x 2 = 10

**4. Describe structure of microtubules and microtubule associated structures indication their main functions.**

**Answer**

1. Micro tubules are hollow tubes;
2. wall consists of 13 columns of tubulin molecules
3. Maintenance of cell shape
4. Cell motility (as in cilia or flagella)
5. Chromosome movements in cell division
6. Organelle movements
7. Cytoskeleton is the supporting structure of the cell and maintains its shape.
8. It is more important for animal cells which lack cell walls.
9. Cytoskeleton is made out of microtubules and protein filaments.
10. Additionally, it is Dynamic hence, has the ability to break and reform as needed.
11. There are three types of components in the Cytoskeleton as follows;
12. Microtubules
13. Actin filaments or Microfilaments,



Essay Aid

Model Question

1. (a) Describe the structure and function of the nucleus.  
(b) Explain how the nucleoid differs from eukaryotic nucleus. (Model)
2. Describe the fine structure of a mitochondrion using a fully labeled diagram (2015 AL)
3. Describe the typical structure of a chloroplast (2014 AL)
4. Describe structure of microtubules and microtubule associated structures indicating their main functions. (Model)
5. Describe the structure and function of plant cell wall. (Model)

Model Question

1. (a) Describe the structure and function of the nucleus.  
(b) Explain how the nucleoid differs from eukaryotic nucleus.

Essay : Answer

(a) Describe the structure and function of the nucleus.

- Most prominent organelle,
- consist most of the genes,
- having an average diameter of 5µm and
- enclosed by a double membrane cover called nuclear envelope.
- Nuclear envelope- composed of two membranes, inner and outer membranes, separated by a space of 20-40 nm.
- Nuclear envelope is perforated by nuclear pores which has pore complex
- to regulate the entry and exit of substances.
- It has nuclear lamina,
- made up of protein filaments which line the interior side of the nuclear envelope.
- nuclear matrix made up of protein filaments and extended throughout the interior of the nucleus.
- Chromatin and nucleolus are embedded in the nuclear matrix.
- Nucleolus- appears as darkly stained granules with fibers adjoining part of the chromatin.
- Chromatin –appears as a diffused mass in electron micrographs of non dividing cells.
- It is a complex of DNA and proteins.
- During nuclear divisions, chromatin condenses,
- tightly coils and form threads, called chromosomes.
- Each species has a constant number of chromosomes. Eg. typical human cell has 46 chromosomes).

Functions

- Control all cellular activities.
- Synthesize DNA to produce new nuclei for cell divisions.
- Synthesize r-RNAs and ribosomal subunits required for protein synthesis, through nucleolus.
- Synthesize mRNA and t-RNA according to the information present on the DNA.
- Store and transport genetic information.

(b) Explain how the nucleoid differs from eukaryotic nucleus.

- DNA is circular and lies free in the cytoplasm.
- DNA is naked and not associated with proteins

\*\*\*\*\*

ADVANCED LEVEL

# Biology

## THEORY

in English Medium

New Syllabus

Unit 02 Cell Structure and Function  
○ Cell Organelles

## Smart Note



**SAMPATH**  
**LANKADHEERA**

B.Sc. (Hons), M.Sc.

*Exhilarating experience of delving in to Biology*

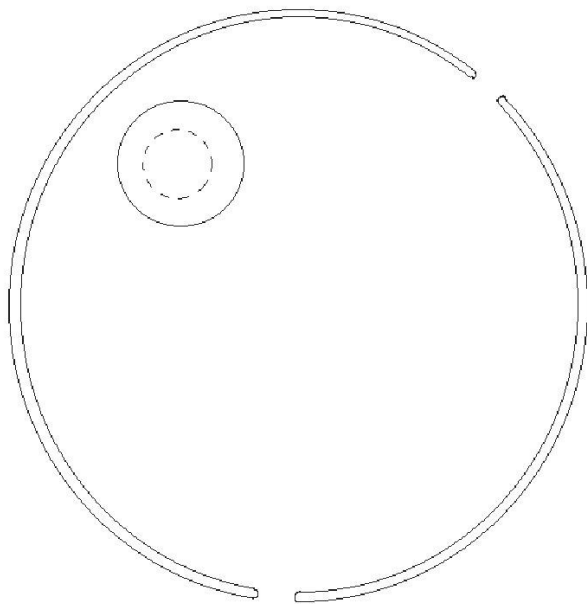


### Sub-cellular components

- There are many sub-cellular components in the cell. ....  
.....  
.....

### Nucleus

- Most ..... organelle, consist most of the genes. having an average diameter of ..... and enclosed by a double membrane cover called nuclear envelope.
- Nuclear envelope:** composed of two membranes, inner and outer membranes, separated by a space of ..... Nuclear envelope is perforated by nuclear pores which has ..... to regulate the entry and exit of substances. It has nuclear ....., made up of protein filaments which line the interior side of the nuclear envelope.
- Nuclear matrix :** is made up of protein ..... and extended throughout the interior of the nucleus. Chromatin and nucleolus are embedded in the nuclear matrix.



A ..... B .....

(ii) State two functions of each of the A and B.

A ..... B .....

(iii) What is a cytoskeleton?

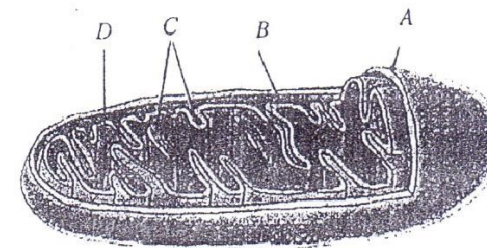
(iii) State three functions of the cytoskeleton.

(iii) Endosymbiotic theory states that mitochondria and chloroplasts have originated from bacteria. Give two common features of chloroplasts and mitochondria that support this theory.

### 2013 Old

6. Given below is a line diagram which shows the ultra structure of a mitochondrion as seen in an electron micrograph.

(i) Label A, B, C, and D.



(ii) Indicate the sites of (a) Krebs cycle reactions and (b) electron transport chain.

### 2022

(a) What is cell junction?

(b) Name cell junctions carryout each of the following

Prevent leakage of extracellular fluid .....

Allow exchange of materials .....



(c) State four functions of cytoskeleton other than providing support.

.....  
 .....  
 .....  
 .....

A/L 2004

3. What are the 4 major concepts included in the cell theory.

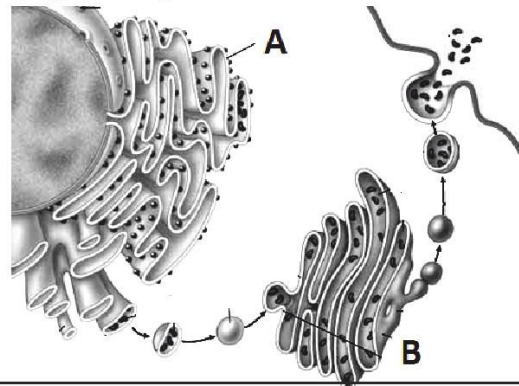
.....  
 .....  
 .....  
 .....

4. List five organelles found in an eukaryotic cell and indicated the presence or absence of protein, lipid, RNA, DNA, (Use + sign for presence and — sign for absence in the relevant column) and one function of each of the organelles.

Organelle	Proteins	Lipids	RNA	DNA	Functions

2010 AL

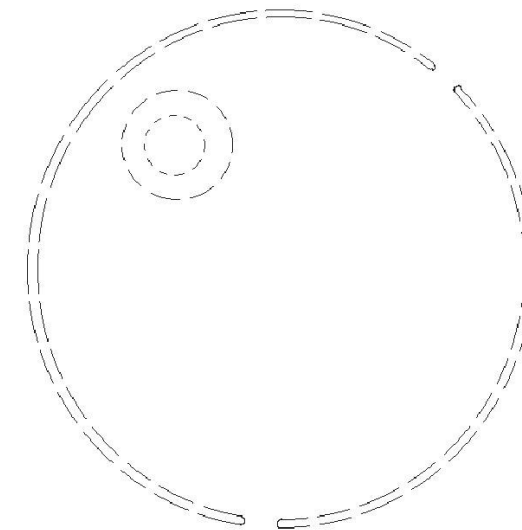
5. (i) Name A and B in the electron micrographic diagram shown below.



- **Nucleolus:** appears as ..... stained granules with fibers adjoining part of the chromatin.
- **Chromatin :** appears as a diffused mass in electron micrographs of non dividing cells. It is a complex of ..... and ..... During nuclear divisions, chromatin condenses, tightly coils and form threads, called chromosomes. Each species has a constant number of chromosomes. (eg. typical human cell has 46 chromosomes).

**Functions**

.....  
 .....  
 .....  
 .....  
 .....  
 .....



### Ribosomes

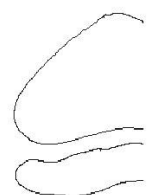
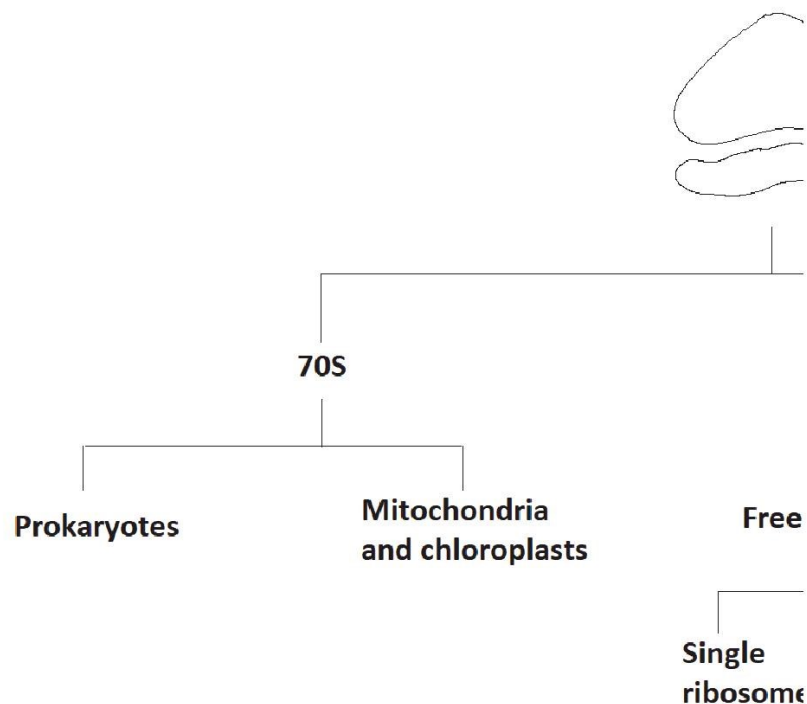
- These are subcellular components which carryout protein synthesis. They consist of two sub-units; ..... and ..... They are composed of ..... and ..... Ribosomes are found in two types; 70S and 80S. 70S ribosomes are found freely on the cytoplasm of prokaryotes, matrix of mitochondria and stroma of chloroplasts.....

.....

.....

.....

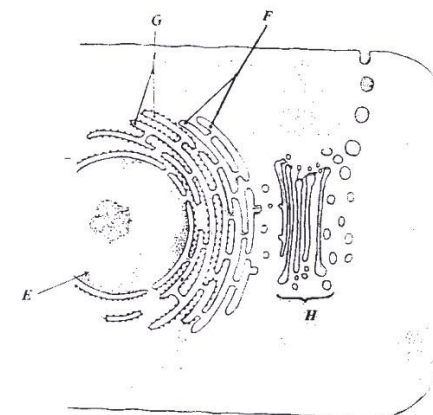
.....



### Structured Essay

A/L 2001/St

1. (B) The questions (i) and (ii) are based on the diagram of an electron micrograph of a part of an animal cell given below.



- (i) Name the structures labelled as **E, F, G** and **H**.

E .....

F .....

G .....

H .....

- (ii) What are the major functions of **G** and **H**.

G .....

H .....

- (C) (i) What are the **four** major types of organic compounds found in an eucaryotic cell?

.....

.....

- (ii) State the major polymeric compound/compounds found in the following.

- (a) Plant cell wall .....
- (b) Bacterial cell wall .....
- (c) Storage material in liver cells .....
- (d) Ribosomes .....

- (iii) What is the common respiratory substrate in living cells?

.....

- (iv) Describe a simple test to confirm the presence of reducing sugars in germinating mung seedlings.

.....

.....

.....

.....

.....

2013 Old

2. (a) What is cytoskeleton?

.....

.....

- (b) What are the main components of a cytoskeleton?

.....

.....



59. Steps involved in observing an onion peel mounted a compound light microscope are as follows.  
A - Adjusting the mirror B - Use of fine focussing knob C - Use of coarse focussing knob  
The correct sequence of above steps are on a glass slide and placed on the stage of  
(1) A, B and C. (2) A, C and B. (3) B, A and C. (4) A, C A and B. (5) C, B and A. (2020 AL/3)
60. Some features of cells are as follows.  
A - Presence of plasma membrane B - Presence of 70S ribosomes C - Occurrence of mitosis  
D - Presence of subcellular components suspended in cytosol  
Which of the above features are common to prokaryotic and eukaryotic cells?  
(1) A and B only. (2) B and C only. (3) B and D only. (4) A, B and C only. (5) A, B and D only. (2020/4)
61. Generally, the highest magnification and resolution power of a compound light microscope are respectively  
(1) and 200 nm.(3) and 200 nm.(5) and 2 pm (2) and 200 um. (4) x1500 and 0.2 mm. (2020 old/3)
62. Which of the following statements regarding plasma membrane is correct?  
(1) It is mainly composed of carbohydrates, phospholipids and proteins.  
(2) Phospholipid molecules are movable and provide a fluid nature to the membrane.  
(3) Peripheral proteins are tightly attached to the outer surface of the membrane  
(4) Phospholipid bilayer enables nearby ceils to communicate with each other.  
(5) Hydrophobic tails of phospholipids attach to cytoskeletal fibers and help to maintain shape of the cell.  
2021 /2
63. Select the correct 'subcellular component - function' combination.  
(1) Glyoxysomes - Transport of residue materials out of the cell  
(2) Smooth endoplasmic reticulum - Production of transport vesicles  
(3) Rough endoplasmic reticulum - Metabolism of carbohydrates  
(4) Nucleus - Synthesis of glycoproteins  
(5) Peroxisomes - Photorespiration (2021/3)
64. In a compound light microscope.  
(1) lenses reflect light to magnify the image of the specimen observed.  
(2) resolution power is inversely proportional to the wavelength of light.  
(3) the image produced by the eye piece lens is magnified by the objective lens.  
(4) the maximum magnification is usually 600 times of the actual size of the specimen.  
(5) resolution power is 0.2 mm. (2022/2)
65. A function common to both rough endoplasmic reticulum and smooth endoplasmic reticulum is  
(1) synthesis of glycoproteins. (2) synthesis of phospholipids. (3) metabolism of carbohydrates.  
(4) production of transport vesicles. (5) storage of calcium ions.
66. Which of the following statements regarding subcellular components of an eukaryotic cell is correct?  
(1) DNA and ribosomes are present in thylakoids.  
(2) Outer membrane of a mitochondrion contains stalk particles.  
(3) Glyoxysomes have enzymes required to convert fatty acids to glycolipids.  
(4) Golgi apparatus manufactures cellulose,  
(5) Chromatin is embedded in nuclear lamina, which is made up of protein. (2022/4)
67. A feature common to lysosomes and peroxisomes is that they  
(1) are single membrane bounded vesicles.  
(2) transport residual materials by exocytosis.  
(3) contain oxidising enzymes that catalyse breakdown of nucleic acids.  
(4) are important in photorespiration.  
(5) digest worn out organelles. (2023 AL/01)
68. Which of the following statements is correct regarding transmission electron microscope?  
(1) Specimens are magnified  $5 \times 10^6$  times.  
(2) Less electrons may get displayed in cellular structures with dense staining.  
(3) Living specimens cannot be observed.  
(4) Three dimensional appearance of the specimens can be observed.  
(5) Specimens scatter many electrons whilst others are absorbed. (2023 AL/3)

.....

.....

.....

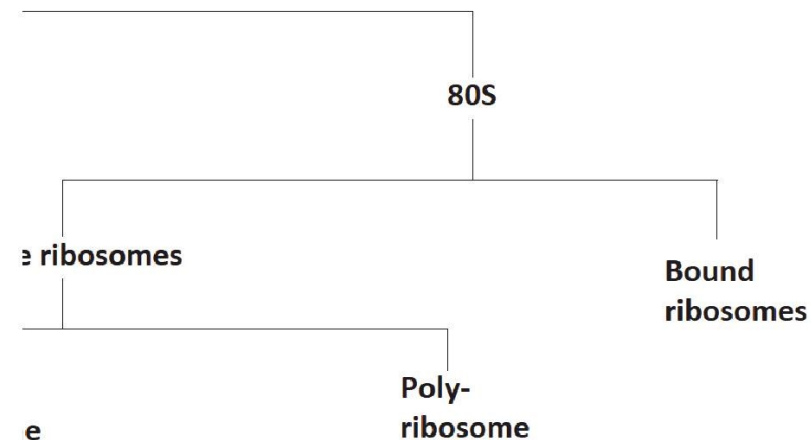
.....

.....

.....

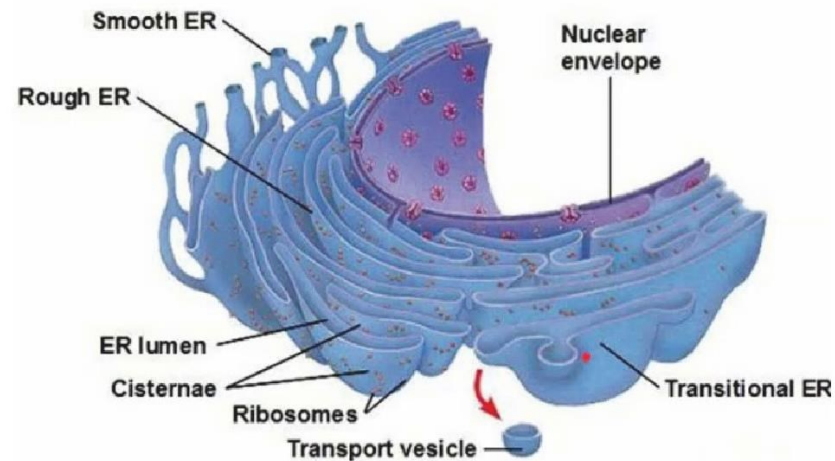
### Functions

- Protein synthesis



## Endoplasmic reticulum

- It is a network of internal membranes forming flattened or tubular sacs separating cytosol from ER lumen. It is continuous with the outer membrane of nuclear envelope. There are two types of ER;



Rough ER	Smooth ER
<ul style="list-style-type: none"> <li>Rough ER consists of flattened sacs, and ribosomes bound to surface.</li> <li>Proteins synthesized by ribosomes move into lumen of ER.</li> </ul>	<ul style="list-style-type: none"> <li>Smooth ER is a network of tubular sacs without ribosomes. Membrane bound enzymes are present.</li> </ul>
<p><b>Functions</b></p> <ul style="list-style-type: none"> <li>Transport protein synthesized by bound ribosomes</li> <li>Synthesizing glycoproteins</li> <li>Produce transport vesicles</li> <li>Synthesizing membrane phospholipids.</li> <li>Facilitate the growth of own membrane by adding phospholipids proteins and carbohydrates. Therefore called as membrane factory</li> </ul>	<p><b>Functions</b></p> <ul style="list-style-type: none"> <li>It synthesizes lipids including oils, steroids and phospholipids.</li> <li>Metabolism of carbohydrates.</li> <li>Produce transport vesicles to transport within cell.</li> <li>Involves in detoxification.</li> <li>Stores Ca<sup>2+</sup> ions.</li> </ul>

47. Which of the following characteristics is/are found only in prokaryotic organisms?  
 (A) Anaerobic respiration (B) Peptidoglycan in the cell wall  
 (C) Presence of naked circular DNA in the cytoplasm  
 (D) Ability to fix atmospheric nitrogen (E) Reproduction by binary fission (2008/51)
48. Which one of the following cannot be seen under a light microscope?  
 (1) Starch grains (2) Yeast cells (3) Plasmids (4) Chloroplasts (5) Stomata (2012/2)
49. Which of the following is/are not found in all organisms?  
 (A) Cytoskeleton (B) Mitochondria (C) Ribosomes (D) Presence of DNA outside the nucleus (E) RNA (2012/41)
55. Which one of the following eyepiece X objective lens combinations is the best for clearly observing stomata of a leaf?  
 (1) 5 X 10 (2) 5 X 40 (3) 10 X 100 (4) 10 X 10 (5) 10 X 40 (2009/38)
50. Which of the following is incorrect regarding living cells?  
 (1) All organisms are composed of cells. (2) The basic structural unit of life is the cell.  
 (3) The basic functional unit of life is the cell. (4) All cells have a cytoskeleton.  
 (5) Any organizational level of matter below the level of the cell is not considered as living. (2015/3)
51. Which of the following is/are not surrounded by a membrane?  
 (A) Nucleus (B) Lysosome (C) Ribosome (D) Plasmid (E) Peroxisome (2013/50)
52. Which one of the following is incorrect regarding prokaryotic cells?  
 (1) All prokaryotic cells have 70S type of ribosomes.  
 (2) All prokaryotic cells have peptidoglycans in the cell wall.  
 (3) All prokaryotic cells do not have a cytoskeleton.  
 (4) All prokaryotic cells do not have membrane bound organelles.  
 (5) All prokaryotic cells contain lipids in the cell membranes. (2014 AL/5)
53. Which of the following is incorrect regarding living cells?  
 (1) All organisms are composed of cells. (2) The basic structural unit of life is the cell.  
 (3) The basic functional unit of life is the cell. (4) All cells have a cytoskeleton.  
 (5) Any organisational level of matter below the level of the cell is not considered as living. (2015/3)
54. Which of the following organelles converts fats into carbohydrates?  
 (1) Lysosomes (2) Peroxisomes (3) Glyoxysomes (4) Endoplasmic reticulum in plant cells (5) Golgi complex (2016/1)
55. Which of the following is correct regarding prokaryotic  
 (1) All prokaryotic organisms are heterotrophic.  
 (2) All prokaryotic organisms do not have peptidoglycan in their cell walls,  
 (3) All prokaryotic organisms can fix atmospheric nitrogen.  
 (4) All prokaryotic organisms do not have ribosomes.  
 (5) All prokaryotic organisms are not microorganisms. (2016/2)
56. In eukaryotic cells, in addition to nucleus, DNA is present in  
 (1) ribosomes and centrioles, (2) mitochondria and chloroplast. (3) nucleolus and peroxisomes.  
 (4) microbodies and Golgi bodies. (5) Glyoxysomes and endoplasmic reticulum. (2017/2)
57. Which of the following cannot be seen in a typical plant cell when observed under a light microscope?  
 (1) Chloroplasts (2) Starch granules (3) Nucleus (4) Mitochondria (5) Vacuoles (2018/2)
58. Which of the following statements regarding microscopes is correct?  
 (1) In a light microscope, visible light is passed through the objective lens and then through the specimen.  
 (2) Projection of a light beam through a vacuum is the principle of an electron microscope.  
 (3) Scanning electron microscope is used to study the internal structure of cells.  
 (4) Transmission electron microscope is used for detail studies of living specimens.  
 (5) Magnification and resolution power are important properties of all microscopes. (2019/3)



32. Which of the following is an incorrect statement?  
 (1) Cytoskeleton is found only in eukaryotic cells.  
 (2) All organelles in eukaryotic cells are membrane bound.  
 (3) Mitochondria are believed to have originated from aerobic bacteria.  
 (4) Ribosomes found in mitochondria are different from those found in the cytoplasm.  
 (5) All cell membranes have a lipid-protein bilayer structure. (A/L 2008)

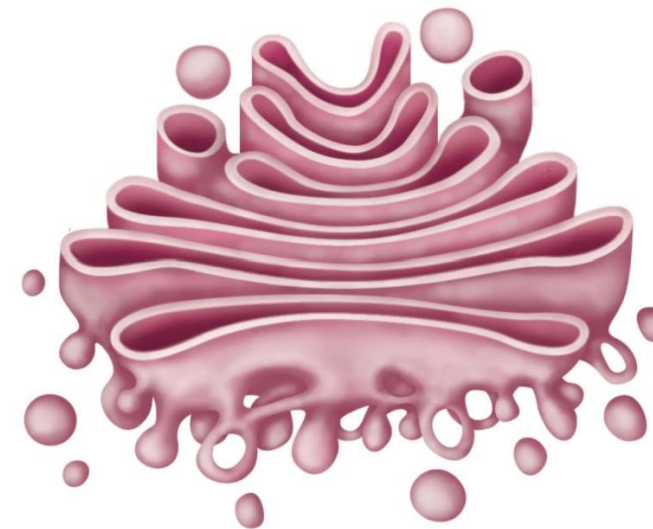
33. Which one of the following structures in the cell does **not** contain RNA?  
 (1) Ribosomes (2) Nucleolus (3) Mitochondria (4) Lysosomes (5) Chloroplasts (A/L 2007)

#### Cell Wall

34. Absent in higher plants cell wall  
 (1) Lignin (2) Suberin (3) Cutin (4) Chitin (5) Protein
35. Which of the following structure is comparatively small  
 (1) Chromosome (2) Nucleolus (3) Golgi complex (4) Chloroplasts (5) Cell wall
36. Two protoplasts are joined with  
 (1) E.R. (2) Cytoplasm (3) Cell membrane (4) Cilia (5) Plasmodesmata
37. Pits can be clearly seen in  
 (1) Sclereids (2) Cork cells (3) Parenchyma cells (4) Xylem vessels (5) Sieve tube element
38. Plasmodesmata are  
 (1) Cytoplasmic threads which interconnects nucleus to cytoplasm  
 (2) Matter which interconnects neighboring cell walls together to form a tissue.  
 (3) Protoplasmic threads interconnects adjacent protoplasm together  
 (4) Membranes around mitochondria.  
 (5) Protoplasmic structures which interconnects cellular organelles together.
39. Pectin is major constituent of  
 (1) Primary cell wall (2) Secondary cell wall (3) Middle lamella (4) Cell membrane (5) Plasmodesmata
40. Which one of the following features of the eukaryotic cells supports the theory of endosymbiotic origin?  
 (1) Presence of a phospholipid cell membrane. (2) Presence of 70S ribosomes in mitochondria.  
 Presence of DNA in the nucleus. (4) Presence of a cytoskeleton. (5) Present of Krebs cycle (2009/2)
41. Which one of the following structure– function relationships is incorrect?  
 (1) Nucleus – Ribosome synthesis (2) Microbodies- Photorespiration in plants  
 (3) Lysosomes- Detoxification (4) Mitochondria- Synthesis of ATP  
 (5) Golgi complex- Synthesis of glycolipids (2011/3)
42. Which of the following combinations organelles in an eukaryotic cell contain DNA?  
 (1) Ribosomes, nucleus and mitochondria only (2) Mitochondria and chloroplasts only.  
 (3) Endoplasmic reticulum and chromosomes only (4) Mitochondria, nucleus and chloroplasts only.  
 (5) Mitochondria, chloroplasts and ribosomes only. (2011/Old/2)
43. Which of the following does not contain DNA?  
 (1) Chloroplasts (2) Mitochondria (3) Plasmids (4) Endospores (5) Ribosomes (2012/Old/1)
44. Which of the following are found only in plants?  
 (1) 80S ribosomes (2) Endoplasmic reticulum (3) Plasmids (4) Glyoxysomes (5) Golgi complex (2013/2)
45. Which of the following statements is **not** included in the cell theory?  
 (1) All organisms are composed of one or more cells. (2) The basic structural unit of an organism is the cell.  
 (3) The cell is the basic functional unit of an organism. (4) All arise from pre-existing cells.  
 (5) All cells are microscopic. (2000)
46. Which of the following is common in plant, animal and bacterial cells?  
 (1) Mitochondria (2) Cytoskeleton (3) Golgi complex (4) Ribosomes (5) Centriole (2001)

#### Golgi apparatus

- Golgi apparatus is a stacks of flattened sacs or Cisternae. Inner and outer surfaces can be identified as ..... and ..... respectively. Cis face is located near the E.R to receive vesicles from ER. Trans face give rise to secretory vesicles which budded off and travel other side. Golgi apparatus is abundant in secretory cells .



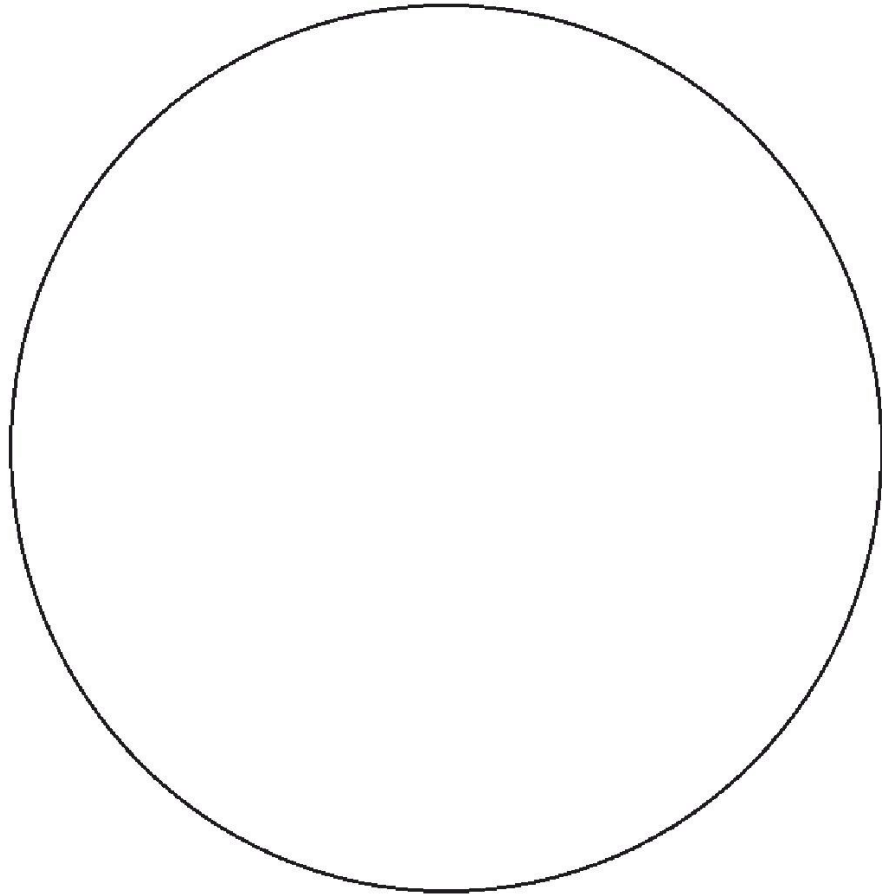
#### Functions

- .....
- Manufacturing ..... and ..... cell wall components such as .....
- Produce .....



## Lysosomes

- They are single membrane bounded vesicles contributing to digestive activity .....



## Functions

- Digest food particles received by phagocytosis
- Transport residue material out of cell by exocytosis.
- Digest worn out organelles
- Autolysis causing cell death.

17. Which of the following pigment present in cell sap.  
(1) Chlorophyll (2) Fucoxanthin (3) Xanthophyll (4) Anthocyanin (5) Phycobilin
  18. Lipoproteins membrane absent in  
(1) Nucleolus (2) Rough ER (3) Mitochondria (4) Golgi body (5) Nucleus
  19. Not involve in transportation of matter within a cell  
(1) Lysosomes (2) Microbodies (3) Chromosomes (4) E.R. (5) Golgi
  20. Which of the following is **incorrect** regarding golgi complex of an animal cell  
(1) They are well developed in secretory cells (2) Closely associated with E.R.  
(3) They form glycoproteins by combining protein and carbohydrates  
(4) Consist of membrane structure (5) Store glycogen granules
  21. Which of the flowing is **incorrect** regarding lysosomes  
(1) Store various different types of Enzymes (2) Formed by golgi vesicles  
(3) Double membrane structures (4) Do not involve in protein synthesis (5) Suicide bags of cells
  22. Which of the following is not a function of Golgi complex?  
(1) Transportation of proteins (2) Detoxification of toxic substances (3) Modifying proteins  
(4) Production of Lysosomes (5) Packaging of proteins (2012 Old/2)
  23. Smooth endoplasmic reticulum is abundantly found In cells that accumulate which of the following substances?  
(1) Proteins (2) Toxins (3) Enzymes (4) Lipids (5) Nucleic acids (2013 Old/1)
  24. Which of the following organelle/organelles is / are involved in detoxification?  
(A) Smooth endoplasmic reticulum (B) Peroxisomes (C) Golgi complex (D) Glyoxysomes (E) Lysosomes (2001)
  25. Which one of the following organelle in the cell synthesizes lipids?  
(1) Golgi complex (2) Endoplasmic reticulum (3) Peroxisomes (4) Lysosomes (5) Chloroplasts (2007/4)
  26. Which of the following organelles in the cell is involved in lipid synthesis?  
(1) Golgi bodies (2) Microbodies (3) Smoot endoplasmic reticulum  
(4) Rough endoplasmic reticulum (5) Lysosomes (2005/4)
  27. Which of the following statements is/are *correct* regarding endoplasmic reticulum?  
(A) It consists of a bilayer of lipids and proteins  
(B) It regulates the exit of waste material from the cell  
(C) It is responsible for lipid synthesis and detoxification of toxic substances.  
(D) It maintains osmotic balance of cells.  
(E) It receives information and generates signals to coordinate activities between cells. (2004/51)
- Chloroplast and Mitochondria**
28. Organelles can replicate  
(1) Mitochondria (2) Chloroplasts (3) Centriole (4) Nucleus (5) 1, 2, 3 and 4.
  29. Which sentence is incorrect about mitochondria?  
(1) Main organelle, which synthesize ATP. (2) Contains enzymes required for citric acid cycle.  
(3) Involve in oxidative phosphorylation. (4) Abundant in physiologically active cells.  
(5) Single membranous organelle. (1985/Zoo)
  30. Which one of the following is incorrect regarding mitochondria?  
(1) They contain enzymes. (2) They contain ribosomes. (3) They contain DNA.  
(4) They are found in all living organisms. (5) They are found in large numbers in heart muscle cells. (2006/4)
- Microtubules/Centrioles**
31. Which of the following sentence is incorrect regarding microtubules?  
(1) They involve in formation of cytoskeleton (2) Facilitate the cytoplasmic streaming  
(3) They are a structural component of bacterial flagella (4) Required for intracellular transport  
(5) They form the mitotic spindle apparatus



### Nucleus

- Eukaryotic chromosomes contain  
(1) RNA/DNA (2) DNA (3) DNA /Protein (4) RNA (5) RNA/DNA/Protein
- Chromosomes are present in,  
(1) Nucleus (2) Nucleus and mitochondria (3) Nucleus, Mitochondria and chloroplasts  
(4) Any protoplasm (5) All cell organelles
- Nucleus  
(1) Bounded by a single membrane (2) Present in all live cells (3) Visible only through E.M.  
(4) Center of information storage in a cell (5) Only structure contain DNA

### Ribosomes

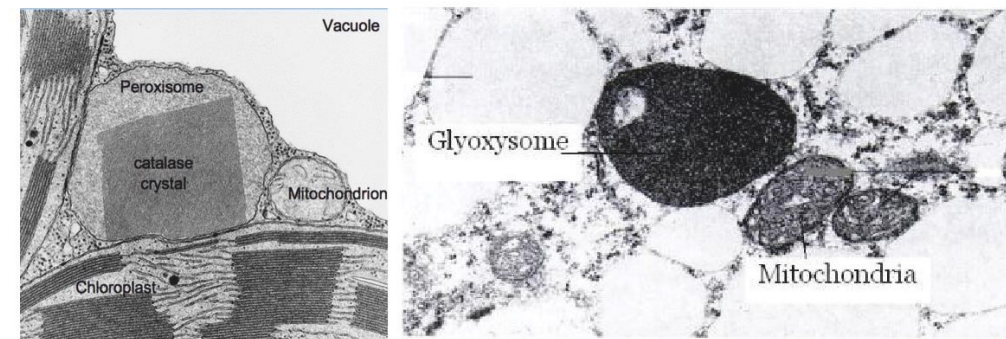
- Ribosomes  
(1) Consist of 3 sub units (2) Attached in smooth E.R. (3) Involve in proteins synthesized  
(4) Involve in storage of synthesized proteins (5) They are not active inside nucleus
- Present in all living cells  
(1) Mitochondria (2) Vacuole (3) Chloroplasts (4) Nucleus (5) Ribosomes
- Ribosome absent  
(1) On E.R. (2) In vacuole (3) In mitochondria (4) In chloroplasts (5) In cytoplasm
- Which of the following organelle is not membrane bounded  
(1) Nucleus (2) Mitochondrion (3) Golgi (4) Ribosomes (5) Vacuole
- Ribosomes found in the chloroplasts of a plant cell  
(1) are of the same size and composition to those seen in bacteria.  
(2) are larger than those seen in bacteria but similar in composition.  
(3) are smaller than those in bacteria and different in composition.  
(4) are of the same size as those seen in bacteria but different in composition  
(5) are similar in size and composition to those found in the cytoplasm of that eukaryotic cell. (2003 AL)

### Single membrane bounded organelles

- Endoplasmic reticulum  
(1) Has a fixed structure. (2) Synthesize proteins. (3) Fully covered with ribosomes.  
(4) Work as an intracellular transport system. (5) Not connected with the membrane. (1985/Zoo)
- Which of the following statements is incorrect regarding lysosome?  
(1) They are derived from Golgi complex. (2) They are double membrane bound organelles.  
(3) They contain different type of digestive enzymes. (4) They help in recycling cellular material  
(5) They are found only in eukaryotic cells. (2001/Bio)
- Tonoplast  
(1) Derive from plasma membrane (2) Dead structures (3) Cannot grow (4) Contain proteins only  
(5) Not selectively permeable
- Main function of Lysosomes  
(1) Intracellular digestion (2) Autophagy (3) Autolysis (4) Release of enzymes (5) Aging of cells
- What is the organelle, which synthesize enzymes in the cell?  
(1) Lysosome (2) Ribosome (3) Chromosome (4) SER (5) Mitochondria (1986/Zoo)
- What is the cellular reaction relates to Lysosome.  
(1) Autophagy (2) Respiration (3) Secretion (4) Synthesis (5) Transport (1986/Zoo)
- Endoplasmic reticulum  
(1) Has a permanent shape (2) Involve in synthesis of proteins (3) Fully covered with ribosome  
(4) Act in intracellular transportation (5) Not attached to cell membrane
- Golgi bodies  
(1) Abundant in nerve cells (2) Synthesize enzymes (3) Not linked with endoplasmic reticulum  
(4) Synthesize by mitochondria (5) Store secretory products

### Peroxisome

- They are single membrane bounded vesicles with oxidizing enzymes.
- They are present in both plants and animals.
- Enzymes in peroxisome (Catalase enzyme) catalyze the breakdown of  $H_2O_2$ .



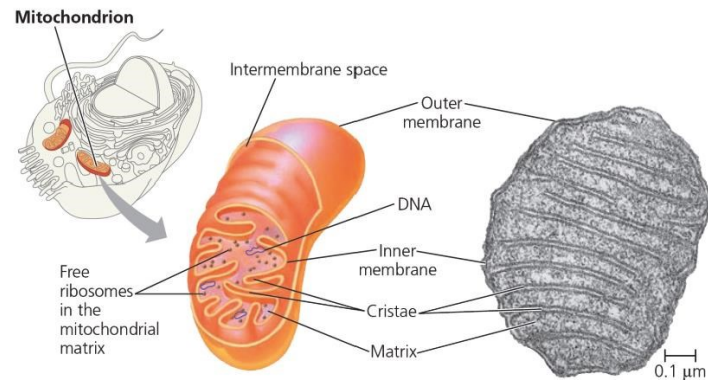
### Functions

- Detoxification of peroxides
- Photorespiration in plants
- Specialized peroxisomes called glyoxysomes are found in fat storing tissues in plants.
- Glyoxysomes converts fatty acids into sugar.



## Mitochondria

- It is one of the most common organelles in eukaryotic cells. It is an elongated organelle with two enclosing membranes. .... membrane is ..... but the inner membrane is ..... to form ..... Cristae increase the surface area. The gap/space in between inner and outer membranes of the mitochondrion is called ..... space.



## 2. Extracellular matrix of animal cells

- Although animal cells lack cell walls they do have elaborate extracellular matrix (ECM). Main components of the ECM are ..... and other carbohydrates containing molecules secreted by the cells. Most abundant glycoprotein in the ECM of most animal cell is ..... which forms strong fibres outside the cell. The collagen fibres are embedded in a network woven out of ..... secreted by cells. Collagen fibers are connected to the ..... of plasma membrane via .....

### Functions

- Forms a protective layer over the cell surface
- Linking extra cellular matrix and cytoskeleton.
- Influences the cell behavior by Involving in the mechanical and chemical signaling.

- Plasmodesmata - Microscopic channels which runs through plant cell walls. They are cytoplasmic living connections between cytoplasm of adjoining cells. These are membrane lined channels filled with cytoplasm.

- The inner most part of the organelle is known as mitochondrial matrix, which consists of ..... ribosomes ..... molecule (mitochondrial DNA), ..... and ..... The matrix carries enzymes for the reactions in Krebs cycle (in cellular respiration). Further, cristae composed of proteins and enzymes essential for electron transport chain and oxidative phosphorylation.

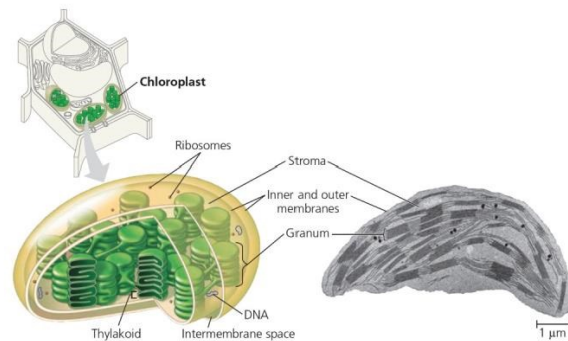
**Functions**

- Synthesize ATP in aerobic respiration
- Involve in Photorespiration



## Chloroplast

- It is a ..... lens shaped organelle with two membranes which is found in plants and some protists. The outer and inner membranes are smooth and are separated by a very narrow intermembrane space. Inside the chloroplast there is another membrane system. This membrane produces flattened and interconnected sacks called .....



## Cell junctions

- Neighbouring cells join, interact and communicate via sites of direct physical contacts.
- .....
- .....
- They connect the internal chemical environment of adjacent cells.
- There are three types of cell junctions in animal cells.

Tight junctions	Desmosomes/ Anchor junctions	Gap junctions / Communicating junctions
<ul style="list-style-type: none"> <li>Connect the plasma membranes of adjacent cells tightly bound by specific proteins forming continuous seals around the cells. Prevent leakages of extracellular fluids through intercellular space.</li> <li>Eg. Skin epithelium</li> </ul>	<ul style="list-style-type: none"> <li>Mechanically attach the cytoskeletons of adjoining cells by intermediate filaments for strong binding.</li> <li>Eg. Muscle tissue</li> </ul>	<ul style="list-style-type: none"> <li>Provide cytoplasmic channels from one cell to an adjacent cell. Gap junctions consists of special membrane proteins that surround the pore through which ions, sugars amino acids may pass. They allow signal and material exchange between adjacent cells through direct connections.</li> <li>Eg. Heart muscles, animal embryo.</li> </ul>



## Extracellular components and connections between cells

### 1. Cell wall

- Cell wall is an extracellular structure of plant cells. Animal cells do not have cell walls. However, prokaryotes, fungi and some protists also have a thin and flexible cell wall. The chemical composition of the cell wall greatly varies from species to species and even from one cell type to another even in the same species. In Plants, cell wall is generally made up of cellulose, pectin and hemicellulose. Lignin and suberin are found in some plant cells.
- Plants generate two types of cell walls: primary and secondary walls. Young cells first secrete primary cell wall: it is the wall laid down during plant cell division.
- Just outside the primary wall there is a thin layer (middle lamella) which is rich in sticky polysaccharides called pectins (magnesium and calcium pectate). Middle lamella glues adjacent cells together. Due to the deposition of hardening substances on the primary wall a secondary cell wall is generated secondarily.
- Primary cell wall is permeable, relatively thin, flexible, composed mainly of cellulose fibers and deposited on the middle lamella. Water can move freely through the free spaces of cell wall.
- Secondary cell wall lies between plasma membrane and primary cell wall, It contains several layers of hard materials, forming a rigid structure. In addition to cellulose, impermeable substances such as lignin and suberin are also incorporated in to the secondary wall. Lignin cement anchors cellulose fibers together providing hard and rigid matrix, giving the cell wall an extra support.
- Cell Wall has pits through which cytoplasm of adjoining cells join through plasmodesmata.

### Functions

- Protection and support
- Allows development of turgidity when water enters the cell
- Prevents bursting during turgidity
- Limits and control cell growth
- Component of apoplast pathway
- Maintaining cell shape hold the plant up against the force of gravity

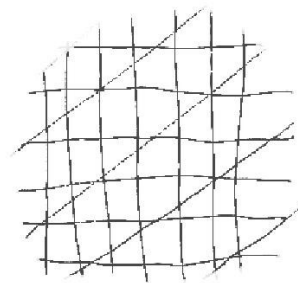
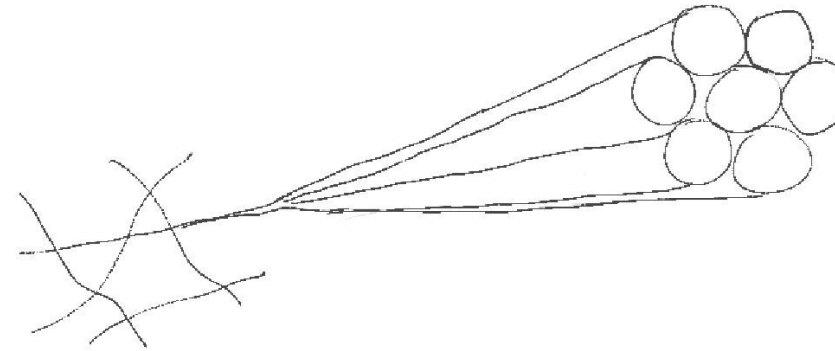
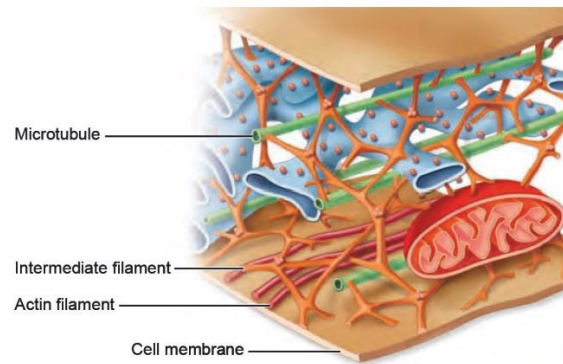
Thylakoids contain complexes called .....which are made up of photosynthetic pigments. Thylakoids stacked to form a ..... The grana are interconnected by .....lamellae. The fluid outside the thylakoid is stroma which contain ..... (chloroplast DNA), ....., many ....., ..... and lipid droplets.

### Functions

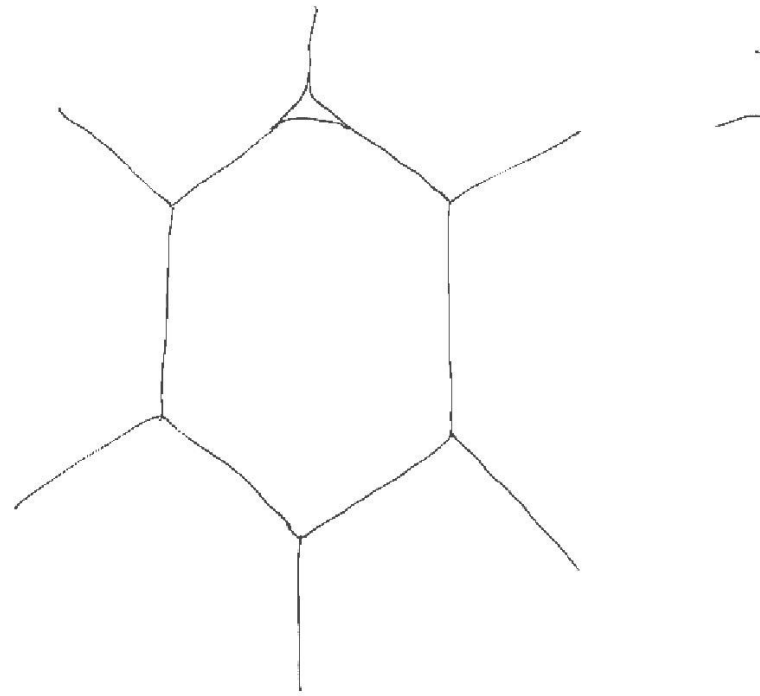
- Photosynthesis

### Cytoskeleton

- Cytoskeleton is the ..... structure of the cell and maintains its shape. It is more important for animal cells which lack cell walls. Cytoskeleton is made out of ..... and protein filaments. Additionally, it is ..... hence, has the ability to ..... and ..... as needed.
- There are three types of components in the Cytoskeleton as follows;
  - .....
  - .....
  - .....







### Differences between Microtubules, Microfilaments and intermediate filaments

Property	Microtubules (Tubulin polymers)	Microfilaments (Actin filaments)	Intermediate filaments
Structure	Hollow tubes; wall consists of 13 columns of tubulin molecules	Two intertwined strands of actin, each strand is a polymer of actin subunits	Fibrous proteins super-coiled into thicker cables
Protein subunits	Tubulin	Actin	One of several different proteins (e.g. Keratin), depending on the cell type

### Functions

- Provide strength to the cytoplasm
- Anchorage organelles and cytosolic enzymes of the cell
- Movement of cytoplasm, cytoplasmic streaming.
- Positioned organelles and move chromosomes when necessary.
- Maintain the shape of the cell (mainly in animal cells)



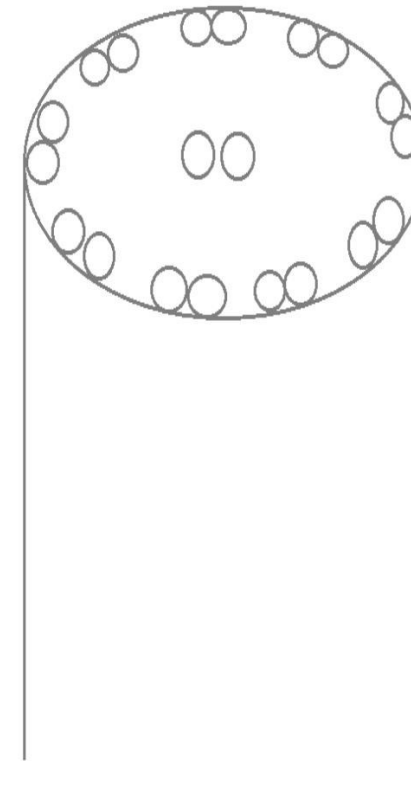
### Cilia and Flagella

- Cilia and flagella share a common structure. Flagella are long ..... structures and Cilia are ..... cellular projections that are often organized in rows. Cilia are more numerous than flagella on the cell surface. ....  
.....  
..... (Nine doublets of microtubules are arranged in a ring, with two single microtubules in its center).

- They are covered by plasma membrane and bound to a basal body which anchors the cilium or flagellum to the cell. The Basal body has 9 + 0 arrangement (no microtubules in its center)

#### Functions

- Act as locomotor appendages
- Can move fluid over the surface of the tissue
- Cilia lining in oviducts help move an egg toward the uterus

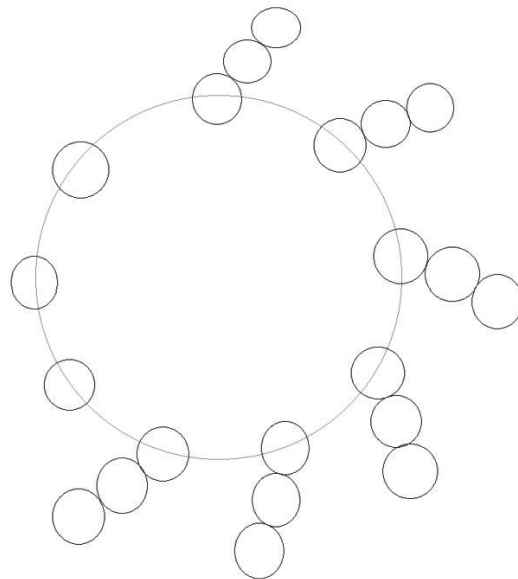
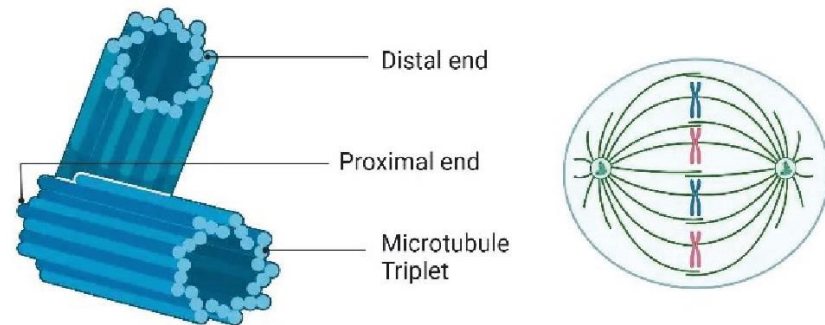


### Centrioles

- Centriole is made up of cylindrically arranged microtubules which are non membrane bounded subcellular component present only in animal cells. ....  
.....  
A pair of centrioles which arranged perpendicular to each other are located in a region called centrosome near the nucleus.

### Functions

- Produce aster and spindle in cell division



### Central Vacuole

- Central vacuole is a large structure, bound by ....., filled with liquid called ..... found in plant cells. The composition of sap differs from cytosol and it contains ....., ..... such as ..... and ..... and sometimes water soluble colored pigments such as ....., In addition, to that there are two other types of vacuoles namely, ..... and .....

### Functions of vacuoles

- Stores water and other materials such as sugars, ions and pigments.
- Maintains water balance of the cell (Osmoregulation)
- Gives turgidity and support to cell.
- Produce colours in some plants with sap pigments
- Helps in digestion.