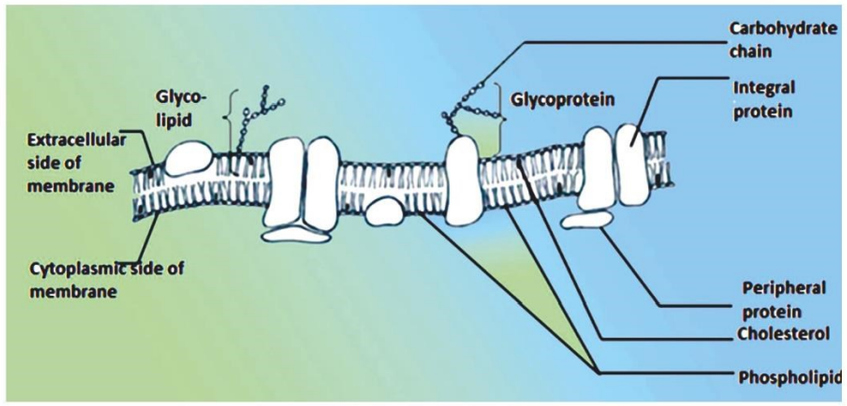
Answer

(a) Briefly describe the fluid mosaic model of the plasma membrane.



1. Plasma membrane is the outer limit of cytoplasm.
2. In 1972, Singer and Nicolson put forward the fluid mosaic model of cell membrane.
3. It is mainly composed of; Phospholipids (most abundant type of lipid in plasma membrane)
4. Protein
5. It is about 7nm thick.
6. It is mainly made up of a phospholipid bilayer.
7. Phospholipids are amphipathic molecules.
8. The hydrophilic heads of the phospholipids face outwards into the aqueous environment of both inside and outside of the cell.
9. The hydrophobic hydrocarbon tails face inwards and create a hydrophobic interior.
10. Since phospholipid molecules are moveable, they provide the fluid nature to the membrane.
11. Protein molecules embedded randomly contribute to its mosaic nature.
12. Some of the protein molecules penetrate all the way through the membrane, called trans-membrane proteins
13. and some others penetrate only part of the way into the membrane.
14. These are called integral proteins.
15. Most of the integral proteins are trans-membrane proteins which have hydrophilic channels.
16. These act as pores through which ions and certain polar molecules can pass.
17. Some proteins are not embedded in the lipid bilayer at all,
18. and are loosely bound to the inner surface of the membrane, called peripheral proteins.
19. Some proteins and lipids have short branching carbohydrate chains like antennae,
20. forming glycoprotein and glycolipids, respectively.
21. Animal's cell membrane may contain few cholesterol molecules randomly integrated into the lipid bilayer.
22. These cholesterol molecules provide flexibility
23. and stability to the membrane by reducing membrane fluidity at moderate temperatures and prevent membrane solidification at low temperatures.
24. The two sides of the membrane may differ in composition and function.

Live Biology

Biology

New Syllabus

SAMPATH LANKADHEERA

Unit 02 **Cell Structure and Function**
Microscope

ADVANCED LEVEL

Biology

Unit - 02

Cell Structure

- Microscope

Print 2024 August

Published by

Sampath Biology

59/4 Muruthalawa Rd.
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0779 925 362

1994/Zoo/06

60. (a) Briefly describe the fluid mosaic model of the plasma membrane.

58. 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)

Model

59. (a) Describe the structure of typical prokaryotic cell.

(b) Explain how they differ from eukaryotic cells.

.....

.....

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.....

.....

Essay : Answer

(a) Describe the structure of typical prokaryotic cell.

1. Average diameter 0.5-5µm.
2. Mainly unicellular
3. DNA is circular and lies free in the cytoplasm. This region is called nucleoid, DNA is naked not associated with proteins or RNA to form chromosomes
4. 70s ribosomes (smaller)
5. Few organelles, none are surrounded by membrane
6. Internal membranes scares; if present usually associated with respiration, photosynthesis and N_2 fixation.
7. Peptidoglycan present in Bacteria, polysaccharide and protein present in Archaea bacteria
8. Flagella are simple, lacking microtubules; extracellular (not enclosed by cell surface membrane) 20 nm diameter

Eg: Bacteria, Archaebacteria

(b) Explain how they structurally differ from eukaryotic cells.

1. Eukaryotic cells are 10µm-100µm diameter
2. DNA is linear and contained in a nucleus.
3. DNA is associated with proteins and RNA to form chromosomes
4. Both 70s and 80s ribosomes (larger) present, may be attached to endoplasmic reticulum
5. Many organelles, membrane bounded organelles present.
6. Great diversity of organelles Eg; nucleus, mitochondria, chloroplasts bounded by two membranes.
7. Eg; Lysosomes, Vacuole, Microbodies are bounded by single membrane.
8. Cellulose is main strengthening compound of plant cell walls.
9. Complex, with '9+2' arrangement of microtubules; intracellular (surrounded by cell surface membrane) 200 nm diameter
10. Eg: Protists, Fungi, Plants, Animals

ADVANCED LEVEL

Biology

THEORY

in English Medium

New Syllabus

Unit 02 **Chemical and Cellular Basis of Life**

- Protein and DNA

Smart Note

SAMPATH LANKADHEERA

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

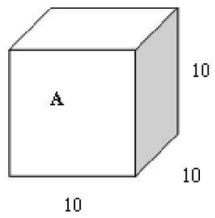
Exhilarating experience of delving in to Biology

$1m = 10^3mm = 10^6\mu m = 10^9nm$

$1nm = 10^{-3}\mu m = 10^{-6}mm = 10^{-9}m$

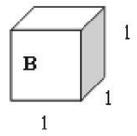
A =

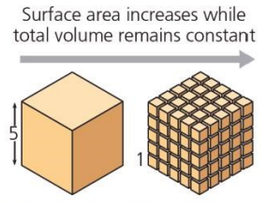
V =



A =

V =





Total surface area [sum of the surface areas (height × width) of all box sides × number of boxes]	6	150	750
Total volume [height × width × length × number of boxes]	1	125	125
Surface-to-volume (S-to-V) ratio [surface area ÷ volume]	6	1.2	6

Exam MCQs

49. 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)

50. Which of the following is common in plant, animal and bacterial cells?
(1)Mitochondria (2) Cytoskeleton (3) Golgi complex (4) Ribosomes (5) Centriole (2001/1)

51. 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 cells. (2000/1)

52. 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 old/ 3)

53. Which of the following may be seen in both prokaryotic and eukaryotic cells?
(A) Nuclear membrane (B) Cytoskeleton (C) Cell wall (D) Flagella (E) Glyoxysomes
(2019 old/41)

54. Generally, the highest magnification and resolution power of a compound light microscope are respectively
(1) x1000 and 200nm. (2) x1000 and 200µm. (3) x2000 and 200nm.
(4) x1500 and 0.2mm. (5) x1500 and 2µm. (2020 old/3)

55. Steps involved in observing an onion peel mounted on a glass slide and placed on the stage of a compound light microscope are as follows.
A - Adjusting the mirror B - Use of fine focusing knob C - Use of coarse focusing knob
The correct sequence of above steps are
(1) A, B and C. (2) A, C and B. (3) B, A and C. (4) C, A and B. (5) C, B and A. (2020/3)

56. 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)

57. 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 cells to communicate with each other.
(5) Hydrophobic tails of phospholipids attach to cytoskeletal fibers and help to maintain the shape of the cell. (2021/2)

46. State the 2 functions of protein present in cell membrane.

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47. State functions carried out by plasma membrane.

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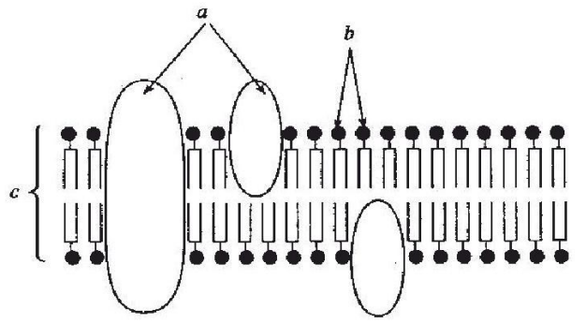
48. Fluid mosaic model is given in the following diagram.

(a) Name structures labeled as a, b, c.



(b) State 3 functions of eukaryotic cell membrane.

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(c) State why the above model is called as fluid mosaic model.

.....

Contribution of microscope to the expansion of knowledge on cells and cellular organization

- Advancement of the …….. is mostly based on the microscopy. The discovery and early study of cells progressed with the invention of ……....

Light microscope

- Visible light is passed through the …….. and then through glass lenses.
- The lenses …….. the light in such a way that the image of the specimen is magnified as it is projected into the eye.
- The simplest microscope is a single lens.

The compound light microscope

- Compound light microscopes are commonly used in …….... laboratories and it is used in …….... laboratories as a …….... tool.
- ……. power and ……. are important parameters which can be seen in a microscope.

Practical 02

Identification of parts and functions of the light microscope and the use of light microscope to observe specimens

Objectives

- Students should be able to

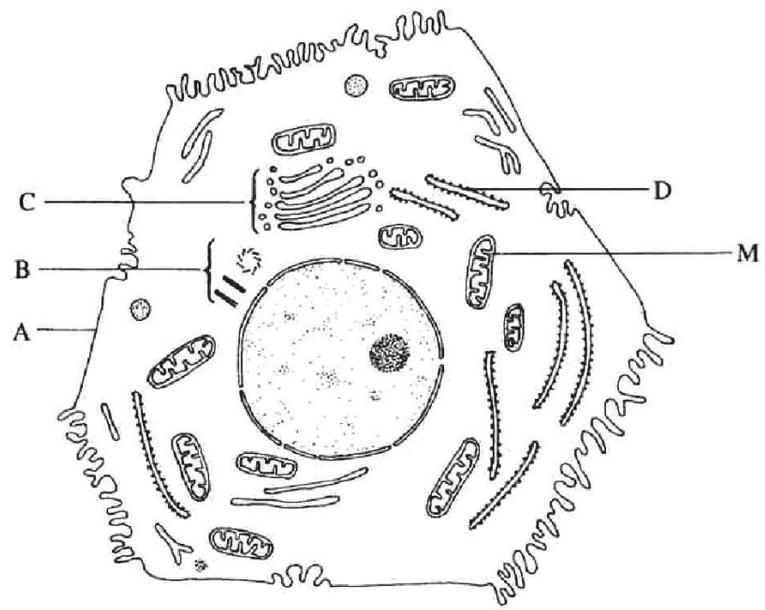
1. name the parts and understand the functions of a light microscope,
2. list the functions of a light microscope,
3. use the microscope in the correct manner,
4. prepare wet mounts of live tissues or cells,
5. manipulate the microscope to observe specimens,
6. calculate the magnification of objects,
7. draw cells proportionately.

Materials and equipment

- Light microscopes with low, medium and high power objective lenses
- Clean dry slides and cover slips
- Beaker and watch glasses/ Petri dishes
- Water sample from paddy field, hay infusion, pond water sample, onion/Rhoeo epidermal peel, buccal cavity lining. Paint brushes, razor blades, Mounting needles.

42. The diagram below shows the structure of a liver cell as seen using an electron microscope.

(a) Name parts labelled as A, B,C D.



(b). The magnification of the diagram is x 12000. Calculate actual length of the mitochondrion labelled M, giving your answer in µm show your working.

43. What are the 3 different lipids present in cell membrane?

……

44. Lipids form the basic structure of cell membrane. Describe this statement.

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45. What are the different types of proteins present in cell membrane?

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38. Give advantages of a L.M compared to E.M

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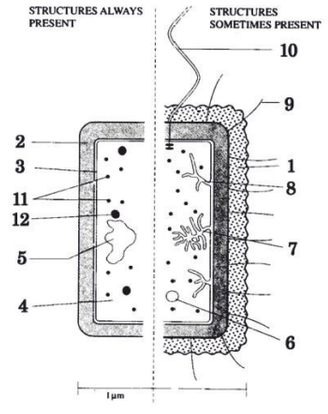
39. What are the two different types of cells present among living organisms?

……

40. State the contribution of following people

Anton Vanleeuwanhook (1650)	……
Robert Hooks (1665)	……
Matthias Schleiden (1831)	……
Theodore Schwann (1839)	……
Radolf Virchow (1855)	……
Schleiden, Schwann and Virchow	……

41. Label the structures from 1 to 10.



Instructions

- Instruct the students to follow the guidelines given below.
- Identify the major parts of the microscope (appendix II): The body and base, ocular tube, eyepieces (interchangeable), rotatable nose piece, low, medium and high power objective lenses (which can be screwed in), focusing knobs for coarse and fine focusing, stage with circular opening at center, stage clips, adjustable mirror.
- Instruct students to observe the samples employing proper microscopic techniques.
- Make thin epidermal peels of onion /Rhoeo (*Tradescantia*) and place in water (in a watch glass or Petri dish).
- Transfer a piece of onion Rhoeo (*Tradescantia*) peel into a drop of water on the center of a clean glass slide using a fine paint brush.
- Hold the cover slip at the edge of the drop of water, with the help of a mounting needle, and gently lower the cover slip while supporting it with the needle onto the drop of water. Do not allow air bubbles to be trapped under the cover slip.
- Place the slide on the stage of the microscope and observe under low power objective lens.
- Looking through the eye piece, move the slide to bring the object into position for study.
- Adjust the mirror and condenser to give optimum illumination to the object for clear viewing.
- Use the coarse focusing knob to get the image as clear as possible.
- Use the fine focusing knob to improve the quality of the image.
- Study and note the structures visible.
- Rotate the nose piece and bring the medium power into position. Adjust the focusing to get a sharp image.
- Bring the high power into position.
- Use the fine focusing knob only to make the image sharp.
- Study and record what you observe under low, medium and high power.
- Follow the steps given above to observe a drop of water from paddy field, hay infusion, pond water and cells obtained from buccal cavity lining
- Direct them to make notes and draw sketches on their observations.

32. What is meant by magnification of a microscope?

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33. What is meant by resolving power of a microscope?

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34. What is meant by contrast of a image

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……

35. Give the resolving powers of following optical structures

Human Eye: Light Microscope: E.M

……

36. Calculate the total magnification of a compound light microscope with an eyepiece lens (15x) under low power (4x), medium power(10x) and high power (40x) objective lenses.

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37. Give following information about the L.M. & E.M

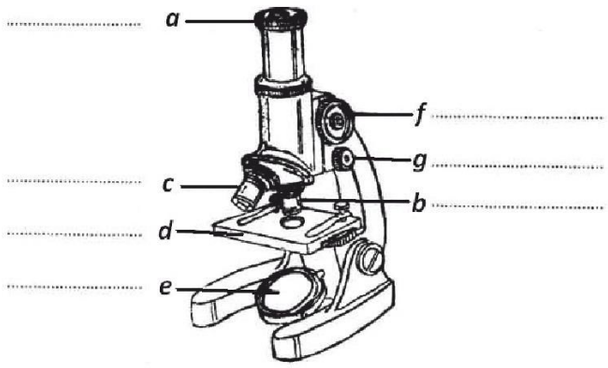
Properties	**Light Microscope**	**Electron microscope**
1. Beam		
3. Max. Magnification		
4. Max. Resolution		
5. Lens		
6. Specimen		
7. Image		

28. What distinguishes peripheral proteins from integral proteins in the plasma membrane?
(1) Peripheral proteins penetrate the membrane fully, while integral proteins do not.
(2) Peripheral proteins are embedded in the lipid bilayer, while integral proteins are not.
(3) Peripheral proteins are loosely bound to the membrane surface, while integral proteins are embedded within it.
(4) Peripheral proteins are involved in cell recognition, while integral proteins are not.
(5) Peripheral proteins are composed of carbohydrates, while integral proteins are composed of lipids.

29. Water soluble matter move into the cell via
(1) Any place with phospholipids (2) Any place of the membrane
(3) Pore formed due to requirement. (4) Pores surround with protein
(5) Lipid and proteins

Structured Essay

30. Given below is a drawing of a microscope. Label the parts a to g.



31. Explain how to prepare a temporary slide to observe *Onion*/Rhoeo epidermal peels

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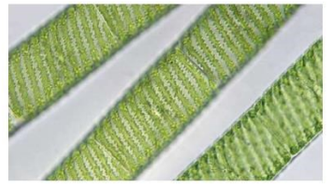
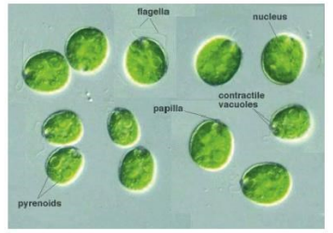
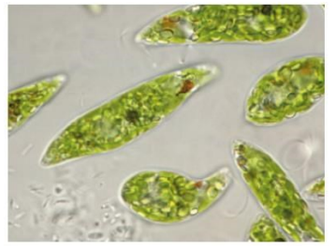
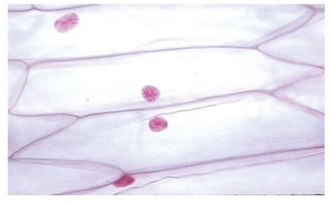
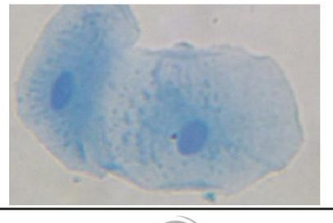
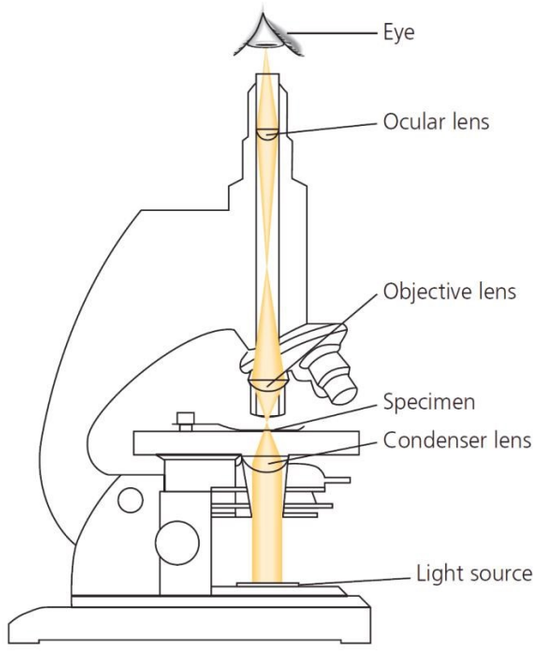
(a) Water sample from paddy field (Spirogyra/Cyanobacteria)	
(b) Hay infusion (*Chlamydomonas*) • Prepared by transferring decaying plant materials in to pond water containing container. • Micro organisms grow rapidly in hay infusion. Can observe fast moving protozoans, especially ciliates, flagellates and bacteria	
(c) Pond water sample (Paramecium, Euglena)	 
(d) Plant cells (Onion epidermal peel)	
(e) Animal cell (Inner cells of Cheek)	

- Magnification ……
  Usually the maximum magnification of light microscope is 1000 times the actual size of the specimen)
- Resolution power ……
  …… (resolution power of light microscope is 0.2µm). It is a measure of the clarity of the image.
- Magnification is limited due to the resolution. Light from an object (specimen on the slide) passes first through objective lens. Then produce a magnified image.
- Above image then acts as an object for the second lens (the eye piece lens) which further magnifies it.



- The total magnification is hence the product of the magnification of each lens.
  Total magnification = Magnification of objective lens x Magnification of eye piece
  Eg: lf magnification of Objective lens = x 40
  Eyepiece = x 15
  Total is = 15 x 40 = x 600 times magnified

(1) All eukaryotes (2) All prokaryotes (3) Some prokaryotes (4) Some eukaryotes
(5) No prokaryotes

19. Multicellular animals have body cells with equal?
(1) Internal environment (2) Dividing ability (3) Regeneration ability
(4) Number of organelles (5) Genetic composition

20. Which one of the following organelles does not have a membrane?
(1) Mitochondria (2) Golgi bodies (3) Lysosomes (4) Plastids (5) Ribosomes

21. Cell membrane structure is explained as
(1) Lipid layer covered with two protein layers
(2) A protein layer covered with two lipid layers
(3) An RNA layer covered with two protein layer
(4) A DNA layer covered with protein and lipids
(5) None of the above.

22. Incorrect about plasma membrane of a pant cell is,
(1) Selectively permeable (2) Adjacent to cell wall.
(3) Control transport of minerals to and from cell. (4) Surround cellular contents.
(5) Mainly contain cellulose

22. Which of the following structure involve in mineral transportation to and from cells?
(1) Cell wall (2) Nuclear membrane (3) Plasma membrane (4) Mitochondria
(5) Tonoplast

23. Which of the following sentence is **incorrect** regarding cell membrane
(1) It is the outer boundary of animal cells (2) It control the exchange of matter
(3) Consist only protein and phospholipids as constituents
(4) Important in cell to cell recognition (5) It is a dynamic structure

24. Which of the following sentence is **incorrect** regarding cell membrane?
(1) All live organisms have cell membranes (2) Phospholipids are more abundant
(3) Some proteins can act as enzymes (4) Permit any mineral to pass through
(5) Contain small pores pass through the membrane

25. What is the primary structural component of the plasma membrane?
(1) Cholesterol (2) Phospholipids (3) Proteins (4) Carbohydrates (5) Nucleic acids

26. Which of the following statements is true about transmembrane proteins?
(1) They are loosely bound to the surface of the membrane.
(2) They are embedded only partially into the membrane.
(3) They have hydrophilic channels that act as pores.
(4) They are not involved in cell recognition.
(5) They are composed mainly of carbohydrates.

27. What role do cholesterol molecules play in the plasma membrane?
(1) They provide rigidity and stability.
(2) They form glycoproteins and glycolipids.
(3) They act as enzymes in the cell membrane.
(4) They help in the exchange of materials.
(5) They identify the cell for communication

8. Who coined the term "cell" to describe the basic units of life?
(1)Anton Van Leeuwenhoek (2) Matthias Schleiden (3) Robert Hooke
(4) Theodore Schwann (5) Rudolf Virchow

9. Which of the following is NOT a component of the cell theory presented by Schleiden, Schwann, and Virchow?
(1) All organisms are composed of one or more cells.
(2) The basic structural and functional unit of organisms is the cell.
(3) All cells arise from pre-existing cells.
(4) Cells can spontaneously generate from non-living matter.
(5) All plants and animals are made up of cells.

10. Which of the following is not present in prokaryotes
(1) Ribosomes (2) Cytosol (3) Flagella (4) Cell membrane (5) Membrane bounded organelles

11. Choose the correct sentence about the cell.
(1) All cells have nucleus. (2) All cells are closely equal in size.
(3) Surface/Volume ratio increase with the increase of size of cell.
(4) Virus show primitive cellular structure.
(5) Proteins do not form a continues layer through the cell membrane. (1987/Zoo)

12. Which of the following is a characteristic feature of prokaryotic cells?
(1) Contains 80S ribosomes (2) Contains DNA associated with histone proteins
(3)Undergoes mitosis and meiosis
(4) Contains circular DNA that lies free in the cytoplasm (5) Mainly multicellular

13. What is the approximate diameter range of eukaryotic cells?
(1) 0.1-1 μm (2) 0.5-5 μm (3) 10-100 μm (4) 100-1000 μm (5) 5-10 μm

14. Which of the following statements about organelles is true for eukaryotic cells?
(1) Eukaryotic cells lack membrane-bound organelles.
(2) Eukaryotic cells have few subcellular components.
(3) Eukaryotic cells have a great diversity of organelles.
(4) Eukaryotic cells have no internal membranes.
(5) Eukaryotic cells contain peptidoglycan in their cell walls.

15. What is the composition of cell walls in bacteria?
(1) Cellulose (2) Chitin (3) Peptidoglycan (4) Polysaccharides only (5) Proteins only

16. Which of the following is a characteristic of the flagella in eukaryotic cells?
(1) Simple and lacking microtubules (2) Complex with '9+2' arrangement of microtubules
(3) Extracellular and not enclosed by cell surface membrane (4) 20 nm in diameter
(5) Lacking a cell surface membrane

17. How do prokaryotic cells typically perform respiration?
(1) Using mitochondria (2) Using internal membrane folding's (3) Using chloroplasts
(4) Using lysosomes (5) Using vacuoles

18. Which of the following organisms have the ability to perform nitrogen fixation?

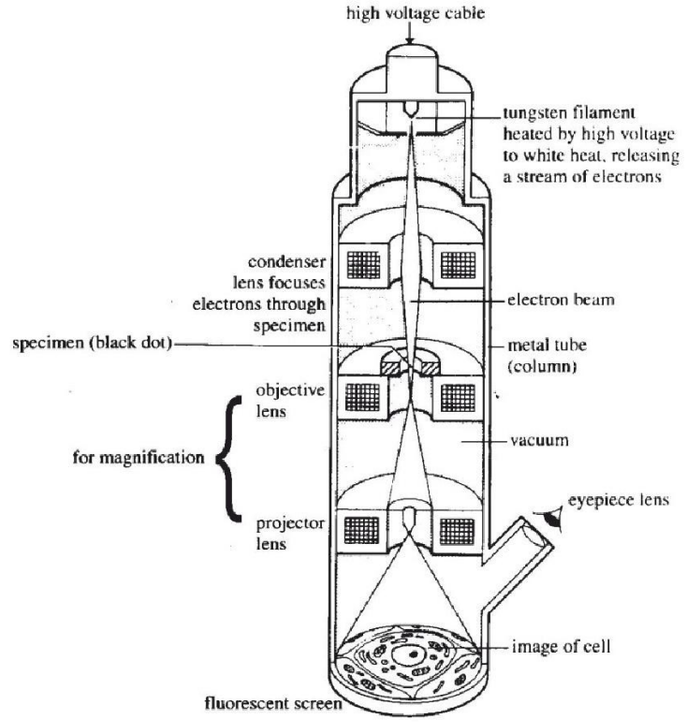
The Electron Microscope

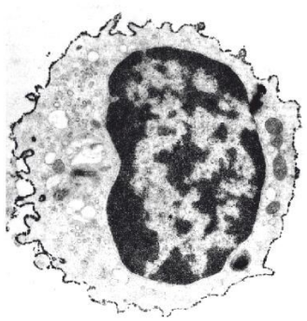
- The limitation imposed upon the resolution power of the light microscope by the wavelength of light.
- ……...
- Due to this, scientists considered the use of other forms of radiations with comparatively ……..wavelengths. As a result, electron microscopes were developed.
- In electron microscopy a beam of electrons is focused …….... the specimen or ……..... In practice, electron microscope magnifies about ……. times with a resolution about ……...

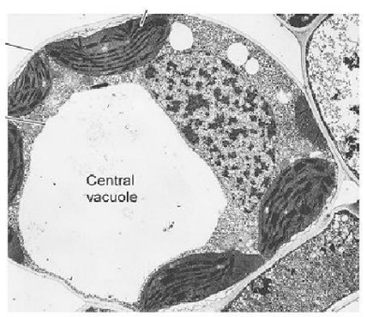
- Electron microscopes have revealed many organelles and other sub cellular structures those were impossible to resolve with the light microscopes. There are two types of electron microscopes.
    1. Transmission electron microscopes (TEM)
    2. Scanning electron microscopes (SEM)

Transmission electron microscopes

- It is used to study the internal structures of cells. In this microscope, a beam of electron is ……... especially prepared slice of material.
- A ……. is used. Specimens ……..… which attach more to certain cellular structures than other areas. Image reflects the pattern of electrons passed through the specimen, displays on a screen.
- ……
  ……







Functions

1. The plasma membrane surrounds the cytoplasm of living cell …….. the intracellular components from the extracellular environment.
2. Plasma membrane is selectively permeable and able to regulate the exchange of material needed for survival.
3. Proteins embedded in the plasma membrane identify the cell, enabling nearby cells to communicate with each other (involved in cell recognition).
4. Some protein molecules act as receptor molecules for interacting with specific biochemicals, such as hormones, neurotransmitters and immune proteins.
5. Some proteins in the cell membrane attach to some cytoskeletal fibers and help to maintain the shape of the cell.
6. Some proteins in the membrane act as enzymes. (Eg. Microvillus on epithelial cell lining of some parts of the gut contains digestive enzymes in their cell surface membrane.)

MCQs

1. Maximum magnification of a light microscope.
   (1) x 1000 (2) x 5000 (3) x 40 (4) x 10000 (5) x 100

2. Maximum resolution of a compound light microscope?
   (1) 0.1µm (2) 0.02µm (3) 0.20µm (4) 0.5µm (5) 1.0µm

3. Magnification of the microscope depends on?
   (1) Eye piece lens (2) Objective lens (3) Condenser lens (4) Objective lens and eye piece lenses (5) Objective lens eye piece and condenser lenses

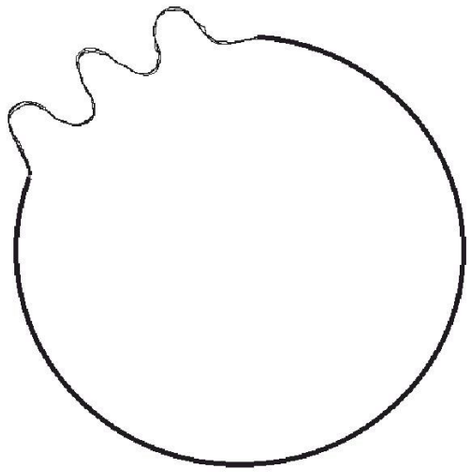
4. Which of the following combination will enable to see maximum number of cells through compound L.M.?
   (1) 5 x 40 (2) 5 x 100 (3) 10 x 10 (4) 10 x 40 (5) 10 x 100

5. What is the magnification of the image resulted from above lens set?
   (1) 40 (2) 15 (3) 600 (4) 400 (5) 100

6. State magnification and resolution of electron microscope
   (1) $5x10^{10}$, 1nm (2) $5x10^{5}$, 2nm (3) $10x10^{5}$, 2nm (4) $5x10^{5}$, 0.5nm (5) $5x10^{5}$, 1nm

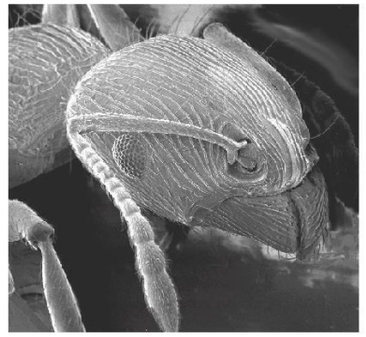
7. Incorrect regarding transmission and scanning electron microscope.
   (1)Specimens stained with heavy metals in TEM specimen is mostly coated with gold in SEM.
   (2) In TEM image reflects the pattern of electrons passed through the specimen, in SEM image is formed by fine beam of electrons is reflected from the surface of specimen.
   (3) TEM used to study internal structure of cells and SEM ideal to observe surface view in three dimensional appearances.
   (4) TEM electrons pass through specially prepared thin slice of materials, in SEM whole specimen coated.
   (5) In TEM image can be directly detected and but in SEM micrographs are used.

- Most of the integral proteins are transmembrane proteins which have hydrophilic channels. These act as pores through which ions and certain polar molecules can pass.
- Some proteins are not embedded in the lipid bilayer at all, and are loosely bound to the surface of the membrane, called peripheral proteins.
- ……
  ……....
- ……
  ……...
- These …….. molecules provide rigidity and stability to the membrane.
- The two sides of the membrane may differ in composition and function.



Scanning electron microscopes

- In this instrument, a fine beam of electrons is ……. of specimen.
- Specimen is mostly coated with ……
- Here the ……... many electrons whereas others are absorbed.
  ……..
  ……



Light Microscope	Electron microscope
• Glass lenses are used to focus light rays	• Powerful magnets are used to focus beam of electrons
• Image is directly detected by eye naked	• Not directly detected by naked eye, micro-graphs are used
• Living and non living objects be observed	• Only nonliving objects are observed
• Actual color of the object can observed be	• Actual color can not be observed.
• Dyes used to stain the object	• Heavy metals are used to stain the object

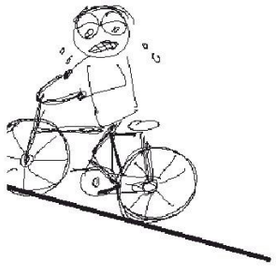
Table 2.3: Differences between light and electron microscope

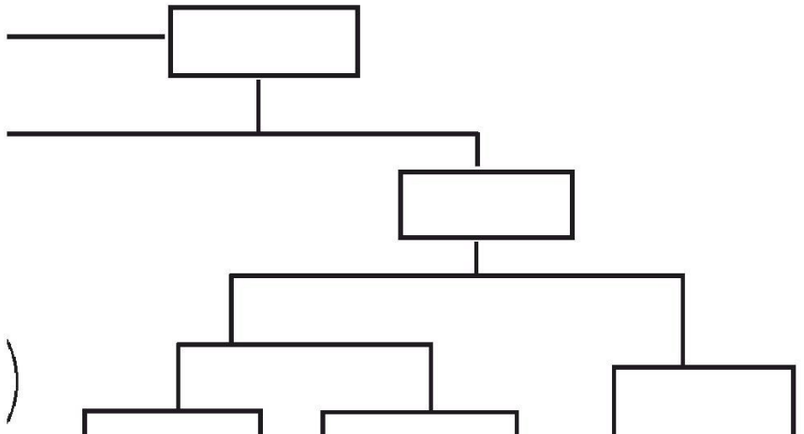
Historical Background of Cell and the Structure and Functions of the Sub Cellular Units

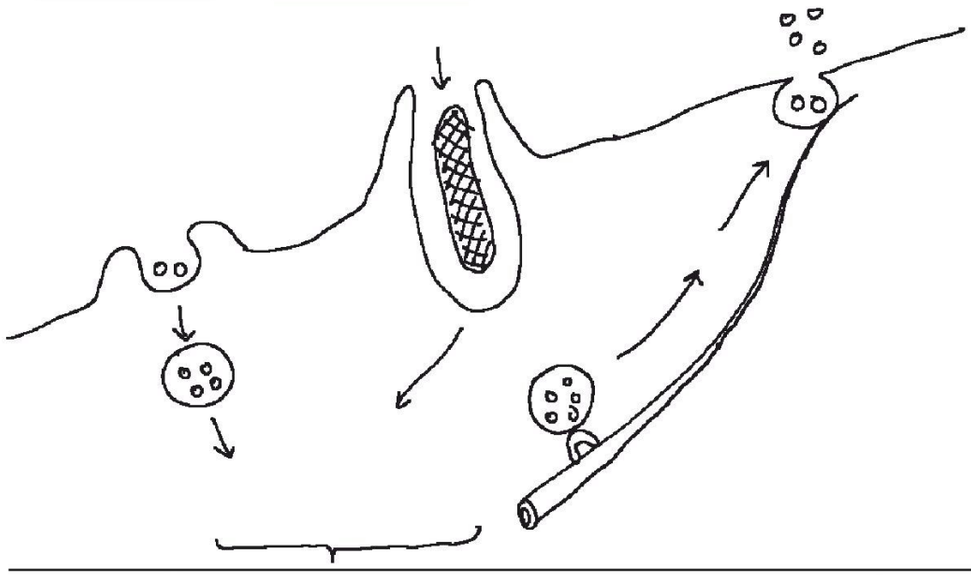
Cell theory

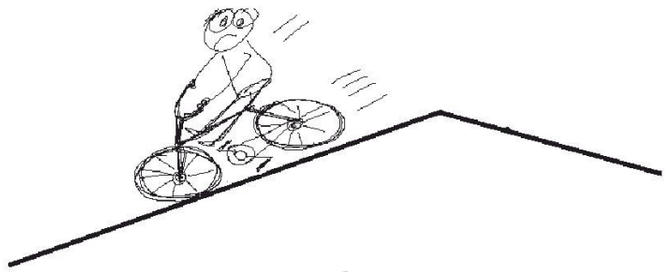
- All organisms are composed of cells. Recall the hierarchy of life, the levels of organization mentioned earlier. ……, which may form a single celled organism (Eg. Chlamydomonas, Yeast) or a multi-cellular plant or animal. ……
- The level of organization of matter represented by a cell shows all the characteristics of life. ……
  whether it is a single celled organism or multicellular plant or an animal.

Scientist	Contribution
Robert Hooke (1665)	examined a cork using simple microscope and gave the term "CELL" to describe the basic units.
Anton Van Leeuwenhoek (1650)	a contemporary of Robert Hooke, was the first to describe and record living single celled organisms, Euglena & bacteria
Matthias Schleiden (1831)	a botanist, studying plant tissues concluded that all plants are made up of cells.
Theodore Schwann a zoologist (1839)	concluded that animal tissues are also made up of cells.
Rudolf Virchow (1855)	showed that all cells arise from pre-existing cells by cell division.

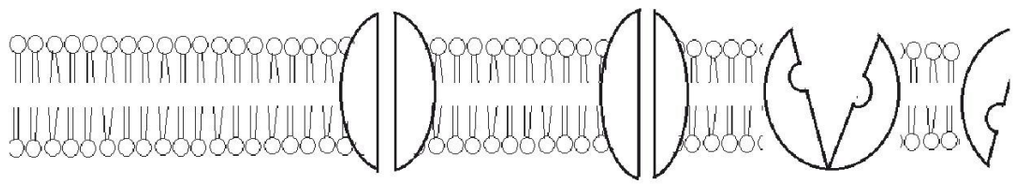








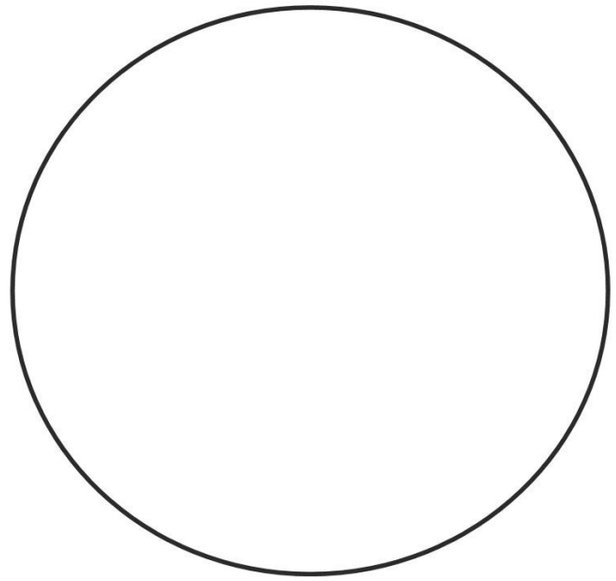
Selective transport

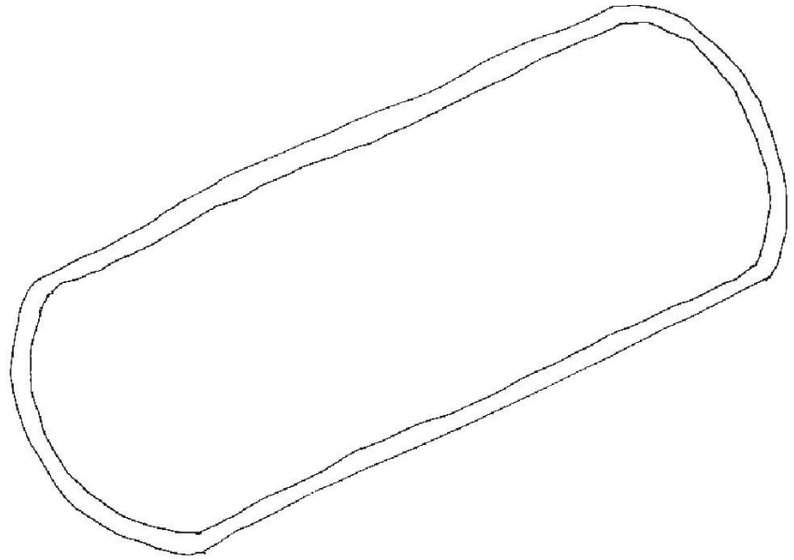


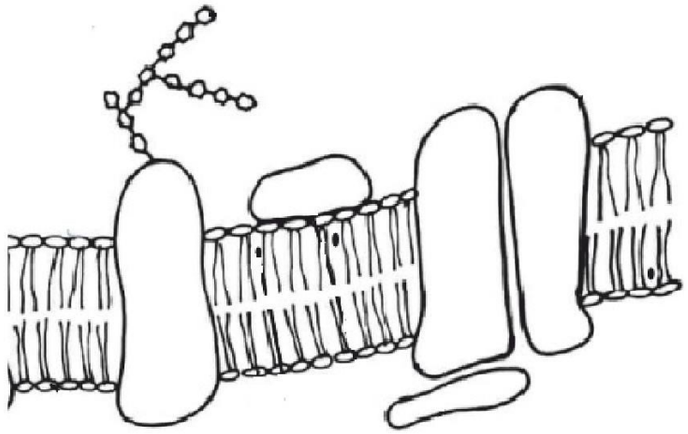
- **Schwann and Virchow presented the 'Cell Theory' which included the following.**
  1. ……
  2. ……
  3. ……

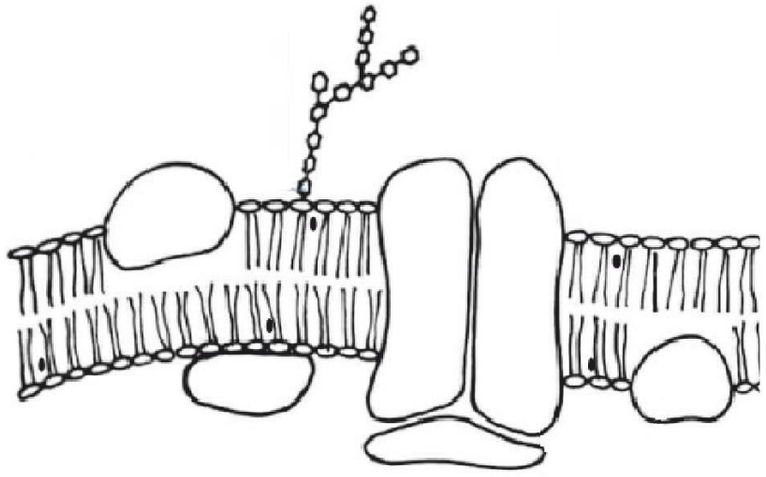
Organization of cells

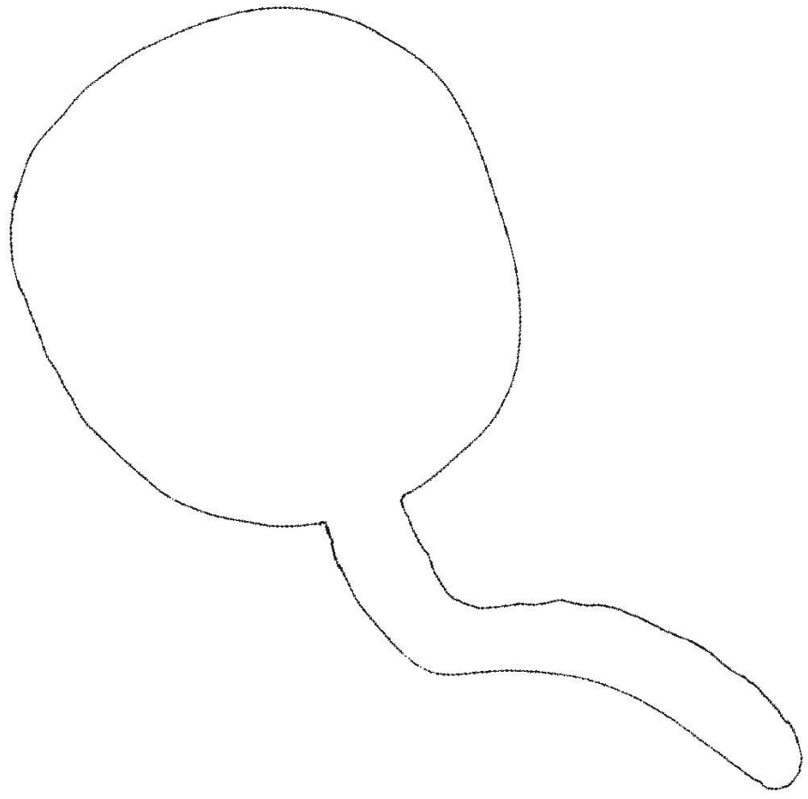
- There are two kinds of cellular organization - Prokaryotic and Eukaryotic
- All cells share certain basic features They are;
  1. ……
  2. ……
  3. ……
  4. ……
  5. ……











PRACTICAL NO.3

Use of electron micrographs to understand the structure of cellular components

Objectives

- Students should be able to

1. Interpret an electron micrograph,
2. Identify the cellular components as seen by an electron micrograph,
3. Draw the cellular components accurately,
4. Compare the electron micrographs and list down the differences among them.

Materials and equipment:

- Electron micrograph of a bacterial cell
- Electron micrograph of an animal cell
- Electron micrograph of a plant cell.

Instructions

- Allow the students to observe the electron micrographs of the following; a bacterial cell, a plant cell and an animal cell
- Advise them to identify /recognize cellular components/organelles.
- Guide students to draw their observations.
- Allow students to compare the above electron-micrographs and guide them to list down the differences.

Structures and functions of organelles and other sub cellular components

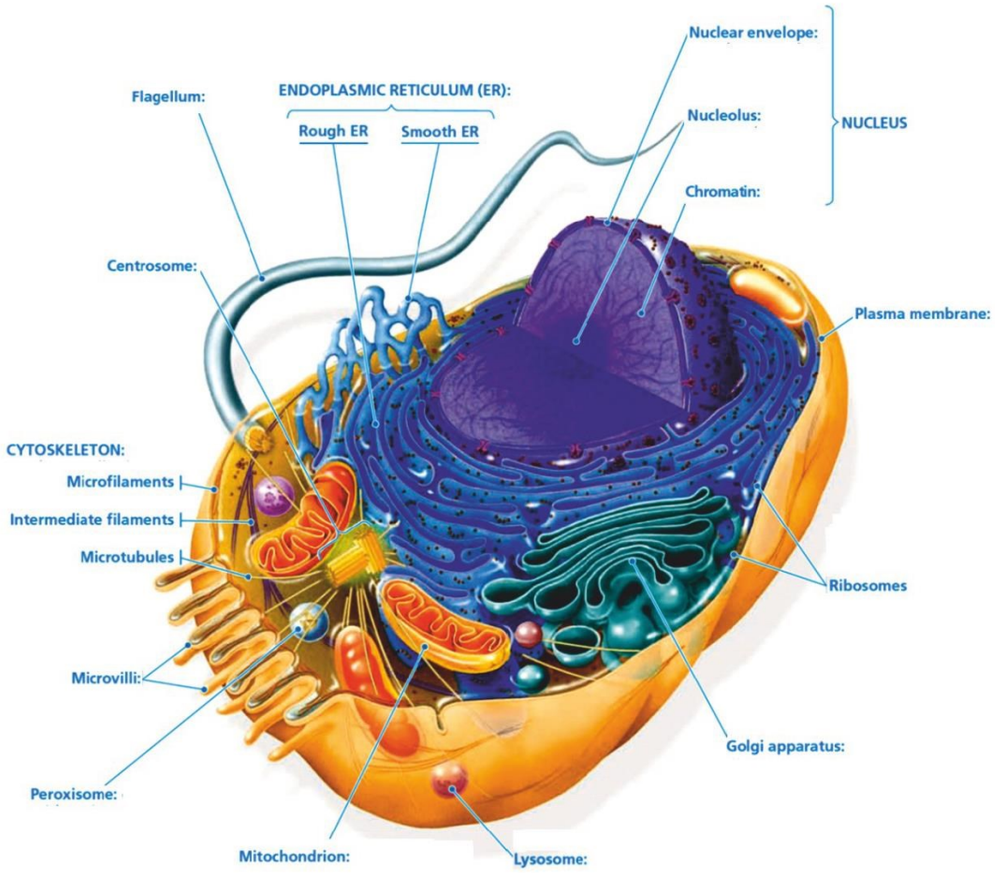
Structure and functions of the plasma membrane:

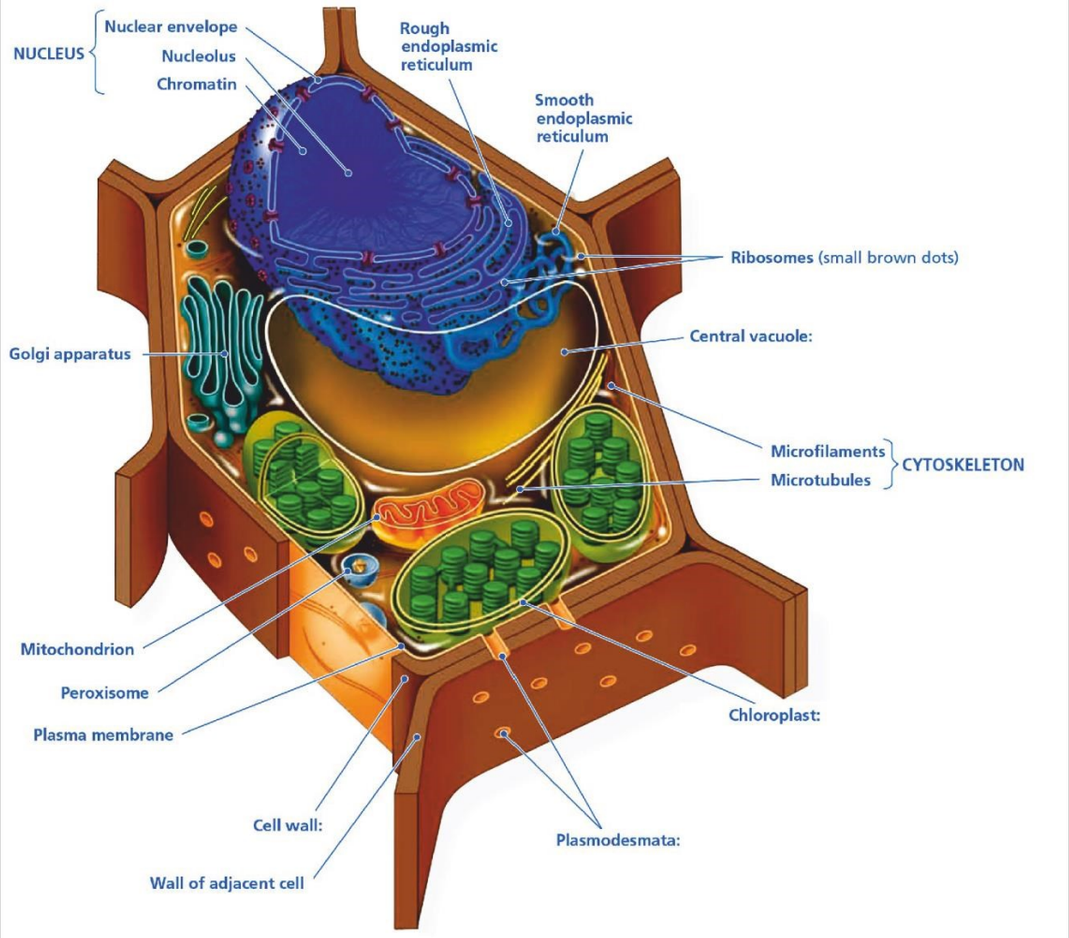
- ……
  ……
  In 1972, ……... put forward the ……..
  of cell membrane. It is mainly composed of;
- …….. (most abundant type of lipid in plasma membrane)
- ……..

- The Plasma membrane has the following features. It is about ……. thick. It is mainly made up of a phospholipid …….. Phospholipids are ……. molecules. The hydrophilic heads of the phospholipids face outwards into the aqueous environment of both inside and outside of the cell.
- The hydrophobic hydrocarbon tails face inwards and create a hydrophobic interior.
- Plasma membrane is compared to the fluid mosaic model. Since phospholipid molecules are ……., they provide the ……. to the membrane.
- Protein molecules …….. contribute to its mosaic nature. These are called ……...
- Some of the integral protein molecules penetrate ……. the membrane, called ……. proteins and some others penetrate only part of the way into the membrane.

The differences between prokaryotic cells and eukaryotc cells

Feature	Prokayote	Eukaryote
Organism	Bacteria, Archaebacteria	Protists,Fungi, plants, animals
Cell size	Average diameter 0.5—5 µm	10µm-100µm diameter
Form	Mainly unicellular	Mainly multicellular (except protista and fungi many of which are unicellular)
Evolutionary origin	3.5 billion years ago	1.8 billion years ago ,evolved from pro-karyotes
Cell division	Binary fission, no spindle	Mitosis, meiosis, or both; spindle formed
Genetic material	DNA is circular and lies free in the cytoplasm. This region is called nucleoid, DNA is naked not associated with proteins.	DNA is linear and contained in a nucleus. DNA is associated with proteins.
Type of ribo-somes	70s ribosomes (smaller)	Both 70s and 80s ribosomes (larger) pre-sent, may be attached to endoplasmic reticulum
Organelles	Few organelles, none are surrounded by membrane Internal membranes scares; if present usually associated with respiration, photosynthesis and N_2 fixation.	Many organelles, membrane bounded organelles present. Great diversity of organelles Eg: nucleus, mitochondria, chloroplasts bounded by two membranes. Eg: Lysosomes, Vacuole, Microbodies are bounded by single membrane.
Cell walls	Peptidoglycan present in Bacteria and cyanobacteria, polysaccharide and pro-tein present in Archaea bacteria	Cell walls of green plants and fungi rigid and contain polysaccharides; cellulose is main strengthening compound of plant cell walls, chitin of fungal walls (none in animal cells)
Flagella	Simple, lacking microtubules; extracellu-lar (not enclosed by cell surface mem-brane) 20 nm diameter	Complex, with (9+2) arrangement of microtubules; intracellular (surrounded by cell surface membrane) 200 nm diam-eter
Respiration	Mostly by Mesosomes in aerobic bacte-ria	Mitochondria for aerobic respiration
Photosynthesis	No chloroplasts; takes place on mem-branes which show no stacking	Chloroplasts containing membranes which are usually stacked into lamellae or grana
Nitrogen fixation	Some have the ability	None have the ability


Flagellum:
ENDOPLASMIC RETICULUM (ER):
Rough ER
Smooth ER
Nuclear envelope:
Nucleolus:
Chromatin:
NUCLEUS
Centrosome:
Plasma membrane:
CYTOSKELETON:
Microfilaments
Intermediate filaments
Microtubules
Ribosomes
Microvilli:
Golgi apparatus:
Peroxisome:
Mitochondrion:
Lysosome:


NUCLEUS
Nuclear envelope
Nucleolus
Chromatin
Rough endoplasmic reticulum
Smooth endoplasmic reticulum
Ribosomes (small brown dots)
Golgi apparatus
Central vacuole:
Microfilaments
Microtubules
CYTOSKELETON
Mitochondrion
Peroxisome
Plasma membrane
Chloroplast:
Cell wall:
Plasmodesmata:
Wall of adjacent cell