



**CHAPTER 12**  
**THE FUNDAMENTAL UNIT OF LIFE : CELL**

**SOLUTIONS**

**TEXTUAL QUESTIONS AND ANSWERS**

**1. Who discovered the cell and how?**

**Ans:** Robert Hooke discovered cells in 1665, while examining a thin section of dead cork cells by using a self-designed microscope. He observed small compartments of dead mature cork cells that resemble the structure of honeycomb.

**2. Give examples of two multicellular organisms?**

**Ans:** 1. Plants 2. Animals

**3. What is the size of the egg of ostrich?**

**Ans:** The size of the egg of ostrich is 170mm.

**4. Why plasma membrane is called a selectively permeable membrane?**

**Ans:** Plasma membrane is called a selectively permeable membrane because it controls the movement of substances in and out of cell by controlling only the movement of some selected substances.

**5. What is the main chemical component part of plant cell wall?**

**Ans:** Cellulose is the main chemical component part of plant cell wall.

**6. How does *Amoeba* acquire its food?**

**Ans:** *Amoeba* acquires its food through the process of **endocytosis** in which the flexible cell membrane produces finger like projections called **pseudopodia** around the food and other materials finally encircling them to form food vacuole.

**7. Can you name two organelles that contain their own DNA and ribosomes?**

**Ans:** Mitochondria and Plastids (Chromoplast, Chloroplast, Leucoplast)

**8. Why are lysosomes called as suicide bags of the cell?**

**Ans:** When the cells get damaged **lysosomes may burst and the powerful hydrolytic enzymes digest their own cell i.e. autolysis**. Therefore, lysosomes are known as **suicide bags of the cell**.



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9. Which organelle is known as the “power house of the cell”? Why?

**Ans:** Mitochondria is known as the *power house of the cell* because it provides the energy required by the cell in the form of ATP to meet their cellular need and demand through oxidation of food.

10. What ATP stands for?

**Ans:** ATP stands for Adenosine triphosphate. It is also known as *energy currency of the cell*.

11. Where do the ribosomes get synthesis?

**Ans:** Ribosomes get synthesized inside the **nucleolus**.

12. Who stated “*omnis cellula-e-cellula*”?

**Ans:** Rudolph Virchow stated “*omnis cellula-e-cellula*” in 1855 which means that **all cells arise from pre-existing cells**.

13. Why do you call mitosis as equational division?

**Ans:** Mitosis is called as equational division because the contents of nucleus and cytoplasm are equally divided into two daughter cells.

14. Meiosis is known as reductional division. Why?

**Ans:** Meiosis is known as reductional division because it forms four daughter cells, each having half the number of chromosomes of the parent cell.

15. In which stage of meiosis, crossing over takes place?

**Ans:** Crossing over takes place in the sub-stage Pachytene of Prophase-I of Meiosis-I.

**EXERCISES**

1. Why is cell called the structural and functional unit of life?

**Ans:** Cell is called the structural and functional unit of life because all living organisms are made up of cells and cellular products capable of independent existence and performing all the activities of life.



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2. Make a comparison and write down the ways in which plant cells are different from animal cells?

**Ans:** Plant cells are different from animal cells in the following ways :

DIFFERENCES			
PLANT CELL		ANIMAL CELL	
1.	Cell wall is present in the outermost layer.	1.	Cell wall is absent in the outermost layer.
2.	Cell wall is outer layer.	2.	Plasma membrane is outer layer.
3.	Cell wall gives rigidity and turgidity to the cell.	3.	Plasma membrane gives turgidity to the cell.
4.	Chloroplasts are present.	4.	Chloroplasts are absent.
5.	Plasmodesmata are present.	5.	Plasmodesmata are absent.
6.	Vacuoles are present, big in size and permanent.	6.	Vacuoles, if present, are smaller in size and temporary.
7.	Tonoplast is present.	7.	Tonoplast is absent.
8.	Centriole is absent.	8.	Centrioles are present.
9.	Nucleus lies in one side.	9.	Nucleus lies in the centre.
10.	Storage material is starch grains and oil.	10.	Storage material is starch glycogen granules and oil.

3. How is a prokaryotic cell different from a eukaryotic cell?

**Ans:** The differences between prokaryotic and eukaryotic cells are given below:

DIFFERENCES	
PROKARYOTIC CELL	EUKARYOTIC CELL
1. Size: generally small (1 – 10µm)	1. Size: generally large (5 – 100µm)
2. Nuclear region is not well defined.	2. Nuclear region is well defined.
3. Nucleus is not covered by nuclear membrane.	3. Nucleus is covered by nuclear membrane.
4. It has a single, circular chromosome.	4. It has several, linear chromosome.
5. Membrane-bound cell organelles are absent.	5. Membrane-bound cell organelles are absent.
<b>Examples</b> - Bacteria, Blue Green Algae	<b>Examples</b> - Fungi, Plant cell & Animal cell



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**4. Why the plasma membrane is called a selectively permeable membrane?**

**Ans:** The plasma membrane is called a selectively permeable membrane because it allows the entry and exit of some substances in and out of the cell while preventing the movement of some other cell substances out of the cell.

**5. What would happen if the plasma membrane ruptures or break down?**

**Ans:** When the plasma membrane ruptures or breaks down, all the contents of the cell will be leaked out into the environment. There will be no difference cell contents and its external environment. The cell will distort its normal shape and size.

**6. What would happen to the life of a cell if there was no Golgi apparatus?**

**Ans:** In the absence of Golgi apparatus, cell cannot perform storage, modification and packaging of substances synthesized inside the cell in vesicles. Besides, no formation of complex sugar and lysosomes take place thereby accumulating worn out and dead cell organelles within the cell. Ultimately, it leads to metabolic disturbance and may cause death of the cell.

**7. Which organelle is known as the power house of the cell? Why?**

**Ans:** Mitochondrion is known as the “Power House of the Cell” because it provides the energy required by the cell in the form of ATP to meet their cellular need and demand through oxidation of food.

**8. Where do the lipids and proteins constituting the cell membrane get synthesized?**

**Ans:** The lipids constituting the cell membrane get synthesized at SER (Smooth endoplasmic reticulum) and the proteins constituting the cell membrane get synthesized at RER (Rough endoplasmic reticulum).

**9. Can you name two organelles that contain their own DNA and ribosomes?**

**Ans:** Plastids and mitochondria



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10. If the organization of a cell is destroyed due to some physical or chemical influence, what will happen?

**Ans:** If the organization of a cell is destroyed, the cell will not be able to carry out its basic functions as lysosomes may burst and their powerful hydrolytic enzymes digest the contents of their own cell i.e. autolysis and causes ultimate death of the cell.

11. Where are proteins synthesized inside the cell?

**Ans:** Proteins are synthesized in the ribosomes attached to the ER or in the free ribosomes present in the cytoplasm.

12. Differentiate Mitosis and Meiosis cell division.

**Ans:** The Differences between Mitosis and Meiosis cell division are given below:

DIFFERENCES	
MITOSIS	MEIOSIS
1. It occurs in <b>diploid or haploid</b> somatic cells.	1. It occurs in <b>diploid</b> germ cells.
2. It includes one division, nucleus divides only once.	2. It includes two divisions, nucleus divides twice.
3. Two daughter cells are formed.	3. Four daughter cells are formed.
4. Daughter cells are diploid.	4. Daughter cells are haploid.
5. Equational division, same number of chromosomes is present in the daughter cells as parent cells.	5. Reductional Division, half the numbers of chromosomes are present in the daughter cells as parent cells.
6. Prophase is short.	6. Prophase is long i.e. 5 sub-phases of prophase I of Meiosis I.
7. Synapsis and tetrad formation do not occur.	7. Synapsis and tetrad formation occur.
8. No pairing of homologous chromosome.	8. Pairing of homologous chromosomes occur.
9. No crossing over in chromosomes takes place.	9. Crossing over in chromosomes takes place.
10. There is only one Prophase, one Metaphase, one Anaphase and one Telophase.	10. There are two Prophases, two Metaphases, two Anaphases and two Telophases.
11. It produces no variation.	11. It produces variation.



12. Draw a Metaphase Chromosome.

Ans:

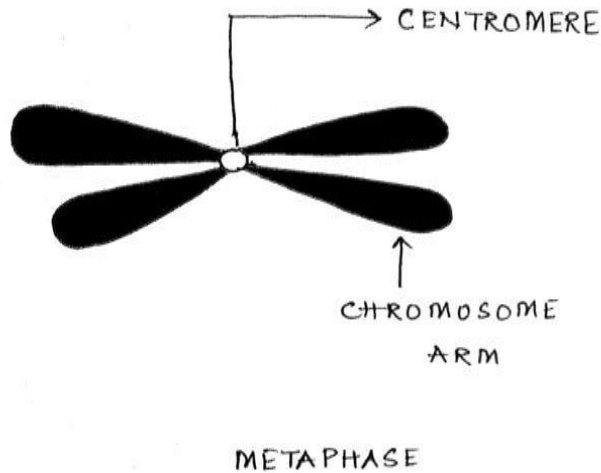


Fig. A Schematic Diagram of a Metaphase Chromosome

13. Diagrammatically differentiate a Metaphase Chromosome from an Anaphase Chromosome.

Ans:

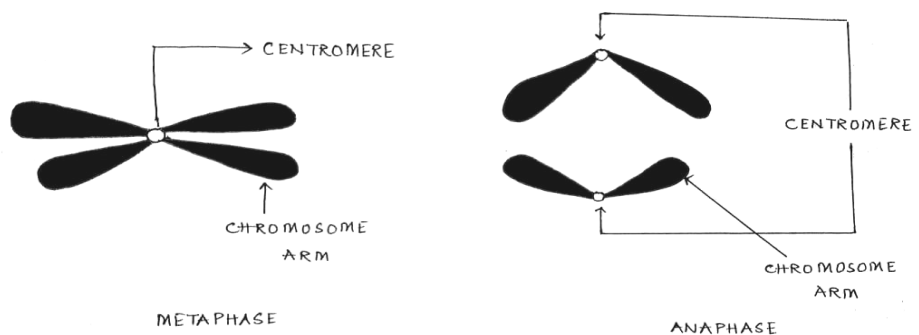


Fig. Diagrams showing difference between a Metaphase Chromosome from an Anaphase Chromosome





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14. Draw and label different stages of mitosis.

Ans:

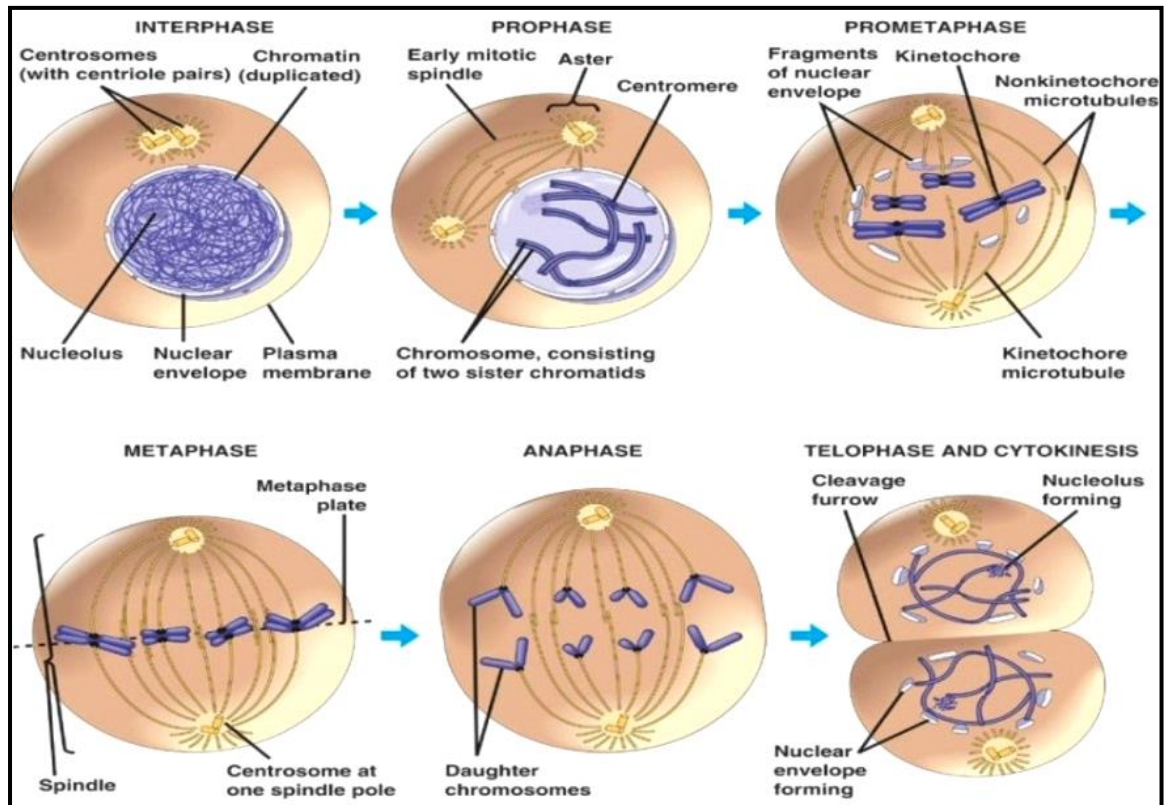


Fig: Photographs showing different stages of mitosis

15. Draw a neat labelled sketch of ultra-structures of the plant cell and an animal cell.

Ans:

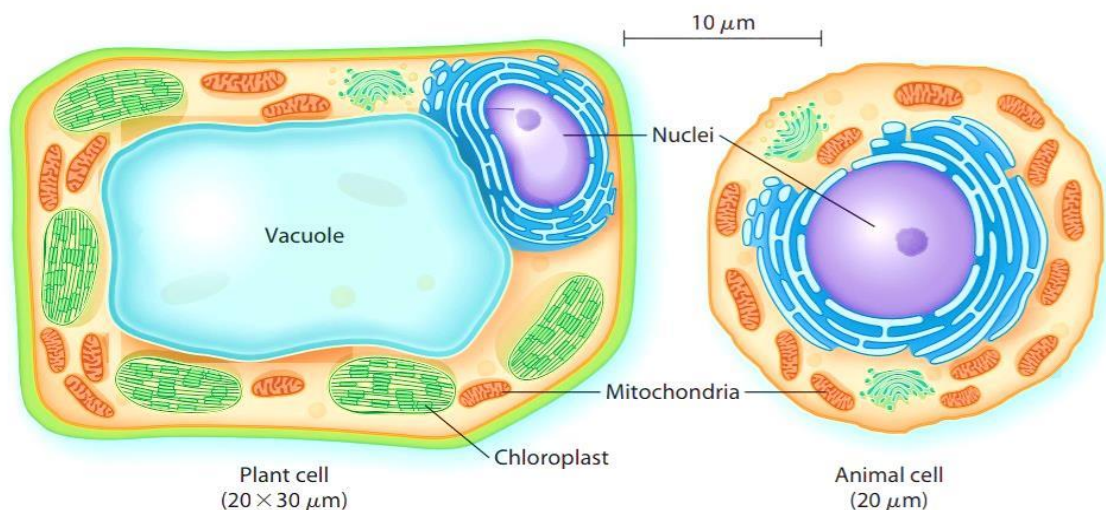


Fig. Ultra-structures of a plant cell and an animal cell



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16. Describe the stages of prophase-I of meiosis.

Ans : The stages of Prophase-I of Meiosis-I are described below :

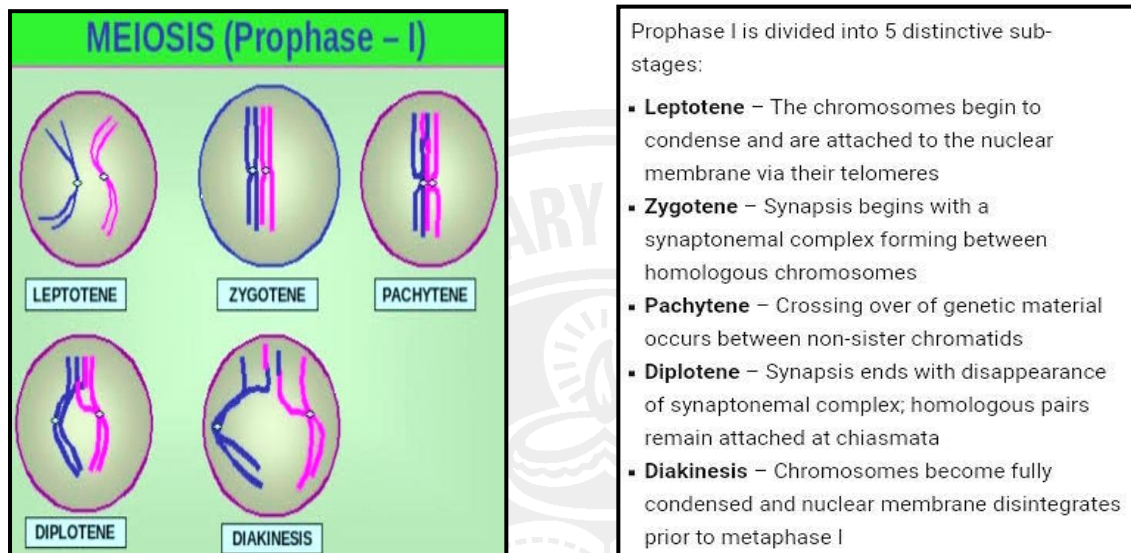


Fig: The stages of Prophase-I of Meiosis-I

### EXTRA QUESTIONS & ANSWERS

1. Write the features of Plasma membrane.

Ans: The features of plasma member are:

- a) Outermost covering of the cell.
- b) Separates the content of the cell from its external environment.
- c) Made up of organic molecules called lipids and protein.

2. Write the features of Cell wall.

Ans: The features of cell wall are:

- a) Outer rigid covering of plant cell.
- b) Mainly composed of cellulose.
- c) Provides strength to plants.

3. What is Plasmolysis?

Ans: The phenomenon of shrinkage of contents of the cell away from the cell wall due to exomosis (under the influence of a hypertonic solution) is called **plasmolysis**.





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4. Draw a compound microscope showing its different components.

Ans:

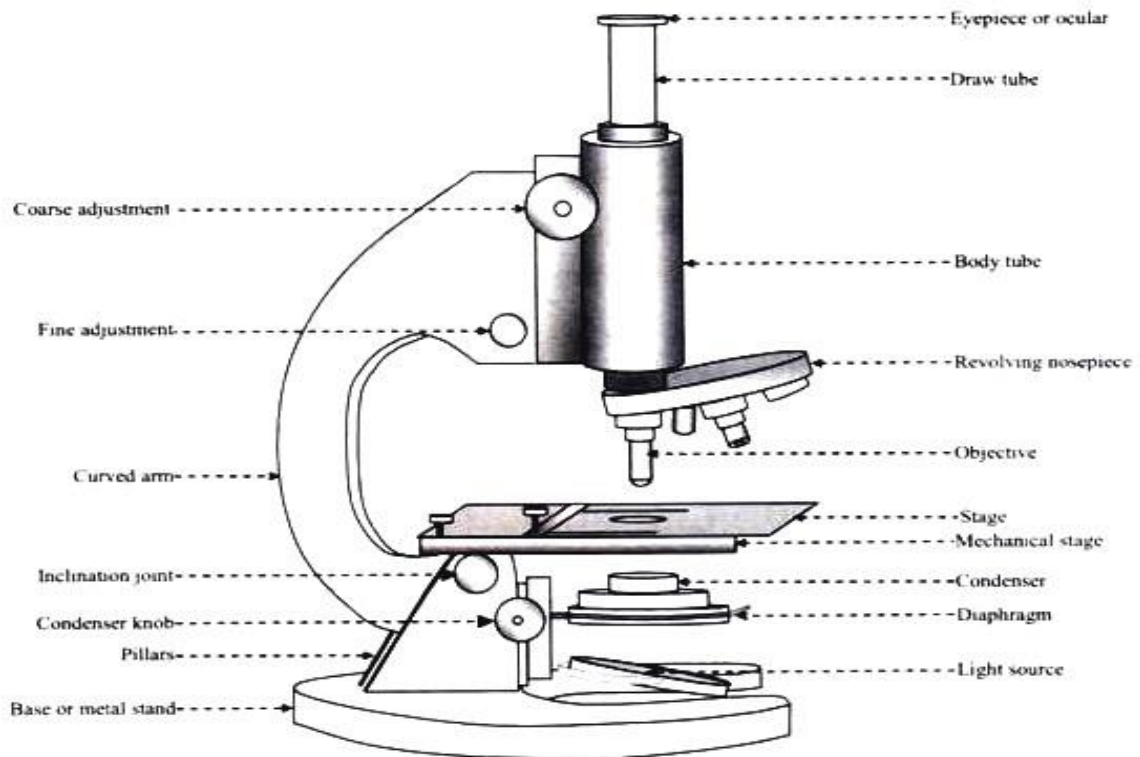


Fig. A Compound Microscope showing its different components

5. What is meiosis? Name different stages of meiosis.

Ans: The type of cell division in which the chromosomes number of diploid parent cell is reduced to half. Hence it is also called reduction division.

The different stages are:

Meiosis-I	Meiosis-II
Prophase -I (Leptotene, Zygotene, Pachytene, Diplotene, Diakinesis)	Prophase - II
Metaphase -I	Metaphase - II
Anaphase -I	Anaphase - II
Telophase-I	Telophase - II



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**6. What are homologous chromosomes?**

**Ans:** Chromosomes exist in same morphologically pairs, each pair is called homologous chromosome.

**7. What is the difference between plasma membrane and cell wall? Give the functions of each one.**

**Ans:** Plasma membrane is an elastic living membrane made up of lipids and proteins, whereas cell wall is a rigid non-living covering made up of cellulose in plant cells present outside the plasma membrane.

**Function of plasma membrane :** It separates contents of cell and also acts as a barrier by control movement of substances in and out of cells.

**Function of cell Wall :** Rigid and protective covering of cell. Apart from protection, it provides shape and structural strength to the cell.

**8. Describe the structure and functions of any three cells organelles.**

**Ans:**

**Endoplasmic Reticulum** is a complex network of membrane bound channel in the form of cisternae.

**Functions:** help in transport proteins and fats within the cell; involved in protein synthesis and lipid biosynthesis (membrane synthesis) and detoxification of drugs and poisons.

**Golgi Apparatus**, first described by Camillo Golgi consists of stacks of membrane bound vesicles in stacks called cisternae.

**Functions:** It performs storage, modification and packaging of substances in vesicles, it is also involved in formation of complex sugar and lysosomes.

**Lysosomes** are single membrane bound small spherical vesicles functioning as a waste disposal system, containing hydrolytic enzymes.

**Functions:** help in digesting bacteria, food and old aged organelles.



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9. Compare the similarities and differences between chloroplasts and mitochondria.

Ans:

**SIMILARITIES:**

1. Both are surrounded by two membranes and present only in eukaryotic cells.
2. Both contain their own DNAs and ribosomes.

DIFFERENCES	
CHLOROPLAST	MITOCHONDRIA
1. Larger, discoid-shaped, restricted to plants cells.	1. Smaller, cylindrical in outline, found in all aerobic cells.
2. Inner membrane smooth, Cristae absent.	2. Inner membrane produces cristae.
3. Thylakoids present	3. Thylakoids absent
4. Site of photosynthesis	4. Site of aerobic respiration

10. What is mitosis? Name the different stages of mitosis.

Ans: The type of cell division in which one parent cell divides to form two daughter cells. The division of nucleus is completed in four stages namely Prophase, Metaphase, Anaphase and Telophase. It is followed by division of cytoplasm or cytokinesis to form two daughter cells.

11. What are chromosomes?

Ans: Chromosomes are thread like structures seen during cell division stages. It is most important component of the cell carrying hereditary materials.

13. Differentiate Nucleus and Nucleoid.

Ans: The Differences between Nucleus and Nucleoid are given below:

DIFFERENCES	
NUCLEUS	NUCLEOID
1. Nucleolus is present.	1. Nucleolus is absent.
2. Nuclear membrane is present.	2. Nuclear membrane is absent.
3. Genetic materials are enclosed inside the nucleus.	3. Genetic materials are not enclosed in any closed structure.
4. It is found in Eukaryotes.	4. It is found in Prokaryotes.
5. Examples : Plants and Animals	5. Examples : Bacteria and Blue Green Algae



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**14. Differentiate SER and RER.**

**Ans: The Differences between SER and RER are given below:**

<b>DIFFERENCES</b>	
<b>SMOOTH ER</b>	<b>ROUGH ER</b>
1. Ribosomes are absent.	1. Ribosomes are present. Due to the presence of ribosomes, they are called RER.
2. It helps in the synthesis of lipids and fat molecules.	2. It helps in the synthesis of protein as ribosomes are attached on the surface of RER.
3. Genetic materials are enclosed inside the nucleus.	3. Genetic materials are not enclosed in any closed structure.
4. It is mainly composed of tubules.	4. It is mainly composed of cisternae.
5. Generally found in adipose cells, leucocytes, retinal cells, interstitial cells, glycogen storing cells of liver, conduction fibre of hearts, etc.	5. Generally found in pancreatic cells, liver cell, plasma cells, goblet cells, etc.

**15. What are the significances of mitosis and meiosis?**

**Ans:**

**Significances of mitosis :**

1. It helps in the growth of multicellular organisms.
2. Replacement of old and damaged cells by producing new cells.
3. A means of reproduction in unicellular organism.

**Significances of meiosis :**

1. It helps in the formation of haploid cell or gametes.
2. Source of variation
3. Maintenance of definite number of chromosome in a species.

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