

# Cell – The Structure and Functions

## Synopsis

- The single-celled organisms are called **unicellular** and if the organisms are made up of more than one cell are called **multicellular**.
- The simple microscope was developed by Antony Von Leeuwenhoek.
- The compound microscope was developed by Robert Hooke.
- The branch of biology which deals with the study of cells is called cytology.
- The living substance of the cell is called protoplasm.
- Examples of
  - **(a) unicellular organisms:**
    1. bacteria
    2. amoeba
    3. yeast
    4. chlamydomonas etc.
  - **(b) multicellular organisms:** plants like rose, neem, animals like man, hydra etc.
- Examples of different cellular shapes.
  1. **irregular** — amoeba
  2. **oval** — chlamydomonas (slipper organism)
  3. **oblong** — paramecium
  4. **elongated** — striated muscle cells
  5. **very long or thread like** — nerve fibre cells
  6. **cubical or rectangular** — plant cell
- **The smallest cell** — Bacterial cell  
**The longest cell** — Nerve cells  
**The largest cell** — Ostrich egg
- **Cell theory explains**
  1. Every living organism is made up of one or many cells.
  2. The structural unit of all the living organisms is the cell.
  3. The functional unit of all the living organisms is the cell.
  4. All cells arise from the pre-existing cells.
- **The three scientists who contributed in the cell theory are:**
  1. M.J. Schleiden
  2. Theodor Schwann
  3. Rudolph Virchow
- Animal cells have no cell walls.
- The cell wall is made up of **cellulose** which is rigid and gives shape to the cell.
- The cell wall is **freely permeable** while the cell membrane is **semi-permeable**.
- The supportive framework which helps in the distribution of various product across the cell is **endoplasmic reticulum**.
- **Power house of the cell** — Mitochondria
- **Synthesise proteins** — Ribosomes.
- The organelle found only in the animal cell which initiate and regulate cell division is **Centrosome**.

- The organelle found only in the plant cell is **plastid**.  
Green plastids are chloroplasts  
Other plastids are amyloplasts.
- Cell organelles are concerned with specific functions.
- **The importance of cell division is.**
  1. Production of new cells.
  2. For growth and repair.
  3. Replacement of the dead and worn out cells. –
  4. For reproduction.
- The process of fusion of sperm and an egg is called fertilisation.
- The result of fertilisation is **Zygote**.

### Review Questions

#### Multiple Choice Questions:

1. Put a tick mark (✓) against the correct alternative in the following statements:

**(i) Identify the part which contain pigment:**

- (a) cell membrane
- (b) plastid**
- (c) centrosome
- (d) cell wall

**(ii) The organelle that controls all activities in**

- (a) nucleus**
- (b) vacuole
- (c) plastids
- (d) cytoplasm

**(iii) A cell that is spherical in shape is:**

- (a) white blood cell
- (b) nerve cell
- (c) red blood cell**
- (d) amoeba

**(iv) The vacuole contains:**

- (a) water**
- (b) cell sap
- (c) salts
- (d) food

## Short Answer Questions:

### Question 1.

Name the scientist who invented the first microscope.

**Answer :**

Antony Von Leeuwenhoek.

### Question 2.

Who coined the term “cell” ?

**Answer :**

The term “cell” was coined by Robert Hooke.

### Question 3.

Briefly describe the three essential basic parts of a cell.

**Answer :**

**The essential basic parts of a cell are:**

1. Cell membrane
2. Cytoplasm
3. Nucleus
  1. **Cell membrane** — It is a very thin, delicate and flexible membrane which surrounds each cell. It is also called plasma membrane. It consists of fine pores which allow only certain molecules to pass through it and prohibit the others and therefore, due to its function, also called selectively permeable membrane.
  2. **Cytoplasm:** This is the living portion of the cell which is a semi-liquid, translucent and colourless liquid. It is the portion of the cell where major functions of the cell are carried out through various finer parts of the cell. The finer structures which are contained in this are called the cell organelles.
  3. **Nucleus:** The small spherical dark coloured body usually located in the centre of the cell. It is the most important part of the cell which regulates and co-ordinates various life processes. Its major role is during cell division. It contains hereditary factors called the genes.

### Question 4.

The cell membrane is called selectively permeable. Why?

**Answer :**

The cell membrane of the cell is composed of fine pores through which only certain molecules of the different substances can pass into the cell. Since it allows only specific molecules to enter prohibiting the other it is referred to as Selectively Permeable.

### Question 5.

State the difference between

**Answer :**

### **(i) Nucleus and nucleolus**

#### **Nucleus**

1. It is a cell organelle.
2. It is the most important part of the cell.
3. It is present in the cytoplasm of the cell.
4. It is bounded by a delicate nuclear membrane

#### **Nucleolus**

1. It is a component of the nucleus.
2. It is the most important part of the nucleus.
3. It is present in the nucleoplasm.
4. It does not have any such membrane around it

### **(ii) Cytoplasm and protoplasm**

**Answer :**

#### **Cytoplasm**

1. The living portion of the cell inside the cell except the nucleus.
2. It has many finer parts contained in it like golgi bodies, mitochondria etc.

#### **Protoplasm**

The living substance of a cell is called the protoplast.

**It consists of two main parts**

1. cytoplasm
2. nucleus.

### **(iii) Cell wall and cell membrane.**

**Answer :**

#### **Cell wall**

1. It is made up of cellulose.
2. It gives shape and rigidity to the plant cell.
3. It is a non-living structure.
4. It protects the cell from the entry of disease-causing agents, as well the underlying protoplasm against mechanical injuries.

#### **Cell Membrane**

1. It is very thin, delicate and flexible.
2. This allows the entry of certain molecules only, while holding back the others.
3. It is living structure.

4. It has fine pores in it, through which only certain substances can pass in and out, while others cannot.

### Question 6.

List the major differences between a plant cell and an animal cell.

#### Answer :

##### Plant cell

1. Cell is comparatively larger with distinct outlines.
2. Has a definite and rigid cell wall.
3. Has negligible amount of cytoplasm.
4. Cytoplasm is not very dense.
5. Contains plastids.
6. No centrosome.
7. Have prominent one or more vacuoles.
8. Has simple golgi apparatus composed of units called dictyosomes.

##### Animal cell

1. Size is small with less distinct outlines.
2. Cell wall absent.
3. Cytoplasm fills almost the entire cell.
4. Cytoplasm is granular and relatively dense.
5. Do not contain plastids
6. Centrosomes are present.
7. Have temporary vacuoles which are small and concerned with secretion or excretion.
8. Have complex and prominent golgi apparatus.

### Question 7.

Briefly discuss the importance of chromosomes to an organism.

#### Answer :

The most important feature of a living cell is that it can divide or reproduce of its own kind and this function is regulated by the nucleus of the cell. The nucleus in its nucleoplasm contains a network of dark stained thread like structures called chromatin fibres. These fibres during cell division become thick and ribbon like which are then called chromosomes. The chromosomes are the actual hereditary factors. These are unique for each species both in number and in character.

Human body has 46 chromosomes which occur in pairs.

**They are further categorised as:**

1. Chromosomes specific for determining the sex of the species called the sex chromosomes.
2. Other chromosomes are called autosomes.

8. Fill up the blanks with the terms given below in the box.  
 Pigments, wall, pre-existing, cell, vacoules

1. The **cell** is the structural unit of all living things.
2. All cells arise from **pre-existing** cells.
3. Animal cells have no cell **wall**.
4. Plastids contain **pigments**.
5. **Vacuoles** are filled with water and dissolved substance

**Question 9.**

Try to find the names of four cell organells hidden in this maze, (hint: The hidden words can appear horizontally or vertically; forwards or backward or even mixed up). Write them in the lines provided. For example :  
 "NUCLEUS" in the last row, seven backward letters.

A	J	F	B	H	E	M	O	E	L	O	U	C	A	V
H	V	L	E	U	C	O	P	L	A	S	T	N	O	E
C	H	R	O	M	O	P	L	A	S	T	X	T	E	R
S	U	E	L	C	U	N	W	P	L	A	S	T	I	D

Answer :

A	J	F	B	H	E	M	O	E	L	O	U	C	A	V
H	V	L	E	U	C	O	P	L	A	S	T	N	O	E
C	H	R	O	M	O	P	L	A	S	T	X	T	E	R
S	U	E	L	C	U	N	W	P	L	A	S	T	I	D

1. Vacuole
2. Leucoplast
3. Chromoplast
4. Nucleus, Plastid

**ADDITIONAL QUESTIONS**

A. Fill in the blanks.

1. Organisms which are made up of a single cell are called **unicellular** organisms.
2. Muscles cells are **elongated** and contractile.
3. The jelly-like fluid that surrounds the nucleus of a cell is called **cytoplasm**.
4. **Plasma** membrane is a selectively permeable membrane.

5. The **Nucleoplasm** contains a network of thread-like structures called chromatin network.
6. Golgi bodies are also called **dictyosomes**.
7. A plant cell gets shape and support from its **cell wall**.
8. In a plant cell food is manufactured in **chloroplast**.
9. **Chromoplasts** give colour to flowers and fruits.
10. Fluid-filled cell organelles that are usually larger in a plant cell than in an animal cell are called **vacuoles**.

**B. Match the name of the organelle given in Column A with its function given in Column B.**

<b>Column A (Organelle)</b>	<b>Column B (Function)</b>
1. leucoplast	a. help in cell division
2. nucleus	b. transport of material
3. ribosomes	c. making food
4. mitochondria	d. digesting foreign bodies
5. endoplasmic reticulum	e. storage of starch and proteins
6. Golgi bodies	f. makes the cell turgid
7. chloroplast	g. making proteins
8. centrosome	h. controlling all the vital activities of a cell
9. vacuole	i. releasing energy.
10. lysosomes	j. synthesis of cell wall in a plant cell

**Answer :**

**Column A (Organelle)**

1. leucoplast
2. nucleus
3. ribosomes
4. mitochondria
5. endoplasmic reticulum
6. Golgi bodies
7. chloroplast
8. centrosome
9. vacuole
10. lysosomes

**Column B (Function)**

- e. storage of starch and proteins
- h. controlling all the vital activities of a cell
- g. making proteins
- i. releasing energy.
- b. transport of material
- j. synthesis of cell wall in a plant cell
- c. making food
- a. help in cell division
- f. makes the cell turgid
- d. digesting foreign bodies

**C. Write true or false for each statement. Rewrite the false statements correctly.**

1. The size of a cell is usually measured in centimetres.

**False.**

Correct: The size of a cell is usually measured in micrometres.

2. The nuclear membrane encloses a colourless, dense fluid called nucleoplasm.

**True**

3. At the time of cell division the chromatin network changes into small thread-like structures called genes.

**False.**

Correct: At the time of cell division the chromatin network changes into small thread like structures called chromosomes.

4. Ribosomes are the sites of respiration in a cell.

**False.**

Correct: Ribosomes are the sites of protein synthesis in a cell.

5. A mitochondrion is bound by two membranes.

**True**

6. Golgi bodies form a network of tubes which run throughout the cytoplasm.

**True**

7. Every cell is bound by a cell wall.

**False.**

Correct: Only plant cell is bound by a cell wall.

8. Chromoplasts are the kitchen of the cell.

**False.**

Correct: Chloroplasts are the kitchen of the cell.

9. Vacuoles are filled with a fluid called nucleoplasm.

**False.**

Correct: Vacuoles are filled with a fluid called cell sap.

10. Growth and reproduction are based on cell division.

True

#### **D. Write short answers.**

##### **Question 1.**

Why is a cell called the structural unit of a living organism ?

**Answer :**

A cell is called the structural unit of life because all living organism irrespective of their size, shape and complexity are made up of cells and functions performed by organism is the result of the activity of the cells in its body.

##### **Question 2.**

Why is the cell membrane called selectively-permeable membrane ?

**Answer :**

Cell membrane is called selectively permeable membrane as it allows only selected substances to pass through it, and prevents the passage of other substances.

##### **Question 3.**

Where are the genes located in a cell ?

**Answer :**

Genes are located on chromosomes in side nucleus of a cell.

##### **Question 4.**

Why are mitochondria called the powerhouse of the cell ?

**Answer :**

Mitochondria are the sites of respiration in cell. Mitochondria forms energy in the form of ATP (Adenosine triphosphate) during the process of respiration. Therefore, they are called power house of the cell.

##### **Question 5.**

Define cell division.

**Answer :**

1. Cell division is a process by which a cell divides, forming two new cells.
2. It is the basis of growth and reproduction of an organism.

### Question 6.

What is the relationship between growth and cell division ?

#### Answer :

The life of all multicellular organisms begin with single cell. This cell divided and redivides, there by forming a cluster of many cells. So cell division is necessary for growth.

### E. Answer in detail.

#### Question 1.

Why was the invention of the microscope so important to the study of living beings ?

#### Answer :

All living organisms, unicellular or multicellular are made up of cells. Microscope make it possible to see inside the cells that make up all living organisms. Without microscope we could not see or understand, how life works. So the invention of microscope made it possible to see the basic component of life.

#### Question 2.

What is cell theory ? Name the three scientists whose work led to the formulation of the cell theory.

#### Answer :

Cell theory was given by Schleiden and Schwann in the year 1838-1839.

It was refined further by Rudolf Virchow.

**The main postulates of cell theory are:**

1. All living beings are made up of one or more cells.
2. Cells are the basic structural and functional unit of all living beings.
3. All cells are basically alike in chemical composition and metabolic processes.
4. New cells arise by division of pre existing cells. (Rudolf Virchow)