CHAPTER 5

The Fundamental Unit of Life

1. OBJECTIVE QUESTIONS

1. Cell theory was proposed by
(a) Robert Brown
(b) Robert Hook
(c) Schleiden and Schwann
(d) Anton von Leeuwenhoek

Ans : (c) Schleiden and Schwann
M.J. Schleiden (1838) and Theodore Schwann (1839) proposed the cell theory which states that the basic structural and functional unit of all plants and animals is cell.

2. Which of these is acellular?
(a) Viruses (b) Bacteria
(c) Protozoans (d) Fungi

Ans : (a) Viruses
Virus is sub-microscopic and acellular particle (ranging in size from 20-300 nm) that can infect the cells of a biological organism. Viruses can replicate themselves only by infecting a host cell.

3. Select the correct pair that comprises of only unicellular organisms.
(a) Amoeba and Rhizopus
(b) Paramecium and Chlamydomonas
(c) Bacteria an fungi
(d) Plants and animals

Ans : (b) Paramecium and Chlamydomonas

4. Select the odd group from the following.
(a) Chlamydomonas, Paramecium, bacteria
(b) Fungi, Plants, Animals
(c) Sperm, Neuron, Amoeba
(d) Schleiden, Schwann, Virchow

Ans : (c) Sperm, Neuron, Amoeba
Cells like Amoeba have changing shapes whereas nerve cells and sperms have definite shape.

5. Which structure in plant cell is responsible for providing the energy required to drive cellular processes?
(a) Chloroplast (b) Mitochondrion
(c) Nucleus (d) Golgi apparatus

Ans : (b) Mitochondrion
Mitochondrion carries out aerobic respiration, which involves the oxidation of food to release stored chemical energy for various metabolic activities in the cell. Option 'A' is incorrect because, chloroplast converts light energy to chemical energy i.e., glucose, but this chemical energy captured in the form of glucose can only be unlocked for usage by the cell via respiration taking place in mitochondria.

6. Plasma membrane is composed of
(a) cellulose and lipids
(b) lipids and proteins
(c) peptidoglycan and lipids
(d) cellulose and proteins

Ans : (b) lipids and proteins
Plasma membrane is a living, thin, delicate, elastic, selectively permeable. Chemically, it is made up of 75% phospholipid. In addition to phospholipid, the membrane contains proteins, cholesterol and polysaccharides.

7. What is the meaning of "Omni's Cellulae Cellula"?
(a) All organisms are composed of cells.
(b) Cell is basic structural unit of an organism.
(c) Cells are capable of producing more of themselves.
(d) Cells arise from the division of pre-existing cell.

Ans : (d) Cells arise from the division of pre-existing cell.
German physiologist Rudolf Virchow in 1958 stated (a latin phrase - Omni cellulae cellula), which means that all cells arise from the division of pre-existing cells.

8. Root hairs absorb water from soil by the process of
(a) plasmolysis (b) diffusion
(c) osmosis (d) endocytosis

Ans : (c) osmosis

9. Cell wall of plants is mainly composed of
(a) chitin (b) cellulose
(c) lipids (d) lignin

Ans : (c) lipids
Cell wall is present in plant cells, bacteria and fungi, It is an additional protective wall present outside plasma membrane. Cell wall is a thick, non-living, rigid and permeable covering made up of cellulose. Cellulose is a kind of carbohydrate (polysaccharides). It provides structural strength to the plant.

10. A plant cell placed in a hypo-tonic solution will not burst because of presence of
(a) plasma membrane (b) cell wall
(c) chloroplast (d) cytoplasm

Ans : (b) cell wall

Cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (hypo-tonic) external media without bursting. In such media the cells tend to take up water by osmosis. The cell swells, building up pressure against the cell wall. The wall exerts an equal pressure against the swollen cell. Because of their walls, such cells can withstand much greater changes in the surrounding medium than animal cells.

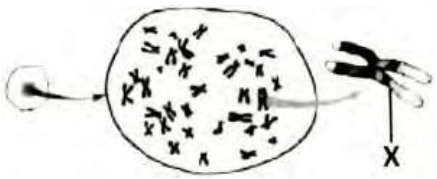
11. What is the important function of nucleus?
(a) Photosynthesis (b) Cellular reproduction
(c) Lipid synthesis (d) Protein synthesis

Ans : (b) Cellular reproduction
Nucleus help in cellular reproduction.

12. An organism has poorly defined nuclear membrane in its cells. This organism could be a/an
(a) bacteria (b) animal
(c) fungi (d) bird

Ans : (a) bacteria
In some organisms like bacteria, the nuclear region of the cell may be poorly defined due to the absence of a nuclear membrane. Such organisms, whose cells lack a nuclear membrane, are called prokaryotes.

13. The diagram below shows a magnified view of a particular part of a human cell. Name the part labelled X.



(a) Ribosome (b) Chromosome
(c) Nucleoplasm (d) Mitochondrion

Ans : (b) Chromosome
The part labelled as X in the diagram is chromosome.

14. Which cell organelle is not bound by a unit membrane?
(a) Lysosome
(b) Ribosome
(c) Endoplasmic reticulum
(d) Nucleus

Ans : (c) Endoplasmic reticulum
Endoplasmic reticulum is not bound by a single membrane. It is a complex network of membranous system in the cytoplasm of eukaryotic cells.

15. Largest number of cell bodies of neuron in our body are found in:
(a) retina (b) spinal cord
(c) brain (d) tongue

Ans : (c) brain
Largest number of cell bodies of neuron are found in brain.

16. If the ribosome of a cell are destroyed then
(a) respiration will not take place
(b) fats will not be stored
(c) carbon assimilation will not occur
(d) proteins will not be formed

Ans : (d) proteins will not be formed
Ribosome's are involved in the synthesis of proteins. Hence, if ribosome's are destroyed, then proteins will not be formed.

17. What is 'autolysis'?
(a) Self-replication (b) Self-digestion
(c) Self-food producers (d) Food decomposer

Ans : (b) Self-digestion
Lysosomes are organelles that contain digestive enzymes (acid hydrolases). They digest excess or worn out organelles, food particles, and engulfed viruses or bacteria. The membrane surrounding a lysosome prevents the digestive enzymes inside from destroying the cell.

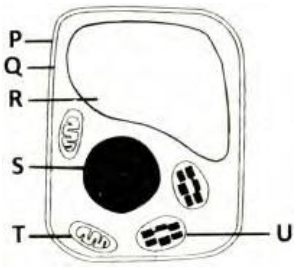
18. What is meant by 'multicellular'?
(a) The single celled organism.
(b) The cytoplasmic projection which helps in locomotion & feeding of Amoeba
(c) Organisms made of more than one cell.
(d) A group of tissues which together perform specific function

Ans : (c) Organisms made of more than one cell.
Organisms made of more than one cell are called multicellular organism.

19. The transportation of materials in the cell is done by
(a) Golgi complex
(b) lysosomes
(c) mitochondria
(d) endoplamic reticulum

Ans : (d) endoplamic reticulum
Endoplasmic reticulum is a tube like structure present in the cell, which extends all over the cell. The ER facilitates transport of materials from one part of the cell to another.

20. Which labelled organelles helped a student to conclude that it is a plant cell?



(a) P and R only (b) P and S only
(c) P, R and T only (d) P, R and U only

Ans : (d) P, R and U only
In the given figure P is cell wall, R is vacuole and U is chloroplast are characteristic features of a plant cell.

21. *X* is a double membraned organelle that oxidises food present in cell to release energy. *X* is
(a) nucleus
(b) endoplasmic reticulum

(c) mitochondrion
(d) chloroplast

Ans : (c) mitochondrion
Mitochondria are small sphere or short rod-shaped organelles that are double membraned. They are the main seat of cell respiration. They bring about stepwise oxidation of food stuffs and produce energy.

22. Find the best definition of 'vacuole'?
(a) A fluid filled structure surrounded by membrane.
(b) A thread like structure containing nuclear material.
(c) A jelly like substance which is present between nucleus and cell membrance.
(d) The basic structural units of an organism.

Ans : (a) A fluid filled structure surrounded by membrane.
Vacuoles are bubble like sacs bounded by a single unit membrane called the tonoplast. They are filled with fluid called cell sap.

23. What is the function of the central vacuole in plants?
(a) Stores water and dissolved nutrients
(b) Carries out photosynthesis
(c) Releases energy from stored nutrients
(d) Protects the genetic material of the cell

Ans : (a) Stores water and dissolved nutrients
The central vacuole in plants has a storage function. It consists of cell sap that has dissolved sugars, mineral salts and amino acids.

24. In chloroplasts, light is captured by
(a) thylakoids within grana
(b) grana within cisternae
(c) cisternae within grana
(d) grana within thylakoids

Ans : (a) thylakoids witihin grana
Grana that are stacks of membrane bound, flattened discoid sacs called thylakoids contain the molecules of chlorophyll pigments. They are the main functional units of chloroplasts. Light is captured by the reaction centre present in the membrane of the thylakoids.

25. Which structures can be found in all plant and animal cells?
(a) Cell wall and nucleus
(b) Mitochondria and centrioles
(c) Cell membrane and centrioles
(d) Mitochondria and cell membrane

Ans : (d) Mitochondria and cell membrane
The cell wall occurs in plant but not animal cells. Centrioles are present in animal but not plant cells. Mitochondria and cell membrane are found in both plant and animal cells.

26. Why is it crucial for root hair cells to have a long, narrow cytoplasmic extension?
(a) To speed up the uptake of oxygen
(b) To speed up the removal of carbon-di-oxide
(c) To speed up the uptake of ions
(d) To speed up the uptake of sugars and amino acids

Ans : (c) To speed up the uptake of ions
The function of root hair cells is to absorb water and mineral salts for the plant.

27. Select the correct match.
(a) Cell was first discovered - 1839
(b) The term 'protoplasm' was coined - 1665
(c) The nucleus was discovered - 1831
(d) Cell theory was proposed - 1674

Ans : (c) The nucleus was discovered - 1831
Cells were first discovered by Robert Hooke in 1665. Purkinje in 1839 coined the term 'protoplasm' for the fluid substance of the cell. The cell theory, that all the plants and animals are composed of cells and that the cell is the basic unit of life, was presented by two biologists, Schleiden (1838) and Schwann (1839). Robert Brown in 1831 discovered the nucleus in the root cells of orchid plant.

28. Identify the organelle that exists only in plant cell but NOT in an animal cell?
(a) Centriole (b) Chloroplast
(c) Golgi apparatus (d) Ribosome

Ans : (b) Chloroplast
Chloroplasts are present only in plant cells. Golgi apparatus and ribosomes exist in both plant and animal cells. Centrioles exist only in animals, but not in plant cells.

29. Amoeba acquires its food by the process of
(a) exocytosis (b) endocytosis
(c) osmosis (d) diffusion

Ans : (b) endocytosis
Amoeba acquires its food through endocytosis Endocytosis refers to invagination of a small region of the plasma membrane and ultimately forming an intra-cellular membrane bound vesicle. This process is generally involved in the ingestion of food material. Intake of liquid food using endocytosis is called pinocytosis or cell drinking. Similarlly, intake of solid particles by a cell through its cell membrane is called phagocytosis or cell eating. In this process, cell membrane puts up protoplasmic processes around the food particle. The processes join, fuse to form phagosome.

30. Find the correct statement.
(a) Many fungi are single celled
(b) Most cells are very large
(c) Animals have many vacuoles
(d) Chemical composition of Prokaryotes and eukaryotes vary

Ans : (d) Chemical composition of Prokaryotes and eukaryotes vary

31. A cell loses water by osmosis when kept in a solution having a lower concentration of water than the cell. The given solution is
(a) hyper-tonic (b) hypo-tonic

(c) isotonic (d) dilute

Ans : (a) hyper-tonic
If a cell is a placed in a hyper-tonic solution which has higher concentration of solute and lower concentration of water as compared to the concentration of cell sap, the water molecules move from cell sap to the external solution so that the cell shrinks.

32. Chemical nature of carrier molecules facilitating transport across plasma membrane is:
(a) starchy (b) sugary
(c) proteinaceous (d) fatty acidic

Ans : (c) proteinaceous
The cell membrane and plasma membrane is selectively permeable and it facilitates proteinaceous molecules across plasma membrane.

33. Cell wall is absent in
(a) plant cells (b) bacterial cells
(c) fungal cells (d) animal cells

Ans : (d) animal cells
Cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (hypo-tonic) external media without bursting.

34. ER remains associated with:
(a) dictyosomes (b) mitochondria
(c) nuclear membrane (d) chloroplast

Ans : (c) nuclear membrane
Endoplasmic reticulum is associated with nuclear membrane. It is a network of tube like structure.

35. Chromosomes are composed of
(a) DNA and protein (b) DNA and sugar
(c) sugar and protein (d) chromatin

Ans : (a) DNA and protein
Chromosomes are composed of DNA and protein. DNA molecules contain the information necessary for the cell to function, grow and divide properly.

36. Vacuole is surrounded by:
(a) plasmalemma (b) cell wall
(c) tonoplast (d) plasmodesmata

Ans : (c) tonoplast
A vacuole is surrounded by tonoplast.

37. Which of the following cell organelles can make complex sugars from simple sugars?
(a) Ribosomes
(b) Lysosomes
(c) Endoplasmic reticulum
(d) Golgi apparatus

Ans : (a) Ribosomes
The Golgi apparatus, first described by Camillo Golgi. Its functions include the storage, modification and packaging of products in vesicles. In some cases, complex sugars may be made from simple sugars in the Golgi apparatus. The Golgi appratus is also involved in the formation of lysosomes.

38. What are suicide bags?
(a) Plastids (b) Mitochondria
(c) Lysosomes (d) Ribosomes

Ans : (c) Lysosomes
Lysosomes are called suicidal bags of cells as sometimes they get destroyed when preventing the attacking of foreign particles and digesting old worn out cells.

39. Besides nucleus, DNA is also present in
(a) ribosome's and Golgi apparatus
(b) mitochondria and chloroplasts
(c) lysosomes and endoplasmic reticulum
(d) Golgi complex and mitochondria

Ans : (b) mitochondria and chloroplasts
Mitochondria and chloroplasts are semi-autonomous organelles that are capable of self duplication. They have DNA, RNA, ribosome's and enzymes and are able to synthesize some of their proteins.

40. Which of the cell organelle take part in the formation of acrosome?
(a) Nucleus (b) Chromosome
(c) They are brittle
(d) They are capable to form anions easily

Ans : (c) They are brittle
Golgi complex take part in the formation of acrosome of sperm.

2. FILL IN THE BLANK

1. Ribosomes are rich in ..... and .....
Ans : RNA, Proteins

2. Membrane-bound non-living structures in a cell is .....
Ans : Vacuole

3. ..... are living, protoplasmic structures capable of growth and sometimes multiplication also.
Ans : Cell Organelles

4. in animals are the longest cells.
Ans : Nerve cells

5. ..... are clear spaces present in the cytoplasm enclosed by a membrane.
Ans : Vacuoles

6. The smallest human cell is (0.0075 mm) .....
Ans : RBC

7. are protein factories.
Ans : Ribosomes

8. The single largest cell in the world is of an .....
Ans : Ostrich egg

9. Colourless plastids are called .....
Ans : Leucoplasts

10. ..... is concerned with transmission of hereditary traits from parents to offspring.
Ans : Nucleus

11. RNA stands for .....
Ans : Ribo Nucleic Acid

12. ..... are hereditary units of specific biological function located in a fixed position on a chromosome.
Ans : Genes

13. are amoeboid cells of blood.
Ans : White blood cells

14. Nucleus was discovered by .....
Ans : Robert Brown

15. Genes are sub units of.....The number and type of which vary from species to species.
Ans : Chromosomes

3. TRUE/FALSE

1. Lamarck propounded the Cell Theory.
Ans : False
Theodar schwann and M.J. Schleiden proposed cell theory in 1839.

2. Endoplasmic reticulum may be smooth or rough.
Ans : True

3. Robert Hooke discovered the wonder world of microbes.
Ans : False
A. Van Leeuwenhoek discovered the wonder world of microbes.

4. The main function of ribosomes is to synthesize proteins.
Ans : True

5. A. Van Leeuwenhoek discovered cell.
Ans : False
Robert Hooke discovered cell.

6. Cell wall is a non-living layer.
Ans : True

7. Endoplasmic reticulum is concerned with protein synthesis.
Ans : True

8. Prokaryotic cells lack nuclear envelope.
Ans : True

9. Centrosomes are present in a plant cell.
Ans : False
Centrosomes are typical of a animals cells absent in plant cells.

10. Chloroplasts are colourless plastids.
Ans : False
Chloroplasts are characteristics of green protist and plant cells. They are plastids which have light absorbing green pigment.

11. The oxidation of food in a cell takes place in mitochondria.
Ans : True

12. Cell wall is a semi-permeable membrane.
Ans : True

13. Plastids are the sites of photosynthesis.
Ans : True

14. Nucleolus is present in cell cytoplasm.
Ans : False
Nucleolus is present in nucleus.

15. Golgi apparatus is present in prokaryotic cell.
Ans : False
Prokaryotic cells lack cell organelles except ribosomes.

16. Striking difference between a plant and animal cell is due to the presence of cell wall.
Ans : True

17. All living organisms consist of cells.
Ans : True

18. Animal cells have larger vacuoles.
Ans : False
Animal cells have small vacuoles.

19. Genes are mainly made up of proteins.
Ans : True
Genes are subunits of chromosomes. Chromosome number and type vary from species to species. Genes are made up of DNA.

20. Compounds like pectin and proteins also occur in cell wall.
Ans : True
Cell wall in plants is chiefly composed of insoluble polysaccharide cellulase. Certain other compounds such as pectin, hemicellulose, proteins also occur in cell wall.

4. MATCHING QUESTIONS

DIRECTION : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column-I have to be matched with statements (p, q, r, s)

in column II.

1.

Column I		Column II	
(A)	ER	(p)	Sorting, packaging, labelling of cell products
(B)	Chloroplast	(q)	Production and segregation of proteins to be secreted
(C)	Golgi body	(r)	Digestion of nutrients and worn-out cell parts
(D)	Lysosomes	(s)	Organelle of photosynthesis

	A	B	C	D
(a)	q	s	p	r
(b)	s	r	q	p
(c)	q	r	s	p
(d)	p	r	q	s

Ans : (a) A – q, B – s, C – p, D – r

2.

Column I		Column II	
(A)	Nerve cells	(p)	Protection
(B)	Muscle cells	(q)	Carry messages
(C)	Red blood cells	(r)	Movement
(D)	Epithelial cells	(s)	Transport of oxygen

	A	B	C	D
(a)	q	s	p	r
(b)	s	r	q	p
(c)	q	r	s	p
(d)	p	r	q	s

Ans : (c) A – q, B – r, C – s, D – p

3.

Column I		Column II	
(A)	Cell wall	(p)	Workbench for protein synthesis
(B)	Cell membrane	(q)	External support and protection, made up of cellulose
(C)	Nucleus	(r)	Selectively permeable
(D)	Ribosome's	(s)	Location of chromatin

	A	B	C	D
(a)	q	s	p	r
(b)	s	r	q	p
(c)	q	r	s	p
(d)	p	r	q	s

Ans : (c) A – (q, s), B – r, C – s, D – p

4.

Column I		Column II	
(A)	Structures with one unit membrane	(p)	Lysosome
(B)	Structures with two membranes	(q)	Ribosome
(C)	Structures without membrane	(r)	Plastids
(D)	Structures with membrane bound tubules	(s)	Endoplasmic reticulum

	A	B	C	D
(a)	q	s	p	r
(b)	s	r	q	p
(c)	q	r	s	p
(d)	p	r	q	s

Ans : (d) A – p, B – r, C – q, D – s

5. ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

1. **Assertion :** A cell swells up when present in a hypotonic solution.
Reason : More water molecules enter the cell than they leave.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
If a cell is placed in a hypo-tonic solution which has lower concentration of solute and higher concentration of water as compared to the concentration of cell sap (i.e., the solution inside the cell), the water molecules move from external solution into the cell sap and thus, the cell swells.

2. **Assertion :** The endoplasmic reticulum which lacks ribosomes is called smooth endoplasmic reticulum

(SER).
Reason : SER is mainly involved in protein synthesis.

Ans : (c) Assertion (A) is true but reason (R) is false. Smooth Endoplasmic Reticulum (SER) possesses smooth membranes which do not bear ribosomes. SER is responsible for synthesis of fats inside the cells of adipose tissue, formation of sphaerosomes, synthesis of glycogen as well as glycogenolysis (hydrolysis of glycogen) in liver cells, synthesis of sterols and steroid hormones as in the interstitial cells of testis and ovary and formation of visual pigments from vitamin A in retinal cells.

3. **Assertion :** Mitochondria and chloroplasts are semiautonomous organelles.
Reason : They are formed by division of pre-existing organelles and contain DNA but lack protein synthesizing machinery.

Ans : (c) Assertion (A) is true but reason (R) is false. Both mitochondria and chloroplasts are double membrane bound, semi-autonomous cell organelles. Their structure and functions are partially controlled by nucleus of the cell and partially by themselves. Both possess their own DNA and arise from the pre-existing cells. 70S type of ribosome is present in both organelles which can help to translate the coded information contained in *m*RNA and protein synthesis.

4. **Assertion :** Plasma membrane is selectively permeable.
Reason : Plasma membrane allows some molecules to pass through it more easily than others.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Each cell is bound by an extremely delicate, thin, elastic, selectively permeable, living membrane called plasma membrane. It is selectively permeable as it allows some molecules to pass through more easily than others.

5. **Assertion :** Leucoplasts perform photosynthesis.
Reason : Chloroplasts store fats, starch and proteins.

Ans : (d) Assertion (A) is false but reason (R) is true. Chloroplasts perform photosynthesis while leucoplasts are storage plastids.

6. **Assertion :** Cell wall is a non-living part of the cell.
Reason : It offers protection, definite shape and support.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Cell wall is a non-living part of the cell. It is an outer, rigid, protective, supportive and semi-transparent covering of plant cells only. The cell wall lies outside the plasma membrane. The cell wall is mainly composed of cellulose. It provides a definite shape to the cell. It protects plasma membrane and internal structures from the attack of pathogens and mechanical injury.

7. **Assertion :** A cell membrane shows fluid behaviour.
Reason : A membrane is a mosaic of lipids and proteins.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
A cell membrane shows fluid behaviour. It was proved by fluid- mosaic model of a biomembrane by Singer and Nicolson in 1972. According to this model, the membrane does not have a uniform disposition of lipids and proteins but is a mosaic of the two. Further, the membrane is not solid but is quasi fluid.

8. **Assertion :** A plant cell bursts if placed in water.
Reason : High turgor pressure causes bursting of plant cells.

Ans : (d) Assertion (A) is false but reason (R) is true. Plant cells have cell wall to counteract turgor pressure (T.P.) by exerting exactly equal and opposite wall pressure. Wall pressure stops entry of water into plant cells beyond a certain limit thus prevents their bursting.

9. **Assertion :** Mitochondria are called 'powerhouses' of the cell.
Reason : Mitochondria produce cellular energy in the form of ATP.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Mitochondria are cell organelles of aerobic eukaryotes. These are site of aerobic respiration, where Krebs cycle occurs in matrix, while ETS and oxidative phosphorylation enzymes are located in inner membrane. They are called powerhouses of cell because they produce energy in the form of ATP. They are the major centres of release of energy in the aerobic respiration.

10. **Assertion :** Plant cells have very large vacuoles.
Reason : In plant cells, vacuoles are full of cell sap.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Plant cells possess large vacuoles to perform functions like:
1. Storage of water, mineral etc.
2. Provide turgidity and rigidity to the cell, as it is filled with cell sap.