

Assignments in Science Class IX (Term I)

5

The Fundamental Unit of Life

IMPORTANT NOTES

1. At the structural level, all living organisms are composed of tiny living units called **cells**.
2. Organisms consisting of only one cell are called **unicellular organisms**. e.g. *Paramecium*, *Amoeba*, etc.
3. Organisms consisting of more than one (may be millions of cells) cell are known as **multicellular organisms**, e.g., plants and animals.
4. Though, cells are generally microscopic, some cells can also be seen with the naked eye, e.g., ostrich egg measuring about 170×150 mm.
5. Cell is the **structural and functional unit** of all living organisms.
6. The shape and size of cells are in fact related to the function they perform.
7. Cells are measured in **micrometers (mm)** sometimes called **microns (m)**.
8. The **smallest cell** is Mycoplasma having 0.1 micron diameter.
9. The **longest cell** is nerve cell, measuring about a metre in length.
10. Cells may be spherical, oval, elliptical, spindle shaped, cuboidal, polygonal, columnar or flat.
11. **J.E. Purkinje** coined the term 'protoplasm' – the **life-giving substance** present in the cell.
12. **Robert Hooke** discovered the basic unit of life '**cell**'.
13. **Schleiden** and **Schwann** proposed the cell theory in 1839.
14. Extremely thin, outer boundary of cytoplasm is **cell membrane**.
15. Cytoplasm contains different cell organelles like nucleus, mitochondria, endoplasmic reticulum, Golgi body, plastid, lysosome, ribosome, etc.
16. **Nucleus** is the most important part of a cell having control over all cellular activities.
17. Nuclear membrane, nuclear sap, nucleolus, chromatin, etc., are the parts of nucleus.
18. Animal cells lack cell wall and plastids.
19. Mitochondria are generally called the "Powerhouse of the cell".
20. Vacuole, surrounded by a single membrane, is called tonoplast.
21. Lysosomes containing powerful enzymes are called **digestive bags** or **suicidal bags**.
22. Centrosomes help in cell division.
23. Vacuoles provide turgidity and rigidity to the cells.
24. Protoplasm is the physical basis of life.
25. **Diffusion** is the movement of molecules of a substance (solid, liquid or gas) from a region of their higher concentration to the region of their lower concentration until they are spread out evenly.
26. **Osmosis** is the diffusion of a solvent, usually water, through a semi-permeable membrane from a dilute or weaker solution into a concentrated or stronger solution.
27. A **semi-permeable or partially permeable membrane** allows movement of solvent molecules but does not allow the movement of solute molecules.
28. **Endosmosis and exosmosis** : In cells, water molecules may diffuse into the cell or out of the cell, depending on whether the cells are kept in a weaker solution or a stronger solution respectively.
29. **Endosmosis (endo = inward)** is the inward diffusion of water when the surrounding solution is less concentrated. This brings about swelling of the cell.
30. **Exosmosis (exo = outward)** is the outward diffusion of water when the surrounding solution is more concentrated. This brings about shrinkage of the cell.
31. **Hypertonic (hyper = more or higher)** : The solution outside the cell has more concentration than the cell sap. If a cell is placed in such a solution, water will move out of the cell, i.e., exosmosis will take place. The protoplasm will, therefore, shrink.
32. **Hypotonic (hypo = less than or lower)** : The solution outside the cell is less concentrated than the cell sap. As a result, water will move into the cell, i.e., endosmosis takes place. The protoplasm will, therefore, increase in volume.

<p>33. Isotonic (iso = same) : The solution outside the cell has same concentration as that of the cell sap. If a cell is placed in such a solution, there is no diffusion of water. There will, thus, be no change in cell size.</p> <p>34. Turgid or turgidity : When a cell reaches a stage that it cannot accommodate any more water, it is fully distended. The cell at this stage is called turgid and the condition is called turgidity.</p> <p>35. Plasmolysis : The phenomenon of the loss of water from a plant cell by osmosis when</p>	<p>a cell is kept in a hypertonic solution so that the cytoplasm shrinks away from the cell wall is called plasmolysis.</p> <p>36. Osmoregulation is the control of the quantity of water entering and leaving the cells of an organism.</p> <p>37. When the food materials engulfed by an organism are solid, the process is called phagocytosis.</p> <p>38. When the food materials taken in by the organisms are liquid, the process is called pinocytosis.</p>
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ASSIGNMENTS FOR SUMMATIVE ASSESSMENT

I. VERY SHORT ANSWER QUESTIONS

(1 Mark)

OTHER IMPORTANT QUESTIONS

- Name the scientist who discovered cell.
- Name the outermost covering of animal cell.
- How does carbon dioxide or oxygen move across the cell membrane?
- Name any cell organelle which is non-membranous?
- Bacteria do not have chloroplast but some bacteria are photoautotrophic in nature and perform photosynthesis. Which part of bacterial cell performs this?
- How does *Amoeba* obtain its food?
- Which cell organelle controls most of the activities of the cell?
- Name the cell organelle which is known as packaging and dispatching unit of the cell.
- Which kind of plastid is more common in flowers and fruits?
- Give an example of semi-permeable membrane in a cell.
- Where is protein synthesised inside the cell?
- Name the substance by which plant cell wall is mainly composed of.
- Name the plant part which provides resistance to microbes to withstand hypotonic external media without bursting.
- Name the molecules containing the information necessary for constructing and organising cells.
- Why does rough endoplasmic reticulum look rough under microscope?
- Name the cell organelle which helps to keep the cell clear by digesting worn out cell organelles.
- What is the main function of vacuoles?
- Name the cell organelle which functions both as a passageway for intracellular transport and as a manufacturing surface.
- Name the cell organelle known as 'kitchen of the cell'.

II. SHORT ANSWER QUESTIONS – I

(2 Marks)

PREVIOUS YEARS' QUESTIONS

- What is DNA? Where is it found?
 - Name the functional segment of DNA.

[2010 (T-I)]
- List two similarities between mitochondria and plastids. [2010 (T-I)]
- Name the organelle that is referred to as the 'powerhouse of the cell'. Why is it called so? [2010 (T-I)]
- Mention any two functions of the endoplasmic reticulum. [2010 (T-I)]
- Give the functions of the following organelles in a cell. [2010 (T-I)]
 - Chloroplast
 - Nucleus
- Which cell organelle is called 'suicide bag of a cell'? Why? [2010 (T-I)]
- Write the names of two cell organelles that have their own DNA and ribosomes. [2010 (T-I)]

8. State any two reasons for plant cells to have large central vacuole. [2010 (T-I)]
9. (a) What is plasma membrane made up of?
(b) Name the process by which food and other substances enter through the plasma membrane. [2010 (T-I)]
10. What is endocytosis? Name an organism that feeds by this method. [2010 (T-I)]
11. Two Rheo peels were taken. One peel was put in a Petri dish containing cold water and the other was put in a Petri dish containing hot water. After a while both were transferred to hypertonic solutions. If the peels were observed under a microscope, will there be any difference in the observation of both the peels? Yes or No, give reasons for your answer. [2010 (T-I)]
12. (a) What would happen to the life of a cell if there was no Golgi apparatus?
- (b) Which cell organelle detoxifies poisons and drugs in liver of vertebrates? [2010 (T-I)]
13. State cell theory. Name the scientist who presented it. [2010 (T-I)]
14. What is plasmolysis? Give its one example. [2010 (T-I)]
15. What will happen to a plant cell if it is kept in a (i) hypotonic solution (ii) hypertonic solution. [2010 (T-I)]
16. Write two differences between plasma membrane and cell wall. [2010 (T-I)]
17. What are endocytosis? Give one example. [2010 (T-I)]
18. Name the scientist who first described Golgi apparatus. What is cisterns? [2010 (T-I)]
19. Give technical term for a medium which has exactly the same concentration as the cell? Why does the size of the cell remain the same when placed in such a solution? [2010 (T-I)]

OTHER IMPORTANT QUESTIONS

1. Name the two organelles in a plant cell that contain their own genetic material and ribosomes.
2. Why are lysosomes also known as “scavengers of the cells”?
3. How can mitochondria make their own protein?
4. Name the two nucleic acids present in the cell.
5. Which kind of plastid is more common in (a) roots of the plant
(b) leaves of the plant
6. Why do plant cells possess large sized vacuole?
7. A person takes concentrated solution of salt, after sometime, he starts vomiting. What is the phenomenon responsible for such a situation?
8. How do substances like carbon dioxide and water move in and out of the cell?

III. SHORT ANSWER QUESTIONS – II

(3 Marks)

PREVIOUS YEARS' QUESTIONS

1. Which cell organelles are called the power houses of the cell and why? Why is ATP called energy currency of the cell? [2010 (T-I)]
2. Draw a neat diagram of an animal cell and label on it the following : [2010 (T-I)]
Plasma membrane, Nucleus, Lysosome
3. List any three differences between prokaryotic cell and eukaryotic cell. [2010 (T-I)]
4. (a) Which substances are transported by blood?
(b) Draw any two types of white blood corpuscle [2010 (T-I)]
5. Draw a neat diagram of a plant cell. Label the following parts in the diagram :
(i) Cell wall (ii) Nucleus (iii) Chloroplast (iv) Vacuoles. [2010 (T-I)]

OTHER IMPORTANT QUESTIONS

1. Write the name of different plant parts in which chromoplast, chloroplast and leucoplast are present.
2. Do you agree that “A cell is a building unit of an organism”. If yes, explain why?
3. We eat food composed of all the nutrients like carbohydrates, proteins, fats, vitamins, minerals and water. After digestion, these are absorbed in the form of glucose, amino acids, fatty acids, glycerol, etc.
What mechanisms are involved in absorption of digested food and water?

4. If you are provided with some vegetables to cook. You generally add salt into the vegetables during cooking process. After adding salt, vegetables release water. What mechanism is responsible for this?
5. Why do plant cells possess large sized vacuole?
6. How are chromatin, chromatid and chromosomes related to each other?
7. What are the consequences of the following conditions?

- (a) A cell containing higher water concentration than the surrounding medium.
- (b) A cell having lower water concentration than the surrounding medium.
- (c) A cell having equal water concentration to its surrounding medium.
8. Name the organelles which show the analogy written as under
 - (a) Transporting channels of the cell
 - (b) Control room of the cell
 - (c) Digestive bag of the cell

IV. LONG ANSWER QUESTIONS

(5 Marks)

PREVIOUS YEARS' QUESTIONS

1. (a) Draw a neat diagram of a plant cell and label the following parts :
 - (i) Cell Wall.
 - (ii) Nucleus.
 - (iii) Vacuole.
 - (iv) Golgi apparatus.
 (b) Name the energy currency of the cell. Which cell organelle releases this currency?
[2010 (T-I)]
2. (a) What are lysosomes? Why are they called "suicide bags of a cell"?
 (b) What happens to the dry raisins when we put them in plain water for some time? State the reason for whatever is observed. What would happen if these raisins are not placed in concentrated salt solution? [2010 (T-I)]
3. (a) What is endoplasmic reticulum?
 (b) Describe its structure.
 (c) Name the two types of endoplasmic reticulum.
 (d) What crucial role does it play in the liver cells of vertebrates?
 (e) What is membrane biogenesis? [2010 (T-I)]
4. (a) What is a cell? Why is a cell called the structural and functional unit of life?
 (b) Why is the plasma membrane called a selectively permeable membrane?
[2010 (T-I)]
5. (a) Distinguish between chloroplast and leucoplast with respect to their pigments and function.
 (b) How would (i) a plant cell (ii) an animal cell behave when placed in a hypotonic

- solution of sodium chloride? Explain giving reasons.
[2010 (T-I)]
6. (a) List any three differences between a prokaryotic and a eukaryotic cell.
 (b) Write the composition of a chromosome. Name the part of a cell where it is formed.
[2010 (T-I)]
7. (a) Differentiate between :
 - (i) nucleus and nucleoid
 - (ii) plant cell and animal cell.
 (b) What is osmosis? [2010 (T-I)]
8. (a) List any six functions of nucleus of a cell.
 (b) What is stratified squamous epithelium? State its function.
[2010 (T-I)]
9. (a) Name the type of tissue whose cells are filled with fat globules. State its function.
 (b) Write in tabular form three differences between a plant cell and an animal cell.
[2010 (T-I)]
10. (a) Categorise plastids based on their colour and function.
 (b) Mention the strange similarity between plastids and mitochondria with reference to synthesis of their own materials? What do they synthesise?
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 (b) Mention the strange similarity between plastids and mitochondria with reference to synthesis of their own materials? What do they synthesise?
[2010 (T-I)]

12. (a) What is lacking in a virus which makes it dependent on a living cell to multiply?
 (b) Expand RER and SER. Differentiate between them in structure and function. [2010 (T-I)]
13. (a) Why organisms like bacteria are called 'Prokaryotes'?
 (b) In what way mitochondria and chloroplasts are different from other organelles present in a cell?

(c) Mention any two functions of vacuoles.

[2010 (T-I)]

14. Draw a well labelled diagram of an animal cell and label the following organelles :

- (a) The organelle that contains powerful digestive enzymes
 (b) The organelle that has its own DNA
 (c) The organelle that forms cytoplasmic framework
 (d) The organelle that helps in expelling excess water in *Amoeba*

[2010 (T-I)]

15. What is osmosis? What happens to a cell when it is placed in hypotonic, isotonic and hypertonic solutions respectively. State two points of differences between osmosis and diffusion. What is plasmolysis? [2010 (T-I)]

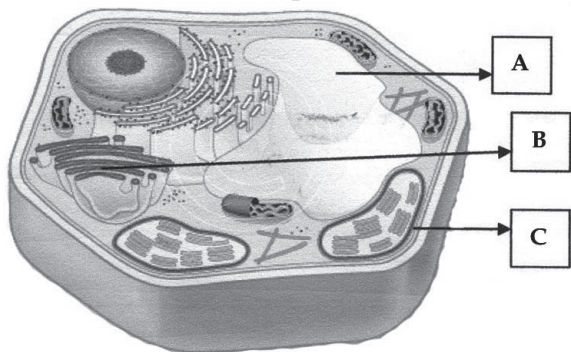
16. (a) In the diagram given below identify the parts marked B and C

(b) What are the substances that organelle A stores?

(c) Mention one function of organelle B and C.

(d) What are cisterns?

[2010 (T-I)]

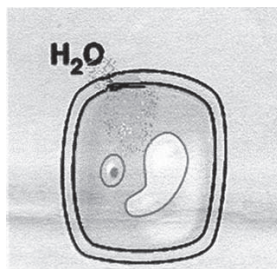


17. Observe the figure given below and answer the following questions :

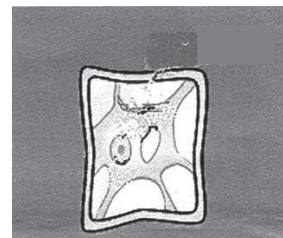
(a) What has happened to cell A and B? Explain.

(b) Identify the type of solution into which cell A and B are placed.

- (c) Name and explain the process that has taken place in cells A and B. [2010 (T-I)]



A



B

18. (a) Describe any three functions of Golgi apparatus.

(b) Name four components of phloem.

[2010 (T-I)]

19. (a) Draw a neat and labelled diagram of a prokaryotic cell.

(b) Differentiate between a prokaryotic and eukaryotic cell. (any 4 points of difference). [2010 (T-I)]

20. Describe an activity to demonstrate endosmosis and exosmosis. Draw a diagram also.

[2010 (T-I)]

21. (a) Give the chemical composition and functions of plasma membrane and cell wall. Differentiate between the two.

(b) What is meant by membrane biogenesis? Which cell organelle is concerned with membrane biogenesis? [2010 (T-I)]

22. (a) What role vacuoles play in a typical plant cell?

(b) What will happen if Golgi apparatus is removed from the cell?

(c) Why the inner membrane of mitochondria deeply folded? [2010 (T-I)]

23. (a) What is plasma membrane? Why is it called selectively permeable?

(b) How mitochondria and plastid different from other organelles of the cell?

(c) What role does the smooth endoplasmic reticulum play in the liver cells of vertebrates? [2010 (T-I)]

24. Draw an animal cell and label the following parts : mitochondria, rough endoplasmic reticulum, Golgi apparatus and cell membrane. [2010 (T-I)]

25. (a) Why mitochondria are known as the powerhouses of the cell. Explain?

(b) What are chromoplasts and leucoplast? Give an example of chromoplasts which has green pigment. [2010 (T-I)]

26. (a) Explain why chromosome is one of the chief component of a nucleus.
- (b) Which two organelles of a cell contain their own genetic material? What will happen if the organisation of a cell is destroyed due to some physical or chemical influence.
- [2010 (T-I)]
27. (a) How does smooth endoplasmic reticulum differ from rough endoplasmic reticulum. (2 points).

- (b) What do you understand by “membrane biogenesis”?
- (c) What are the two main functions of endoplasmic reticulum? [2010 (T-I)]
28. (a) Why does nuclear membrane have pores?
- (b) Why do chromosomes contain DNA in the nucleus?
- (c) Give two roles of nucleus in the cell.
- [2010 (T-I)]

ASSIGNMENTS FOR FORMATIVE ASSESSMENT

A. Activities

1. Objective

To study the different parts of simple microscope and learn how to use the simple (dissecting) microscope.

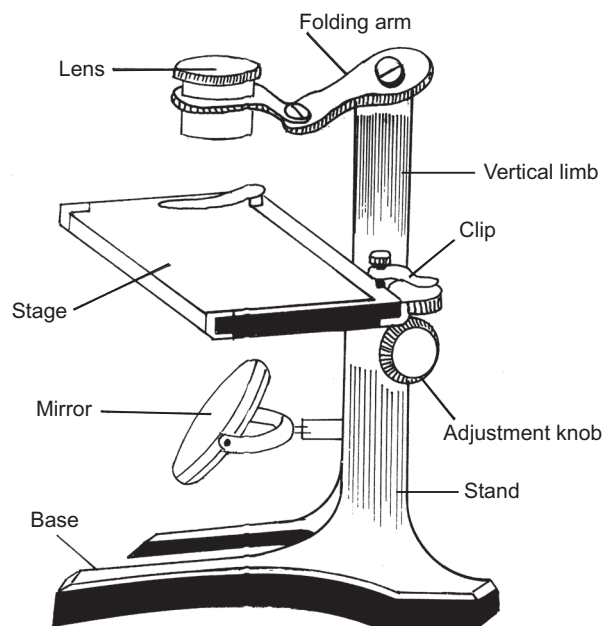
Materials Required

A simple (dissecting) microscope, permanent slides of plant or animal materials, parts of plants, a slide, forceps and a needle.

Description of Simple Microscope

A simple microscope consists of following parts :

- i. **Base :-** It is bifurcated, generally horse shoe shaped, made up of metal and supports the height of the microscope as a basal part.



- ii. **Stand :-** It is a hollow cylindrical rod shaped, short structure fixed to the base. At the upper

and another small cylindrical rod ‘Vertical’ limb fits into the stand. We can move the vertical limb up and down with the help of adjustment knob.

- iii. **Folding Arm :-** It is a flat horizontal folding arm attached to the upper end of vertical limb. It can be moved sideways.

- iv. **Stage :-** It is a glass plate rectangular in shape and fitted with a pair of clips on its upper surface. The slide or study material can be hold by these clips on the glass stage.

- v. **Mirror :-** A plano-concave mirror is attached to the stand below the stage. It is movable and reflects light into the stage.

- vi. **Lens :-** A simple convex lens i.e. eye piece is mounted on the folded arm. It may be with the magnification of 5x, 10x or 20x.

Procedure

- Clean the mirror, stage and lens with a silk cloth.
- Place a permanent slide on the stage.
- Adjust the mirror to get reflected light onto the object
- Adjust the microscope lens over the object to be observed.
- Rotate the adjustment knob to bring the clear focus.

Precautions

- Keep the microscope in its box after use.
- Always carry the microscope in an upright position.
- The microscope lens should not come in contact with the slide.

2. Objective

To study the different parts of compound microscope and learn how to handle the compound microscope.

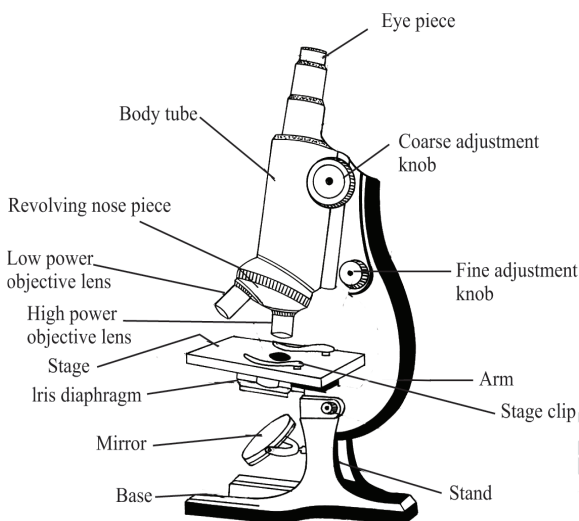
Materials Required

A compound microscope and a permanent slide.

Description of Compound Microscope

A compound microscope consists of the following parts.

- i. **Base :-** The basal part which is bifurcated and supports the weight of the microscope is known as base. A small stand is attached on it.



- ii. **Arm :-** It is curved and supports the body tube, coarse and fine adjustment knob, mirror and stage. The arm is used for holding the microscope.

- iii. **Body tube :-** It is a hollow tube attached to the upper end of arm. It has a metallic ring called nose piece at lower end and eye piece at the upper end. Usually two objective lenses low powered (10x) and high powered (40x) magnification are provided.

- iv. **Stage :-** It is a solid metallic rectangular platform attached to the lower end of the arm.

At its centre, there is a hole which allows light from the mirror to pass through it fall on mounted slide. A pair of clips attached on it are used to hold the slide.

- v. **Iris Diaphragm :-** Iris diaphragm is present below the stage and is used for adjusting the intensity of light.

- vi. **Adjustment knobs :-** There are two knobs. The coarse adjustment knob moves the body tube up and down for focusing the object. The fine adjustment knob moves the body tube up and down very slowly. Fine adjustment is very important for fine focusing of object in high power.

- vii. **Mirror :-** A plano-concave mirror is fitted below the stage. It reflects the light onto the slide or object.

- viii. **Eye piece :-** The upper end of body tube carries an eye piece of magnification 5x, 10x and 12.5x which is easily replaceable.

Procedure

- Place the microscope on the working table with the arm facing yourself.
- Clean the eye piece, objectives and the mirror with a soft and dry silk cloth.
- Rotate the nose-piece slowly and bring the low power objective in line with the body tube.
- Adjust the diaphragm for allowing optimum light onto the stage.
- Adjust the position of eye piece till the microscope field appears bright.
- Place the slide on the stage and move it to view the object on the slide.
- Move the body tube with the help of coarse adjustment knob and sharpen the focus with the help of fine adjustment knob.
- Turn the nose piece to high power objective and then use the fine adjustment knob to focus the object.

Precautions

- Keep the microscope in upright position.
- Do not use coarse adjustment when viewing through high power objective. The slide may break.
- Do not allow direct sun rays to strike the mirror. Use plane mirror for natural day light.

3. Objective

To study the phenomenon of osmosis.

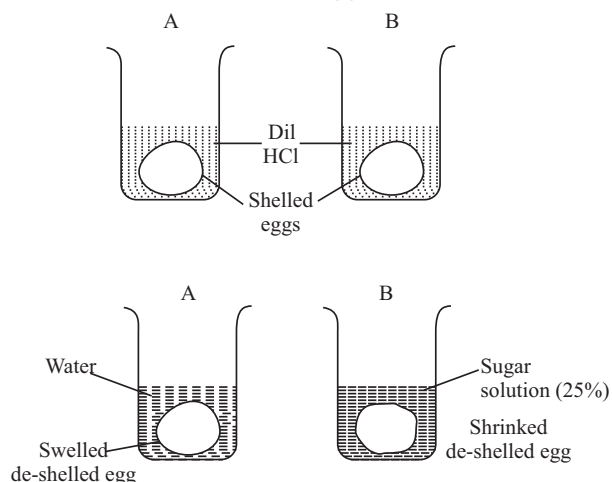
Materials Required

Two raw eggs, dil HCl, sugar solution (25% conc), beakers and Petri dishes.

Procedure

Place the two raw eggs in two separate beakers A and B containing dil. HCl. dil HCl dissolves the egg shells slowly.

- Drain off the acid from the beakers carefully and wash the eggs thoroughly with the water in the same beakers. Repeat this process several times till the HCl acid is completely removed and the eggs become de-shelled.



- Now fill beaker A with water and beaker B with conc (25%) sugar solution. Both the beakers have one de-shelled egg in each.
- Observe the de-shelled egg after four hours.

Observations

1. The de-shelled egg placed in beaker A containing water, swells.
2. The de-shelled egg placed in beaker B containing sugar solution, shrinks.

Conclusions

The de-shelled egg placed in water shows endosmosis because the concentration of water molecules outside the egg is much higher than concentration inside the egg. While the egg placed in sugar solution shows exosmosis because the concentration of water molecules outside the egg is lower than the concentration of water molecules inside the egg.

Precautions

- Extra care should be taken to prevent the damage of egg membrane.
- Use dil. HCl only lest the egg membrane gets damaged.

4. Objective

To study Plasmolysis in leaf epidermal peels of *Rhoeo* or *Tradescantia*.

Materials Required

Compound microscope, fresh leaves of *Rhoeo* or *Tradescantia*, sugar solution (10%), a new razor blade, slide, coverslip, needle, forceps, brush, and a piece of blotting paper.

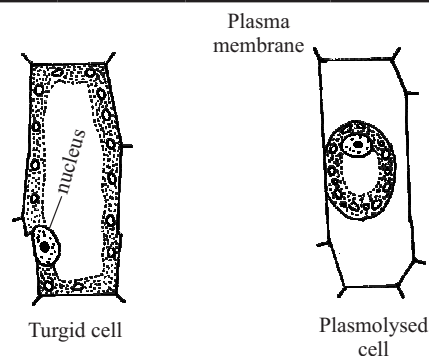
Procedure

Take out 3 or 4 small peels from the lower epidermis of leaf of *Rhoeo* or *Tradescantia* with the help of a new razor blade.

- Place one peel in a drop of water on a slide, cover it with a coverslip and observe under the low power of microscope.
- Count about 20 cells and note down the number of turgid cells and number of plasmolysed cells.
- Remove the cover slip and add 4-5 drops of sugar solution on the peel.
- After 5 minutes cover the peel with cover slip. Remove the excess solution with the help of blotting paper. Observe the peel under the low power of microscope.
- Again count about 20 cells and note down the number of turgid cells and number of plasmolysed cells.

Observations

Peel	No. of cells counted	Number of turgid cells	Number of plasmolysed cells
Peel in water			
Peel in sugar solution			










Conclusion

When the leaf peel was kept in water, most of the cells were in turgid condition but when the same leaf peel was placed in sugar solution which was hypertonic in compare to cell sap, the cells become plasmolysed or shrinked. It is due to the process of exosmosis.

B. Quiz

Identify and name the different types of cells given in the table.

1.		
2.		
3.		
4.		
5.		
6.		
7.		

C. Puzzle

Find out the name of different parts (6) of a eukaryotic cell from the given table vertically, horizontally and diagonally. Write down the names in the space provided.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

D. Group Activity

1. Divide the class into two groups. Give dissecting (simple) microscope to group A and a compound microscope to group B. Ask each group to observe the permanent slides of different parts of a flower. Then exchange the microscopes, observe and ask the differences in their observations.
2. Ask the students to prepare a chart showing different parts of animal and plant cells. They can compare the organelles of these two cells.

E. Seminar

Topic : Structural Organisation of a cell :

Hints :- The teacher can organise a seminar and ask the students to include the following points :

1. The functions of outermost covering.
2. Role of nucleus
3. Effect of different types of solutions on the cytoplasm
4. Functions of different organelles.

F. Debate

Topic : Are the eukaryotic cells derived from prokaryotic cells?

G. Group Discussion

[Hints :- The teacher can divide the class into groups of 8-10 students and can allot a topic to each group.

1. Importance of vacuoles
2. Lysosomes help to keep the cell clean
3. Nucleoid in bacterial cells.

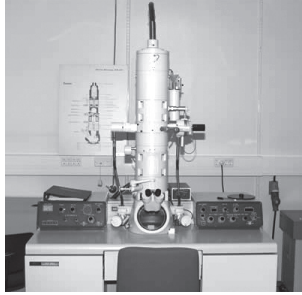
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Y	B	N	H	R	M	Y	K	P	L
T	Q	U	N	I	K	S	E	J	N
O	H	C	R	B	J	M	G	V	B
P	N	L	J	O	O	P	A	L	V
L	P	E	O	S	V	L	P	C	F
A	D	U	O	O	V	Q	N	E	R
S	Z	S	Y	M	R	N	L	P	N
M	Y	S	P	E	L	P	R	D	O
L	C	V	A	C	U	O	L	E	Z

H. Project

Objective

To find out about electron microscope

- An electron microscope is a type of microscope that produces an electronically magnified image of a specimen for detailed observation.



- The electron microscope uses a particle beam of electron to illuminate the specimen and create a magnified image of it.
- The electron microscope has a greater resolving power than a light powered optical microscope.
- It uses electrostatic and electromagnetic lenses to control the electron beam and focus it to form an image.
- The german engineers Ernst Ruska and Max Knoll constructed the prototype electron microscope, capable of 400x magnification, in 1931.
- In 1933, Ruska constructed an electron microscope that exceeded the resolution attainable with an optical (lens) microscope.

Class IX Chapter 5 – The Fundamental Unit of Life Science

Question 1:

Who discovered cells and how?

Answer:

Cells were discovered in 1665 by an English Botanist, Robert Hooke. He used a primitive microscope to observe cells in a cork slice.

Question 2:

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

Answer:

Cells constitute various components of plants and animals. A cell is the smallest unit of life and is capable of all living functions. Cells are the building blocks of life. This is the reason why cells are referred to as the basic structural and functional units of life. All cells vary in their shape, size, and activity they perform. In fact, the shape and size of the cell is related to the specific functions they perform.

How do substances like CO_2 and water move in and out of the cell? Discuss.

Answer:

The cell membrane is selectively permeable and regulates the movement of substances in and out of the cell.

Movement of CO_2 :

CO_2 is produced during cellular respiration. Therefore, it is present in high concentrations inside the cell. This CO_2 must be excreted out of the cell. In the cell's external environment, the concentration of CO_2 is low as compared to that inside the cell. Therefore, according to the principle of diffusion, CO_2 moves from a region of higher concentration (inside the cell) towards a region of lower concentration (outside the cell). Similarly, O_2 enters the cell by the process of diffusion when the concentration of O_2 inside the cell is low as compared to its surroundings.

Movement of water:

Water moves from a region of high concentration to a region of low concentration through the plasma membrane. The plasma membrane acts as a semi-permeable membrane, and this movement of water is known as osmosis. However, the movement of water across the plasma membrane of the cell is affected by the amount of substance dissolved in water.

Question 2:

Why is the plasma membrane called a selectively permeable membrane?

Answer:

The cell membrane or the plasma membrane is known as a selectively permeable membrane because it regulates the movement of substances in and out of the cell. This means that the plasma membrane allows the entry of only some substances and prevents the movement of some other materials.

4.	Membrane-bound cell organelles are absent	4.	
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Fill in the gaps in the following table illustrating differences between prokaryotic and eukaryotic cells.

	Prokaryotic cell		Eukaryotic cell
1.	Size: generally small (1-10 μm) $1 \mu\text{m} = 10^{-6} \text{ m}$	1.	Size: generally large (5-100 μm)

Answer:

	Prokaryotic cell		Eukaryotic cell
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2.	Nuclear region: _____ and is known as _____.	2.	Nuclear region: well-defined and surrounded by a nuclear membrane
3.	Chromosome: single	3.	More than one chromosome

1.	Size: generally small (1-10 μm) $1 \mu\text{m} = 10^{-6} \text{ m}$	1.	Size: generally large (5-100 μm)
2.	Nuclear region: <u>poorly defined because of the absence of a nuclear membrane,</u> and is known as <u>nucleoid</u>	2.	Nuclear region: well-defined and surrounded by a nuclear membrane
3.	Chromosome: single	3.	More than one chromosome
4.	Membrane-bound cell organelles are absent	4.	<u>Membrane-bound cell organelles such as mitochondria, plastids, etc., are present</u>

Can you name the two organelles we have studied that contain their own genetic material?

Answer:

Mitochondria and plastids are the two organelles that contain their own genetic material.

Both these organelles have their own DNA and ribosomes.

Question 2:

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

Answer:

Cell is the smallest unit of life, which is capable of all living functions. If the organisation of a cell is destroyed due to some physical or chemical influence, then the ability of the cell to perform all living functions such as respiration, nutrition, excretion, etc. would be affected.

Question 3:

Why are lysosomes known as suicide bags?

Answer:

Lysosomes are membrane-bound vesicular structures that contain powerful digestive enzymes. These enzymes are capable of breaking down any foreign food particle or microbes entering the cell. Sometimes, lysosomes can cause self-destruction of a cell by releasing these digestive enzymes within the cells. Hence, they are also known as 'suicidal bags'.

Question 4:

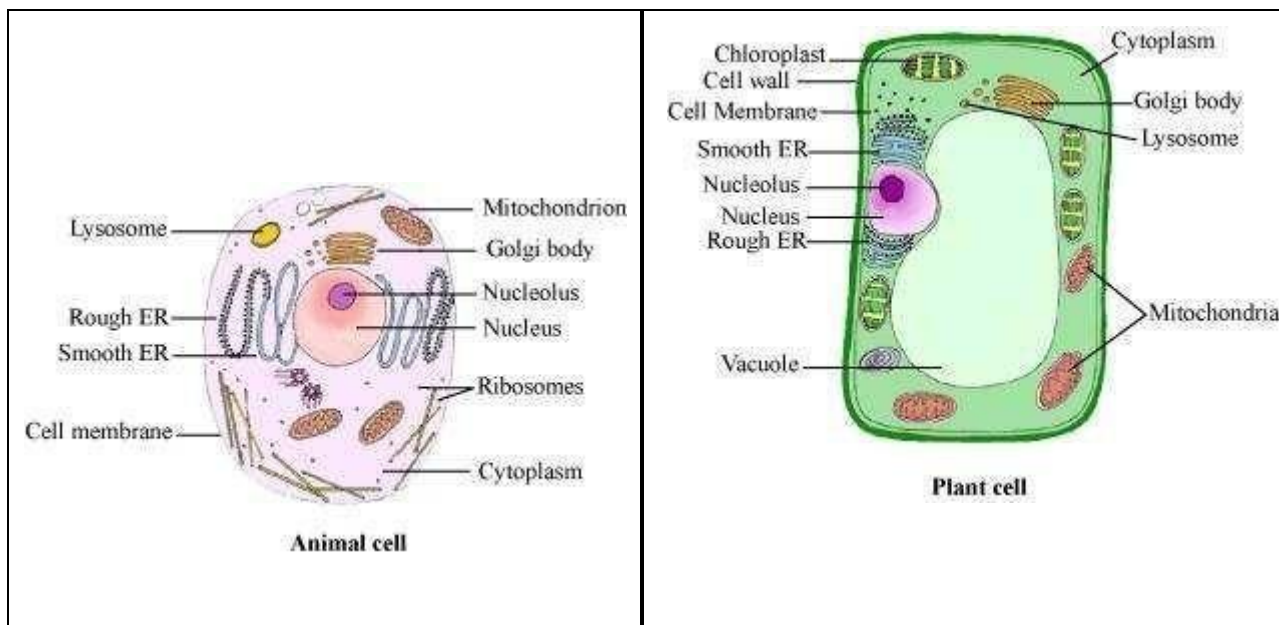
Where are proteins synthesized inside the cell?

Answer:

Ribosomes are the site for protein synthesis. Ribosomes are very small structures found either in a free state, suspended in the cytoplasm, or attached to the surface of the endoplasmic reticulum. They are composed of ribonucleic acids and proteins. Make a comparison and write down ways in which plant cells are different from animal cells.

Answer:

Animal cell	Plant cell
Animal cells are generally small in size.	Plants cells are usually larger than animal cells.
Cell wall is absent.	Cell wall is present.
Except the protozoan Euglena, no animal cell possesses plastids.	Plastids (chromoplasts and leucoplasts) are present.
Vacuoles are smaller in size.	Vacuoles are larger in size.



Question 2:

How is a prokaryotic cell different from a eukaryotic cell?

Answer:

Prokaryotic cell	Eukaryotic cell
Most prokaryotic cells are unicellular.	Most eukaryotic cells are multicellular.
Size of the cell is generally small (0.5- 5 μm).	Size of the cell is generally large (50- 100 μm).
Nuclear region is poorly defined due to the absence of a nuclear membrane or the cell lacks true nucleus.	Nuclear region is well-defined and is surrounded by a nuclear membrane, or true nucleus bound by a nuclear membrane is present in the cell.
It contains a single chromosome.	It contains more than one chromosome.
Nucleolus is absent.	Nucleolus is present.
Membrane-bound cell organelles such as plastids, mitochondria, endoplasmic reticulum, Golgi apparatus, etc. are absent.	Cell organelles such as mitochondria, plastids, endoplasmic reticulum, Golgi apparatus, lysosomes, etc. are present.
Cell division occurs only by mitosis.	Cell division occurs by mitosis and meiosis.
Prokaryotic cells are found in bacteria and blue-green algae.	Eukaryotic cells are found in fungi, plants, and animal cells.

Question 3:

What would happen if the plasma membrane ruptures or breaks down?

Answer:

If the plasma membrane of a cell is ruptured, then the cell will die. The plasma membrane regulates the movement of substances in and out of the cell by diffusion or osmosis. Thus, if the plasma membrane is ruptured, then the cell might leak out its contents.

Question 4:

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

Answer:

If there was no Golgi apparatus in the cell, then most activities performed by the Golgi apparatus will not take place.

(i) Membranes of the Golgi apparatus are often connected to ER membranes. It collects simpler molecules and combines them to make more complex molecules. These are then packaged in small vesicles and are either stored in the cell or sent out as per the requirement. Thus, if the Golgi apparatus is absent in the cell, then the above process of storage, modification, and packaging of products will not be possible.

(ii) The formation of complex sugars from simple sugars will not be possible as this takes place with the help of enzymes present in Golgi bodies.

(iii) The Golgi apparatus is involved in the formation of lysosomes or peroxisomes. Thus, if the Golgi body is absent in a cell, the synthesis of lysosomes or peroxisomes will not be possible in the cell.

Question 5:

Which organelle is known as the powerhouse of the cell? Why?

Answer:

Mitochondria are known as the powerhouse of cells. Mitochondria create energy for the cell, and this process of creating energy for the cell is known as cellular respiration. Most chemical reactions involved in cellular respiration occur in the mitochondria. The energy required for various chemical activities needed for life is released by the mitochondria in the form of ATP (Adenosine triphosphate) molecules.

For this reason, mitochondria are known as the powerhouse of cells.

Question 6:

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

Answer:

Lipids and proteins constituting the cell membrane are synthesized in the endoplasmic reticulum.

SER (Smooth endoplasmic reticulum) helps in the manufacturing of lipids.

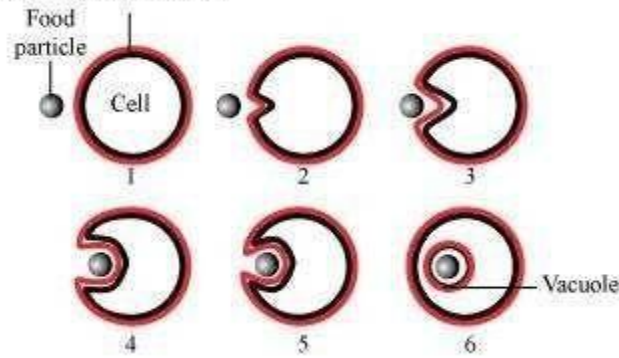
RER (Rough endoplasmic reticulum) has particles attached to its surface, called ribosomes. These ribosomes are the site for protein synthesis.

Question 7:

How does an Amoeba obtain its food?

Answer:

Amoeba obtains its food through the process of endocytosis. The flexibility of the cell membrane enables the cell to engulf the solid particles of food and other materials from its external environment.



Cell engulfing food particle

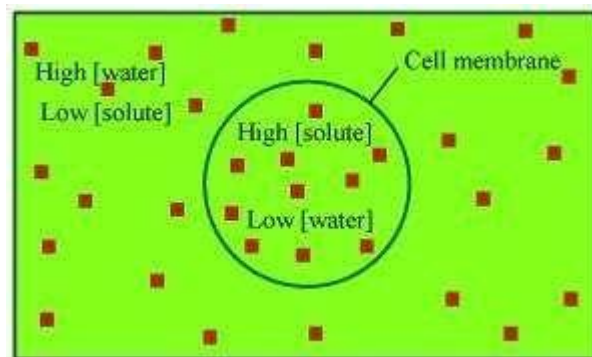
Question 8:

What is osmosis?

Answer:

The movement of water molecules from a region of high concentration to a region of low concentration through a selectively permeable membrane is called osmosis. It is a special case of diffusion, where the medium is water.

For example, if the medium surrounding the cell has a higher water concentration than the cell i.e., if the solution is a dilute solution, then the cell will gain water by osmosis.



Movement of water inside the cell Question 9:

Carry out the following osmosis experiment:

Take four peeled potato halves and scoop each one out to make potato cups. One of these potato cups should be made from a boiled potato. Put each potato cup in a trough containing water. Now,

- (a) Keep cup A empty
- (b) Put one teaspoon sugar in cup B
- (c) Put one teaspoon salt in cup C
- (d) Put one teaspoon sugar in the boiled potato cup D.

Keep these for two hours. Then observe the four potato cups and answer the following:

- (i) Explain why water gathers in the hollowed portion of B and C.
- (ii) Why is potato A necessary for this experiment?
- (iii) Explain why water does not gather in the hollowed out portions of A and D.

Answer Discussion

Experimental set up

(i) Water gathers in the hollowed portions of set-up B and C because water enters the potato as a result of osmosis. Since the medium surrounding the cell has a higher water concentration than the cell, the water moves inside by osmosis. Hence, water gathers in the hollowed portions of the potato cup.

(ii) Potato A in the experiment acts as a control set-up. No water gathers in the hollowed portions of potato A.

(iii) Water does not gather in the hollowed portions of potato A because potato cup A is empty. It is a control set-up in the experiment.

Water is not able to enter potato D because the potato used here is boiled. Boiling denatures the proteins present in the cell membrane and thus, disrupts the cell membrane. For osmosis, a semi-permeable membrane is required, which is disrupted in this case. Therefore, osmosis will not occur. Hence, water does not enter the boiled potato cup.