Class 9 Science Chapter 2: Cell: The Building Block of Life - Notes, Important Questions and MCQs (2026-27)

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These Class 9 Science Chapter 2 notes cover “Cell: The Building Block of Life” from the new NCERT textbook Exploration (2026-27): how cells are studied, the cell membrane and cell wall, cell organelles, plastids, cell division (mitosis and meiosis), the cell theory and how cancer cells differ from normal cells – with tables, Q&A, 10 MCQs and a free PDF.

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Chapter Overview

The cell is the basic structural and functional unit of all living organisms. Most cells are too small to see with the unaided eye, whose limit of resolution is about 0.1 mm at 25 cm, so we use microscopes. Robert Hooke first observed cells in 1665 in a thin slice of cork.

Cells have a cell membrane, cytoplasm and genetic material. Eukaryotic cells have a well-defined nucleus and membrane-bound organelles that work together like a coordinated system. Cells grow and divide by mitosis and meiosis, and normally die in a controlled way – when this control fails, cancer can develop.

Important Topics and Concepts

How to Study Cells

- Limit of resolution of the human eye ≈ 0.1 mm (two points closer than this look like one).
- Light microscopes use an objective lens and an eyepiece to magnify; electron microscopes show much finer detail (organelles, viruses).
- Robert Hooke (1665) saw box-like compartments in cork with a self-made microscope (about 200–300× magnification) and called them cells.

Cell Membrane and Cell Wall

- Cell membrane (plasma membrane): thin boundary around every cell, made of lipids and proteins; it is selectively permeable.
- Water moves across the membrane by osmosis – from higher to lower water concentration. A cell in pure water swells; in concentrated salt solution it shrinks.
- Cell wall: an extra rigid covering outside the membrane in plants, fungi and bacteria; in plants it is mainly cellulose and is freely permeable, giving strength against wind and rain.

Prokaryotic and Eukaryotic Cells

- Prokaryotic cells (bacteria): no well-defined nucleus; genetic material lies in a region called the nucleoid; no membrane-bound organelles.
- Eukaryotic cells: larger, with a nucleus bounded by a nuclear membrane and many membrane-bound organelles.
- The nucleus contains chromosomes made of DNA and proteins, which carry genetic information and control cell activities.

Cell Organelles

- Endoplasmic reticulum (ER): network of membranes; rough ER has ribosomes (protein synthesis), smooth ER makes lipids.
- Ribosomes: sites of protein synthesis.
- Golgi apparatus: packs, modifies and stores materials received from the ER and dispatches them.
- Mitochondria: site of cellular respiration – release energy; have their own DNA.
- Lysosomes: digestive sacs that break down foreign material and worn-out parts.
- Vacuoles: storage; large central vacuole in plant cells gives rigidity.
- Plastids (plants only): chloroplasts (green, photosynthesis, have DNA), chromoplasts (coloured pigments in flowers and fruits), leucoplasts (colourless, store starch, oils, proteins – found even in roots).

Cell Division and Cell Theory

- Mitosis: one parent cell → two genetically identical daughter cells; used for growth, repair and asexual reproduction.
- Meiosis: occurs only in reproductive organs (testes, ovaries, anthers); two successive divisions give four daughter cells with half the chromosome number; creates variation.
- Cell theory: Schleiden (1838) – all plants are made of cells; Schwann (1839) – all animals are made of cells; Virchow (1855) – all cells arise from pre-existing cells.

- Normal cells grow, function and die in a controlled way; cancer cells divide uncontrollably, forming tumours (benign or malignant) that can spread.
- Haberlandt (1902): plant cells are totipotent – any living plant cell can grow into a whole plant – the basis of plant tissue culture.

Comparison Tables

Frequently asked differences.

Feature	Plant cell	Animal cell
Cell wall	Present (cellulose)	Absent
Plastids	Present	Absent
Vacuole	One large central	Small, many or absent
Shape	Usually regular	Often irregular
Lysosomes	Rare	Common

Mitosis vs Meiosis

Mitosis	Meiosis
One division	Two successive divisions
2 daughter cells	4 daughter cells
Same chromosome number as parent	Half the chromosome number
Identical cells	Genetically varied cells
Body cells: growth, repair	Reproductive organs: gametes

Organelles and Functions at a Glance

Organelle	Function
Nucleus	Controls all activities; contains DNA
Mitochondria	Cellular respiration (energy)
Ribosomes	Protein synthesis
Rough ER / Smooth ER	Protein transport / lipid synthesis
Golgi apparatus	Packaging and storage of materials
Lysosomes	Digestion of foreign agents and worn-out parts
Chloroplast	Photosynthesis (food)
Vacuole	Storage, rigidity in plant cells
Cell membrane	Separates cell contents; selective permeability
Cell wall	Rigidity and protection

Important Definitions and Terms

Term	Meaning
Cell	Basic structural and functional unit of life
Limit of resolution	Smallest separation at which two points look distinct (eye ≈ 0.1 mm)
Selectively permeable	Allows some substances to pass but not others
Osmosis	Movement of water across a selectively permeable membrane from higher to lower water concentration
Nucleoid	Region with genetic material in prokaryotic cells
Plastids	Organelles in plant cells: chloroplasts, chromoplasts, leucoplasts
Mitosis	Division giving two identical daughter cells
Meiosis	Division giving four cells with half the chromosomes
Totipotency	Ability of a plant cell to develop into a whole plant

Short Answer Questions

Q1. Who first observed cells and how?

Robert Hooke in 1665, by looking at a thin slice of cork through a self-designed microscope; he saw box-like compartments and named them cells.

Q2. Differentiate between cell membrane and cell wall based on permeability.

The cell membrane is selectively permeable; the cell wall is freely permeable.

Q3. What happens when an animal cell is placed in pure water and in concentrated salt solution?

In pure water it swells as water enters by osmosis; in concentrated salt solution it shrinks as water moves out.

Q4. Why are lysosomes called digestive sacs?

They contain digestive enzymes that break down foreign agents and worn-out cell parts.

Q5. Which organelles contain their own DNA?

Nucleus, mitochondria and chloroplasts.

Q6. Do plant roots contain plastids? Justify.

Yes. Roots lack chloroplasts but contain leucoplasts, which store starch; so plastids are present in all parts of the plant.

Q7. What would happen if all mitochondria were removed from a eukaryotic cell?

The cell could not carry out cellular respiration to release enough energy, so its activities would stop and it would die.

Q8. What is totipotency?

The ability of a living plant cell to develop into a complete plant under suitable conditions, proposed by Haberlandt in 1902.

Long Answer Questions

Q1. Compare mitochondria and chloroplasts.

Both are double-membrane organelles with their own DNA and ribosomes.

Mitochondria release energy by cellular respiration; chloroplasts make food by photosynthesis.

Mitochondria are found in almost all eukaryotic cells; chloroplasts only in green plant cells.

Chloroplasts contain the green pigment chlorophyll; mitochondria do not.

Both are involved in energy transformation in the cell.

Q2. State the cell theory and name the scientists who contributed to it.

All living organisms are made up of one or more cells.

The cell is the basic structural and functional unit of life.

All cells arise from pre-existing cells.

Schleiden (1838) – plants; Schwann (1839) – animals.

Virchow (1855) – cells arise from pre-existing cells.

Q3. Explain the carrot experiment: one carrot in plain water and one in concentrated salt solution.

Hypothesis: water moves into or out of cells depending on the surrounding solution (osmosis).

In plain water, water enters the carrot cells, they become turgid, so the carrot stays stiff and crunchy.

In salt solution, water leaves the cells, they lose turgor, so the carrot becomes rubbery and limp.

Improvement: use equal-sized pieces, measure mass before and after, and repeat with controls.

This is the same principle used to preserve pickles with salt or sugar.

MCQs with Answers

1. The limit of resolution of the human eye is about(a) 0.01 mm (b) 0.1 mm (c) 1 mm (d) 1 cmAnswer: (b) 0.1 mm

2. Which organelle is the site of cellular respiration?(a) Ribosome (b) Mitochondrion (c) Golgi apparatus (d) LysosomeAnswer: (b) Mitochondrion

3. Prokaryotic cells lack(a) cell membrane (b) genetic material (c) a well-defined nucleus (d) cytoplasmAnswer: (c) a well-defined nucleus

4. Protein synthesis occurs in(a) lysosomes (b) ribosomes (c) vacuoles (d) Golgi bodiesAnswer: (b) ribosomes

5. Colourless plastids that store starch are(a) chloroplasts (b) chromoplasts (c) leucoplasts (d) mitochondriaAnswer: (c) leucoplasts

6. Meiosis produces(a) 2 identical cells (b) 4 cells with half the chromosomes (c) 4 identical cells (d) 1 cellAnswer: (b) 4 cells with half the chromosomes

8. A cell placed in concentrated salt solution will(a) swell (b) shrink (c) burst (d) stay the sameAnswer: (b) shrink

9. Which pair contains DNA?(a) Chloroplast, ribosome (b) Mitochondria, nucleus (c) Golgi body, ribosome (d) Nucleus, lysosomeAnswer: (b) Mitochondria, nucleus

10. Cell wall is present in cells of(a) animals only (b) plants, fungi and bacteria (c) humans (d) all organismsAnswer: (b) plants, fungi and bacteria

Quick Revision Points

- Cell = basic unit of life; Hooke 1665 (cork).
- Eye resolution ≈ 0.1 mm → microscopes needed.
- Membrane selectively permeable; wall freely permeable.
- Prokaryotes: nucleoid, no membrane organelles.
- Organelles: nucleus, ER, ribosome, Golgi, mitochondria, lysosome, vacuole, plastids.
- Mitosis (2 identical) vs meiosis (4, half chromosomes).
- Cell theory: Schleiden, Schwann, Virchow.
- Cancer = uncontrolled division; totipotency = Haberlandt.

Chapter Summary

The cell is the basic structural and functional unit of life. Prokaryotic cells have a nucleoid and no membrane-bound organelles, while eukaryotic cells have a nucleus and organelles such as ER, ribosomes, Golgi apparatus, mitochondria, lysosomes, vacuoles and, in plants, plastids. All cells have a selectively permeable membrane; plants, fungi and bacteria also have a cell wall.

Cells multiply by mitosis (two identical cells for growth and repair) and meiosis (four cells with half the chromosomes for reproduction). The cell theory states that all organisms are made of cells that arise from pre-existing cells. Normal cells grow and die in a controlled way, while cancer cells divide uncontrollably.

Exam Tips and PYQ Pattern

- Organelle–function matching and diagram labelling are very common.
- Learn the osmosis examples (cell in water/salt, carrot, potato cups).
- Practise difference questions: membrane vs wall, plant vs animal cell, mitosis vs meiosis.
- Remember which organelles have DNA.
- Expect a case-based question on preservation with salt or sugar.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the new NCERT Class 9 Science textbook “Exploration” (first edition 2026), prescribed for the 2026-27 session.

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What is the cell theory?

All organisms are made of cells, the cell is the basic unit of life, and all cells arise from pre-existing cells.

What is the difference between mitosis and meiosis?

Mitosis gives two identical cells; meiosis gives four cells with half the chromosome number.

Conclusion

Cell: The Building Block of Life is the foundation for the whole biology section. Learn the organelle table, practise the differences and osmosis experiments here, and save the free PDF for revision.

More Notes: Class 9 Science Chapter 1: Exploration: Entering the World of Secondary Science notes | Class 9 Science Chapter 3: Tissues in Action notes | All Class 9 Science notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE science educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 9 Science textbook, Exploration (First Edition 2026, NCF-SE 2023), and the CBSE syllabus for the 2026-27 session. Last checked on 17 November 2026.