

Cell as a structural and functional unit of life

Lesson Plan | Grade 9 | Science

CBSE

Cell as a structural and functional unit of life

Class 9

Science

- Time allowed: 90 minutes
- Maximum marks: 40

General Instructions

- This question paper consists of 18 questions in five sections: A, B, C, D, and E.
- Section A has 6 Multiple Choice Questions (MCQs) of 1 mark each.
- Section B has 3 Very Short Answer (VSA) questions of 2 marks each.
- Section C has 3 Short Answer (SA) questions of 3 marks each.
- Section D has 2 Long Answer (LA) questions of 4 marks each.
- Section E has 4 Case-based questions of 3 marks each. There is no overall choice. However, internal choices have been provided in some questions. You have to attempt only one of the alternatives in all such questions.

Blueprint

Section	Question type	Questions	Marks each	Total
Section A	Multiple Choice Questions (MCQ)	6	1	6
Section B	Very Short Answer (VSA)	3	2	6
Section C	Short Answer (SA)	3	3	9
Section D	Long Answer (LA)	2	4	8
Section E	Case-based Questions	4	3	12

Section A (1 mark each)

Questions 1 to 6 are Multiple Choice Questions (MCQs) of 1 mark each.

1. Which of the following is known as the 'powerhouse of the cell'? **[1]**
 - Nucleus
 - Mitochondria
 - Chloroplast
 - Vacuole
2. The outermost boundary of an animal cell is: **[1]**
 - Cell wall
 - Plasma membrane
 - Cytoplasm
 - Nucleus
3. Which cell organelle is responsible for synthesizing lipids and proteins for the cell membrane? **[1]**
 - Ribosomes
 - Mitochondria
 - Endoplasmic Reticulum
 - Golgi apparatus
4. What is the primary function of the cell wall in plant cells? **[1]**
 - Photosynthesis
 - Providing structural support and protection
 - Energy production
 - Storing water and nutrients
5. Prokaryotic cells lack which of the following? **[1]**
 - Genetic material
 - Plasma membrane
 - Nucleus
 - Ribosomes
6. The process by which a cell takes in substances from its external environment is called: **[1]**
 - Osmosis
 - Diffusion
 - Endocytosis
 - Exocytosis

Section B (2 marks each)

Questions 7 to 9 are Very Short Answer (VSA) questions of 2 marks each.

7. Define osmosis. How is it different from diffusion? **[2]**
8. Name two types of meristematic tissues found in plants and state one function for each. **[2]**
9. List two differences between a prokaryotic cell and a eukaryotic cell. **[2]**

Section C (3 marks each)

Questions 10 to 12 are Short Answer (SA) questions of 3 marks each.

10. Explain the role of the plasma membrane in maintaining the cell's internal environment. **[3]**
11. Describe the structure and function of mitochondria. **[3]**

OR Distinguish between plant and animal cells based on any three features.

12. Why are lysosomes known as 'suicidal bags' of the cell? ****[3]****

Section D (4 marks each)

Questions 13 and 14 are Long Answer (LA) questions of 4 marks each.

13. Draw a well-labelled diagram of a plant cell and label any four organelles. **[4]**
14. Describe the different types of epithelial tissues found in animals and mention where they are located. (Any two types) **[4]**

OR Explain the process of fertilisation in flowering plants.

Section E (3 marks each)

Questions 15 to 18 are Case-based questions of 3 marks each.

15. Read the following passage and answer the questions that follow:

Cells are the basic structural and functional units of all living organisms. They exhibit a wide variety of shapes and sizes depending on their functions. All cells have a plasma membrane, cytoplasm, and genetic material. However, the organisation of these components varies between prokaryotic and eukaryotic cells. Eukaryotic cells have a well-defined nucleus and membrane-bound organelles, while prokaryotic cells lack these features.

- 15.1. Name one organism that has prokaryotic cells. (1 mark)
- 15.2. Mention two key differences in the internal organisation of prokaryotic and eukaryotic cells. (2 marks) **[3]**

16. Read the following passage and answer the questions that follow:

Plant tissues are broadly classified into meristematic and permanent tissues. Meristematic tissues are responsible for growth and are found in actively dividing regions. Permanent tissues are derived from meristematic tissues and have lost the ability to divide. They are further classified into simple and complex permanent tissues.

16.1. Where are apical meristematic tissues located? (1 mark)

16.2. Name one type of simple permanent tissue and state its function. (2 marks) **[3]**

17. Read the following passage and answer the questions that follow:

Reproduction is a fundamental characteristic of all living organisms, ensuring the continuity of species. It can be broadly classified into asexual and sexual reproduction. Asexual reproduction involves a single parent and produces genetically identical offspring. Sexual reproduction typically involves two parents and leads to offspring with genetic variation.

17.1. Give an example of an organism that reproduces asexually by budding. (1 mark)

17.2. Why is genetic variation considered an advantage in sexual reproduction? (2 marks) **[3]**

18. Read the following passage and answer the questions that follow:

The human female reproductive system is designed to produce eggs, facilitate fertilisation, and support the development of an embryo. It includes ovaries, fallopian tubes, uterus, and vagina. The menstrual cycle is a monthly series of changes a woman's body goes through in preparation for the possibility of pregnancy.

18.1. Name the site of fertilisation in the human female reproductive system. (1 mark)

18.2. Briefly explain the role of the uterus in human reproduction. (2 marks) **[3]**

Marking Scheme

- **1:** B. Mitochondria _(1 mark for correct option)_
- **2:** B. Plasma membrane _(1 mark for correct option)_
- **3:** C. Endoplasmic Reticulum _(1 mark for correct option)_
- **4:** B. Providing structural support and protection _(1 mark for correct option)_
- **5:** C. Nucleus _(1 mark for correct option)_
- **6:** C. Endocytosis _(1 mark for correct option)_
- **7:** Osmosis: The movement of water molecules from a region of higher water concentration to a region of lower water concentration through a semi-permeable membrane. (1 mark)
Diffusion: Movement of particles (solutes, gases) from a region of higher concentration to a region of lower concentration. Osmosis specifically deals with water movement across a semi-permeable membrane, while diffusion can occur with any particles and does not necessarily require a membrane. (1 mark) _(1 mark for defining osmosis, 1 mark for differentiating from diffusion)_
- **8:** 1. Apical meristem: Found at the tips of stems and roots; responsible for increase in length. (1 mark)
- 2. Lateral meristem (cambium): Found in the bark region; responsible for increase in girth/thickness. (1 mark)
(Any two types with one function each) _(1 mark for each type and its function)_
- **9:** Prokaryotic cell: No true nucleus, lacks membrane-bound organelles. (1 mark)
Eukaryotic cell: Possesses a true nucleus, contains membrane-bound organelles. (1 mark) _(1 mark for each difference)_
- **10:** The plasma membrane is selectively permeable, regulating the entry and exit of substances into and out of the cell. (1.5 marks) This selective nature helps maintain a stable internal environment by controlling the movement of ions, nutrients, and waste products. (1.5 marks) _(1.5 marks for selective permeability, 1.5 marks for maintaining internal environment)_
- **11:** Mitochondria are oval or rod-shaped organelles. They have two membranes: an outer smooth membrane and an inner membrane folded into cristae. (1.5 marks) Their function is to carry out cellular respiration to produce ATP (adenosine triphosphate), which is the energy currency of the cell. Hence, they are known as the 'powerhouse of the cell'. (1.5 marks) _(1.5 marks for structure, 1.5 marks for function OR
Plant cell: Has a cell wall, large central vacuole, plastids (e.g., chloroplasts). (1 mark each for 3 features, total 3 marks)
Animal cell: Lacks a cell wall, has small vacuoles or none, lacks plastids. (Corresponding differences for 3 features))_
- **12:** Lysosomes contain powerful digestive enzymes capable of breaking down organic material. (1.5 marks) When a cell is damaged or dies, lysosomes burst and the enzymes digest their own cell, leading to the cell's destruction. This is why they are called 'suicidal bags'. (1.5 marks) _(1.5 marks for containing digestive enzymes, 1.5 marks for self-digestion)_
- **13:** A well-labelled diagram of a plant cell with at least four organelles correctly labelled (e.g., Cell wall, Plasma membrane, Nucleus, Vacuole, Chloroplast, Mitochondria). (1 mark for drawing, 3 marks for 4 labels) _(1 mark for drawing, 0.75 marks for each of 4 correct labels)_
- **14:** 1. Squamous epithelium: Thin, flat, and delicate lining cells. Location: Lining of blood vessels, lung alveoli. (2 marks)

2. Cuboidal epithelium: Cube-shaped cells. Location: Lining of kidney tubules, ducts of salivary glands. (2 marks)
3. Columnar epithelium: Tall and pillar-like cells. Location: Inner lining of intestine, respiratory tract. (Any two types with location and brief description for 2 marks each)

OR

Fertilisation in flowering plants involves the fusion of male gametes (from pollen grain) with the female gamete (egg cell) within the ovule. (1 mark)

Pollen grain lands on the stigma, germinates to form a pollen tube. (1 mark)

The pollen tube grows through the style and enters the ovule, where it releases male gametes. (1 mark)

One male gamete fuses with the egg cell to form the zygote, and another male gamete fuses with the central cell to form endosperm. (1 mark) *(2 marks for each type of epithelial tissue (description + location) OR 1 mark for each correct step in fertilisation)*

- ****15.1:**** Bacteria / Cyanobacteria (Blue-green algae) *_(1 mark for correct organism)_*
- ****15.2:**** Prokaryotic cells lack a true nucleus and membrane-bound organelles. Eukaryotic cells possess a true nucleus and membrane-bound organelles. (1 mark for each difference) *_(1 mark for nucleus difference, 1 mark for membrane-bound organelles difference)_*
- ****16.1:**** At the tips of stems and roots. *_(1 mark for correct location)_*
- ****16.2:**** Parenchyma: stores food, provides support, and performs photosynthesis in some cases. (1 mark for type, 1 mark for function)

OR

Collenchyma: provides flexibility and mechanical support to plants. (1 mark for type, 1 mark for function)

OR

Sclerenchyma: provides strength and rigidity to the plant. (1 mark for type, 1 mark for function) *_(1 mark for type of tissue, 1 mark for function)_*

- ****17.1:**** Yeast / Hydra *_(1 mark for correct organism)_*
- ****17.2:**** Genetic variation allows offspring to have different traits, which can help them adapt better to changing environmental conditions and increases the chances of species survival over time. (2 marks) *_(2 marks for explanation of adaptation/survival)_*
- ****18.1:**** Fallopian tube (or Oviduct) *_(1 mark for correct site)_*
- ****18.2:**** The uterus is where the fertilised egg (zygote) implants and develops into an embryo and then a fetus during pregnancy. It provides protection and nourishment to the developing baby. (2 marks) *_(1 mark for implantation, 1 mark for development/nourishment)_*