1 Cell: The Unit of Life

1. Within an animal cell, the most abundant inorganic constituent of protoplasm is *[2014-I]*
   (a) sodium and potassium salt
   (b) water
   (c) iron
   (d) phosphate
2. The site of cellular respiration in animal cells is *[2014-I]*
   (a) ribosome
   (b) mitochondria
   (c) endoplasmic reticulum
   (d) lysosome
3. Growth and repair of damaged tissue involve *[2014-II]*
   (a) mitotic cell division only
   (b) both mitotic and meiotic cells divisions
   (c) meiotic cell division only
   (d) amitotic cell division only
4. **Statement I:** *Amoeba* is a unicellular organism and the single cell performs all functions of a living organism.
   Statement II: Cell is the fundamental unit of living organism. *[2014-II]*
   (a) Both the statements are individually true and Statement-II is the correct explanation of Statement-I.
   (b) Both the statements are individually true, but Statement-II is ***not*** the correct explanation of Statement-I.
   (c) Statement-I is true, but Statement-II is false.
   (d) Statement-I is false, but Statement-II is true.
5. Which one of the following is the smallest unit showing the properties of life such as capacity for metabolism, response to the environment, growth and reproduction ? *[2015-I]*
   (a) Gene (b) Chromosome
   (c) Nucleus (d) Cell
6. Which one of the following is not an example of eukaryotic organism? *[2015-II]*
   (a) Yeast (b) Bacteria
   (c) Plant (d) Human being
7. Cell wall of any fungus is different from plants in having *[2017-I]*
   (a) cellulose (b) chitin
   (c) cholesterol (d) glycogen
8. Which one of the following is an organelle that is NOT found in prokaryotic cells? *[2018-I]*
   (a) Cell wall (b) Mitochondria
   (c) Plasma membrane (d) Ribosome
9. Who among the following first discovered cell? *[2018-I]*
   (a) Robert Brown (b) Robert Hooke
   (c) Leeuwenhoek (d) Rudolf Virchow
10. Which one of the following groups of cellular organelles contains DNA? *[2018-II]*
    (a) Mitochondria, nucleus, chloroplast
    (b) Mitochondria. Golgi bodies, nucleus
    (c) Mitochondria, plasma membrane, nucleus
    (d) Chloroplast, nucleus, ribosomes
11. One of the additional functions of Smooth Endoplasmic Reticulum (SER) is *[2018-II]*
    (a) protein synthesis
    (b) lipid synthesis
    (c) storage of biomolecules
    (d) detoxification of toxic substances
12. Which one of the following cell organelles does NOT possess nucleic acid? *[2019-I]*
    (a) Nucleolus (b) Chloroplast
    (c) Ribosome (d) Plasma Membrane
13. Which one of the following cell organelles does NOT possess its own genetic material encoding proteins ? **[2019-I]**
    (a) Ribosome (b) Nucleus
    (c) Mitochondria (d) Chloroplast
14. Which one of the following organelles of mammalian cells is rich in hydrolytic enzymes? *[2019-I]*
    (a) Mitochondria (b) Ribosomes
    (c) Lysosome (d) Nucleus
15. Net movement of water from a dilute to a concentrated solution through a selectively permeable membrane is called *[2019-II]*
    (a) Diffusion (b) Dispersion
    (c) Osmosis (d) Absorption
16. Mitochondria are able to produce their own *[2019-II]*
    (a) Hydrolytic enzymes (b) Proteins
    (c) Chloroplasts (d) Digestive enzymes
17. Which one of the following cell organelles may play a role in expelling excess water and wastes in case of unicellular organisms'? *[2020-I]*
    (a) Lysosome (b) Vacuole
    (c) Golgi body (d) Endoplasmic reticulum

18. In prokaryotic organisms, the nuclear region is not surrounded by a membrane. This undefined nuclear region is known as *[2020-I]*

(*a*) Nucleic acid (*b*) Nucleoid
(*c*) Nucleolus (*d*) Nucleosome

19. Movement of materials to different parts of cytoplasm and nucleus is generally carried out by *[2021-I]*

(*a*) Ribosomes (*b*) Mitochondria
(*c*) Lysosomes (*d*) Endoplasmic reticulum

20. In mitochondria, ATP synthesising chemical reactions take place in the *[2021-I]*

(*a*) outer membrane (*b*) matrix
(*c*) inner membrane (*d*) DNA of mitochondria

21. If human blood is placed in a 2% detergent solution, what will happen to the RBC? *[2021-I]*

(*a*) The RBC will shrink.
(*b*) The RBC will swell and become turgid.
(*c*) The RBC will swell and burst.
(*d*) The RBC will lyse.

22. Which one of the following plant plastids stores starch, oil and protein granules? *[2022-I]*

(*a*) Chloroplast (*b*) Leucoplast
(*c*) Chromoplast (*d*) Xanthoplast

23. Which one of the following statements about 'vacuoles' is not correct? *[2022-I]*

(*a*) In plants, there is a large central vacuole that may occupy 90% of total cell volume.
(*b*) In plant cells, vacuoles provide turgidity and rigidity.
(*c*) In *Amoeba*, vacuoles have role in nutrition.
(*d*) Vacuoles are absent in animal cells.

24. A cell is unable to synthesize lipids. Which of its cell organelles might be defective? *[2022-I]*

(*a*) Smooth endoplasmic reticulum
(*b*) Golgi bodies
(*c*) Lysosomes
(*d*) Mitochondria

25. Which one of the following statements about animal cells and plant cells is correct? *[2022-II]*

(*a*) Animal cells have only cell membrane not cell wall, whereas plant cells have only cell wall not cell membrane.
(*b*) Animal cells have only cell membrane not cell wall, but plant cells have both.
(*c*) Both animal and plant cells have cell membrane and cell wall.
(*d*) Only some cells of animals have cell wall and all plant cells have cell membrane.

26. Which one of the following will be resulted when an animal cell is surrounded by a medium with lower concentration of water? *[2022-II]*

(*a*) Cell will lose water
(*b*) No change in movement of water
(*c*) Cell will gain water
(*d*) Cell will swell up

27. The digestive enzymes are present in *[2022-II]*

(*a*) mitochondria (*b*) vacuoles
(*c*) lysosomes (*d*) ribosomes

28. Which one of the following structures or components is ***not*** always present in living cells? *[2023-I]*

(*a*) Cell wall (*b*) Plasma membrane
(*c*) Cytoplasm (*d*) Genetic material

29. Consider the following statements regarding cell wall composition: *[2023-I]*

1. Bacterial cell wall is made of peptidoglycan.
2. Fungal cell wall is made of cellulose.
3. Animals lack cell wall and have extracellular matrix made up of sugar and proteins.

Select the correct answer using the code given below:

(*a*) 2 only (*b*) 1 and 2 only
(*c*) 1 and 3 only (*d*) 1, 2 and 3

30. Which one of the following structures is ***not*** present in a prokaryotic cell? *[2023-I]*

(*a*) Cell wall (*b*) Ribosomes
(*c*) Nucleus (*d*) Plasma membrane

31. In a plant cell, which one of the following contains their own DNA? *[2023-I]*

(*a*) Nucleus and Endoplasmic Reticulum
(*b*) Ribosome and Golgi apparatus
(*c*) Mitochondria and Chloroplast
(*d*) Chloroplast and Vacuoles

32. During a laboratory experiment, a student immerses epidermal leaf peel in a hypertonic solution. After some time, the student examined the cells under a microscope and observed that: *[2023-I]*

(*a*) the cells swelled.
(*b*) the cells were plasmolysed.
(*c*) the cells built up turgor pressure.
(*d*) the cells size was unaffected.

33. The two important features of sexual reproduction in higher organisms that create genetic diversity in offspring are *[2023-II]*

(*a*) Mitosis and fertilization (*b*) Meiosis and fertilization
(*c*) Mitosis and binary fission (*d*) Meiosis and conjugation

34. Eukaryotic cells are much more complex as compared to prokaryotes. Which one of the following structures is exclusively present in a eukaryotic cell? *[2023-II]*

(*a*) Cell wall (*b*) Plasma membrane
(*c*) Nucleic acid (*d*) Mitochondria

35. In a sexually reproducing organism, which one of the following statements is appropriate both for the parent and offspring ? *[2023-II]*

(*a*) Chromosome number increases but DNA content remains constant
(*b*) Both chromosome number and DNA content remains constant
(*c*) Chromosome number decreases but DNA content remains constant
(*d*) Both chromosome number and DNA content decreases

36. Which of the following statements regarding animal cell membrane is correct? *[2024-I]*

(*a*) They are composed of phospholipids only.
(*b*) They are composed of proteins only.
(*c*) They are composed of phospholipids and proteins only.
(*d*) They are composed of phospholipids, proteins and cholesterol (lipid).

37. Which of the following is ***not*** a part of compound microscope? ***[2024-I]***

(*a*) Mirror (*b*) Stage
(*c*) Clip (*d*) Retina

38. Consider the following statements: ***[2024-I]***

1. DNA replication takes place when chromatin is opened up.
2. Chromatin organises itself into rod-shaped chromosomes before cell division.
3. Both prokaryotes and eukaryotes have the same process for cell division.

Which of the statements given above is/are correct?

(*a*) 1 only (*b*) 1 and 2 only
(*c*) 1,2 and 3 (*d*) 3 only

39. In most prokaryotes, the chromosome number is: ***[2024-I]***

(*a*) 4 (*b*) 3 (*c*) 2 (*d*) 1

40. Bacterial DNA is referred to as naked because it is ***not*** associated with: ***[2024-I]***

(*a*) any scaffold (*b*) proteins
(*c*) ribozymes (*d*) plasmid

ANSWER KEY

1. (*b*)	**2.** (*b*)	**3.** (*a*)	**4.** (*a*)	**5.** (*d*)	**6.** (*b*)	**7.** (*b*)	**8.** (*b*)	**9.** (*b*)	**10.** (*a*)
11. (*d*)	**12.** (*d*)	**13.** (*a*)	**14.** (*c*)	**15.** (*c*)	**16.** (*b*)	**17.** (*b*)	**18.** (*b*)	**19.** (*d*)	**20.** (*c*)
21. (*a*)	**22.** (*b*)	**23.** (*d*)	**24.** (*a*)	**25.** (*b*)	**26.** (*a*)	**27.** (*c*)	**28.** (*a*)	**29.** (*c*)	**30.** (*c*)
31. (*c*)	**32.** (*b*)	**33.** (*b*)	**34.** (*d*)	**35.** (*b*)	**36.** (*d*)	**37.** (*d*)	**38.** (*b*)	**39.** (*d*)	**40.** (*b*)

EXPLANATIONS

1. (*b*) The most abundant inorganic constituent of protoplasm in an animal cell is water. Water constitutes about 70-90% of the cell's protoplasm.

2. (*b*) Mitochondria are the powerhouse of the cell, where cellular respiration occurs to produce ATP, the energy currency of the cell. Ribosomes are involved in protein synthesis, the endoplasmic reticulum assists in protein and lipid processing, and lysosomes contain digestive enzymes that break down waste and unwanted materials inside cells.

3. (*a*) Growth and repair of damaged tissue require mitotic cell division, which produces identical cells, ensuring the replacement of damaged or dead cells. Meiotic cell division generates gametes for reproduction and is not involved in tissue repair. Amitotic cell division is not a standard process in complex organisms.

4. (*a*) *Amoeba*, a unicellular organism, conducts all life processes within a single cell, illustrating that the cell is the fundamental unit of life.

5. (*d*) The smallest unit showing properties of life, such as metabolism, response to the environment, growth, and reproduction, is the cell. Unlike genes, chromosomes, or nuclei, which are components within cells, the cell itself is a complete unit capable of independently performing all necessary life processes.

6. (*b*) Bacteria are prokaryotic organisms, lacking a nucleus and membrane-bound organelles. Yeast, humans, and plants are eukaryotic, having a defined nucleus and organelles within their cells.

7. (*b*) The cell wall of fungi contains chitin, unlike plant cell walls, which have cellulose. Chitin provides structural support and rigidity to the fungal cell wall.

8. (*b*) Prokaryotes lack membrane-bound organelles, including mitochondria. Instead, they perform cellular respiration in the cytoplasm or across the plasma membrane. Conversely, cell walls, plasma membranes, and ribosomes are found in prokaryotic cells.

9. (*b*) Robert Hooke first discovered cells in 1665 while examining cork under his microscope. He observed the structure of cork resembling a honeycomb and coined the term "cells," referring to the small compartments he saw.

10. (*a*) Mitochondria, nucleus, and chloroplasts contain DNA, crucial for their functions.

11. (*d*) The Smooth Endoplasmic Reticulum (SER) is primarily involved in lipid synthesis and also helps in the detoxification of toxic substances from the body.

12. (*d*) The plasma membrane is a semi-permeable barrier that surrounds the cell and separates its internal environment from the external environment. It is composed of a lipid bilayer with embedded proteins but does not possess nucleic acid. The other options, nucleolus, chloroplast, and ribosome, all possess nucleic acid:

Nucleolus: The nucleolus is a substructure within the cell nucleus responsible for the synthesis of ribosomal RNA (rRNA), which is a type of nucleic acid.

Chloroplast: Chloroplasts are organelles found in plant cells and some algae, and they are involved in photosynthesis. They contain their own DNA, which is a type of nucleic acid.

Ribosome: Ribosomes are cellular structures responsible for protein synthesis. They contain ribosomal RNA (rRNA) and ribosomal proteins.

13. (*a*) Ribosomes do not possess their own genetic material encoding proteins. Ribosomes are cellular structures responsible for protein synthesis, but they do not contain DNA or any genetic material. Instead, they are composed of ribosomal RNA (rRNA) and ribosomal proteins,

both of which are produced using genetic information from the cell's nucleus. The ribosomes read the genetic code provided by the nucleus to assemble proteins during the process of translation.

14. (*c*) The hydrolytic enzymes are prevalent in the lysosomes of the mammalian cell as it only uses the enzymes for the purpose of digestion of carbohydrates,proteins, lipids etc. They are also known as suicidal bag of cells because of having the capacity of destroying the cell.

The hydrolytic enzymes include various enzymes for the digestion of macronutrients and are as follows: lipases,hydrolases, proteases etc.

15. (*c*) The flow of solvent from dilute solution to the concentrated solution across a semipermeable membrane is due to osmosis.

16. (*b*) The ability to make their own proteins exists in mitochondria.

They have their own ribosomes and DNA, which explains this.

17. (*b*) Vacuoles, especially the contractile vacuoles take part in osmoregulation and excretion in unicellular organisms.

Vacuoles help to maintain the shape and rigidity of the cell. They protect a cell from absorbing excess water and maintain the osmotic pressure of a cell.

Vacuoles help in the removal of wastes such as ammonia from the cell. Ammonia which is soluble in water is excreted along with excess water.

Hence, the correct option is (*b*) i.e, Vacuole

18. (*b*) In prokaryotic cells, the nucleus is not defined properly because it is not surrounded by a nuclear membrane.

Most of the genetic material is present in nucleoids.

Hence, the Correct option is (*b*) i.e., nucleoid

19. (*d*) Endoplasmic reticulum is a membrane bound cell organelle that serve as a channels for the transport of materials between various regions of the cytoplasm or between the cytoplasm and the nucleus. It is also involved in protein and lipid synthesis.

20. (*c*) ATP synthesising chemical reaction in mitochondria takes place in inner-mitochondrial membrane. It contains the ATP synthesis complex or oxysome or F_1-particles which are the site of Electron Transportation System (ETS) of aerobic cellular respiration.

21. (*a*) Detergent solution is a hypertonic solution, if human blood is placed in it, then the RBCs found in blood will shrink due to exosmosis, i.e. movement of water from its higher concentration (RBC) to lower concentration (Detergent solution) through cell membrane of RBCs.

22. (*b*) Leucoplasts are a group of plastids that include many differentiated colourless organelles with very different functions, e.g., the amyloplasts (act as a storage site for starch in non-green tissues such as roots, tubers, or seeds), elaioplasts (specialised in oil synthesis and storage) and the aleuroplast (responsible for storage of proteins).

23. (*d*) Vacuoles are also present in animal cells. In animal cells, vacuoles are generally smaller and help sequester waste products. In the plant cells, it mainly helps in maintaining the water balance.

24. (*a*) The smooth ER is important in the synthesis of lipids, such as cholesterol and phospholipids, which form the membranes of the organism. In addition it is also important for the synthesis and secretion of steroid hormones.

25. (*b*) Plant cells are characterised by the presence of a rigid cell wall made up of cellulose. Animal cells do not contain cell wall. Cell membrane is present in both animal and plant cells.

26. (*a*) If the medium has a lower concentration of water than the cell, i.e., it is a very concentrated solution, the cell will lose water by osmosis.

27. (*c*) Lysosomes are small single membrane-bound vesicles that contain digestive or hydrolytic enzymes. The important enzymes include acid phosphatases, glycosidases, proteases and sulfatases.

28. (*a*) All living cells contain nucleus and cytoplasm. Nucleus contains the genetic material of the cell. Cytoplasm in the cell is enclosed by a plasma membrane. Cell wall is the non-living covering to plant cell so, it is not always present in living cell as animal cell lack cell wall.

29. (*c*) Fungal cell wall is made up of chitin.

30. (*c*) Prokaryotes are single-celled micro-organisms, in which true nucleus and membrane-bound organelles are absent. The genetic material in prokaryotic cell is located in an area with an irregular form called a nucleoid, which is a nucleus like structure.

31. (*c*) Within the plant cell, the mitochondria and chloroplast have their own DNA and ribosomes because of which they are able to synthesize their own proteins and replicate independent of the nucleus.

32. (*b*) When a student immerses epidermal leaf peel in a hypertonic solution, then after some time the cells would be plasmolysed as water moves out of the cell and the cell membrane of a plant cell shrinks away from its cell wall.

33. (*b*) Sexual reproduction has the potential to produce tremendous genetic variation in offspring. This variation is due to independent assortment and crossing-over during meiosis and random union of gametes during fertilization. Meiosis is a process where a single cell divides twice to produce four cells containing half the original amount of genetic information. These cells are our sex cells - sperm in males, eggs in females. Fertilization is the process of fusion of male and female gametes to form a new cell (zygote).

34. (*d*) In prokaryotes, beside the absence of a defined nuclear region, the membrane-bound cell organelles are also absent. On the other hand, the eukaryotic cells have nuclear membrane as well as membrane-enclosed organelles. So, prokaryotes lack mitochondria (powerhouse of the cell). Mitochondria are double membrane-bound organelles present in almost all eukaryotic cells.

35. (*b*) The number of chromosomes remain constant in sexually reproducing organisms because meiosis reduces the number of chromosomes in gametes to half, ensuring that the number of chromosomes in a species remains constant. Fertilization of egg and sperm restores the number of chromosomes in the zygote (46 or 23 pairs).

The amount of DNA is maintained in each generation by a specialized mode of cell division called meiosis which produces specialized male and female germ cells called gametes which are haploid. One male and female gamete fertilize to give rise to a diploid zygote which has the same chromosome number as the parent.

36. (*d*) The cell membrane includes phospholipids, proteins and cholesterol. This composition ensures the structural stability and functionality of the cell.

37. (*d*) The retina is part of the human eye, not the compound microscope. A compound microscope consists of components that assist in viewing small objects, such as the mirror (for directing light), the stage (where the specimen is placed), and the clip (to hold the slide in place).

38. (*b*) DNA replication involves the opening up of the chromatin to allow the replication machinery access to the DNA. Before cell division, chromatin condenses into rod-shaped chromosomes to ensure proper distribution of genetic material. However, cell division differs between prokaryotes, which use binary fission, and eukaryotes, which can undergo mitosis or meiosis.

39. (*d*) Prokaryotes generally have a single, circular chromosome that contains all their genetic information.

40. (*b*) Bacterial DNA is referred to as naked because it is not associated with histone proteins and absence of nuclear envelope around it.