Chapter - 8 Cell: The Unit of Life

Question-1

Who proposed the cell theory? Give its postulates.

Solution:

In the year 1938-1939 two German biologists, Schleiden and Schwann proposed the cell theory.

Postulates of Cell Theory

(i) All living things are made of cells and cell products.

(ii) The cell is the structural and functional unit of all living organisms.

(iii) All the metabolic reactions in living things take place within the cell.

Question-2

Explain the ways of flow of information in a cell.

Solution:

The cell is a very complex and specialized structure. It takes part in many biological activities.
There are two ways of flow of information in cells. They are,

(i) intrinsic information and

(ii) extrinsic information

The intrinsic genetic information is contained in DNA within the cell that bring about its control on cellular activities through transcription and translation. This is how proteins are synthesized. The extrinsic information is through hormones.

Question-3

What are the main functions of the cell wall?

Solution:

The main functions of the cell wall are listed below:

(i) It provides a definite shape to the cell.

(ii) It protects the inner contents of the cell.

(iii) It allows the transport of various substances to and from the cell.

(iv) It prevents the cell contents from drying up.

Question-4

Distinguish between the prokaryotic and eukaryotic cells.

Solution:

Following are the differences between a prokaryotic and eukaryotic cell

Prokaryotic cell	Eukaryotic cell
(i) A cell wall formed of amino sugars is present.	(i) A cell wall formed of cellulose is present in plant cells.
(ii) Endoplasmic reticulum, golgi complex, mitochondria, lysosomes, vacuoles and ribosomes are absent.	(ii) Endoplasmic reticulum, golgi complex, mitochondria, lysosomes, vacuoles and ribosomes are present.
(iii) Chromosomes formed of DNA are present in the cytoplasm.	(iii) Chromosomes formed of DNA are present in the nuclear membrane.
(iv) Chromosomes are not enclosed in a nuclear membrane.	(iv) Chromosomes are enclosed in a nuclear membrane.
(v) Nucleoli are absent.	(v) Nucleoli are present.
(vi) Axial filaments are absent.	(vi) Axial filaments are present.

Question-5

What are the advantages of muti-cellularity?

Solution:

The advantages of multi-cellularity are as follows :-

(i) As a result of multi cellularity, division of labor occurs in the body of an organism.

(ii) As a result of division of labor, tissue formation takes place.

(iii) Tissues perform only specialized functions for which they are meant and no other function.

(iv) Tissues form organs and organs form organ systems.

(v) The various organ systems work in coordination for the benefit of the multi cellular organisms.

(vi) It is because of multi cellularity that big organisms grow.

(vii) The body works very efficiently only because of division of labour.

Question-6

What are the differentiated cells?

Solution:

The differentiated cells are the post-mitotic cells, which have undergone specialization. They may show division of labour. These cells perform a specific function. For example, the muscle cells perform movement in animals. In plants, the mesophyll cells are involved in the synthesis of food by photosynthesis. Red blood corpuscles in man transport oxygen and carbon dioxide in the body.

Question-7

What is tissue culture and what are the major applications of the tissue culture technique?

Solution:

Tissue culture is a technique in which plant cells, tissues and organs are first isolated, taken out of the plant body and then made to grow in a suitable medium, which must be sterile with the correct pH and containing all the necessary micro, macro nutrients and growth hormones.

The tissue culture technique has five important steps. They are

(i) Isolation of cell.

(ii) Growing the cells in an aseptic medium.

(iii) A suitable container for the culture to grow.

(iv) An artificial nutrient medium, supplies nutrients for the culture to grow.

(v) All these to be done under experimental conditions.

Applications of Tissue Culture Technique

(i) For the rapid multiplication of plants with desirable characters.

(ii) Production of disease-free plants.

(iii) It is useful in the control of fertilization, parthenocarpy, shortening of breeding cycles, genetical plant hybridization, etc.

Question-8

State the three types of cells in an organism on the basis of levels of organisation.

Solution:

The three types of cells in an organism on the basis of levels of organization are,

(a) undifferentiated cells

(b) differentiated cells and

(c) dedifferentiated cells.

Question-9

Distinguish between cell wall and cell membrane.

Solution:

The differences between cell wall and cell membrane are as follows:

Cell wall	Cell membrane
(i) Present in plant cells exclusively.	(i) Present predominantly in animal cells.
(ii) Made up of cellulose.	(ii) Made up of protein, fat and water.
(iii) Thick and tough in nature.	(iii) Extremely thin and elastic in nature.
(iv) It is not selectively permeable.	(iv) It is selectively permeable.

Question-10

How do unicellular organisms adapt to maintain their continuity without division of labour? Explain briefly.

Solution:

In unicellular organisms there is no division of labour. The single cell of the organism is capable of performing all the vital activities of life like such as respiration, movement, digestion, reproduction, etc. Respiration, nutrition and excretion in most of these unicellular organisms take place through the general body surface. No special organs are present in them. Most of these unicellular organisms reproduce by simple division, to maintain their continuity. However, in some, sexual reproduction has also been observed.

Question-11

Name the two-cell organelle other than nucleus in which DNA is found.

Solution:

Mitochondria and chloroplast are the other two-cell organelles in which DNA is found.

Question-12

Which organelle is responsible for increasing the surface area of absorption in a cell?

Solution:

The endoplasmic reticulum is responsible for increasing the surface area of absorption in a cell.

Question-13

What are dedifferentiated cells?

Solution:

Dedifferentiated cells are the differentiated cells, which are capable of reverting back to the undifferentiated meristematic stage. These cells are essential for secondary growth. In animals they are needed for wound healing.

Question-14

Define totipotency.

Solution:

Every vegetative cell has the capacity to develop into a full plant. This potential of a cell is called the totipotency of the cell.

Question-15

What is the unit measurement in cytology?

Solution:

The unit measurement in cytology is Angstrom, which is symbolized by A^{o}.

Question-16

How are organisms graded?

Solution:

Organisms are graded into two categories. They are unicellular and multicellular. The unicellular organisms are made up of only one cell. The multicellular organisms are made up of a large number of cells. Amoeba, Euglena and Chlamydomonas are the examples of unicellular organisms. Man and whale are examples of multicellular organisms.

Question-17

Name the membrane, which surrounds the vacuole in cell.

Solution:

Tonoplast is the membrane, which surrounds the vacuole in cell.

Question-18

Give one example to prove that " Dead cells also play a role in the body".

Solution:

In animals, dead cells of skin protect the inner lining of the body from germs and temperature of the surroundings. It proves that dead cells also play a vital role in the body.

Question-19

What are the essential steps involved in plant cell fusion?

Solution:

The following steps are involved in plant cell fusion:

Leaf pieces of two parent plants are taken. Plant A with non-green leaves and plant B with deep green leaves are taken separately. Both the leaves are treated with a mixture of enzymes to obtain spherical protoplast. The protoplasts of the two populations are mixed and treated with polyethylene glycol, they first adhere to each other in groups of two or more and later fuse. These fusion bodies are then cultured on a suitable medium wherein their nuclei fuse. The hybrid cells thus formed divide to give rise to callus masses. These calluses are transferred to another medium, which induces plantlet formation. From amongst these plants hybrids are selected.

Question-20

Name the membrane which surrounds the vacuole in cell.

Solution:

Tonoplast.

Question-21

Who gave the term 'chromosome' ?

Solution:

Waldayer (1881).

Question-22

Define autolysis.

Solution:
Autolysis is the break down of cell component or organism by its own enzyme.

Question-23

What are pilli ?

Solution:
Pilli are elongated, tubular structure in Gram – ve bacteria.

Question-24

Name the largest and second largest cell organelle.

Solution:
(i) Nucleus, and (ii) Mitochondrion.

Question-25

Give one example for each of the following:

Nitrogen fixing symbiotic bacteria.

A bacterium producing intestinal disease in man.

Solution:
Rhizobium leguminosarum

coli.

Question-26

What are fimbriae?

Solution:

Fimbriae are small, bristle-like fibres sprouting out of the cell in bacteria.

Question-27

What are Mycopolasmas ?

Solution:

They are called PPLO and were discovered by Nocard and Rous (1898). Mycoplasmas are aerobic prokaryotes. Cell wall is absent in them and they have a nucleoid.

Question-28

Name some cells in which nuclei are absent.

Solution:

(i) Mammalian RBC's and
(ii) Sieve tube cells.

Question-29

What are tunnel proteins?

Solution:

They are Integral proteins of plasma membrane functioning as channels.

Question-30

Define active transport.

Solution:

When the molecules move from a region of lower concentration to a region of higher concentration, i.e. against concentration gradient, the process is called active transport. It requires energy.

Question-31

Name the scientists who proposed "cell theory". Discuss main points of this theory.

Solution:

Cell Theory: In the year 1838 two German scientists – Mathias Jacob Schleiden and Theodore Schwann proposed the cell theory. The main points of the theory are All living things are composed of cells and cell products.

Cells are the structural and functional units of all living things.

All metabolic reactions in living things (unicellular or multicellular) take place within the cell.

The cell theory was later modified by Rudolf Virchow (1885) who stated that all the cells arise from pre-existing cells.

Question-32

What are chromatophores?

Solution:

Chromatophores : These are internal membrane systems found in the prokaryotic cells. They are extensive and complex in photo-synthetic forms. Examples are cyanobacteria and purple-bacteria. These membranes form aggregates of spherical, flattened or tubular vesicles in nitrifying bacteria. They help to increase membrane surface for greater metabolic activities.

Question-33

Give the significance of glycocalyx.

Solution:

Glycocalyx : It protects the cells. It helps in adhesion. The outer covering is immunogenic in bacteria cel