

INTERMEDIATE BIOLOGY NOTES

CELL

- A cell is the fundamental, structural and functional unit of all living organisms.
- Robert Hooke: Discovered cell.
- Anton Von Leeuwenhoek: First observed and described a live cell.
- The invention of the compound & electron microscopes revealed all the structural details of the cell.
- Q) Development of electron microscope helped in cell study because resolving power of electron microscope is much higher than light microscope
- Q) Electron microscope has high resolution power because of very low wavelength of electron beam
- Q) Under microscope we should use light with min wavelength (eg among option blue, green, yellow and red we should choose blue)

CELL THEORY

- Matthias Schleiden (1838) observed that all plants are composed of different kinds of cells.
- Theodore Schwann (1839) found that cells have a thin outer layer (plasma membrane).
- He also found that plant cells have cell wall. He proposed a hypothesis that animals and plants are composed of cells and products of cells.
- Schleiden & Schwann formulated the cell theory.
- Rudolf Virchow (1855) first explained that cells divide and new cells are formed from pre-existing cells (Omnis cellula-e cellula).
- He modified the cell theory.
- Cell theory states that:
 - (i) All living organisms are composed of cells and products of cells.
 - (ii) All cells arise from pre-existing cells.
- Q) Cell theory was given by Schleiden and Schwann
- Q) Virus do not have cellular structure, hence are exception to cell theory
- Q) Concept of OMNIS CELLULA-E-CELLULA was given by Rudolf Virchow

AN OVERVIEW OF CELL

- All cells contain
 - o Cytoplasm:
 - A semi-fluid matrix where cellular activities and chemical reactions occur. This keeps the cell in 'living state'.
 - o Ribosomes:
 - Non-membrane bound organelles seen in cytoplasm, chloroplasts, mitochondria & on rough ER.
 - Cells differ in size, shape and activities.
- o Smallest cells:
 - Mycoplasmas (0.3 μm in length).

- These are surface structures that have no role in motility.
 - Pili (sing. Pilus) are elongated tubular structures made of a special protein (pilin).
 - Fimbriae are small bristle like fibres sprouting out of the cell.
 - In some bacteria, they help to attach the bacteria to rocks in streams and to the host tissues.
- Q) Pili and fimbriae have no role in motility

5) RIBOSOMES

- They are associated with plasma membrane of prokaryotes.
- They are about 15 nm by 20 nm in size.
- They are made of 2 subunits - 50S & 30S (Svedberg's unit).
- They together form 70S prokaryotic ribosomes. (S = sedimentation coefficient; a measure of density & size).
- Function: Ribosomes are the site of translation (protein synthesis).
- Several ribosomes may attach to a single mRNA to form a chain called polyribosomes (polysome).
- Ribosomes translate the mRNA into proteins.

6) INCLUSION BODIES

- These are non-membranous, stored reserve material seen freely in the cytoplasm of prokaryotic cells.
 - E.g. phosphate granules, cyanophycean granules and glycogen granules, gas vacuoles etc.
 - Gas vacuoles are found in blue green and purple and green photosynthetic bacteria.
 - They have well organized membrane bound nucleus and organelles.
 - Presence of membranes gives clear compartmentalization of cytoplasm.
 - Their genetic material is organized into chromosomes.
 - They have complex locomotory & cytoskeletal structures.
- Q) Inclusion bodies are not bound by any membrane
- Q) Inclusion bodies lie free in cytoplasm
- Q) Inclusion bodies represent reserve material in cytoplasm
- Q) Inclusion bodies have no role in ingestion of food
- Q) eg of inclusion bodies are Glycogen granules, phosphate granules, cyanophycean granules

CELL ORGANELLES IN EUKARYOTIC CELL

1) CELL MEMBRANE

- Chemical studies on human RBCs show that cell membrane is composed of a lipid bilayer, protein & carbohydrate.
- Lipids (mainly phosphoglycerides) have outer polar head and the inner hydrophobic tails.
- So the non-polar tail of saturated hydrocarbons is protected from the aqueous environment.
- Ratio of protein and lipid varies in different cells.
- E.g. In human RBC, membrane has 52% protein and 40% lipids.
- Based on the ease of extraction, membrane proteins are 2 types:
 - o Integral proteins: Partially or totally buried in membrane.