For XAT , CMAT , MAT , IIFT Exam

THE FUNDAMENTAL UNIT OF LIFE

- All organisms are made of smaller parts called organs. Organs are made of still smaller parts. The smallest living part of an organism is a cell
- **Cells were first** observed in **cork** by **Robert Hooke** in 1665.
- Cells **without well organised nucleus**, i.e. lacking nuclear membrane, are called **prokaryotic cells**. Examples are bacteria and blue green algae
- The cells which **have definite nucleus** with a nuclear membrane are designated as **eukaryote**. All organisms other than bacteria and blue green algae are called **eukaryotes**
- The smallest cell is 0.1 to 0.5 micrometre in **bacteria**. The largest cell measuring 170 mm ×130 mm is the egg of an **ostrich**
- The number of cells present in different organisms may vary. Organisms may be either unicellular (single cell) or multicellular. Organisms such as Bacteria, Amoeba, Chlamydomonas, and Yeast are unicellular. On the other hand, organisms such as Spirogyra, Mango, and Human beings are multicellular. (i.e) made up of a few hundreds to millions of cells
- Plant cells have two unique components such as cell wall and chloroplasts compared to animal cells.
- The cell has three main parts: (i) the cell membrane, (ii) cytoplasm which contains smaller components called organelles, and (iii) the nucleus.

CELL MEMBRANES

- This is the outermost covering of the cell that separates the contents of the cell from its external environment. The plasma membrane allows or permits the entry and exit of some materials in and out of the cell
- Compounds called proteins and phospholipids make up most of the cell membrance
- The proteins are found around the holes and help move molecules in and out of the wall

CELL WALL

- Plant cells in addition to the plasma membrane have another rigid outer covering called the cell wall. The cell wall lies outside the plasma membrane
- The plant cell wall is mainly composed of cellulose. Cellulose is a complex substance and provides structural strength to plants

- Cell wall **absent** in **animal cell**

NUCLEUS

- The cell nucleus acts like the brain of the cell. It help control the eating ,movement and reproduction
- Nucleus is separated from the cytoplasm by a membrane called the **nuclear membrane**
- The nucleus contains chromosomes which are visible as rod-shaped structures only when the cell is about to divide
- **Chromosomes** are composed of **DNA and protein**
- Chromosomes contain information for inheritance of characters from parents to next generation in the form of DNA (Deoxyribonucleic Acid) molecules
- Functional segments of DNA are called genes
- Gene is a unit of inheritance in living organisms
- **Chromosomes** are usually found in **pairs**
- Human beings probably have **46 chromosomes(23 pair)**
- Peas have 12, a dog has 78 chromosomes
- The nucleus plays a central role in cellular reproduction the process by which a single cell divides and forms two new cells
- Organisms, whose cells lack a nuclear membrane, are called prokaryotic. Organisms with cells having a nuclear membrane are called eukaryote

CYTOPLASM

- It is the jelly-like substance present between the cell membrane and the nucleus
- Various other components or organelles of cells are present in the cytoplasm
- The cytoplasm is the fluid content inside the plasma membrane. It also contains many specialised cell organelles. Each of these organelles performs a specific function for the cell
- Important examples of cell organelles are endoplasmic reticulum, Golgi apparatus, lysosomes, mitochondria and plastids. They are important because they carry out some very crucial functions in cells.

ENDOPLASMIC RETICULUM

- It is a network of tulsular membranes connected at one end to the nucleus and on the other to the plasma membranes
- The ER membrane is similar in structure to the plasma membrane. There are two types of ER– rough endoplasmic reticulum (RER) and smooth endoplasmic reticulum (SER)
- The **ribosomes** which are present in all active cells are the sites of **protein manufacture**
- The **manufactured proteins** are then sent to various places in the cell depending on need, using the **endoplasmic reticulum**

GOLGI APPARATUS

- The material synthesized near the ER is packaged and dispatched to various targets inside and outside the cell through the Golgi apparatus. Its functions include the storage, modification and packaging of products in vesicles
- The **Golgi apparatus** is also involved in the **formation of lysosomes**

LYSOSOMES

- **Lysosomes** are a kind of waste **disposal system** of the cell. These help to keep the cell clean by digesting any foreign material as well as worn-out cell organelles.
- Foreign materials entering the cell such as bacteria or food as well as old organelles end up in the lysosomes which break complex substances into simpler substances.
- When the cell gets damaged lysosomes may burst and the enzymes digest their own cell. Therefore lysosomes are also known as the **'suicide bags'** of a cell.

MITOCHONDRIA

- **Mitochondria** are known as the **powerhouses** of the cell
- Mitochondria have two membrane coverings. The outer membrane is porous while the inner membrane is deeply folded. These folds increase surface area for ATP generating chemical reactions
- The energy required for various chemical activities needed for life is released by mitochondria in the form of **ATP (Adenosine triphopshate)** molecules. ATP is known as the energy currency of the cell. The body uses energy stored in ATP for making new chemical compounds and for mechanical work.
- Mitochondria are absent in bacteria and the red blood cells of mammals and higher animal
- Mitochondria are strange organelles in the sense that they have their **own DNA and ribosomes.** Therefore, mitochondria are able to **make some of their own proteins**.

PLASTIDS

- Plastids are **present only** in **plant cells**
- There are two types of plastids – **chromoplasts (coloured plastids)** and **leucoplasts (white or colourless plastids)**
- Chromoplasts containing the pigment chlorophyll are known as chloroplasts.
- Chloroplasts are important for photosynthesis in plants. Chloroplasts also contain various yellow or orange pigments in addition to chlorophyll
- Chromoplast impart colour to flowers and fruits
- Leucoplasts are primarily organelles in which materials such as starch, oils and protein granules are stored
- The primary function of **leucoplasts** is **storage**
- The internal organisation of the Chloroplast consists of numerous membrane layers embedded in a material called the stroma. These are similar to mitochondria in external structure
- Like the mitochondria, plastids also have their own DNA and ribosomes.

VACUOLES

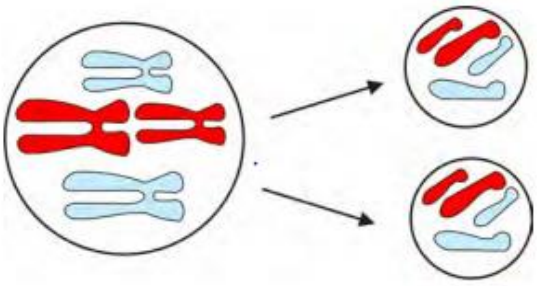
- Vacuoles are storage sacs for solid or liquid contents
- Vacuoles are small sized in animal cells while plant cells have very large vacuoles
- Most mature plant cells have a large central vacuole that helps to maintain the turgidity of the cell and stores important substances including wastes
- In plant cells vacuoles are full of cell sap and provide turgidity and rigidity to the cell. Many substances of importance in the life of the plant cell are stored in vacuoles. These include amino acids, sugars, various organic acids and some proteins. In single-celled organisms like Amoeba, the food vacuole contains the food items that the Amoeba has consumed. In some unicellular organisms, specialised vacuoles also play important roles in expelling excess water and some wastes from the cell.

CELL DIVISION

- New cells are formed in organisms in order to grow, to replace old, dead and injured cells, and to form gametes required for reproduction. The process by which new cells are made is called cell division.
- There are two main types of cell division are mitosis and meiosis

MITOSIS

- The process of cell division by which most of the cells divide for growth is called mitosis.Each cell called mother cell divides to form two identical daughter cells.
- The daughter cells have the same number of chromosomes as mother cell. It helps in growth and repair of tissues in organisms

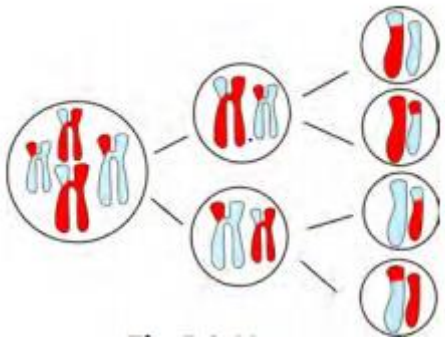


SIGNIFICANCE OF MITOSIS

- This equational division results in the production of diploid daughter cells (2n) with equal distribution of genetic material (DNA).
- In multicellular organisms growth, organ development and increase in body size are accomplished through the process of mitosis.
- Mitosis helps in repair of damaged and wounded tissues by renewal of the lost cells

MEIOSIS

- Cell divides by meiosis it produces four new cells instead of just two. The new cells only have half the number of chromosomes than that of the mother cells



SIGNIFICANCE OF MEIOSIS

- The constant number of chromosomes in a given species is maintained by meiotic division.
- Genetic valiation is produced due to crossing over within the species which is transmitted from one generation to next generation.