

## Examrace

# Virus, Characteristics of Bacteria, Significance of Mitosis, Classification of Plants

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## Virus

- Viruses are the micro-organisms which are strict or obligate parasites of animals or plant cells.
- Many of the viruses are also parasites on bacteria.
- A large number of viruses cause diseases in plants and animals.

## Characteristics of Virus

- A virus consists of two components, a protein coat and a core of nucleic acid which is either DNA or RNA.
- DNA viruses are called adenoviruses and RNA viruses are called retroviruses.
- The shape of a virus is due to its protein coat.
- Viruses are of many shapes i.e. rods, spherical, hexagonal or icosahedral.
- Sometimes their shape is complicated.
- Virus replicate inside a living cell and many viruses are synthesized along with their protein coats and nucleic acid.
- The nucleic acid contains instructions for the shape of the virus.

## Diseases Caused by Viruses

- Polio
- AIDS
- Smallpox
- Measles
- Hepatitis

## Bacteria

Characteristics of Bacteria:

- Bacteria are unicellular prokaryotic organisms which generally divide by transverse binary fission.
- They possess rigid cell walls and act as pathogens
- Nucleus is not well organised
- No definite chloroplast, chlorophyll is dissolved in chromoplasm.
- There are three forms of bacteria which are:
  - Round called Cocci
  - Rod like called Bacilli
  - Spiral called Spirilla

### **Classification of Bacteria According To Mode of Nutrition:**

According to mode of nutrition, there are three types of Bacteria: a) Parasitic:

- Devoid of chlorophyll
- Are heterotrophic and get food from living animals and plants

### **Saprophytic**

- Lack chlorophyll hence cannot prepare their own food.
- Get food from dead organic remains

### **Autotrophic**

- Contain chlorophyll
- Can synthesis food by photosynthesis
- Few get their food by chemosynthesis

### **Reproduction in Bacteria**

- Vegetative: By Binary Fission
- Asexual: By Formation of Endospores
- Sexual: By Conjugation

### **Cell Division**

- The process in which the cells divide and replicate. This process is the basis for growth and replication. There are two main types of cell division, which are as under:
  - Mitosis
  - Meiosis

## Mitosis

A type of cell division in which a cell divides into two identical daughter cells each having same number of chromosomes as that of parent cell.

- **Stages of Mitosis:** There are four stages of mitosis, which are as under:
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
- **Prophase:** - Prophase is the first phase of mitosis. - Chromatin material condenses and becomes visible - The nucleolus of the cell disappears - The nuclear membrane also disappears - Centrioles begin to move opposite ends of the cell
- **Metaphase:** - Metaphase is the second stage of mitosis. - Chromosomes line up in the centre of the cell, separate and become a pair of identical chromosomes.

The chromatids become uncoiled and apart from each other.

- **Anaphase:** - It is the third phase of mitosis. - During this phase each set of chromosomes move towards the opposite end of the cell.
- **Telophase:** - The fourth phase of mitosis is known as Telophase. - During this phase spindle fibres disappear. - Nuclear membrane appears - Cell divides into two daughter cells - Nucleolus re-appear - The chromosomes disperse and are no longer visible.

## Significance of Mitosis

- **Growth:** The number of cells within an organism increases by mitosis and this is the basis of growth in multicellular organisms.
- **Cell Replacement:** Cells are constantly sloughed off, dying and being replaced by new ones in the skin and digestive tract. When damaged tissues are repaired, the new cells must be exact copies of the cells being replaced so as to retain normal function of cells.
- **Regeneration:** Some animals can regenerate parts of the body, and productions of new cells are achieved by mitosis.
- **Vegetative Reproduction:** Some plants produce offspring which are genetically similar to themselves. These offspring are called clones.

## Meiosis

A type of cell division in a cell divides into four daughter cells with having half number of chromosomes as compared to parent cell.

### Characteristics of Meiosis

- Takes place in sexual reproduction at the time of formation of male and female gametes
- In animals it takes place during the formation of sperms and ova while in plants during spore formation
- Diploid cells reduce to haploid cells
- Consists of two consecutive divisions
- First division is reductional or meiotic and the second is simple mitotic division.

### **Stages of Meiotic Division**

- Prophase I
- Metaphase I
- Anaphase I
- Telophase I
- Prophase II
- Metaphase II
- Anaphase II
- Telophase II

**Prophase I:** Prophase I consists of 5 sub stages, these are:

- Leptotene - Nucleus increases in size - Chromosomes become long and uncoiled threads - They become more visible
- Zygotene - Homologue (similar) chromosomes attract each other and form pairs. - This process is called synapses
- Pachytene - Chromosomes become condensed due to widening of coils - They form chiasmata i.e. cross each other in double nature or bivalents.
- Diplotene - Homologous chromosomes go apart from each other except at chiasmata - Chromosomes become more short and thicker
- Diakinesis - The bivalents become more apart. - Chromosomes become deeply stained - Nucleolus and nuclear membrane disappear and spindles become distinct
- **Metaphase I:** - Chromosomes now rearrange themselves in an equatorial line - Spindles attach to the centrosome of the chromosomes
- Anaphase I: - Spindles start to contract - Split the tetrahedral chromosomes into two chromatids and drag them to opposite poles - Here the reduction takes place.

- **Telophase I:** - Spitted chromosomes reach to opposite poles - Nucleolus and nuclear membrane reappear - At the end of Telophase I, prophase II starts.
- **Prophase II:** - Chromatin network breaks into bivalent chromosomes - Nuclear membrane and nucleolus disappear and spindles start to reappear
- **Metaphase II:** - Bivalent chromosomes rearrange themselves at equator - Spindles attach to the centrosomes of each chromosome
- **Anaphase II:** - Spindles contract and split the chromosomes longitudinally into two chromatids - Each chromatid travel to opposite pole
- **Telophase II:** - Each chromatid reach to the opposite pole - Spindles disappear and nuclear membrane and nucleoli reappear - As a result 4 nuclei are formed

### **Significance of Meiosis**

- To allow trait inheritance in offspring
- To maintain diploid number in each generation
- To ensure the production of haploid gametes in sexual reproduction
- To produce genetic variations among offspring

### **Classification of Plants**

- Plants are those organisms which contain chlorophyll and synthesize their own food through photosynthesis. Plants are divided into:
  - Flowering Plants OR Phanerogams
  - Non-Flowering Plants OR Cryptogams
- **Flowering Plants:** Flowering plants are those plants which contain seed. These are known as Phanerogams. They are further subdivided into:
  - Gymnosperms
  - Angiosperms
- **Gymnosperms:** Gymnosperms are those flowering plants which contain naked and unprotected seeds. Examples: Pine, Fir, Cedar, Spruce and Cypress etc.
- **Angiosperms:** Angiosperms are those flowering plants whose seeds are protected by a fruit or seed pod. Examples: Grass, Crops, Vegetables, Fruits and weeds.
- **Non-Flowering Plants:** Non-Flowering plants are also known as cryptogams. These are the plants which do not have seed or in other words they are seedless. Following are the main characteristics of these plants: - They reproduce by spores - They have long life - They have no long fibres - They cannot grow to greater size - They generally have simple structure, except ferns. Examples: Moses, Ferns, Algae.

