



Chapter 10: - Cell Cycle and Cell Division
Competency based questions

I. Case based Question

Mitosis is also divided into four stages namely prophase, metaphase, anaphase and telophase. Chromosome condensation occurs during prophase. Simultaneously, the centrioles move to the opposite poles. The nuclear envelope and the nucleolus disappear and the spindle fibres start appearing. Metaphase is marked by the alignment of chromosomes at the equatorial plate. During anaphase the centromeres divide and the chromatids start moving towards the two opposite poles. Once the chromatids reach the two poles, the chromosomal elongation starts, nucleolus and the nuclear membrane reappear. This stage is called the telophase. Nuclear division is then followed by the cytoplasmic division and is called cytokinesis. Mitosis thus, is the equational division in which the chromosome number of the parent is conserved in the daughter cell.

1. Onion root tip cells has 16 chromosomes and the cells multiply by mitosis.

a. Can you tell how many chromosomes will the cell have

- i. at G₁ phase
- ii. after S phase
- iii. after M phase?

b. What will be the DNA content of the cells at

- i. G₁
- ii. after S
- iii. at G₂

if the content after M phase is 2C?

Multiple choice questions

- 1. Centromere duplicates in
 - a. G₂ phase of cell cycle
 - b. S phase of cell cycle
 - c. Prophase of cell cycle
 - d. G₁ phase of cell cycle
- 2. Yeast cell can progress through cell division in
 - a. 30 minutes
 - b. 60 minutes
 - c. 90 minutes
 - d. 120 minutes
- 3. The correct sequence of different phases of cell cycle is
 - a. S- G₁ – G₂ – M
 - b. G₁ – S – G₂ – M
 - c. G₂ – S – G₁ – M

- d. $G_1 - G_2 - S - M$
4. Amitosis is shown by
 - a. Bacteria
 - b. Syphilis
 - c. Euglena
 - d. Hydra
5. How many equational divisions are necessary in a cell of onion root tip to form 128 cells
 - a. 64
 - b. 128
 - c. 7
 - d. 127

III Source based

The production of offspring by sexual reproduction includes the fusion of two gametes, each with a complete haploid set of chromosomes. Gametes are formed from specialised diploid cells. This specialized kind of cell division that reduces the chromosome number by half results in the production of haploid daughter cells. This kind of division is called meiosis. Meiosis ensures the production of haploid phase in the life cycle of sexually reproducing organisms whereas fertilisation restores the diploid phase. We come across meiosis during gametogenesis in plants and animals. This leads to the formation of haploid gametes. The key features of meiosis are as follows:

- Meiosis involves two sequential cycles of nuclear and cell division called meiosis I and meiosis II but only a single cycle of DNA replication.
 - Meiosis I is initiated after the parental chromosomes have replicated to produce identical sister chromatids at the S phase.
 - Meiosis involves pairing of homologous chromosomes and recombination between non-sister chromatids of homologous chromosomes.
 - Four haploid cells are formed at the end of meiosis
1. Does interphase occur between Meiosis I and Meiosis II. Justify your answer.
 2. Why crossing over cannot take place between sister chromatids?
 3. Meiosis I is also referred to as _____ division and Meiosis II as _____ division
 4. What is expected to happen if meiosis does not occur at the time of gamete formation
 5. In which sub stage does formation of homologous chromosomes occur?