

# Important Questions Class 11 Biology Chapter 10

## Cell Cycle and Cell Division

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**Question 1. Why is the process of Meiosis necessary in sexually reproducing organisms?**

**Answer 1.**

The process of meiosis is necessary for sexually reproducing organisms because of the following reasons:

Firstly, it constantly maintains the number of chromosomes in the generation process, as Meiosis is also called reductional division.

Secondly, it causes variations among the progeny because crossing over occurs during Meiosis. This variation is important for evolution.

**Question 2. Describe the importance of mitosis.**

**Answer 2-**

Mitosis is an important process because –

through the process of mitosis, genetic stability occurs.

It helps in the growth and development of multicellular organisms.

Many plants and animals multiply with mitosis, i.e., asexual reproduction occurs to regenerate the whole organism.

It helps regenerate the lost parts of an animal's body by regenerating the new cells in place of dead and worn-out cells.

**Question 3. What do you understand by the term cell reproduction?**

**Answer 3:**

**Cell reproduction:** Reproduction is an essential phenomenon in the continuity of life. Rudolf Virchow discovered that new cells arise by the division of pre-existing cells.

Reproduction is mainly classified into two types:

Sexual reproduction

Asexual reproduction.

The growth and development of the living being depend on cell division. The single-celled zygotes, by the process of cell division, develop into an adult having many cells.

**Question 4. What is the importance of chromosomal replication during the interphase?**

**Answer 4.** Interphase is a stage that occurs between successive cell divisions. It is considered the resting stage of the nucleus as it does not show any morphological changes. But physiologically, it is a very active stage in the life of a cell as the cell prepares itself for division and many biochemical changes occur during this stage.

**Question 5. Name the stages of the cell cycle at which these events occur:**

**Chromosomes are moved to the spindle equator.**

**Centromere splits apart, and chromatids separate.**

**Pairing between homologous chromosomes occurs.**

**Crossing over takes place between the homologous chromosomes.**

**Answer 5.**

Chromosomes move to the spindle equator in the Metaphase stage.

Centrosomes split apart, and the chromatids separate in the Anaphase

Pairing occurs between the homologous chromosomes in the Zygotene stage of prophase 1 in Meiosis

Crossing over occurs between homologous chromosomes and takes place during the Pachytene stage of prophase 1 in Meiosis

**Question 6. Is there mitosis without DNA replication in the 'S' phase, and can there be DNA replication without cell division?**

**Answer 6:**

No, without DNA replication, mitosis does not occur. Because during the S phase, DNA synthesis or replication of DNA takes place and DNA replication is essential for cell division.

Yes, DNA replication can take place without the cell division process. To prepare for cell division, DNA replication is necessary. Cell division is the next logical step that occurs post-cell division.

**Question 7. Describe the different phases occurring in meiotic prophase – I. Also, mention the chromosomal events during each stage.**

**Answer 7-**

During the meiotic prophase – I, entities like genetic recombination and variation in sexually reproducing take place. Also, the chromosomal events during each stage are-

### **Leptotene stage-**

In this stage, the chromosomes are long, thin and slender, where the chromatin network gets exposed and threads appear clear.

Also, it contains a diploid number of chromosomes.

### **Zygotene stage-**

In this stage, the similar chromosomes turn intimately associated with the

Synapse. And as the synapses are exact, pairing occurs between the chromosomes and corresponding individual units.

These chromosomes appear thicker and shorter.

### **Pachynema Stage-**

In this stage, the synaptic chromosomes become intimately related to each other. There are thick and short pairs of chromosomes crossed over one another, and the chiasmata are visible clearly.

### **Diplotene Stage-**

The homologous chromosomes start detaching from each other and the

Chiasmata tend to shift away, resulting in the terminalization of chiasmata.

Also, the chromosomes detach and result in incomplete separation.

The nucleolus and nuclear membrane also start to fade.

### **Diakinesis**

In this stage, the bivalents are distributed randomly after further condensation.

Also, the paired chromosomes separate, and the terminalisation of chiasmata is concluded with the disappearance of the nucleolus and nuclear membrane.

**Question 8. Telophase is said to be the reverse of prophase. Describe the statement.**

**Answer 8-**

The condensation of the chromosomal material initiates the prophase. During this process, chromatin condensation occurs, and the chromosomal material untangles.

Also, at the start of the final stage of mitosis, that is, the telophase phase, the chromosomes arrive at the respective poles and then de-condense and lose their individuality. When observed under a compound microscope, the cells at the end of the prophase stage do not show organelles like golgi complexes, nucleolus, endoplasmic reticulum, and the nuclear envelope. The nuclear envelope then gathers around the chromosomes cluster at the telephone stage: the Golgi complex, ER, and nucleolus reform.

**Question 9. Which tissue of plants and animals exhibits Meiosis?**

**Answer 9-**

The process of Meiosis takes place only in the tissues that produce gametes. So, in animals, Meiosis occurs within the body's reproductive cells or germ cells. This also includes the cells of the ovaries and testes. In plants, Meiosis occurs in the Androecium (male reproductive) and Gynoecium (female reproductive) parts of the plant.

**Question 10. What cell type is captured in the diplotene phase for months or years? And how does it complete its cell cycle?**

**Answer 10-**

The cells of oocytes of a few vertebrates can last for months or years in the diplotene stage.

The diplotene chromosome is present in a few animals, like oocytes of amphibians or frogs in the diplotene phase.

In the meiotic prophase, lampbrush chromosomes are noticed, and these chromosomes tend to turn normal after growth, thereby completing the cell cycle.

**Question 11. Describe the following events that take place during interphase.**

**Answer 11:**

Interphase involves a series of changes that occur during the preparation of a cell for division. It is said to be the period during which the cell experiences growth and DNA replication in a definite and orderly manner. Interphase is majorly divided into three phases.

(i) G1 phase

(ii) G2 phase

(iii) S phase

**G1 phase:** The G1 phase is the stage during which the cell grows and prepares the DNA for its replication. Also, in this phase, the cell becomes metabolically active.

**S phase:** S phase is the stage during which DNA synthesis occurs. In other words, during this phase, the amount of DNA doubles, but the number of chromosomes remains the same.

**G2 phase:** In the G2 phase, the cell continues to grow and prepares itself for division. The proteins and RNA required for mitosis are synthesised during this stage.

**Question 12. What is the significance of Meiosis?**

**Answer 12-**

Meiosis is said to be a process involving a reduction in the amount of genetic material. It comprises two successive nuclear and cell divisions, with a single cycle of DNA replication. As a result, four haploid cells are generated at the end of Meiosis II.

**The Significance of Meiosis-**

Meiosis maintains the constant chromosome number from generation to generation. It also reduces the chromosome number to half because the fertilisation process restores the original number in the zygote.

Variations are caused by the cross-over of the daughter cells and the random distribution of homologous chromosomes between daughter cells. Variations also play an important role in evolution.

The introduction of certain abnormalities generates chromosomal mutations. These chromosomal mutations generated may be advantageous for an individual.

**Question 13. Analyse the following events during every stage of the cell cycle and notice the following two parameters-**

**(i) Number of chromosomes changed per cell**

**(ii) Amount of DNA content (C) changed per cell**

**Answer 13.**

During the process of Meiosis, the number of chromosomes and the amount of DNA change are.

**(i) Number of chromosomes (N) changed per cell**

During the Anaphase I stage of the meiotic cycle, the homologous chromosomes separate and start moving toward their poles, respectively. As a result, the bivalent chromosomes get divided into two sister chromatids and receive half the chromosomes in the parent cell.

Therefore, the number of chromosomes reduced in the meiotic cycle anaphase I.

**(ii) Amount of DNA content (C) changed per cell**

During the anaphase II stage of the meiotic cycle, the chromatids separate through the splitting of the centromere. It is said that the centromere holds together the sister chromatids present in each chromosome. By this, the chromatids move toward their respective poles. And at each pole, a haploid number of chromosomes with a haploid amount of DNA is present.

During the mitosis process, the number of chromosomes always remains the same. The DNA duplicated in the S phase gets separated and forms two daughter cells during the anaphase stage. Through this result, the DNA content (C) of the two newly formed daughter cells remains the same.

**Question 14. What is the definition of the cell cycle?**

**Answer 14.** The cell cycle, also called the cell-division cycle, is the series of events that occur in a cell and subsequently cause it to divide into two daughter cells.

**Question 15. How does the cell cycle work?**

**Answer 15.** A cell cycle is a series of events in a cell as it grows and divides. A cell spends most of its time in what is called interphase; during this time, it grows, replicates its chromosomes, and prepares for cell division. The cell then leaves interphase, undergoes mitosis, and completes its division.

**Question 16. List out the 4 stages of the cell cycle.**

**Answer 16.** The cycle of cells is a four-stage process consisting of the following

Gap 1 (G1)

Synthesis

Gap 2 (G2)

Mitosis.

**Question 17. Write the phases of the cell cycle against each of the events**

**The disintegration of the nuclear membrane**

**The appearance of the nucleolus**

**Division of centromere**

**Replication of DNA**

**Answer 17.** The phases of the cell cycle are as follows:

Prophase.  
Telophase.  
Anaphase.  
S-phase.

**Question 18. Explain cell division?**

**Answer 18.** When a parent cell gets divided into two or more cells called daughter cells, Cell Division occurs, usually as part of a larger cell cycle. All the cells are known to reproduce by splitting into two, where each parental cell gives rise to two daughter cells. These daughter cells divide and then grow into a new cell population formed as the result of the division and growth of the single parental scale. This explains the cell division process.