
Important Questions for Class 11

Biology

Chapter 10 – Cell Cycle and Cell Division

1 Mark

1. Name the stage of cell division in which paired homologous chromosomes get shortened and thickened?

Ans: Pachytene is the stage of cell division in which paired homologous chromosomes get shortened and thickened.

2. Which structure of animal cell forms the asters of spindle?

Ans: Centrosome is that structure of animal cell which forms the asters of spindle.

3. Name the cells in which meiosis occurs?

Ans: Meiosis occurs in the reproductive cells or germ cells.

4. At which stage of meiosis crossing over of genetic material takes place?

Ans: Pachytene is the stage of meiosis in which crossing over of genetic material takes place.

5. What is Go phase?

Ans: A stage when cell cycle is arrested during interphase is called Go phase.

6. Name the cell division concerned with cancer?

Ans: Mitosis is the type of cell division which is concerned with cancer.

7. What are kinetochores?

Ans: Kinetochores are small disc-shaped structure at the surface of the centromeres.

8. What is interkinesis?

Ans: Interkinesis is the stage between two meiotic divisions.

9. Why is mitosis called equational division?

Ans: The chromosome number in the daughter cells is equal to the number of chromosomes in the parent cell hence mitosis is called equational division.

10. Name the stage of meiosis during which synaptonemal complex is formed.

Ans: Zygotene is the stage of meiosis during which synaptonemal complex is formed.

11. What is G_0 phase of cell cycle?

Ans: G_0 is that phase of a cell cycle where the cells are metabolically active but no longer proliferate.

12. Where does mitosis take place in plants and animals?

Ans: In plants mitosis takes place in the meristematic tissues whereas, in animals it occurs in the somatic cells.

1. What is the importance of chromosomes replication during interphase?

Ans: Interphase is a stage between successive cell divisions. It is considered as the resting stage of a nucleus because it does not show any changes in the morphology however, physiologically it is a active stage in the life of a cell as the cell prepares itself for division and other biochemical changes as well.

2. Distinguish between metaphase of mitosis and metaphase I of meiosis?

Ans: The metaphase of mitosis and metaphase I of meiosis differ from each other as:

Metaphase of Mitosis	Metaphase of Meiosis: I
Each chromosome consists of two chromatids held together by the centromere.	Homologous chromosomes form bivalent and each bivalent consists of four chromatids along with two centromeres.
Chromosomes line up in one plane to make up a equatorial plate.	Bivalents become arranged in the plane of equator forming an equatorial plate.

3. How does duration affect the cell cycle in an organism?

Ans: Duration depends on the type of cell and other external factors such as temperature, food and oxygen. The time period for G, S, G, and M-phase in different species under specific environmental conditions is like 20 min for bacterial cell, 10 hours for intestinal epithelial cell, 20 hours for onion root tip cell etc. This shows that time required for each step has been pre-set within cell of each organism.

4. Why is meiosis called reductional division and mitosis called equational division?

Ans: In meiosis, the number of chromosomes gets reduced to half hence, it is known as reductional division. Gametes are formed in sexually reproducing organisms in the germ cell. In mitosis, the number of chromosomes remains constant after division therefore, it is called equational division.

5. Write three processes which take place in interphase?

Ans: The three processes in interphase are:

- I. Replication of DNA with synthesis of histones and nuclear proteins.
- II. Division of the centriole to new centriole which lie at right to each other.
- III. Synthesis of energy- rich compounds to provide energy for mitosis.

6. Enumerate the significance of mitosis?

Ans: The various significances of mitosis are:

- I. The number of chromosomes in the mitosis cell division remains constant in daughter cells.
- II. Asexual reproduction occurs with the help of mitosis.
- III. Size of a cell is controlled by the process of mitosis.
- IV. The growth and development of zygote is maintained by the process of mitosis.

7. Differentiate between chromatin and chromate.

Ans: Chromatin and chromate differ from each other as:

Chromatin	Chromatid
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It is the diffused, deep staining hereditary material.	It is longitudinally split half of a chromosome, light staining hereditary material.
It is metabolically inert	It is metabolically active

8. Give the terms for the following:

- a. The pet between 2 successive mitotic divisions.
- b. Colt division in which chromosome number is halved.
- c. Phase in cell cycle where DNA is synthesized.
- d. Division of nuclear material.

Ans:

- a. Interphase
- b. Meiosis
- c. S phase
- d. Karyokinesis

3 Marks

1. What is the significance of meiosis?

Ans: The significance of meiosis is:

- a. Meiosis reduces the number of chromosomes to half in the daughter cells.
- b. Meiosis is a process in sexually reproducing animals because it restores fixed number of chromosomes.
- c. Meiosis results in the formation of gametes. Each of these gamete possesses half the number of chromosomes present in the somatic cells.

- d. Gametes avoid multiplication of chromosomes thus maintaining the stability and constant number of chromosomes of the species.
- e. During crossing over, the exchange of nuclear material, genetic variations within the species occurs resulting in a new combination of genetic material.

2. Differentiate between animal cell mitosis & plant cell mitosis?

Ans: Animal cell mitosis and plant cell mitosis differ from each other as:

Animal cell Mitosis	Plant cell Mitosis
It occurs in the bone marrow	It occurs in the meristems
Animal cell becomes spherical before the division of the cell	The shape of the cell does not change before division
Multiple hormones are involved in the cell division	It is induced by plant hormone cytokine only
Presence of centrosome	Absence of centrosome
The mitotic apparatus have asters	The mitotic apparatus lacks asters
Mid body is formed	Mid body is not formed
It occurs through cleavage	It occurs by cell-plate formation
Microfilaments are involved in it	No microfilaments are formed
In this, cleavage proceeds centripetally	In this, the cell grows centrifugally

3. Write six differences between mitosis & meiosis?

Ans: Mitosis and meiosis differ from each other as:

Mitosis	Meiosis
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In this process, the doubling of chromosome is followed by separation of the daughter chromosomes hence, the cell divides once only	In this process, doubling of chromosomes occurs once but it is followed by two nuclear divisions hence, the cell divides twice
It occurs in all the somatic cells	It occurs in only reproductive or germ cells
It is completed in one sequence of stages	The whole process completes in two successive divisions
Synopsis is absent	Synopsis is present
No crossing over or formation of chiasmata	Both crossing over and formation of chiasmata occurs
A cell produces two diploid cells	A cell produces four haploid cells

4. What are homologous chromosomes? What happens to homologous chromosomes during meiosis?

Ans: Homologous chromosomes are defined as pairs of similar chromosomes having corresponding genes governing the same set of traits.

During heterotypic division of meiosis in leptotene, the chromosomes are thread shaped and are coiled. During zygotene, homologous chromosomes start pairing. In pachytene, chromosomes show both- thickening and shortening. Diplotene, is marked by cessation of attraction force between the two homologous chromosomes. Uncoiling of the homologous chromosomes separate them from each other but also remains attached at chiasmata. During diakinesis, separation of the homologous chromosome is complete. Exchange of parts between chromatids of homologous chromosomes may take place. During Anaphase I, centromeres of homologous compounds of bivalents repel each other post the separation of the centromere. The homologous chromosomes start to move apart, in telophase-I, chromosomes reach poles and become shortened.

5. What will be the DNA content of a cell at G₁, after S and G₂, if the content after Mphase is 2C.

Ans:

- Before mitotic division, cell is in the interphase. There are three phases in interphases G₁, S, G₂. Daughter cell grows in size and produces enzyme required for replication in G₁ phase.
- In S phase, DNA replicates and the content of the chromosome gets double. In the G₂ phase, cells grow in size and prepare to move in mitosis.
- Hence, when DNA content after the M-phase of a cell is 2c than in G₁ phase it remain in 2c as no replication occurs in this phase.
- In S phase, DNA content becomes 4c as DNA replication takes place in this stage and in the G₂ phase the DNA content will remain 4c.
- Then, when this cell finishes mitosis, the DNA content gets reduced to half i.e, 2c.

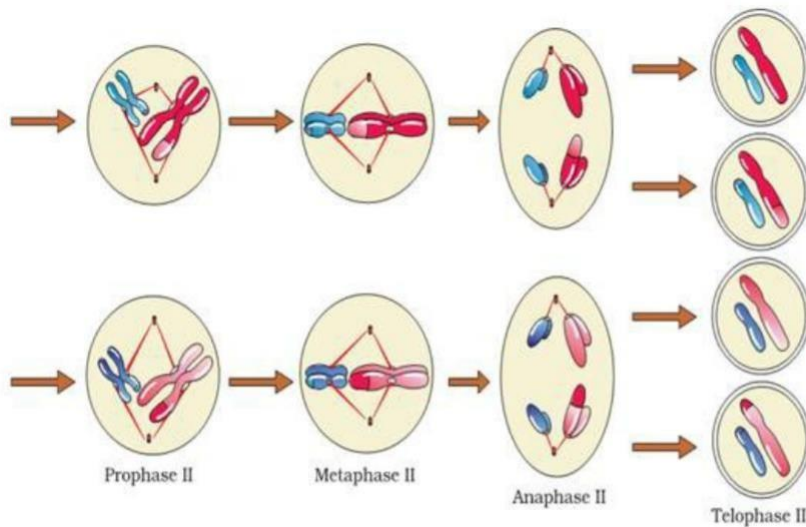
G₁-2C₁S-4C, G₂-4C

5 Marks

1. Explain the various phases of meiosis II division?

Ans. Stages of meiosis II are:

- I. Prophase II: Meiosis II is initiated immediately after cytokinesis usually before chromosomes have fully elongated. The nuclear membrane disappears by the end of prophase-II. The chromosomes again become compact.
- II. Metaphase-II: At this stage the chromosomes align at the equator & the microtubules form opposite poles of the spindle get attached to the kinetochores of sister chromatids.
- III. Anaphase-II: It begins with the simultaneous splitting of the centromere of each chromosome allowing them to move towards opposite poles of the cell.
- IV. Telophase-II: Meiosis ends with telophase-II, in which two groups of chromosomes once again get enclosed by nuclear envelope, cytokinesis follows resulting in the formation of tetrad of cell i.e. four haploid daughter cells.



2. What is mitosis? Give a brief account of mitosis in animal cell?

Ans: Mitosis is an equational cell division in which number of chromosomes in parent and, progeny cell remains same.

Stages of mitosis:

I. Prophase:

- a. Chromosome material condenses to form compact mitotic chromosomes. Chromosomes are seen to be composed of two chromatids attached together at centromere.
- b. Initiation of assembly of mitotic spindle, microtubules the protein components of the cell cytoplasm help in the process.

II. Metaphase:

- a. Spindle fibres attach to kinetochores of chromosomes
- b. Chromosomes are moved to spindle equator and get aligned along the metaphase plate through spindle fibres to both poles.

III. Anaphase:

- a. Centromere splits and chromatids separate
- b. Chromatids move to the opposite poles.

IV. Telophase:

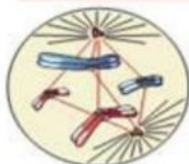
- a. Chromosomes cluster at opposite spindle poles and lose their identity.
- b. Nuclear envelope assembles around the clusters of chromosome.
- c. Nucleolus, Golgi complex and the ER reform.



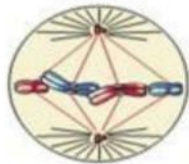
Early Prophase



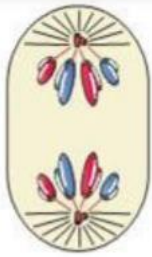
Late Prophase
(a)



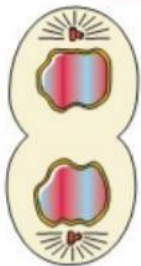
Transition to
Metaphase



Metaphase
(b)



Anaphase
(c)



Telophase
(d)



Interphase
(e)

The difference stages of mitosis.