



## Cell Cycle And Cell Division Important Questions With Answers

### NEET Biology 2023

1. When the cell has started DNA replication, which check point should be predominantly activated?  
a)  $G_1/S$    b)  $G_2/M$  and M   **c)  $G_2/M$**    d) M

**Solution : -**

During the  $G_2$  phase, proteins are synthesised in preparation for mitosis while cell growth continues

2. Best stage to observe shape, size and number of chromosomes is \_\_\_\_\_ .  
a) Interphase   **b) Metaphase**   c) Prophase   d) Telophase

**Solution : -**

Metaphase can be characterised by the chromosomes that are least coiled which show maximum condensation and are shortest in length. It is the best stage to study the structure, size and number of chromosome in a cell. Idiogram/karyotype of chromosomes is prepared at metaphase.

3. The enzyme recombinase is required at which stage?  
**a) Pachytene**   b) Zygotene   c) Diplotene   d) Diakinesis

**Solution : -**

Crossing over leads to recombination of genetic material takes place in the pachytene stage. The site where crossing over occurs forms a recombination nodule. The recombination is an enzyme-mediated process. The enzyme called recombinase is involved in the process

4. At which of the following stages, the chromosomes appear single, thin and thread like?  
a) Leptotene   b) Zygotene   c) Pachytene   **d) Diplotene**

**Solution : -**

Leptotene also known as leptoneuma is the first stage of prophase I during which individual chromosomes begin to condense into long strands within the nucleus which are loosely interwoven. However, the two sister chromatids are still so tightly bound that they are indistinguishable from one another. They possess a string of swollen areas called chromomeres.

5. Crossing over occurs during  
**a) Pachytene**   b) Diplotene   c) Diakinesis   d) Zygotene

6. During cell division in apical meristem the nuclear membrane appears in \_\_\_\_\_ .  
a) Metaphase   b) Anaphase   **c) Telophase**   d) Cytokinesis

**Solution : -**

(i) During telophase, nuclear envelope initially reforms around each chromosome individually which later on fuse to form complete nuclear envelope.

(ii) Metaphase Chromosomes are arranged on equatorial plate.

(iii) Anaphase Chromosomes split longitudinally. Chromatids migrate towards opposite poles. Cytokinesis Division of cytoplasm.

7. Microtubules are absent in  
a) mitochondria   b) flagella   **c) spindle fibres**   d) centriole

8. Mitotic anaphase differs from metaphase in possessing \_\_\_\_\_ .

- a) Same number of chromosomes and same number of chromatids
- b) Half number of chromosomes and half number of chromatids
- c) Half number of chromosomes and same number of chromatids
- d) Same number of chromosomes and half number of chromatids**

**Solution : -**

(i) Mitotic metaphase is the best stage to observe the structure, size and number of chromosomes in a cell. Centromeres of all chromosomes lie closely at equator and their arms in different directions towards poles. Chromosomes are shortest in metaphase but thickest in anaphase.

(ii) In anaphase, centromere of each chromosome divides so that each sister chromatid now has its own centromere. Thus, mitotic anaphase differs from metaphase in possessing same number of chromosomes and half number of chromatids.

9. During anaphasic movements of chromosomes, \_\_\_\_\_ of each chromosome is/are towards the pole and \_\_\_\_\_ of the chromosome trail(s) behind.

- a) centromere, arms**
- b) arms, centromere
- c) chromatids, centromere
- d) none of these

**Solution : -**

In anaphasic movement of chromosomes, the centromeres lead the path while the arms trail behind. As a result the anaphasic chromosomes appear V-, L-, J- and I-shaped. The shapes are formed respectively in metacentric, submetacentric, acrocentric and telocentric chromosomes.

10. In which of the following ways are mitosis and meiosis similar?

- a) Both have pairing of homologous chromosomes
- b) Both are preceded by DNA replication.
- c) Both occur in all kinds of cells.**
- d) Both include separation of paired chromosomes

11. Crossing over takes place in ;

- a) Diplotene
- b) Diakinesis
- c) Zygotene
- d) pachytene**

12. Disjunction refers to

- a) the separation of homologous chromosomes at anaphase I**
- b) the type of chromosomal aberration in which there is loss of a part of a chromosome
- c) incompatibility in fungi and other thallophytes
- d) modification of gene action by a nonallelic gene.

**Solution : -**

The homologous chromosomes break their connections and separate out during anaphase I of meiosis I. This process of separation is named as disjunction.

13. During cell division, spindle fibers attach to which part of chromosome ;

- a) Primary constriction**
- b) Sec. constriction
- c) Chromomere
- d) Chromatid

14. During anaphasic movements of chromosomes, \_\_\_\_\_ of each chromosome is/are towards the pole and \_\_\_\_\_ of the chromosome trail(s) behind.

- a) centromere, arms**
- b) arms, centromere
- c) chromatids, centromere
- d) none of these

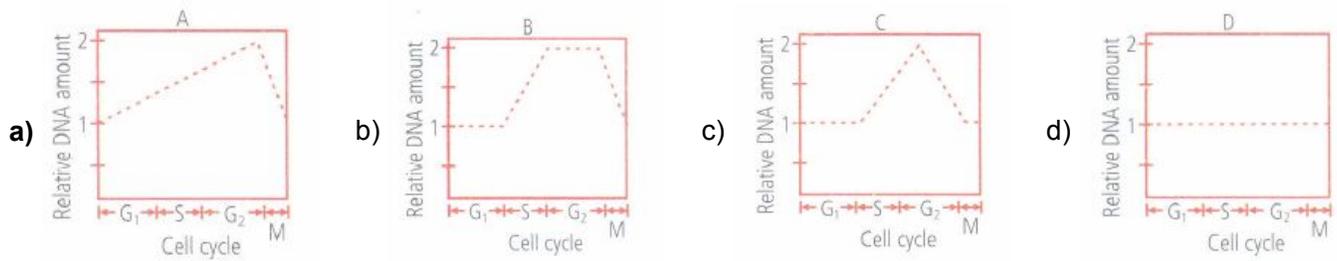
15. If the number of bivalents are 8 in metaphase - I, what shall be the number of chromosomes in daughter cells after meiosis - I and meiosis -II respectively;

- a) 8 and 4
- b) 4 and 4
- c) 8 and 8**
- d) 16 and 8

16. In which order, cytokinesis occurs in plants ;

- a) Centripetal
- b) Centrifugal**
- c) oblique
- d) Equatorial

17. Which of the following graphs shows the relative change in the amount of mitochondrial DNA of a cell undergoing mitosis?



**Solution : -**

Mitochondrion has its own replication cycle, completely separate from the cell in which it resides

18. Number of chromosome in primary oocyte is:

- a) Same as that of secondary oocyte    b) Half as that secondary oocyte  
**c) Double as that of secondary oocyte**    d) Same as that of ovum

19. When synapsis is completed all along the chromosome, the cell is said to have entered a stage called

- a) Zygotene    **b) Pachytene**    c) Diplotene    d) Diakinesis

20. This phase of cell cycle is a period of intense synthesis and growth. It constitutes 95% of the duration of cell cycle. It is

- a) interphase**    b) telophase    c) prophase    d) anaphase.

21. Condensation of chromosomes and appearance of astral rays occur during;

- a) Prophase**    b) Metaphase    c) Anaphase    d) Telophase

22. **Assertion:** During anaphase, centromere of each chromosome splits and chromatids separate.

**Reason:** During anaphase, chromatids move to opposite poles.

- a) If both assertion and reason are true and reason is the correct explanation of assertion  
**b) If both assertion and reason are true but reason is not the correct explanation of assertion**  
 c) If assertion is true but reason is false    d) If both assertion and reason are false

**Solution : -**

In anaphase, chromosomes are arranged on the equatorial plate for a short period. In anaphase centromeres of chromosomes start to divide into two, forming daughter chromatids with centromere in each. Daughter chromosomes are repulsive so, migrate towards opposite poles. Spindle fibres attached to the centromeres shorten and pull the chromosomes to the poles. In anaphasic movement of chromosomes, the centromeres lead the path while the limbs trail behind. So anaphasic chromosomes appear as V-, L-, J- and I-shaped.

23. The role of mitosis is not merely to divide a cell into two daughter cells but to ensure genetic continuity from one cell generation to another cell generation. The mechanism ensuring genetic continuity is

- a) formation of cells with new chromosomes    b) formation of two daughter cells  
**c) formation of two cells with identical DNA**  
 d) having the chromosome number between the two new cells.

**Solution : -**

All the daughter cells of a multicellular organism have the same number and type of chromosomes as parent cells due to equitable distribution of all the chromosomes in mitosis. This helps in ensuring genetic continuity.

24. Meiosis in diploid organisms results in

- a) production of gametes    b) reduction in the number of chromosomes    c) introduction of variation  
**d) all of the above**

**Solution : -**

Meiosis is cell division responsible for production of gametes through reductional division, which results in halving of the number of chromosomes. The crossing over that takes place in pachytene (prophase I, meiosis I) results in introduction of variation.

25. If gametes are produced after reduction division, they are termed a

- a) coenogametes   b) mitogametes   c) pseudogametes   **d) meiogametes.**

**Solution : -**

Reduction division is known as meiosis, gametes formed from this division are known as meiogametes.

26. Select the correct option with respect to mitosis

- a) Chromosomes move to the spindle equator and get aligned along the equatorial plate in metaphase**  
 b) Chromatids separate but remain in the centre of the cell in anaphase  
 c) Chromatids start moving towards opposite poles in telophase.  
 d) Golgi complex and endoplasmic reticulum are still visible at the end of prophase.

**Solution : -**

Metaphase is the stage of mitosis where the highly coiled chromosome align in the middle of cell.

27. Chromosomal morphology (Structure) is best observed at;

- a) Prophase   b) Metaphase   **c) Interphase**   d) Anaphase

28. The movement of homologous chromosomes towards opposite poles occur by disassembly of spindle fibres during

- a) Anaphase   **b) Anaphase-I**   c) Anaphase-II   d) Metaphase

29. In meiosis;

- a) Division of nucleus twice but replication of DNA only once  
**b) Division of nucleus twice and replication of DNA twice**  
 c) Division of nucleus once and replication of DNA is also once  
 d) Division of nucleus once and DNA - replication is twice

30. The point, at which polytene chromosomes appear to be attached together, is called \_\_\_\_\_ .

- a) Centriole   b) Centromere   c) Chromomere   **d) Chromocentre**

**Solution : -**

Polytene chromosomes are in fact formed by pairing of two somatic homologous chromosomes which undergo repeated endomitosis, forming a number of strands. These strands remain attached to a common large chromocentre of all polytene chromosomes and are rich in heterochromatin.

31. Identify the given stages of mitosis and select the correct option.

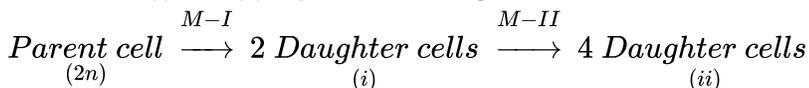
a)			
A	B	C	D
Prophase	Metaphase	Telophase	Anaphase

b)			
A	B	C	D
Metaphase	Anaphase	Prophase	Telophase

c)			
A	B	C	D
Anaphase	Metaphase	Prophase	Telophase

d)			
A	B	C	D
Prophase	Metaphase	Anaphase	Telophase

32. What does (i) and (ii) represent in the given flowchart?



- (i) = 2n   **(ii) = n**   (i) = n   (ii) = 2n

- a) (ii) = n   **b) (ii) = n**   c) (ii) = 2n   d) (ii) = 2n

**Solution : -**

Meiosis I consists of separation of the homologous chromosomes, each made up of two sister chromatids into two cells. Entire haploid content of chromosomes is contained in each of the resulting daughter cells; the first meiotic division therefore reduces the ploidy of the original cell by a factor of 2. Meiosis II consists of decoupling of each chromosome sister strands (chromatids) and segregating the individual chromatids into haploid daughter cells. The two cells resulting from meiosis I divide during meiosis II, creating 4 haploid daughter cells

33. Complex formed by a pair of synapsed homologous chromosomes is known as:

- a) Kinetochore   b) Axoneme   c) Equatorial plate   **d) Bivalent**

**Solution : -**

Electron micrographs of this stage indicate that chromosome synapsis is accompanied by the formation of complex structure called synaptonemal complex. The complex formed by a pair of synapsed homologous chromosomes is called a bivalent or a tetrad.

34. Select the incorrect match regarding mitotic cell division.

(i) Prophase	Chromosomes begin to uncoil
(ii) Metaphase	Chromatids move apart
(iii) Telophase	The nuclear membrane reappears
(iv) Late	Each chromosome consists of two anaphase chromatids
(v) Interphase	Chromosomes are not distinct

- a) (ii) and (iv) only**   b) (i) and (iii) only   c) (ii), (iv) and (v) only   d) (i) and (v) only

**Solution : -**

Chromatids move apart in anaphase stage of cell division. In late anaphase, splitting of centromere occurs so chromatids of a chromosome separate apart.

35. The DNA content of individual cells and the number of cells in each phase of a "cell cycle" can be determined using flow cytometry. Which of the following combinations of "phase of a cell cycle and its corresponding DNA content" can be considered normal?

- (i) Diploid cells found in the  $G_0$  or  $G_1$  phase.  
 (ii) Cells with twice the normal DNA content in the early M phase.  
 (iii) Cells with intermediate amounts of DNA in the S phase.  
 (iv) Cells with twice the normal DNA content in the  $G_2$  phase.

- a) (i) and (ii)**   b) (ii) and (iii)   c) (iii) and (iv)   **d) (i), (ii), (iii) and (iv)**

36. Which of the following statements is correct regarding  $G_0$  phase?

- a) Mitogens are present in  $G_0$  phase.   b) Mitogens are present but energy rich compounds are absent.  
 c) Both mitogens and energy rich compounds are present.

**d) Neither mitogens nor energy rich compounds are present.**

37. Chiasmata appears during;

- a) Diakinesis   b) Synaptotene   **c) Diplotene**   d) Leptotene

38. Which phase of mitosis is essentially the reverse of prophase in terms of nuclear changes?

- a) S-phase   b) Anaphase   **c) Telophase**   d) Interphase

**Solution : -**

During telophase of mitosis viscosity of cytoplasm decreases. A new nuclear membrane is formed (either from older nuclear envelope or ER) around each set of chromosomes. Chromosomes overlap forming chromatin. The Nucleolar organiser region of satellite chromosomes produce nucleolus for each daughter nucleus. Nucleoplasm surrounds in the area of chromatin. The gel state of spindle is converted into sol state and disappears. In this way two daughter nuclei are formed at the poles of spindle. Hence, this phase is just reverse of prophase.

39. The number of DNA in chromosome at  $G_2$  State of cell Cycle;

- a) One   **b) Two**   c) Four   d) Eight

40. Meiosis-II performs \_\_\_\_\_ .

- a) Separation of sex chromosomes   b) Synthesis of DNA and centromeres  
 c) Separation of homologous chromosomes   **d) Separation of chromatids**

**Solution : -**

Meiosis-II is homotypic or equational division similar to mitosis but occurs in haploid nuclei. Meiosis-II is essential to separate out the chromatids of dyad chromosomes to bring real haploidy in amount of DNA. It also increases the number of daughter cells though the chromosome number remains the same in daughter cells as produced

after meiosis-I.

41. Four different steps that occur during meiosis are given in the following list  
a) Complete separation of chromatids    b) Pairing of homologous chromosomes  
**c) Lining up of paired chromosomes on equator**    d) Crossing over between chromatids

**Solution : -**

Pairing of homologous chromosomes occurs in zygotene and crossing over occurs in pachytene stage of prophase I of meiosis I. Paired chromosomes line up on equator in metaphase I. Then there is complete separation of chromatids in anaphase I of meiosis I.

42. \_\_\_\_\_ is the best stage to count the number and study the morphology of chromosomes.  
a) Prophase    **b) Metaphase**    c) Anaphase    d) Telophase

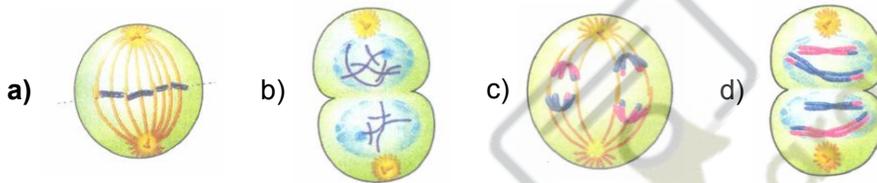
**Solution : -**

Metaphase is the best phase to count total number of chromosomes in any species and detailed study of morphology of chromosome. Idiogram (arrangement of chromosomes in a series of decreasing length) can be drawn in this stage.

43. Refer to the given figure of cell division.



Which of the following options show previous stage of this process?



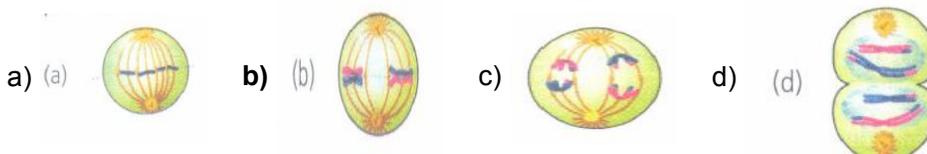
**Solution : -**

The given represent anaphase of mitotic division. Option (a), (b), (c) and (d) represent metaphase of mitotic division, telophase of mitotic division, anaphase I of meiotic division and telophase I of meiotic division. Metaphase is the previous stage of anaphase of mitotic division.

44. Preparation phase of mitosis is  
a) G<sub>1</sub> - phase    b) S - Phase    **c) Prophase**    d) Interphase
45. A cell cycle includes  
**a) interphase and M phase**    b) prophase, metaphase, anaphase and telophase    c) G<sub>1</sub>, S and G<sub>2</sub> phases  
d) karyokinesis and cytokinesis.
46. In meiosis, how many cycles of chromosome division occurs?  
**a) One**    b) Four    c) Two    d) Three
47. The figure given below shows a cell undergoing meiosis.



Which of the options below shows the next stage in the process?



**Solution : -**

The given figure is showing diplotene stage of prophase I of meiosis I. Next stage would be metaphase I.

48. During cell cycle in which phase normal components of cell synthesized , and assembled?

- a) S   b) G<sub>2</sub>   **c) G<sub>1</sub>**   d) M

49. Which phase occupies the maximum part of cell cycle?

- a) Mitotic phase   b) Meiotic phase   **c) Interphase**   d) Cytokinesis

**Solution : -**

One cycle of cell division in human cells takes 24 hours in which cell division proper lasts for only about an hour while interphase lasts more than 95% of the duration of cell cycle.

50. **Assertion:** Prophase is the first stage of mitosis which follows S and G<sub>1</sub> phases of interphase.

**Reason:** Prophase is marked by the initiation of clusters of chromosomes.

- a) If both assertion and reason are true and reason is the correct explanation of assertion  
b) If both assertion and reason are true but reason is not the correct explanation of assertion  
c) If assertion is true but reason is false   **d) If both assertion and reason are false**

**Solution : -**

Prophase which is the first stage of mitosis follows the S and G<sub>2</sub> phases of interphase. In the S and G<sub>2</sub> phases the new DNA molecules formed are not distinct but intertwined. Prophase is marked by the initiation of condensation of chromosomal material. The chromosomal material becomes untangled during the process of chromatin condensation.

