

CHAPTER-10: CELL CYCLE AND CELL DIVISION

One mark questions

1. Define cell cycle
2. Name the phases of cell cycle
3. What is the G₁ phase of the interphase?
4. Which phase follows the S phase in the cell cycle?
5. What is mitosis?
6. What is meiosis?
7. In which phase of cell division crossing over?
8. What term is used for a full set of DNA instructions in a cell?
9. In which phase of the cell division the chromosomes are set free in the cytoplasm?
10. By which method cytokinesis occurs in animal cells?
11. What is the significance of Pachytene?
12. At what stage of mitosis, chromosomes arrange themselves around the equator?
13. What is karyokinesis?
14. What is cytokinesis?
15. What is the average cell cycle span for mammalian cell?
16. What is quiescent phase (G₀)?
17. Why is mitosis called equational division?
18. What are bivalents?
19. What is the Synapse?
20. What is chiasmata?
21. Why is meiosis called reductional division?
22. What is terminalization?
23. What is cell plate?
24. In yeast mitosis is a means of reproduction, Why?
25. Mention the significance of chiasmata.
26. The chromosomes are set free into cytoplasm in one of the following stages
a) Prophase b) Telophase c) Anaphase d) Metaphase
27. In which phase of the M phases the morphology of the chromosome can be best studied?
28. Spindle fibers get attached to centromere of the chromosome of the following stage
a) Telophase b) Anaphase c) Prophase d) Metaphase

29. What is a metaphasic plate?
30. Name the pathological condition when uncontrolled cell division occurs.
31. Name the enzyme which is involved in crossing over.
32. What is a significance of crossing over?
33. What is mean by recombination?
34. What is interphase
35. Which phases of the cell cycle takes longer time to complete
36. Name the adult animal cell which do not divide
37. What is syncytium?
38. Give an example for syncytium condition.
39. What id diad?
40. What is interkinesis?
41. What is tetrad?

Two Marks questions

1. Mention the role of centriole during cell division?
2. Write difference between zygotene and pachytene?
3. Draw a labeled diagram of Anaphase.
4. Draw a labeled diagram of Metaphase.
5. Write any two significance of mitosis?
6. Two events occur during S – phase in animal cells. DNA replication and duplication of centriole. In which parts of the cell do events occur?
7. Comment on the statement “Meiosis enables the conservation of specific chromosome number of each species even though the process actually results in reduction of chromosome number.
8. How does cytokinesis in plant cells differ from that in the animal cells?
9. Write a note on S – phase?
10. Mention different sub-stages of prophase-1 of meiosis?
11. Mention the significance of cell cycle?
12. Mention the phases of mitosis?
13. Give the sequence of events occurring during prophase of mitosis.
14. Give the key features of meiosis.
15. Differentiate between Meiosis-1 and meiosis-2.
16. List the features of diakinesis.
17. Write the characteristics of metaphase of M phase ?

18. Write the characteristic feature of telophase M phase?

19. Write the features of diplotene?

20. Mention the anaphase-1 character?

Four Marks Questions .

1. Distinguish between prophase and telophase?
2. Explain interphase with its stages.
3. With neat labeled diagram compare metaphase and anaphase of mitosis.
4. Match the following

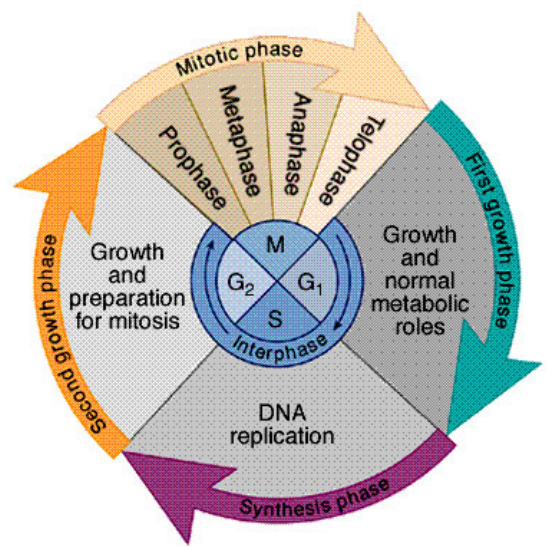
Column 1

Column 2

- | | |
|--------------|-------------------------------------|
| a) Prophase | 1. Formation of metaphasic plate |
| b) Metaphase | 2. Disintegration of nucleolus |
| c) Anaphase | 3. Reformation of nuclear membrane |
| d) Telophase | 4. Movement of daughter chromosomes |
-
5. List the difference between prophase and telophase of mitosis.
 6. With neat labeled diagram distinguish between zygotene and pachytene of prophase 1

Five marks Question

1. Distinguish between mitosis and meiosis.
2. Describe the stages of prophase-1 of meiosis.
3. Describe the stages of mitosis.
4. Distinguish between metaphase of mitosis and metaphase -1 of meiosis.



CHAPTER CELL CYCLE AND CELL DIVISION

Answers

- 1) The sequence of events by which cell duplicates its genome, synthesis of other constituents of the cell and eventually divides into two daughter cell.
- 2) a) Interphase b) M Phase
- 3) The G_1 phase Corresponds to interval between mitosis & initiation of DNA replication.
- 4) G_2 Phase
- 5) Cell divides equally to produce identical daughter cell so that they receive equal number of chromosomes as that of it's parents cell
- 6) It is a special type of division takes place in the gonads during gametogenesis by which the diploid cell undergo division producing haploid daughter cells
- 7) During pachytene of prophase-1
- 8) Genome
- 9) Metaphase
- 10) By process of furrowing of plasmamembrane exactly at the middle
- 11) Genetic recombination occurs
- 12) Metaphase
- 13) It is a process of division of nucleus into daughter nuclei in a dividing cell.or segregation of duplicated chromosome into daughter nuclei.
- 14) Division of cytoplasm
- 15) 24 hours
- 16) G_0 Phase means cell remain metabolically active but no longer proliferate.
- 17) Since the no of chromosomes in the parent and progeny cells is the same.
- 18) The homologous chromosomes which are involved in pairing process are called bivalent
- 19) The process of pairing of homologous chromosomes during zygotene
- 20) cytological appearance of X mark at the site of recombination
- 21) When cell under goes meiotic division that daughter cells receives half the chromosome number that of it's parent cell.
- 22) It is the process of movement of X mark appearance from the middle of the chromatids to the end of the chromatids of homologous chromosomes

- 23) It is a precursor of cell wall formed at middle of the nuclei in a divisional cell. later forms middle lamella
- 24) The yeast is a unicellular organism
- 25) Chiasmata helps in exchange of part of the chromatids of non-sister chromatids
- 26) d) metaphase
- 27) Metaphase
- 28) Metaphase
- 29) The plane of alignment of the chromosomes at equator
- 30) Cancer
- 31) Recombinase
- 32) Crossing over helps in genetic recombination
- 33) It is a process of exchange of part of the chromatids of non-sister chromatids of homologous chromosomes
- 34) The phase between two successive M phases
- 35) Interphase
- 36) Heart cells
- 37) It is a multinucleate condition arise due to karyokinesis not followed by cytokinesis
- 38) Liquid endosperm in coconut.
- 39) The two haploid daughter cell still attached each other at the end of telophase-1 is called diad.
- 40) The stage between the two meiotic divisions
- 41) The four haploid cell still attached together at the end of telophase-II

Or

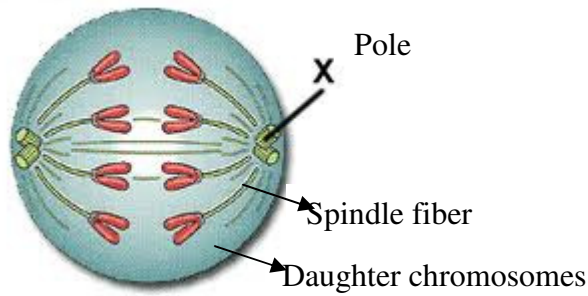
A four-part structure that forms during the prophase of meiosis and consists of two homologous chromosomes, each composed of two sister chromatids.

Two Marks Answers

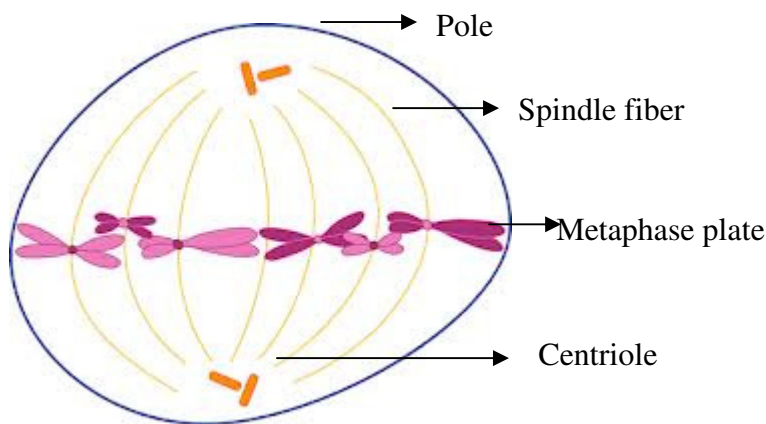
1. a) Centriole undergoes duplication during S-phase
b) it establishes the polarity in a divisional cell
c) it produces spindle fibers
- 2.

Zygotene	Pachytene
The homologous chromosome started pairing	The bivalents clearly appear as tetrads
Formation of synaptonemal complex	Appearance of recombination nodules

3.



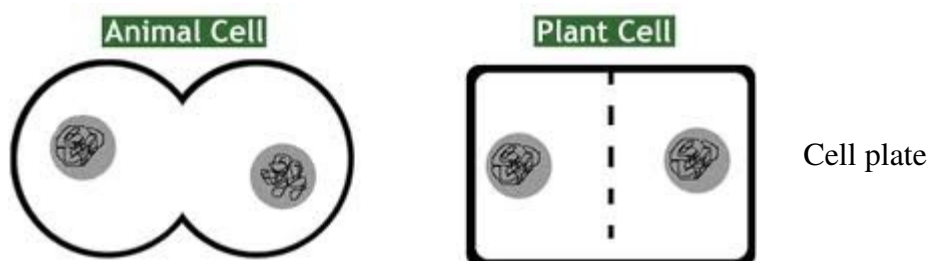
4.



- 5) a) The mitosis helps in increase in number of cells
- b) In unicellular organism it is a means of reproduction

- 6) DNA replication —Occur in nucleus
- Duplication of centriole —Occur in cytoplasm

- 7) During gamete formation parent diploid cell undergoes meiosis producing two haploid cell, they become gametes. The two male and female haploid gametes fuse together to form zygote – restoring diploidy.
- 8) In plant cell wall formation starts in the centre of the cell as cell plate and grows outward to meet existing lateral walls but in animal cell the cytokinesis is achieved by the appearance of a furrow in the plasmammembrane. This furrow gradually deepens towards meddle and join divides the cell.



→

a) During S-phase the DNA replicates.

10) Substages of prophase - 1

1 leptotene 2. Zygotene 3. Pachytene 4. Deplotene 5. Diakinesis

11) a) Multiplication of cell (Reproduction of cell)

b) Ensuring the exact distribution of chromosomes and cell content to daughter cells

12) Phases of mitosis

a) Prophase

c) Anaphase

b) Metaphase

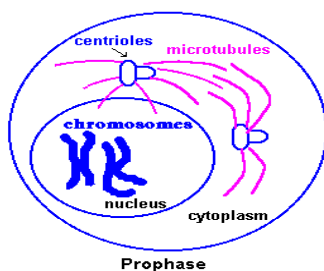
d) Telophase

13) a) Chromatin material started condensing

b) Duplicated centriols move towards opposite poles(In animals cells)

c) Mitotic spindle start appearing

d) Cell do not show gogli compelx endoplasmic reticulum nucleolus and nuclear envelop(Disappear)



14) Key features:

a) The diploid cell become haploid

b) chiasmata occurs in pachytene

c) Variations are created which are the source for evolution

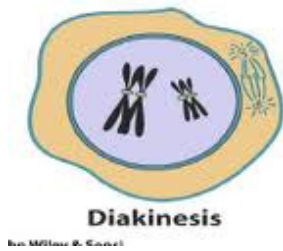
d) Meiosis occurs during gametogenesis

15)

Meiosis – 1	Meiosis – 2
* It occurs in Diad stage	* It occurs in tetrad stage
* Homologous chromosomes forms metaphasic plate	* Separated chromosomes forms metaphasic plate
* Homologous chromosomes gets separated	* Separated chromosomes gets divided
* Chromosomes are reduce to half by separation	* Chromosomes are duplicated by division

16) * Terminalisation of chiasmata

- * Chromosomes are highly condensed
- * Meiotic spindle is ready to prepare the homologous chromosomes for separation
- * Nucleolus and nuclear membrane starts break down



17) * Chromosomes are set free into cytoplasm

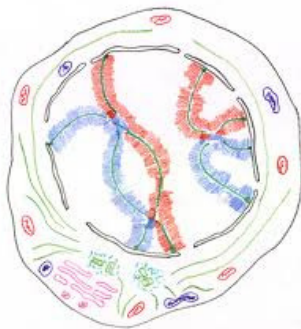
- * Chromatids of a chromosomes are attached to spindle fibers
- * Formation of metaphase plate
- * The chromosomes divide longitudinally produce daughter chromosomes

18) * The chromosomes that have been reached their respective poles

- * Chromosomes decondense so that individual identity is lost
- * Nuclear envelop develops around the chromosomes cluster
- * Nucleolus, golgi complex & endoplasmic reticulum reform

19) * dissolution of synaptonemal complex

- * Tendency of recombine homologous chromosomes starts separate from each other
- * X-marks are clearly appeared.(sites of chiasmata)

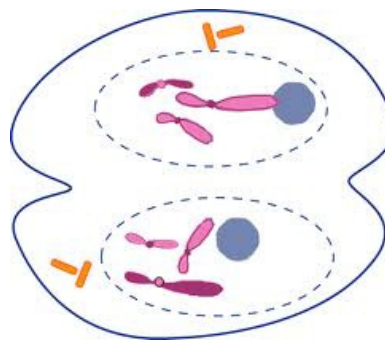
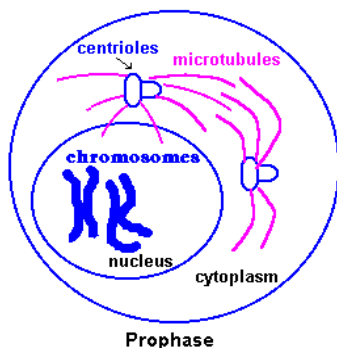


20) * Homologous chromosomes separates

- * Separated Homologous chromosomes moving towards opposite poles

Four Marks Answers

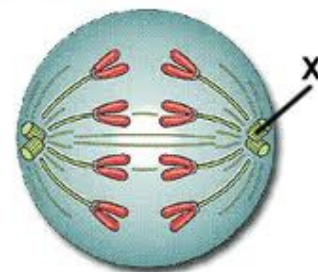
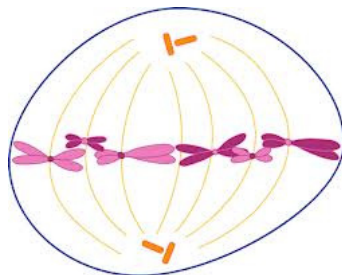
1)



Prophase	Telophase
<ul style="list-style-type: none"> • Chromatin condense • Chromatin becomes chromosomes • Nucleolus disappear • Nuclear membrane breaks 	<ul style="list-style-type: none"> • Chromosomes decondense • Chromosomes become chromatin form • Reforming of nucleolus • New nuclear membrane develops

- 2) * The phase between two successive M phases
- *The interphase includes G_1 , S and G_2 ,
 - *In G_1 phase cell is metabolically active and continuously grows
 - *S or synthesis phase marks the period during which DNA synthesis takes place. So that DNA per cell doubles. In animals cell centriole replicates
 - * G_2 during the G_2 phase proteins are synthesised in preparation for mitosis while cell growth continues.

3)



Metaphase	Anaphase
<ul style="list-style-type: none"> *chromosomes are all align on the equatorial line *Formation of metaphasic plate *Centromere touches equatorial line and their arms facing respective poles *The spindle fibers are attaches to kinetochore *Chromosomes are divide and produce daughter chromosomes 	<ul style="list-style-type: none"> *The daughter chromosomes started moving from equator towards their poles *The spindle fibers are shortening *The chromosomes alignment is in such a way the centromeres takes the leading position on their arms follows *Chromosomes during their movement looks like V, J, I, And rod shapes *Chromosomes reaches their poles

4)

Column 1

Column 2

- | | |
|--------------|--|
| a) Prophase | 1. Formation of metaphasic plate (b) |
| b) Metaphase | 2. Disintegration of nucleolus (a) |
| c) Anaphase | 3. Reformation of nuclear membrane(d) |
| d) Telophase | 4. Movement of daughter chromosomes(c) |

5)

Prophase	Telophase
<ul style="list-style-type: none"> Chromosomes are chromatin form Chromosome are lightly visible Nucleolus disappear Nuclear membrane breaks 	<ul style="list-style-type: none"> Chromosomes are decondence Chrsomosomes become chromatin form Reforming of nucleolus New nuclear membrane develops

6)



Zygotene	Pachytene
The homologous chromosome started pairing	The bivalents clearly appears as tetrads
Formation of synaptonemal complex	Appearance of recombination nodules

Five Marks Answers

1.

Mitosis	Meiosis
It occurs in somatic (body) cells	It occurs in reproductive (germ) cells.
It is an equational division.	It is a reductional division.
Two diploid daughter cells are	Four haploid daughter cells are

formed	formed
Daughter cells are similar.	Daughter cells are dissimilar
Nucleus and cytoplasm divides once	Nucleus and cytoplasm divides twice
Prophase is of short duration	Prophase-1 is of long duration
Synapsis do not occur	Synapsis occur
Chiasmata do not takes place	Chiasmata occur

2.

The prophase -1 is the longest process it is divided into 5 sub stages namely leptotene zygotene pachytene diplotene and diakinesis

Leptotene: the chromosomes are thin and lightly visible

Zygotene: Chromosomes starts pairing between homologous chromosomes

Formation of synaptonemal complex

Pachytene: Bivalent clearly appears as tetrads

Appearance of recombination nodules, crossing over occurs

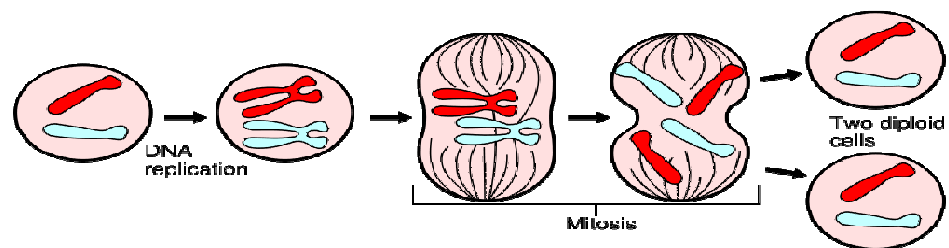
Diplotene: Dissolution of synaptonemal complex

Tendency recombined homologous chromosomes of the bivalents separate from each other

Diakinesis: Terminalization of chiasmata

Nucleolus and nuclear membrane breaks down

3.



a) Prophase

Chromosomes are chromatin form

Chromosome are lightly visible

Nucleolus disappear

Nuclear membrane breaks

Metaphase

*chromosomes are all align on the equatorial line

*Formation of metaphasic plate

*Centromere touches equatorial line and their arms facing respective poles

*The spindle fibers are attaches to kinatochore

*Chromosomes are divide and produce daughter chromosomes

Anaphase

*The daughter chromosomes started moving from equator towards their poles

*The spindle fibers are shortening

*The chromosomes alignment is in such a way the centromeres takes the leading position on their arms follows

*Chromosomes during their movement looks like V, J, I, And rod shapes

*Chromosomes reaches their poles

Telophase

Chromosomes are decondence

Chrmosomes become chromatin form

Reforming of nucleolus

New nuclear membrane develops

4)

Metaphase	Metaphase-1
Parental chromosomes are align on equator	The bivalent chromosomes align on equator
Chromosomes contain two chromatids	The chromosomes contain four chromatids
Centromere splits	Centromere do not splits
Daughter chromosomes are formed	The separation of homologous chromosomes occur