CHAPTER 10

Cell Cycle and Cell Division

10.1 Cell Cycle

1. Identify the correct statement with regard to G_1 phase (Gap 1) of interphase.
(a) DNA synthesis or replication takes place.
(b) Reorganisation of all cell components takes place.
(c) Cell is metabolically active, grows but does not replicate its DNA.
(d) Nuclear division takes place. *(NEET 2020)*

2. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of
(a) M phase (b) G_1 phase
(c) S phase (d) G_2 phase.
(NEET 2020)

3. Cells in G_0 phase
(a) terminate the cell cycle
(b) exit the cell cycle
(c) enter the cell cycle
(d) suspend the cell cycle. *(NEET 2019)*

4. The correct sequence of phases of cell cycle is
(a) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$ (b) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$
(c) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$ (d) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$.
(NEET 2019)

5. During cell growth, DNA synthesis takes place on
(a) S-phase (b) G_1-phase
(c) G_2-phase (d) M phase.
(NEET-II 2016)

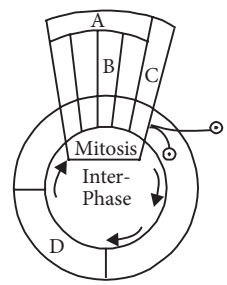
6. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?
(a) G_1/S (b) G_2/M
(c) M (d) Both G_2/M and M
(NEET-II 2016)

7. A somatic cell that has just completed the S phase of its cell cycle, as compared to gamete of the same species, has
(a) twice the number of chromosomes and four times the amount of DNA
(b) four times the number of chromosomes and twice the amount of DNA
(c) twice the number of chromosomes and twice the amount of DNA
(d) same number of chromosomes but twice the amount of DNA. *(2015 Cancelled)*

8. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C?
(a) G_0 and G_1 (b) G_1 and S
(c) Only G_2 (d) G_2 and M *(2014)*

9. In 'S' phase of the cell cycle
(a) amount of DNA doubles in each cell
(b) amount of DNA remains same in each cell
(c) chromosome number is increased
(d) amount of DNA is reduced to half in each cell.
(2014)

10. Given below is a schematic break-up of the phases/stages of cell cycle. Which one of the following is the correct indication of the stage/phase in the cell cycle?



(a) C - karyokinesis
(b) D - synthetic phase
(c) A - cytokinesis
(d) B - metaphase *(2009)*

11. At what stage of the cell cycle are histone proteins synthesized in a eukaryotic cell?
(a) During G_2 stage of prophase
(b) During S-phase
(c) During entire prophase
(d) During telophase *(2005)*

12. In the somatic cell cycle
(a) in G_1 phase DNA content is double the amount of DNA present in the original cell
(b) DNA replication takes place in S phase
(c) a short interphase is followed by a long mitotic phase
(d) G_2 phase follows mitotic phase. *(2004)*

13. In which stage of cell cycle, DNA replication occurs?
(a) G_1-phase (b) S-phase
(c) G_2-phase (d) M-phase *(2000)*

14. Which typical stage is known for DNA replication?
(a) S-phase (b) G_2-phase
(c) metaphase (d) G_1-phase *(1996)*

15. In a somatic cell cycle, DNA synthesis takes place in
(a) G_1 phase (b) prophase of mitosis
(c) S-phase (d) G_2 phase. *(1994)*

10.2 M Phase

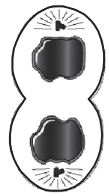
16. Which of the following options gives the correct sequence of events during mitosis ?
(a) Condensation → Nuclear membrane disassembly → Arrangement at equator → Centromere division → Segregation → Telophase
(b) Condensation → Crossing over → Nuclear membrane disassembly → Segregation → Telophase
(c) Condensation → Arrangement at equator → Centromere division → Segregation → Telophase
(d) Condensation → Nuclear membrane disassembly → Crossing over → Segregation → Telophase *(NEET 2017)*

17. Anaphase Promoting Complex (APC) is a protein degradation machinery necessary for proper mitosis of animal cell. If APC is defective in a human cell, which of the following is expected to occur?
(a) Chromosomes will be fragmented.
(b) Chromosomes will not segregate.
(c) Recombination of chromosome arms will occur.
(d) Chromosomes will not condense. *(NEET 2017)*

18. Spindle fibres attach on to
(a) centromere of the chromosome
(b) kinetosome of the chromosome
(c) telomere of the chromosome
(d) kinetochore of the chromosome. *(NEET-I 2016)*

19. Which of the following is not a characteristic feature during mitosis in somatic cells?
(a) Chromosome movement
(b) Synapsis
(c) Spindle fibres
(d) Disappearance of nucleolus *(NEET-I 2016)*

20. A stage in cell division is shown in the figure.
Select the answer which gives correct identification of the stage with its characteristics.



(a) Cytokinesis — Cell plate formed, mitochondria distributed between two daughter cells.
(b) Telophase — Endoplasmic reticulum and nucleolus not reformed yet.
(c) Telophase — Nuclear envelope reforms, Golgi complex reforms.
(d) Late anaphase — Chromosomes move away from equatorial plate, Golgi complex not present. *(NEET 2013)*

21. During the metaphase stage of mitosis, spindle fibres attach to chromosomes at
(a) kinetochore
(b) both centromere and kinetochore
(c) centromere, kinetochore and areas adjoining centromere
(d) centromere. *(Karnataka NEET 2013)*

22. A stage of mitosis is shown in the diagram. Which stage is it and what are its characteristics?

(a) Metaphase - Spindle fibers attached to kinetochores, centromeres split and chromatids separate.
(b) Metaphase - Chromosomes moved to spindle equator, chromosomes made up of two sister chromatids.
(c) Anaphase - Centromeres split and chromatids separate and start moving away.
(d) Late prophase - Chromosomes move to spindle equator. *(Karnataka NEET 2013)*

23. Select the correct option with respect to mitosis.
(a) Chromatids separate but remain in the centre of the cell in anaphase.
(b) Chromatids start moving towards opposite poles in telophase.
(c) Golgi complex and endoplasmic reticulum are still visible at the end of prophase.
(d) Chromosomes move to the spindle equator and get aligned along equatorial plate in metaphase. *(2011)*

24. At metaphase, chromosomes are attached to the spindle fibres by their
(a) satellites
(b) secondary constrictions
(c) kinetochores
(d) centromeres. *(Mains 2011)*

25. During mitosis, ER and nucleolus begin to disappear at
(a) late prophase (b) early metaphase
(c) late metaphase (d) early prophase. *(2010)*

26. Which stages of cell division do the following figures A and B represent respectively?

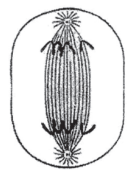


Fig. A

Fig. B

	A	B
(a)	Metaphase	Telophase
(b)	Telophase	Metaphase
(c)	Late anaphase	Prophase
(d)	Prophase	Anaphase

(2010)

27. If you are provided with root-tips of onion in your class and are asked to count the chromosomes, which of the following stages can you most conveniently look into?
(a) Metaphase (b) Telophase
(c) Anaphase (d) Prophase *(2004)*

28. Which one of the following precedes reformation of the nuclear envelope during M phase of the cell cycle?
(a) Decondensation from chromosomes and reassembly of the nuclear lamina
(b) Transcription from chromosomes and reassembly of the nuclear lamina
(c) Formation of the contractile ring and formation of the phragmoplast
(d) Formation of the contractile ring and transcription from chromosomes *(2004)*

29. Mitotic spindle is mainly composed of which protein?
(a) Actin (b) Myosin
(c) Actomyosin (d) Myoglobin *(2002)*

30. Best material for the study of mitosis in laboratory is
(a) anther (b) root tip
(c) leaf tip (d) ovary. *(2002)*

31. Spindle fibre unite with which structure of chromosomes?
(a) Chromocentre (b) Chromomere
(c) Kinetochore (d) Centriole *(2000)*

32. Microtubule is involved in the
(a) muscle contraction
(b) membrane architecture
(c) cell division
(d) DNA recognition. *(1998)*

33. How many mitotic divisions are needed for a single cell to make 128 cells?
(a) 28 (b) 32
(c) 7 (d) 14 *(1997)*

34. During cell division in apical meristem, the nuclear membrane appears in
(a) telophase (b) cytokinesis
(c) metaphase (d) anaphase. *(1997)*

35. Which of the following structures will not be common to mitotic cell of a higher plant?
(a) Centriole (b) Spindle fibre
(c) Cell plate (d) Centromere *(1997)*

36. Colchicine is an inhibitory chemical, which
(a) stops the functioning of centriole
(b) prevents attaching of centromeres with rays
(c) prevents the spindle formation in mitosis
(d) prevents the formation of equatorial plane. *(1996)*

37. Which of the following represents the best stage to view the shape, size and number of chromosomes?
(a) Prophase (b) Metaphase
(c) Interphase (d) Telophase *(1994)*

38. 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. *(1991)*

10.4 Meiosis

39. Dissolution of the synaptonemal complex occurs during
(a) pachytene (b) zygotene
(c) diplotene (d) leptotene. *(NEET 2020)*

40. Match the following with respect to meiosis.

(A) Zygotene	(i) Terminalization
(B) Pachytene	(ii) Chiasmata
(C) Diplotene	(iii) Crossing over
(D) Diakinesis	(iv) Synapsis

Select the correct option from the following

	(A)	(B)	(C)	(D)
(a)	(iii)	(iv)	(i)	(ii)
(b)	(iv)	(iii)	(ii)	(i)
(c)	(i)	(ii)	(iv)	(iii)
(d)	(ii)	(iv)	(iii)	(i)

(NEET 2020)

41. Crossing over takes place between which chromatids and in which stage of the cell cycle ?
(a) Non-sister chromatids of non-homologous chromosomes at Zygotene stage of prophase I.
(b) Non-sister chromatids of homologous chromosomes at Pachytene stage of prophase I.
(c) Non-sister chromatids of homologous chromosomes at Zygotene stage of prophase I.
(d) Non-sister chromatids of non-homologous chromosomes at Pachytene stage of prophase I. *(Odisha NEET 2019)*

42. The stage during which separation of the paired homologous chromosomes begins is
(a) pachytene (b) diplotene
(c) diakinesis (d) zygotene. *(NEET 2018)*

43. Match the stages of meiosis in column I to their characteristic features in column II and select the correct option using the codes given below.

	Column I		Column II
A.	Pachytene	(i)	Pairing of homologous chromosomes
B.	Metaphase I	(ii)	Terminalisation of chiasmata
C.	Diakinesis	(iii)	Crossing-over takes place
D.	Zygotene	(iv)	Chromosomes align at equatorial plate

(a) A-(iii), B-(iv), C-(ii), D-(i)
(b) A-(i), B-(iv), C-(ii), D-(iii)
(c) A-(ii), B-(iv), C-(iii), D-(i)
(d) A-(iv), B-(iii), C-(ii), D-(i) *(NEET-II 2016)*

44. In meiosis crossing over is initiated at
(a) zygotene (b) diplotene
(c) pachytene (d) leptotene.
(NEET-I 2016)

45. Arrange the following events of meiosis in correct sequence
(i) Crossing over (ii) Synapsis
(iii) Terminalisation of chiasmata
(iv) Disappearance of nucleolus
(a) (i), (ii), (iii), (iv) (b) (ii), (iii), (iv), (i)
(c) (ii), (i), (iv), (iii) (d) (ii), (i), (iii), (iv)
(2015)

46. Select the correct option.

	Column I		Column II
A.	Synapsis aligns homologous chromosomes	(i)	Anaphase II
B.	Synthesis of RNA and protein	(ii)	Zygotene
C.	Action of enzyme recombinase	(iii)	G_2-phase
D.	Centromeres do not separate but chromatids move towards opposite poles	(iv)	Anaphase I
		(v)	Pachytene

(a) A-(i), B-(ii), C-(v), D-(iv)
(b) A-(ii), B-(iii), C-(iv), D-(v)
(c) A-(ii), B-(i), C-(iii), D-(iv)
(d) A-(ii), B-(iii), C-(v), D-(iv) *(2015 Cancelled)*

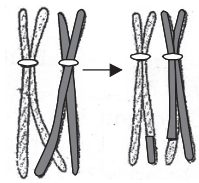
47. The enzyme recombinase is required at which stage of meiosis?
(a) Pachytene (b) Zygotene
(c) Diplotene (d) Diakinesis *(2014)*

48. The complex formed by a pair of synapsed homologous chromosomes is called
(a) bivalent (b) axoneme
(c) equatorial plate (d) kinetochore.
(NEET 2013)

49. During meiosis I, the chromosomes start pairing at
(a) zygotene (b) pachytene
(c) diplotene (d) leptotene.
(Karnataka NEET 2013)

50. During gamete formation, the enzyme recombinase participates during
(a) metaphase I (b) anaphase II
(c) prophase I (d) prophase II. *(2012)*

51. The given figure is the representation of a certain event at a particular stage of a type of cell division. Which is this stage?



(a) Prophase I during meiosis
(b) Prophase II during meiosis
(c) Prophase of mitosis
(d) Both prophase and metaphase of mitosis *(2012)*

52. Identify the meiotic stage in which the homologous chromosomes separate while the sister chromatids remain associated at their centromeres.
(a) Metaphase I (b) Metaphase II
(c) Anaphase I (d) Anaphase II
(Mains 2012)

53. Synapsis occurs between
(a) *m*RNA and ribosomes
(b) spindle fibres and centromere
(c) two homologous chromosomes
(d) a male and a female gamete. *(2009)*

54. When paternal and maternal chromosomes change their materials with each other in cell division this event is called
(a) bivalent-forming (b) dyad-forming
(c) synapsis (d) crossing-over. *(1996)*

55. Which statement best explains the evolutionary advantage of meiosis?
(a) Meiosis is necessary for sexual reproduction.
(b) Genetic recombinations are possible from generation to generation.
(c) Meiosis alternates with mitosis from generation to generation.
(d) The same genetic system is passed on from generation to generation. *(1994)*

56. Meiosis II performs
(a) separation of sex chromosomes
(b) synthesis of DNA and centromere
(c) separation of homologous chromosomes
(d) separation of chromatids. *(1993)*

57. Number of chromatids at metaphase is
(a) two each in mitosis and meiosis
(b) two in mitosis and one in meiosis
(c) two in mitosis and four in meiosis
(d) one in mitosis and two in meiosis. *(1992)*

58. In meiosis, the daughter cells differ from parent cell as well as amongst themselves due to
(a) segregation, independent assortment and crossing over
(b) segregation and crossing over
(c) independent assortment and crossing over
(d) segregation and independent assortment. *(1991)*

59. Meiosis I is reductional division. Meiosis II is equational division due to
(a) pairing of homologous chromosomes
(b) crossing over
(c) separation of chromatids
(d) disjunction of homologous chromosomes. *(1988)*

ANSWER KEY

1.	(c)	**2.**	(b)	**3.**	(b)	**4.**	(a)	**5.**	(a)	**6.**	(b)	**7.**	(a)	**8.**	(c)	**9.**	(a)	**10.**	(b)
11.	(b)	**12.**	(b)	**13.**	(b)	**14.**	(a)	**15.**	(c)	**16.**	(a)	**17.**	(b)	**18.**	(d)	**19.**	(b)	**20.**	(c)
21.	(a)	**22.**	(b)	**23.**	(d)	**24.**	(c)	**25.**	(d)	**26.**	(c)	**27.**	(a)	**28.**	(c)	**29.**	(c)	**30.**	(b)
31.	(c)	**32.**	(c)	**33.**	(c)	**34.**	(a)	**35.**	(a)	**36.**	(c)	**37.**	(b)	**38.**	(d)	**39.**	(c)	**40.**	(b)
41.	(b)	**42.**	(b)	**43.**	(a)	**44.**	(c)	**45.**	(d)	**46.**	(d)	**47.**	(a)	**48.**	(a)	**49.**	(a)	**50.**	(c)
51.	(a)	**52.**	(c)	**53.**	(c)	**54.**	(d)	**55.**	(b)	**56.**	(d)	**57.**	(a)	**58.**	(a)	**59.**	(c)		