EXERCISE – I (Conceptual Question) Build Up your Understanding

1. Which of the following not ocurs in Anaphase-I but occurs in Anaphase-II :-
(1) Condensation of chromosomes (2) Poleward movement of chromosome
(3) Contraction of spindle fibers (4) Splitting of centromere

2. During G_2 - phase a diploid cell contains the amount of DNA equal to a :-
(1) Diploid cell (2) Tetraploid cell (3) Haploid cell (4) None of the above

3. Crossing over takes place in :-
(1) Zygotene (2) Pachytene (3) Diplotene (4) Diakinesis

4. A contractile mid body forms during cytokinesis in :-
(1) Animals (2) Higher plants (3) Fungi (4) Algae

5. In which order, cytokinesis occurs in plants :-
(1) Centripetal (2) Centrifugal (3) Oblique (4) Equatorial

6. Which of the two events restore the normal number of chromosomes in life cycle ?
(1) Mitosis and Meiosis (2) Meiosis and fertilisation
(3) Fertlisation and mitosis (4) Only meiosis

7. Match the column-I with column-II and select the correct answer:-

	Column-1		**Column-II**
(A)	Pachytene	(i)	Bouquet stage
(B)	Zygotene	(ii)	Chiasma visible
(C)	Diplotene	(iii)	Terminalisation
(D)	Leptotene	(iv)	Gene exchange
(E)	Diakinesis	(v)	Synapsis

(1) A-i, B-ii, C-iii, D-iv, E-v (2) A-iv, B-v, C-ii, D-i, E-iii
(3) A-iii B-iv C-v D-ii E-I (4) A-ii, B-iii, C-iv, D-i, E-v

8. Which part of plant is suitable for the study of meiosis
(1) Root apex (2) Ovary (3) Anther (4) Shoot apex

9. Chromosomal movement in Anaphase occurs with the help of :-
(1) Astral rays (2) Centrioles (3)NOR (4) Spindle fibres

10. Nuclear envelope reappears at :-
(1) Metaphase (2) Prophase (3) Anaphase (4) Telophase

11. Slipping of chiasmata towards the ends of bivalent is called :-
(1) Terminalisation (2) Diakinesis (3) Interkinesis (4) Congression

12. In meiosis, how many cycles of chromosome division occurs?
(1) One (2) Four (3)Two (4)Three

13. Which does not occurs in prophase ?
(1) Decondensation of chromatin
(2) Condensation of chromatin
(3) Appearance of chromosome
(4) Disappearance of nuclear membrane and nucleolus

14 . In which. stage of cell division, number of chromosomes best counted:-
(l) Prophase (2) Metaphase (3) Telophase (4) Interphase

15. How many chromosome shall be present in a diploid cell at mitotic anaphase if its egg cell has ten, chrompsome:-
(1) 10 (Ten) (2) 20 (Twenty) (3) 30 (Thirty) (4) 40 (Forty)

16. Chromosome exhibit high level of coiling at which phase of karyokinesis :
(1) Prophase (2) Metaphase (3) Telophase (4) Interphase

17. "Bouquet-stage" occur in which sub stages of prophase -I ?
(1) Leptotene (2) Zygotene (3) Pachytene (4) Diplotene

18. At anaphase - II of meiosis each chromosome contains:-
(1) 4 DNA (2) 3 - DNA (3) 2- DNA (4) 1- DNA

19. In which stage of mitosis, the chromosomes are composed of two chromatids ?
(1) Prophase & metaphase (2) Anaphase and telophase
(3) Prophase and telophase (4) Metaphase and anaphase

20. In Anaphase- I each chromosome composed of:-
(1) One chromatid (2) Two chromatid (3) Four chromatid (4) Many chromatid

21. Gap between division phase and start of DNA-replication is called :-
(1) G_1 - phase (2) G_2 – phase (3) M- phase (4) Interkinesis

22. In meiosis, division of centromere occurs during:-
(1) Interphase (2) Anaphase- I (3) Anaphase - II (4) Metapqase - I

23. In meiosis, nuclear membrane and nucleolus disappear during:
(1) Zygotene (2) Pachytene (3) Diakinesis (4) Metaphase - I

24. In cell cycle, which stage is misnomerly called resting phase :
(1) S-phase (2) Telophase (3) Cytokinesis (4) Interphase

25. Separation of homologous chromosomes during Anaphase - I is called :-
(1) Synapsis (2) Disjunction (3) Nondisjunction (4) Crossing over

26. During cell division, spindle fibers attach to which part of chromosome :-
(1) Primary constriction (2) Secondary constriction
(3) Telomere (4) Satellite

27. Diakinesis represents :-
(1) transition to prophase (2) transition to metaphase
(3) transition to anaphase (4) transition to telophase

28. Synaptonemal complex is characteristic of :
(1) Mitotic chromosomes (2) Leptotene chromosomes
(3) Paired meiotic chromosomes (4) Metaphase

29. During which stage a diploid cell becomes tetraploid in mitosis:-
(1) G_2 (2) Prophase (3) Metaphase (4) Anaphase

30. Division of centromere occurs in:
(1) Prophase (2) Metaphase (3) Anaphase (4) Telophase

31. Each chromosome composed of one chromatid in:
(1) Anaphase -I (2) Anaphase - II (3) Metaphase - I (4) Metaphase - II

32. If the number of bivalents are 8 in metaphase -I, what shall be the number of chromosomes in daughter cells after meiosis - I ~nd meiosis – II respectively:-
(1) 8 and 4 (2) 4 and 4 (3) 8 and 8 (4) 16 and 8

33. Which one of the following statements is correct ?
(1) Cell divided by cytokinesis only in mitosis
(2) DNA is replicated before the start of meiosis only
(3) Spindles consisting of microtubules are formed only in mitosis
(4) Exchange of genetic materials occurs only in meiosis

34. Which of the following not occurs in Anaphase -1
(1) Segregation of homologous chromosomes
(2) Shortening spindle
(3) Poleward movement of chromosomes
(4) Division of centromere

35. In meiosis :
(1) Division of nucleus twice but replication of DNA only once
(2) Division bf nucleus twice and replication of DNA twice
(3) Division of nucleus once and replication of DNA is also once
(4) Division of nucleus once and DNA- replication is twice

36. After meiosis - I, the two chromatids of a chromosome are :-
(1) Genetically similar

(2) Genetically different
(3) There occurs only one chromatid in each chromosome
(4) None of the above

37. Chiasmata appears during :-
(1) Diakinesis (2) Synaptotene (3) Diplotene (4) Leptotene

38. What happens in synthesis phase during cell cycle:
(1) DNA synthesis (2) Chromosome number becomes double
(3) Formation of two nuclei (4) Synthesis of tubulin proteins_

39. Reappearance of nuclear membrane & nucleolus along with thining_&_elongation in chromosomes are diagnostic characters for the phase:-
(1) Anaphase (2) Metaphase (3) Interphase (4)Telophase

40. Condensation of chromosomes and appearance of astral rays occur during:-
(1) Prophase (2) Metaphase (3) Anaphase (4) Telophase

41. During telophase:-
(1) Nuclear membrane is formed (2) Nucleolus appears
(3) Astral rays disappear (4) All the above

42. Chromosomal morphology (Structure) is best observed at:-
(1) Prophase (2) Metaphase (3) Interphase (4) Anaphase

43. Pairing of homologous chromosomes is called:-
(1) Disjunction (2) Synapsis (3) Segregation (4) Polyteny

44. Preparation phase of mitosis is :-
(1) G_1-phase (2) 5-phase (3) Prophase (4) Interphase

45. Synaptonemal complex first appear :-
(1) Leptotene (2) Pachytene (3) Zygotene (4) Diplotene

46. The correct sequence of prophase-! of meiosis is :
(1) Leptotene, pachytene, zygotene, diplotene, diakinesis
(2) Leptotene, diplotene, pachytene, zygotene, diakinesis
(3) Leptotene, zygotene, pachytene, diplotene, diakinesis
(4) Leptotene, zygotene, diakinesis, diplotene

47. M-phase of cell cycle consist of :-
(1) G_1 , Sand G_2 phase
(2) Prophase, Metaphase, Anaphase, Telophase
(3) Interphase, Prophase, Metaphase, Anaphase; Telophase
(4) Only prophase

48. If the cell is diploid in G_1 than after the S phase cell remain/become :
(1) n (2) 4n (3) 8n (4) 2n

49. Nuclear membrane disappears in :-
(1) Late prophase (2) Early prophase (3) Metaphase (4) Telophase

50. Pre-DNA synthesis phase is:-
(1) G_1 - phase (2) G_2 – phase (3) S-phase (4) Prophase

51. Which of the following is called heterotypic division:-
(1) Meiosis-I (2) Meiosis-II (3) Mitosis (4) Amitosis

52. DNA replication is found in:-
(1) Mitosis and meiosis-I (2) Mitosis and meiosis-I and meiosis-II
(3) Meiosis only (4) Mitosis only

53. Thick-thread stage occured in :-
(1) Leptotene (2) Zygotene (3) Pachytene (4) Diplotene

54. How many times divisions will occur in an isolated tip cell to form 128 cells ?
(1) 128 (2) 127 (3) 32 (4) 7

55. In which stage the DNA is doubled :-
(1) Metaphase (2) Anaphase (3) Interphase (4) Prophase

56. The significance of Meiosis is that it -
(1) Produce four cells having chromosomal numberequal to mother cell
(2) Occurs in all types of cells
(3) Maintains the constant Chromosomes number to a particular species
(4) Growth of animal body ograns

57. Cell cycle of an ordinary animal cell-
(1) $2n \xrightarrow{\text{Mitosis}} n \xrightarrow{\text{Fertilization}} 2n \xrightarrow{\text{Meiosis}} 2n$
(2) $n \xrightarrow{\text{Meiosis}} 2n \xrightarrow{\text{Fertilization}} 2n \xrightarrow{\text{Mitosis}} n$
(3) $2n \xrightarrow{\text{Meiosis}} n \xrightarrow{\text{Fertilization}} 2n \xrightarrow{\text{Mitosis}} 2n$
(4) $2n \xrightarrow{\text{Fertilization}} (n) \xrightarrow{\text{Mitosis}} 2n \xrightarrow{\text{Meiosis}} n$

58. The number of DNA in chromo-some at G_2 state of cell cycle :-
(1) One (2) Two (3) Four (4) Eight

59. Crossing over that results in genetic recombination in higher organisms occurs between-
(1) Non-sister chromatids of a bivalent (2) Two daughter nuclei
(3) Two different bivalents (4) Sister chromatids of a bivalents

60. In the somatic cell cycle :-
(1) DNA replication takes place in 5-phase
(2) A short interphase is followed by a long mitotic phase
(3) G_2 phase follows mitotic phase
(4) In G1 phase DNA content is double the amount of DNA present in the original cell

61. When synapsis is complete all along the chromosome, the cell is said to have entered a stage called.
(1) Zygotene (2) Pachytene (3) Diplotene (4) Diakinesis

62. Many cells function properly and divide mitotically even through they do not have :-
(1) Plasma membrane (2) Cytoskeleton
(3) Mitochondria (4) Plastids

63. Centromere is required for -
(1) Movement of chromosomes towards poles
(2) Cytoplasmic cleavage
(3) Crossing over
(4) Transcription

64. At which stage of the cell cycle are histone proteins synthesized in a eukaryotic cell ?
(1) During telophase (2) During 5-phase
(3) During G_2-stage of prophase (4) During entire prophase

65. If the n = 16 in plant cell then what is possible in metaphase - I of meiosis ?
(1) 32 Bivalents (2) 16Telravalehts (3) 16 Bivalents (4) 32 Bivalents

66. Prophase which follows the S and G_2 phases of interphase, is the first stage of :-
(1) Meiosis-II (2) Karyokinesis (3) Interphase (4) G_1 phase

67. The two asters together with spindle fibres form:-
(1) Mitotic apparatus (2) Asters
(3) Astral fibres (4) Centrosome

68. In prophase centrosome which had undergone duplication during. interphase, begins to move towards:
(1) Same poles of the cell
(2) Opposite poles of the cell
(3) One towards centre while another towards pole
(4) Both towards centre

69. During prophase each centrosome radiqtes out microtubules called :
(1) Mitotic apparatus (2) Spindle apparatus
(3) Asters (4) Spindle fibres

70. Telophase is :
(1) Final stage of karyokinesis (2) Final stage of mitosis
(3) Mid stage of karyokinesis (4) First stage of cytokinesis

71. Which one of the following is most correct statement :
(1) Chromatin material tends to collect in a mass in the two poles
(2) Each set of chromatin material tends to collect at each of the two poles
(3) Each set of chromatin material tends to collect at metaphasic plate

(4) Chromatin material tends to collect in a mas at one pole

72. Nuclear envelop develops around the chromosome clusters at :
(1) One pole (2) Centre
(3) Each pole (4) Pole as well as centre both

73. Cytokinesis is :
(1) Formation of cell wall (2) Formation of cell membrane
(3) Separation of nucleoplasm (4) Separation of cytoplasm

74. Meiosis involves:
(1) Pairing of homologous chromosomes and recombination between sister chromatids of nonhomologous chromosomes
(2) Pairing of homologous chromosomes and recombination between nonsister chromatids of homologuus chromosomes
(3) Pairing of nonhomologous chromosomes and recombination between nonsister chromatids of homologous chromosomes
(4) Pairing of homologous chromosomes and recombination between sister chromatids of homologous chromosomes

75. In which on of the following stage, the four chromatids of each bivalent chromosomes-becomes distinct and clearly appears as tetrads.
(1) Leptotene (2) Zygotene (3) Pachytene (4) Diplotene

76. Which one of the following statement is incorrect for interkinesis ?
(1) It is the stage between the two subphases of a meiotic division
(2) There is no replication of DNA
(3) DNA replicate but chromosome number remains same
(4) It is generally short lived.

77. At anaphase-II, sister chromatids move towards opposite poles of the cell by :
(1) Contraction in spindle fibre attached to kinetochores
(2) Shortening of microtubules attached to kinetochores
(3) Lengthening of microtubules attached to kinetochores
(4) Relaxation in spindle fibre attached to kinetochores

78. G_0 (Quiscent) stage is :
(1) Part of interphase (2) Part of M-phase
(3) Part of G_2 phase (4) Not a part of cell cycle

79. In a slow dividing normal cell:
(1) G_1 phase is more longer than S phase (2) S phase is more longer than G_1 phase
(3) Both phases are equal in duration (4) Can't be determined

ANSWER KEY

EXERCISE-I (Conceptual Question)

1.	(4)	**2.**	(2)	**3.**	(2)	**4.**	(1)	**5.**	(2)	**6.**	(2)	**7.**	(2)
8.	(3)	**9.**	(4)	**10.**	(4)	**11.**	(1)	**12.**	(1)	**13.**	(1)	**14.**	(2)
15.	(4)	**16.**	(2)	**17.**	(1)	**18.**	(4)	**19.**	(1)	**20.**	(2)	**21.**	(1)
22.	(3)	**23.**	(3)	**24.**	(4)	**25.**	(2)	**26.**	(1)	**27.**	(2)	**28.**	(3)
29.	(4)	**30.**	(3)	**31.**	(2)	**32.**	(3)	**33.**	(4)	**34.**	(4)	**35.**	(1)
36.	(2)	**37.**	(3)	**38.**	(1)	**39.**	(4)	**40.**	(1)	**41.**	(4)	**42.**	(2)
43.	(2)	**44.**	(4)	**45.**	(3)	**46.**	(3)	**47.**	(2)	**48.**	(4)	**49.**	(1)
50.	(1)	**51.**	(1)	**52.**	(1)	**53.**	(3)	**54.**	(4)	**55.**	(3)	**56.**	(3)
57.	(3)	**58.**	(2)	**59.**	(1)	**60.**	(1)	**61.**	(2)	**62.**	(4)	**63.**	(1)
64.	(2)	**65.**	(3)	**66.**	(2)	**67.**	(1)	**68.**	(2)	**69.**	(3)	**70.**	(1)
71.	(2)	**72.**	(3)	**73.**	(4)	**74.**	(2)	**75.**	(3)	**76.**	(3)	**77.**	(2)
78.	(4)	**79.**	(1)										