BIOLOGY

CLASS-XI NEET

EXPLANATIONS

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Physics Wallah

Answer Key

Topic-wise Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
b	c	b	a	a	c	a	b	d	d	d	c	b	b	d	a	a	a
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
b	d	a	a	c	a	d	c	c	d	a	c	a	c	c	d	d	b
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
d	a	d	a	b	a	c	c	d	b	d	b	c	c	a	c	b	c
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
c	d	c	a	c	c	d	d	b	d	a	d	b	a	d	d	b	c
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
b	d	a	b	a	b	d	c	c	d	a	c	d	b	b	c	c	a
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
b	c	c	a	a	d	c	b	b	a	b	d	a	b	b	d	c	c
109	110	111	112	113	114												
b	d	b	a	c	a												

NCERT Based Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
c	c	a	d	a	b	b	a	b	d	a	b	d	a	a	c	d	d
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
b	b	d	d	d	a	a	c	c	c	d	d	a	d	b	d	b	c

Multi-Concept Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
c	a	a	c	b	a	c	d	a	a	a	a	b	a	d	d	d	b
19	20	21	22														
d	d	a	d														

NEET Past 10 Year Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
a	b	b	d	a	c	c	a	d	a	b	b	c	c	d	d	c	d
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34		
c	d	a	d	a	a	b	d	b	d	b	c	d	b	a	a		

10. Cell Cycle and Cell Division

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Topic-wise Questions

1. (b) The sequence of events in which a cell duplicates its genome, synthesises the other constituents of the cells and eventually divides into two daughter cells is called cell cycle.

2. (c) A typical eukaryotic cell cycle is illustrated by human cells in culture.

3. (b) In the 24 hour average duration of cell cycle of a human cell, cell division proper lasts for about an hour.

4. (a) The interphase lasts more than 95% of the total duration of cell cycle.

5. (a) If a cell possesses twice as much DNA as in the functional cell, the cell is preparing to divide.

6. (c) **7. (a)**

8. (b) Most of the organelle duplication occurs during interphase.

9. (d) **10. (d)**

11. (d) **12. (c)**

13. (b) DNA replication occurs only once in each cell cycle (during S-phase).

14. (b) Virchow stated that new cells develop from pre-existing cells.

15. (d) Amitosis is characteristic of lower organisms.

16. (a) Gap 1/G_1 phase corresponds to the interval between mitosis and initiation of DNA replication.

17. (a) G_0 state of cell denotes exit of cell from cell cycle.

18. (a) G_1, S and G_2 are the stages of interphase.

19. (b) DNA polymerase is active during S phase of cell cycle.

20. (d) "Post-mitotic phase" of the cell in which active synthesis of RNA and proteins takes place is G_1 phase.

21. (a)

22. (a) ATP is stored in G_1 phase.

23. (c) **24. (a)**

25. (d) Usually, a cell is bound to divide if it has entered the S - phase.

26. (c) **27. (c)**

28. (d) Some cells in the adult animals do not show division (e.g., heart cells, and many other cells divide only occasionally i.e., when there is need to replace cells that have been lost due to injury or cell death). These cells do not divide further and exit G_1-phase to enter an inactive stage called quiescent stage (G_0) of the cell cycle. Cells in this stage remains metabolically active but no longer proliferate.

29. (a) **30. (c)**

31. (a) **32. (c)**

33. (c) G_2 phase is also called pre-mitotic gap phase.

34. (d) **35. (d)**

36. (b) End of prophase is marked by disappearance of ER, GB, nucleolus and nuclear envelope.

37. (d) The completion of prophase can be marked by chromosomal material condensation to form compact mitotic chromosomes and initiation of the assembly of mitotic spindle.

38. (a) **39. (d)**

40. (a) The centriole begins to move towards opposite poles of the cell in prophase.

41. (b) By metaphase stage, condensation of chromosomes is completed.

42. (a) **43. (c)**

44. (c) The plane of alignment of the chromosomes at metaphase is referred to as the metaphase plate.

45. (d) Mitosis results in the production of diploid daughter cells with identical genetic complement. The cells of the upper layer of the epidermis, cells of the lining of the gut and blood cells being constantly replaced and repaired by mitosis.

46. (b) In metaphase stage of cell division, chromosomes are most condensed.

47. (d) **48. (b)**

49. (c) In mitosis, centromere divides during anaphase.

50. (c) Any agent that stimulates cell division is called mitogen, e.g., temperature, cytokinin, auxin, gibberellin, insulin and steroids.

51. (a) One mitotic division give rise to 2 cells hence 8 divisions are required for a single cell to make 256 cells.

52. (c) **53. (b)**

54. (c) Cytokinesis and karyokinesis involves the division of cytoplasm and nucleus respectively.

55. (c) Phragmoplast is the precursor of cell plate.

56. (d) **57. (c)**

58. (a) Centromere is required for the movement of chromosomes towards poles.

59. (c)

60. (c) MTOCs stands for microtubule organising centres.

61. (d) Prophase is generally identified by the initiation of condensation of chromosomal material. The chromosomal material condenses to form chromosomes. The nuclear envelope breaks down and spindles start to assemble at opposite ends of the cell.

62. (d)

63. (b) During prophase each chromosome consists of two chromatids. Thus 46 chromosomes having 2 chromatids per chromosome = 92 chromatids.

64. (d)

65. (a) Although no centrioles are visible, there is spindle formation and the chromosomes do exhibit equatorial arrangement. Spindle formation is probably by another organelle, unknown as yet.

66. (d) A very significant contribution of mitosis is cell repair. Repairing takes place in our body in blood cells, upper layer of epidermis and cells of the lining of the gut.

67. (b) **68. (a)**

69. (d) Mitosis a type of cell division which leads to formation of two daughter cells each having the same number and kind of chromosomes as the parent cells have. The significance of mitosis includes:

(i) Helps in growth and development of multicellular organisms from a single-celled zygote.

(ii) Helps the cell in maintaining proper size.

(iii) Helps in restoring wear and tear in body tissues, replacement of damaged or lost part, healing of wounds and regeneration of detached parts (as in tail of lizards).

(iv) It is a method of multiplication in unicellular organisms.

(v) If mitosis remains unchecked, it may result in uncontrolled growth of cells leading to cancer or tumour

70. (d) **71. (b)**

72. (c) Prophase-I is subdivided into five phases based on chromosomal behaviour.

73. (b) Shape of chiasmata is X-shaped.

74. (d)

75. (a) Electron micrographs of zygotene stage of prophase I of meiosis I indicate that chromosomes accompanied by the formation of complex structure called synaptonemal complex. During this stage chromosomes start pairing together (a process called synapsis).

76. (b) The stages through which a cell passes from one division to the next is called cell cycle.

77. (a)

Early prophase | Late prophase | Transition to metaphase

78. (b)

79. (d) During pachytene, exchange between non-sister chromatids of the homologous chromosomes occurs.

80. (c) Homologous chromosomes behave independently in mitosis only.

81. (c) During metaphase II, microtubules from opposite poles of spindle get attached to kinetochores of sister chromatids.

82. (d) In meiosis, synapsis occurs during prophase.

83. (a) Meiosis involves two nuclear divisions and one chromosome division.

84. (c) In diplotene stage of interphase, synaptonemal complex dissolves, chromatids become clear and bivalents are called tetrads.

85. (d) The number of chromosomes become half during anaphase I

86. (b) Poleward movement of dyads occurs during anaphase I.

87. (b) In leptotene stage, the chromosomes appear thin and long thread-like.

88. (c) In pachytene, the chromatids/chromosomes clearly visible in meiosis.

89. (c) The synthesis of histones occurs during S-phase.

90. (a) The term meiosis was coined by Farmer and Moore.

91. (b) Nucleolus and nuclear membrane always disappears during mitosis and meiosis. At the beginning of mitosis, the chromosomes condense, the nucleolus disappears, and the nuclear envelope breaks down, resulting in the release of most of the contents of the nucleus into the cytoplasm. At the end of mitosis, the process is reversed. In diakinesis

stage of prophase I of meiosis I, nucleolus and nuclear membrane disappear and chromosomes set free in the cytoplasm.

92. (c) Crossing over is the exchange of genetic material between two homologous chromosomes. It results in recombination of linked alleles.

93. (c) Second division of meiosis is called equational division.

94. (a) Spindle fibres arise from centriole/centrosome.

95. (a) A single mitotic division of one cell produces two cells. So, number of cells after 'n' divisions = 2^n Thus, 7 mitotic divisions required to produce 128 cells from a single cell.

96. (d) Meiosis is evolutionary significant as it results in recombinations between homologous chromosomes.

97. (c) Zygotic meiosis occurs in *Chlamydomonas* algae.

98. (b) Segregation of Mendelian factors (Aa) occurs during Anaphase I.

99. (b) **100. (a)**

101. (b) After meiosis - I, the two chromatids of a chromosomes are genetically different.

102. (d) Diplotene phase May last for months or years in oocytes of vertebrates.

103. (a)

104. (b) During pachytene, the bivalent chromosomes appears as tetrad.

105. (b) **106. (d)**

107. (c) During prophase stage, the chromosomes become gradually visible under the light microscope.

108. (c) The number of chromosome will be same (50), but each chromosome will have 2 chromatids.

109. (b)

110. (d) Meiotic cell division is also termed as reduction division since it reduces the chromosome number by half while making the ganetes.

111. (b) Meiosis ensures the maintenance of chromosome number generation after generation.

112. (a)

113. (c) Meiosis ensures the production of haploid phase in the life cycle of sexually reproducing organisms whereas fertilization restores the diploid phase.

114. (a) Karyokinesis is the first step of M-phase of cell cycle. It brings about division of nucleus to form two daughter nuclei.

NCERT Based Questions

1. (c) The M phases start with the nuclear division, corresponding to the separation of daughter chromosome called karyokinesis and usually ends with division of cytoplasm called cytokinesis.

2. (c) Heart cells in an adult animal do not appear to exhibit division.

3. (a) The starting of metaphase is marked by the complete disintegration of nuclear membrane.

4. (d) Meiosis is a reduction division which reduces the chromosomes number to half in gametes. Since, it is a special kind of cell division in which exchange of genetic material takes place that brings about variation in next generations. So, all options are characteristic features of meiotic cell division.

5. (a) Microtubules, the proteinaceous components of the cell cytoplasm, help in the initiation of the assembly of mitotic spindle.

6. (b) Cell wall formation starts in the centre of cell and grows outward to meet the existing lateral walls.

7. (b) The structure, number and shape of chromosomes can be observed clearly during metaphase stage.

8. (a) A bivalent of meiosis I consists of four chromatids and two centromeres.

9. (b) At G_1 stage, no DNA replication occurs thus the chromosome number remains same. After S phase, DNA content doubles but chromosome number still remains same, i.e., 14. After the completion of M phase, the number of chromosomes will be 14.

10. (d) G_1 stage of interphase of cell cycle shows active synthesis of RNA and protein.

11. (a) Meiosis occurs in sexually reproducing organisms to reduce the chromosome number to half before their gametes unit, so as to maintain the constant chromosome number ($2n$) in the progeny.

12. (b) By equational division, the chromosome number of the parent is conserved in the daughter cell. The segregation of chromosomes during meiosis II is required to generate gametes with the correct number of chromosomes.

13. (d) Both prokaryotic and eukaryotic cells duplicate their DNA prior to dividing.

14. (a) G_1 phase corresponds to the interval between mitosis and initiation of DNA replication. In this stage, synthesis of enzymes, proteins, RNA, nucleotides, etc. takes place.

15. (a) During Anaphase-I, homologous chromosomes separate,

while sister chromatids remain associated at their centromeres.

16. (c) DNA replicates and its amount becomes double in S or synthesis phase.

17. (d) When cells do not divide after G_1 phase and start undergoing differentiation into specific type of cells such cells are said to be in G_0 phase/ G_0 state.

18. (d) Cytokinesis is the division of one cell into two daughter cells.

19. (b)

20. (b) Mitosis is characterised by equal division because the chromosome numbers in the daughter cells remain same as that of parent cell. While reduction division is the characteristic of meiosis.

21. (d) **22. (d)**

23. (d) Diakinesis is the last stage of prophase I of meiosis I. The stages of meiosis can be observed in the pollen mother cells of the anthers of flower bud.

24. (a) In anaphase, the two chromatids of a chromosome marks replicated chromosomes to be separated.

25. (a) During mitosis, chromosomes formed due to the separation of sister chromatids during cell division are called daughter chromosomes. During anaphase of mitosis, paired chromosomes (sister chromatids) separates to form daughter chromosomes.

26. (c) G_0 is also called quiescent stage. Some cells of the body like heart cells, neuron, etc., which do not divide, exit at G_1 stage and enter G_0 of the cell cycle which is an inactive stage.

27. (c) The mitotic spindle is made up of microtubules. The spindle originates from the centrosome, which may or may not have centrioles.

28. (c) **29. (d)**

30. (d) Crossing over is the phenomenon of genetic exchange between homologous pair of chromosomes and is a characteristic feature of meiotic cell division. It does not occur in mitosis.

31. (a) During prophase, nucleolus and nuclear membrane disappears. The completion of prophase is marked by the initiation of the assembly of mitotic spindle.

32. (d) Two cycles of DNA replication does not occur in meiosis.

33. (b)

34. (d) Synapsis occurs during melosis, is the pairing of homologous chromosomes. While autosomes undergo synapsis during meiosis, sex chromsomes often remain unpaired. A consequence of recombinant synapsis is to increase genetic variability within both the offspring and population.

35. (b) G_1 phase means gap 1 phase. It is the interval between mitosis and initiation of DNA replication. The cell is metabolically active and continuously grows but does not replicate the DNA content. The cell also synthesises proteins that are required for DNA replication.

36. (c) In meiosis I, the homologous chromosomes separate but two sister chromatids remain joined at centromere. At the end of meiosis I, the homologous chromosomes are separated thus receive 8 chromosomes.

Multi-Concept Questions

1. (c) A cell divides every minute and doubles its number. The cell took one hour, i.e., 60 minutes to fill a 100 ml beaker. Thus, as the cells double their number in every one minute, there must have been formed 150 cells in the 59 minutes which divided in the next one minute to become 300 in number and completely filled the 100 ml beaker. Thus, it becomes clear that a 50 ml beaker will be filled in 59 minutes.

2. (a) S phase is the stage during which DNA synthesis occurs. In this phase, the amount of DNA (per cell) doubles, but the chromosome number remains the same. Each chromosome now consists of two sister chromatids. The sister chromatids are held together by a structure called a centromere. The cell is now committed to division.

3. (a)

4. (c) The figure represents the stages of meiosis I. A represents metaphase I, B represents anaphase I and C represents prophase I.

5. (b) In the figure, X represents prophase II, Y represents anaphase II and Z represents prophase I.

6. (a) **7. (c)**

8. (d) Division of centromere takes place during anaphase of mitosis.

9. (a) **10. (a)**

11. (a) In S phase, duplication of DNA takes place while the chromosome number remains same. The final stage of meiotic prophase I is diakinesis. This is marked by terminalisation of chiasmata.

12. (a) **13. (b)**

14. (a) Replication of DNA takes place only once for both kinds of cell division.

15. (d)

16. (d) Mitosis or the equational division on is usually restricted to the diploid cells only.

17. (d) The M Phase starts with the nuclear division, corresponding to the separation of daughter chromosomes (karyokinesis) and usually ends with division of cytoplasm (cytokinesis).

18. (b) **19. (d)**

20. (d) The correct order of mitotic events which occur during meiosis is: Formation of synaptonemal complex, recombination, separation of homologous chromosomes, and separation of sister chromatids.

21. (a)

22. (d) Meiosis reduces the chromosome count from diploid to haploid and halves the amount of genetic material.

NEET Past 10 Year Questions

1. (a) ***NCERT (XI) Ch - 10, Pg. 168***

Zygotene - Synapsis

Pachytene - Crossing over

Diplotene - Chiasmata formation

Diakinesis – Terminalisation

2. (b) ***NCERT (XI) Ch - 10, Pg. 163***

During G_1 phase, the cell is metabolically active and continuously grows but does not replicate its DNA. S or synthesis phase marks the period during which DNA synthesis or replication takes place. Reorganisation of all cell components takes place in M-Phase.

3. (b) ***NCERT (XI) Ch - 10, Pg. 168***

Diplotene stage is characterized by the dissolution of the synaptonemal complex, and X-shaped structures called chiasmata.

4. (d) ***NCERT (XI) Ch - 10, Pg. 164***

Some dividing cells exit the cell cycle and enter vegetative inactive stage, called quiescent stage (G_0). This process occurs at the end of M-phase and beginning of G_1 phase.

5. (a) ***NCERT (XI), Ch - 10, Pg. 163***

The cell progresses through defined phases of the cell cycle during its division. It is divided into two phases. The M Phase represents the phase when the actual cell division or mitosis occurs and the interphase represents the phase between two successive M phases. Interphase is divided into three phases: G_1 (first gap), S (synthesis), and G_2 (second gap).

6. (c) ***NCERT (XI), Ch - 10, Pg. 165***

Metaphase is characterised by all the chromosomes coming to lie at the equator with one chromatid of each chromosome connected by its kinetochore to spindle fibres from one pole and its sister chromatid connected by its kinetochore to spindle fibres from the opposite pole.

7. (c) ***NCERT (XI), Ch - 10, Pg. 163 & 165***

G_1 phase – Cytoplasmic growth

S phase – Only DNA replication takes place, the chromosome number remains same.

G_2 phase – Cell grows and organelle duplication

Metaphase in M-phase – Alignment of chromosomes

Note: The events given in the question are not exactly matched with the respective phases of the cell cycle, however the most appropriate answer is (c)

8. (a) ***NCERT (XI), Ch - 10, Pg. 168***

Pairing of homologous chromosomes (synapsis) takes place during zygotene

9. (d) ***NCERT (XI) Ch - 10, Pg. 163***

The correct sequence of phases of cell cycle is

$G_1 \rightarrow S \rightarrow G_2 \rightarrow M$

10. (a) ***NCERT (XI) Ch - 10, Pg. 164***

Cells in G_0 phase are said to exit cell cycle. These are at quiescent stage and do not proliferate unless called upon to do so but they remain metabolically active.

11. (b) ***NCERT (XI) Ch - 10, Pg. 168***

Diplotene is the 4^{th} stage of prophase - I in meiosis, during which the paired chromosomes begin to separate and appear as 0 or 8 - shaped structure under microscope.

12. (b) ***NCERT (XI) Ch - 10, Pg. 164-167***

The correct sequence of events during mitosis would be as follows:

(i) Condensation of DNA so that chromosomes become visible occurs during early to mid-prophase.

(ii) Nuclear membrane disassembly begins at late prophase or transition to metaphase.

(iii) Arrangement of chromosomes at equator occurs during metaphase, called congression.

(iv) Centromere division or splitting occurs during anaphase forming daughter chromosomes.

(v) Segregation also occurs during anaphase as daughter chromosomes separate and move to opposite poles.

(vi) Telophase leads to formation of two daughter nuclei.

13. (c) Anaphase Promoting Complex (APC) is a protein necessary for separation of daughter chromosomes during anaphase. If APC is defective then the chromosomes will fail to segregate during anaphase.

14. (c) DNA replication in bacteria occurs prior to fission. Prokaryotes do not show well marked S-phase due to their primitive nature.

15. (d) ***NCERT (XI) Ch - 10, Pg. 164***

The cells that do not divide further exit G_1 phase and enter an inactive stage called **quiescent stage (G_0).** Such cells remain metabolically active but do not proliferate.

16. (d) ***NCERT (XI) Ch - 10, Pg. 169***

In anaphase I, the homologous chromosomes separate, while sister chromatids remain associated at their centromeres.

17. (c) ***NCERT (XI) Ch - 10, Pg. 168***

Pachytene: Crossing over is the exchange of genetic material between non-sister chromatids of two homologous chromosomes with the help of an enzyme, recombinase.

Metaphase-I: Chromosomes align at equatorial plate

Diakinesis: Terminalisation of chiasmata.

Zygotene: Similar chromosomes start pairing together (synapsis) with the help of a complex structure called synaptonemal complex.

18. (d)

19. (c) ***NCERT (XI) Ch - 10, Pg. 163***

S or synthesis phase marks the period during which DNA synthesis or replication takes place. During this time, the amount of DNA per cell doubles.

20. (d) ***NCERT (XI) Ch - 10, Pg. 168***

In somatic cells, only mitosis takes place. But in germ cells (sperm/ova), meiosis take place. During zygotene stage of meiosis I, chromosomes start pairing together and this process of association is called synapsis.

21. (a) ***NCERT XI Ch - 10, Pg. 168***

Crossing over is the exchange of genetic material between two non-sister chromatids of the homologous chromosomes. Crossing over is also an enzyme-mediated process and the enzyme involved is called recombinase.

22. (d) ***NCERT (XI) Ch - 10, Pg. 168***

23. (a) ***NCERT (XI) Ch - 10, Pg. 164***

	Gamete	Somatic cell
Ploidy	n	2n
DNA	c	4c

24. (a) ***NCERT (XI) Ch - 10, Pg. 168***

Zygotene - Synapsis

Pachytene - Crossing over

Diplotene - Chiasmata Terminalisation

Diakinesis - Disappearance of nucleolus

25. (b) ***NCERT (XI) Ch - 10, Pg. 168***

Crossing over is an enzyme-mediated process and recombinase enzyme is involved in this. This occurs in pachytene.

26. (d) ***NCERT (XI) Ch - 10, Pg. 164***

	Ploidy level	Amount of DNA
G_1	n	2C
S	n	4C
G_2	n	4C
M	2n	2C

27. (b) ***NCERT (XI) Ch - 10, Pg. 163***

'S' phase marks the period during which DNA synthesis or replication takes place. Amount of DNA per cell doubles.

28. (d) ***NCERT (XI) Ch - 10, Pg. 168***

Bivalent or tetrad refers to paired homologous chromosomes in zygotene stage.

29. (b) ***NCERT (XI) Ch - 10, Pg. 166***

In telophase, nucleolus, Golgi complex and ER reform.

30. (c) ***NCERT (XI) Ch - 10, Pg. 169***

During anaphase I, the homologous chromosomes separate, while sister chromatids remain associated at their centromeres.

31. (d) ***NCERT (XI) Ch - 10, Pg. 168***

During prophase-I of meiosis (Pachytene): Crossing over occurs (the exchange of genetic material between two homologous chromosomes). Crossing over is also an enzyme-mediated process and the enzyme involved is called recombinase.

32. (b) ***NCERT (XI) Ch - 10, Pg. 169***

Prophase I during meiosis: Prophase of the first meiotic division is typically longer and more complex when compared to prophase of mitosis. It has been further subdivided into the following five phases based on chromosomal behavior, i.e., leptotene, zygotene, pachytene, diplotene and diakinesis.

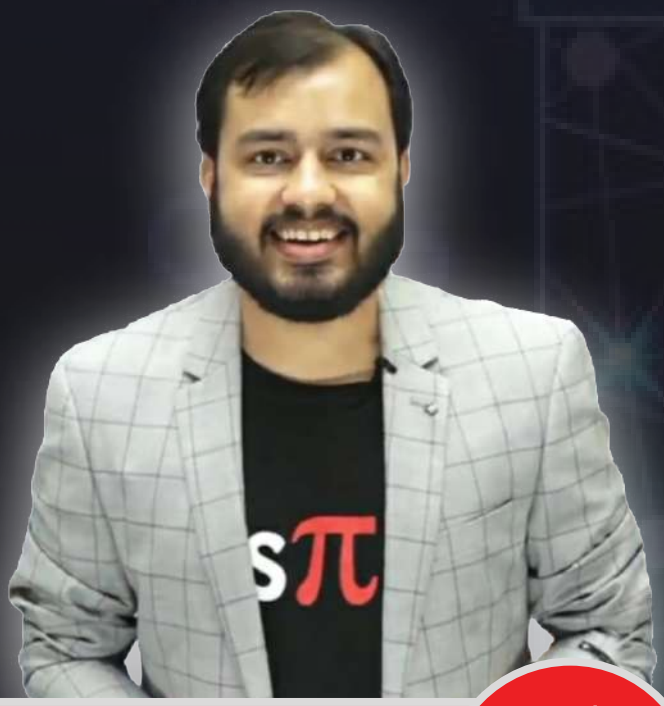
33. (a) ***NCERT (XI) Ch - 10, Pg. 165***

At metaphase, chromosomes are attached to the spindle fibres by their kinetochores (A protein structure present on chromatids).

34. (a) ***NCERT (XI) Ch - 10, Pg. 165***

Chromosomes move to the spindle equator and get aligned along equatorial plate in metaphase during mitosis.

ABOUT PHYSICS WALLAH



Alakh Pandey is one of the most renowned faculty in NEET & JEE domain's Physics. On his YouTube channel, Physics Wallah, he teaches the Science courses of 11th and 12th standard to the students aiming to appear for the engineering and medical entrance exams.

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