

Exercise - I (Conceptual Questions)

Build Up Your Understanding

INTRODUCTION TO MODIFICATIONS OF MITOSIS

1. 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) Hexaploid cell

BCD001

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

BCD002

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

BCD003

4. 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

BCD004

5. In which stage of cell division, number of chromosomes can be best counted?
 (1) Prophase (2) Metaphase
 (3) Telophase (4) Interphase

BCD005

6. How many chromosomes shall be present in a diploid cell at mitotic anaphase if ovum of same species has ten chromosomes?
 (1) 10 (Ten) (2) 20 (Twenty)
 (3) 30 (Thirty) (4) 40 (Forty)

BCD006

7. 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

BCD007

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

BCD008

9. During cell division, spindle fibres attach to which part of chromosome ?
 (1) Primary constriction
 (2) Secondary constriction
 (3) Telomere
 (4) Satellite

BCD009

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

BCD010

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

BCD011

12. What happens in synthesis phase during cell cycle?
 (1) DNA replication
 (2) Chromosome number becomes double
 (3) Formation of two nuclei
 (4) Synthesis of tubulin proteins

BCD012

- | | |
|--|--|
| <p>13. Reappearance of nucleolus along with thinning & elongation in chromosomes are diagnostic characters for the :-
 (1) Anaphase (2) Metaphase
 (3) Interphase (4) Telophase
 BCD013</p> <p>14. Condensation of chromosomes and appearance of astral rays occur during :-
 (1) Prophase (2) Metaphase
 (3) Anaphase (4) Telophase
 BCD014</p> <p>15. Chromosomal morphology (Structure) is best observed at :-
 (1) Prophase (2) Metaphase
 (3) Interphase (4) Anaphase
 BCD015</p> <p>16. M-phase of cell cycle consist of :-
 (1) G_1, S and G_2 phase
 (2) Prophase, Metaphase, Anaphase, Telophase
 (3) Interphase, Prophase, Metaphase, Anaphase, Telophase
 (4) Only prophase
 BCD016</p> <p>17. If the cell is diploid in G_1 than after the S phase cell remain/become :-
 (1) n (2) $4n$
 (3) $8n$ (4) $2n$
 BCD017</p> <p>18. Nuclear membrane disappears in :-
 (1) Late prophase (2) Early prophase
 (3) Metaphase (4) Telophase
 BCD018</p> <p>19. Pre - DNA synthesis phase is:-
 (1) G_1 - phase (2) G_2 - phase
 (3) S-phase (4) Prophase
 BCD019</p> | <p>20. How many steps of division will occur in an isolated tip cell to form 128 cells ?
 (1) 128 (2) 127 (3) 32 (4) 7
 BCD020</p> <p>21. The number of chromatids in a chromosome at G_2 state of cell cycle will be:-
 (1) One (2) Two (3) Four (4) Eight
 BCD021</p> <p>22. Many cells function properly and divide mitotically even though they do not have :-
 (1) Plasma membrane
 (2) Cytoskeleton
 (3) Mitochondria
 (4) Plastids
 BCD022</p> <p>23. Centromere is required for –
 (1) Movement of chromosomes towards poles
 (2) Cytoplasmic cleavage
 (3) Crossing over
 (4) Transcription
 BCD023</p> <p>24. At which stage of the cell cycle are histone proteins synthesized in a eukaryotic cell ?
 (1) During telophase
 (2) During S-phase
 (3) During G_2-phase
 (4) During entire prophase
 BCD024</p> <p>25. 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
 BCD025</p> <p>26. The two asters together with spindle fibres form:-
 (1) Mitotic apparatus (2) Centromere
 (3) Astral fibres (4) Centrosome
 BCD026</p> |
|--|--|

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

BCD027

MEIOSIS, SIGNIFICANCE OF MEIOSIS, DIFFERENCES BETWEEN MITOSIS AND MEIOSIS

28. Which of the following not occurs in Anaphase-I but occurs in Anaphase-II :-
- (1) Condensation of chromosomes
 - (2) Poleward movement of chromosomes
 - (3) Shortening of spindle fibres
 - (4) Splitting of centromere

BCD028

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

BCD029

30. Which of the two events maintain the constant number of chromosomes across generations?
- (1) Mitosis and Meiosis
 - (2) Meiosis and fertilisation
 - (3) Fertilisation and mitosis
 - (4) Only meiosis

BCD030

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

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

Options :-

- (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

BCD031

32. Which part of plant is suitable for the study of meiosis?

- (1) Root apex
- (2) Ovary
- (3) Anther
- (4) Shoot apex

BCD032

33. Slipping of chiasmata towards the ends of bivalent is called :-

- (1) Terminalisation
- (2) Diakinesis
- (3) Interkinesis
- (4) Congression

BCD033

34. "Bouquet-stage" occur in which sub stages of prophase-I ?

- (1) Leptotene
- (2) Zygotene
- (3) Pachytene
- (4) Diplotene

BCD034

35. At anaphase-II of meiosis each chromosome contains:-

- (1) 4 chromatids
- (2) 3 chromatids
- (3) 2 chromatids
- (4) 1 chromatid

BCD035

36. In Anaphase-I each chromosome composed of :-

- (1) One chromatid
- (2) Two chromatids
- (3) Four chromatids
- (4) Many chromatids

BCD036

37. In meiosis, division of centromere occurs during:-

- (1) Interphase
- (2) Anaphase - I
- (3) Anaphase - II
- (4) Metaphase - I

BCD037

- 38.** In meiosis, nuclear membrane and nucleolus disappear during :-
 (1) Zygotene (2) Pachytene
 (3) Diakinesis (4) Metaphase - I
BCD038
- 39.** Separation of homologous chromosomes during anaphase-I is called :-
 (1) Synapsis (2) Disjunction
 (3) Nondisjunction (4) Crossing over
BCD039
- 40.** Diakinesis represents :-
 (1) transition to prophase
 (2) transition to metaphase
 (3) transition to anaphase
 (4) transition to telophase
BCD040
- 41.** Synaptonemal complex is characteristic of :-
 (1) Mitotic chromosomes
 (2) Leptotene chromosomes
 (3) Paired meiotic chromosomes
 (4) Metaphase
BCD041
- 42.** Each chromosome composed of one chromatid in:-
 (1) Anaphase – I (2) Anaphase – II
 (3) Metaphase – I (4) Metaphase – II
BCD042
- 43.** 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:-
 (1) 8 and 4 (2) 4 and 4
 (3) 8 and 8 (4) 16 and 8
BCD043
- 44.** Which of the following not occurs in anaphase-I?
 (1) Segregation of homologous chromosomes
 (2) Shortening in spindle fibres
 (3) Poleward movement of chromosomes
 (4) Division of centromere
BCD044
- 45.** In meiosis :-
 (1) Division of nucleus twice but replication of DNA only once
 (2) Division of 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
BCD045
- 46.** After meiosis-I :-
 (1) the two chromatids of a chromosome are genetically similar
 (2) the two chromatids of a chromosome are genetically different
 (3) There occurs only one chromatid in each chromosome
 (4) Four similar daughter cells are formed
BCD046
- 47.** The correct sequence of prophase-I 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, pachytene
BCD047
- 48.** Which of the following is called heterotypic division ?
 (1) Meiosis-I (2) Meiosis-II
 (3) Mitosis (4) Amitosis
BCD048
- 49.** DNA replication occurs before :-
 (1) Mitosis and meiosis-I
 (2) Mitosis, meiosis-I and meiosis-II
 (3) Meiosis-I only
 (4) Mitosis only
BCD049

- 50.** Thick-thread stage is :-
 (1) Leptotene (2) Zygotene
 (3) Pachytene (4) Diplotene

BCD050

- 51.** 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 bivalent

BCD051

- 52.** 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

BCD052

- 53.** If in a diploid plant cell the 'n' value is 16 then what is possible in metaphase - I of meiosis ?
 (1) 32 Bivalents (2) 64 Bivalents
 (3) 16 Bivalents (4) 8 Bivalents

BCD053

- 54.** Which one of the following statements is incorrect for interkinesis ?
 (1) It is the stage between the two subphases (I & II) 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.

BCD054

- 55.** 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

BCD055

- 56.** Synapsis occurs between :-
 (1) Two homologous chromosomes
 (2) A male and a female gamete
 (3) mRNA and ribosomes
 (4) Spindle fibres and centromere

BCD056

- 57.** During gamete formation, the enzyme recombinase participates during :-
 (1) Prophase-I
 (2) Prophase-II
 (3) Metaphase-I
 (4) Anaphase-II

BCD062

- 58.** Identify the meiotic stage in which the homologous chromosomes separate while the sister chromatids remain associated at their centromeres :-
 (1) Anaphase I
 (2) Anaphase II
 (3) Metaphase I
 (4) Metaphase II

BCD064

EXERCISE-I (Conceptual Questions)

ANSWER KEY

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

Exercise - II (Previous Year Questions)

AIPMT/NEET

AIPMT 2014

1. 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 ?
 (1) G_0 and G_1 (2) G_1 and S
 (3) Only G_2 (4) G_2 and M

BCD067

2. In 'S' phase of the cell cycle :-
 (1) Amount of DNA doubles in each cell.
 (2) Amount of DNA remains same in each cell.
 (3) Chromosome number is increased.
 (4) Amount of DNA is reduced to half in each cell.

BCD068

3. The enzyme recombinase is required at which stage of meiosis :
 (1) Pachytene
 (2) Zygotene
 (3) Diplotene
 (4) Diakinesis

BCD069

AIPMT 2015

4. A somatic cell that has just completed the S phase of its cell cycle, as compared to gamete of the same species, has :
 (1) same number of chromosomes but twice the amount of DNA
 (2) twice the number of chromosomes and four times the amount of DNA
 (3) four times the number of chromosomes and twice the amount of DNA
 (4) twice the number of chromosomes and twice the amount of DNA

BCD070

Re-AIPMT 2015

5. Arrange the following events of meiosis in correct sequence :
 (a) Crossing over
 (b) Synapsis
 (c) Terminalisation of chiasmata
 (d) Disappearance of nucleolus
 (1) (b), (c), (d), (a)
 (2) (b), (a), (d), (c)
 (3) (b), (a), (c), (d)
 (4) (a), (b), (c), (d)

BCD071

NEET-I 2016

6. Spindle fibres attach on to :-
 (1) Telomere of the chromosome
 (2) Kinetochore of the chromosome
 (3) Centromere of the chromosome
 (4) Kinetosome of the chromosome

BCD072

7. In meiosis crossing over is initiated at :
 (1) Pachytene (2) Leptotene
 (3) Zygotene (4) Diplotene

BCD073

NEET-II 2016

8. During cell growth, DNA synthesis takes place in:-
 (1) G_2 phase (2) M phase
 (3) S phase (4) G_1 phase
9. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?
 (1) M
 (2) Both G_2/M and M
 (3) G_1/S
 (4) G_2/M

BCD074

BCD075

Cell Cycle and Cell Division

10. 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	Terminalization of chiasmata
c	Diakinesis	iii	Crossing over takes place
d	Zygotene	iv	Chromosomes align at equatorial plate

Codes :

	a	b	c	d
(1)	ii	iv	iii	i
(2)	iv	iii	ii	i
(3)	iii	iv	ii	i
(4)	i	iv	ii	iii

BCD076

NEET (UG) 2017

11. Which of the following options gives the correct sequence of events during mitosis ?
- (1) Condensation → nuclear membrane disassembly → arrangement at equator → centromere division → segregation → telophase
 - (2) Condensation → crossing over → nuclear membrane disassembly → segregation → telophase
 - (3) Condensation → arrangement at equator → centromere division → segregation → telophase
 - (4) Condensation → nuclear membrane disassembly → crossing over → segregation → telophase
- BCD077
12. Anaphase Promoting Complex (APC) is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is

defective in a human cell, which of the following is expected to occur ?

- (1) Chromosomes will be fragmented
- (2) Chromosomes will not segregate
- (3) Recombination of chromosome arms will occur
- (4) Chromosomes will not condense

BCD078

NEET (UG) 2018

13. The stage during which separation of the paired homologous chromosomes begins is
- (1) Pachytene
 - (2) Diplotene
 - (3) Diakinesis
 - (4) Zygotene

BCD079

NEET (UG) 2019

14. The **correct** sequence of phases of cell cycle is:
- (1) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$
 - (2) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$
 - (3) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$
 - (4) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$
- BCD080
15. Cells in G_0 phase:
- (1) exit the cell cycle
 - (2) enter the cell cycle
 - (3) suspend the cell cycle
 - (4) terminate the cell cycle

BCD081

NEET (UG) 2019 (Odisha)

16. After meiosis-I, the resultant daughter cells have:
- (1) Same amount of DNA as in the parent cell in S phase
 - (2) Twice the amount of DNA in comparison to haploid gamete.
 - (3) Same amount of DNA in comparison to haploid gamete
 - (4) Four times the amount of DNA in comparison to haploid gamete

BCD082

17. Crossing over takes place between which chromatids and in which stage of the cell cycle?

- (1) Non-sister chromatids of non-homologous chromosomes at Zygotene stage of prophase I.
- (2) Non-sister chromatids of homologous chromosomes at Pachytene stage of prophase I.
- (3) Non-sister chromatids of homologous chromosomes at Zygotene stage of prophase I.
- (4) Non-sister chromatids of non-homologous chromosomes at Pachytene stage of prophase I.

BCD083

NEET (UG) 2020

18. 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) |
|-----|-------|-------|-------|-------|
| (1) | (ii) | (iv) | (iii) | (i) |
| (2) | (iii) | (iv) | (i) | (ii) |
| (3) | (iv) | (iii) | (ii) | (i) |
| (4) | (i) | (ii) | (iv) | (iii) |

BCD084

19. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

- (1) Nuclear Division takes place.
- (2) DNA synthesis or replication takes place.
- (3) Reorganisation of all cell components takes place.
- (4) Cell is metabolically active, grows but does not replicate its DNA.

BCD085

20. 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 :

- | | |
|-----------------|-------------|
| (1) G_2 phase | (2) M phase |
| (3) G_1 phase | (4) S phase |

BCD086

21. Dissolution of the synaptonemal complex occurs during :

- | | |
|---------------|---------------|
| (1) Leptotene | (2) Pachytene |
| (3) Zygotene | (4) Diplotene |

BCD087

NEET (UG) 2020 (Covid-19)

22. Attachment of spindle fibres to kinetochores of chromosomes becomes evident in :

- | | |
|--------------|---------------|
| (1) Anaphase | (2) Telophase |
| (3) Prophase | (4) Metaphase |

BCD088

23. In a mitotic cycle, the correct sequence of phases is

- | | |
|--------------------------|--------------------------|
| (1) S, G_1 , G_2 , M | (2) G_1 , S, G_2 , M |
| (3) M, G_1 , G_2 , S | (4) G_1 , G_2 , S, M |

BCD089

24. During Meiosis-I, in which stage synapsis takes place ?

- | | |
|---------------|---------------|
| (1) Pachytene | (2) Zygotene |
| (3) Diplotene | (4) Leptotene |

BCD090

25. Match the following events that occur in their respective phases of cell cycle and select the correct option :

(a)	G_1 phase	(i)	Cell grows and organelle duplication
(b)	S phase	(ii)	DNA replication and chromosome duplication
(c)	G_2 phase	(iii)	Cytoplasmic growth
(d)	Metaphase in M-phase	(iv)	Alignment of chromosomes

- (1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
 (3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
 (4) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

BCD091

NEET (UG) 2021

26. Which of the following stages of meiosis involves division of centromere ?

- (1) Metaphase I (2) Metaphase II
 (3) Anaphase II (4) Telophase II

BCD092

27. Match List -I with List - II.

List -I		List -II	
(a)	S phase	(i)	Proteins are synthesized
(b)	G ₂ phase	(ii)	Inactive phase
(c)	Quiescent stage	(iii)	Interval between mitosis and initiation of DNA replication
(d)	G ₁ phase	(iv)	DNA replication

Choose the **correct** answer from the options given below.

- | | | | | |
|-----|------------|------------|------------|------------|
| | (a) | (b) | (c) | (d) |
| (1) | (iii) | (ii) | (i) | (iv) |
| (2) | (iv) | (ii) | (iii) | (i) |
| (3) | (iv) | (i) | (ii) | (iii) |
| (4) | (ii) | (iv) | (iii) | (i) |

BCD093

28. The fruit fly has 8 chromosomes (2n) in each cell. During interphase of Mitosis if the number of chromosomes at G₁ phase is 8, what would be the number of chromosomes after S-phase ?

- (1) 8 (2) 16 (3) 4 (4) 32

BCD094

29. The centriole undergoes duplication during:

- (1) S-phase (2) Prophase
 (3) Metaphase (4) G₂ phase

BCD095

30. Which stage of meiotic prophase shows terminalisation of chiasmata as its distinctive feature?

- (1) Leptotene (2) Zygotene
 (3) Diakinesis (4) Pachytene

BCD096

NEET (UG) 2022

31. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes:

- (1) Bivalent
 (2) Sites at which crossing over occurs
 (3) Terminalization
 (4) Synaptonemal complex

BCD097

32. Which one of the following never occurs during mitotic cell division ?

- (1) Movement of centrioles towards opposite poles
 (2) Pairing of homologous chromosomes
 (3) Coiling and condensation of the chromatids
 (4) Spindle fibres attach to kinetochores of chromosomes

BCD098

33. Select the **incorrect** statement with reference to mitosis:

- (1) Spindle fibres attach to centromere of chromosomes.
 (2) Chromosomes decondense at telophase.
 (3) Splitting of centromere occurs at anaphase.
 (4) All the chromosomes lie at the equator at metaphase.

BCD099

34. Regarding Meiosis, which of the statements is **incorrect** ?

- (1) DNA replication occurs in S phase of Meiosis-II
 (2) Pairing of homologous chromosomes and recombination occurs in Meiosis-I
 (3) Four haploid cells are formed at the end of Meiosis-II
 (4) There are two stages in Meiosis, Meiosis-I and II

BCD100

Re-NEET (UG) 2022

35. Which stage of meiosis can last for months or years in the oocytes of some vertebrates?

- (1) Leptotene (2) Pachytene
(3) Diplotene (4) Diakinesis

BCD101

36. In meiosis, crossing over and exchange of genetic material between homologous chromosomes are catalyzed by the enzyme.

- (1) Phosphorylase (2) Recombinase
(3) Transferase (4) Polymerase

BCD102

37. Identify the **correct** sequence of events during Prophase I of meiosis :

- (a) Synapsis of homologous chromosomes
(b) Chromosomes become gradually visible under microscope
(c) Crossing over between non-sister chromatids of homologous chromosomes
(d) Terminalisation of chiasmata
(e) Dissolution of synaptonemal complex

Choose the **correct answer** from the options given below :

- (1) (a), (b), (c), (d), (e)
(2) (b), (c), (d), (e), (a)
(3) (b), (a), (c), (e), (d)
(4) (a), (c), (d), (e), (b)

BCD103

38. Bivalent or Tetrad formation is a characteristic feature observed during :

- (1) Synaptonemal complex in zygotene stage
(2) Chiasmata in Diplotene stage
(3) Synaptonemal complex in Pachytene stage
(4) Chiasmata in zygotene stage

BCD104

39. With respect to metaphase, which of the following statements is incorrect ?

- (1) Complete disintegration of nuclear envelope takes place

- (2) Chromosomes are highly condensed
(3) Metaphase chromosomes are made up of four sister chromatids held together by centromere
(4) Chromosomes lie at the equator of the cell

BCD105

NEET (UG) 2023

40. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis ?

- (1) Pachytene (2) Diplotene
(3) Diakinesis (4) Zygotene

BCD146

41. Which of the following stages of meiosis involves division of centromere ?

- (1) Metaphase II (2) Anaphase II
(3) Telophase (4) Metaphase I

BCD147

42. Among eukaryotes, replication of DNA takes place in -

- (1) S phase (2) G₁ phase
(3) G₂ phase (4) M phase

BCD148

43. Match List I with List II:

	List-I		List-II
(A)	M Phase	(I)	Proteins are synthesized
(B)	G ₂ Phase	(II)	Inactive phase
(C)	Quiescent stage	(III)	Interval between mitosis and initiation of DNA replication
(D)	G ₁ Phase	(IV)	Equational division

Choose the correct answer from the options given below:

- (1) A-IV, B-II, C-I, D-III
(2) A-IV, B-I, C-II, D-III
(3) A-II, B-IV, C-I, D-III
(4) A-III, B-II, C-IV, D-I

BCD149

44. Select the correct statements.
- Tetrad formation is seen during Leptotene.
 - During Anaphase, the centromeres split and chromatids separate.
 - Terminalization takes place during Pachytene.
 - Nucleolus, Golgi complex and ER are reformed during Telophase.
 - Crossing over takes place between sister chromatids of homologous chromosome.

Choose the **correct** answer from the options given below:

- B and D only
- A, C and E only
- B and E only
- A and C only

BCD150

NEET (UG) 2023 (Manipur)

45. The dissolution of synaptonemal complex occurs during :
- Pachytene
 - Diplotene
 - Diakinesis
 - Leptotene

BCD151

46. Doubling of the number of chromosomes can be achieved by disrupting mitotic cell division soon after :
- Anaphase
 - Telophase
 - Prophase
 - Metaphase

BCD152

47. During which stages of mitosis and meiosis, respectively does the centromere of each chromosome split ?
- Mataphase, Metaphase II
 - Prophase, Telophase I
 - Telophase, Anaphase I
 - Anaphase, Anaphase II

BCD153

48. Which one of the following is the quiescent stage of cell cycle ?
- M
 - G₂
 - G₁
 - G₀

BCD154

49. Select **correct** sequence of substages of Prophase-I of Meiotic division :

- Zygotene
- Pachytene
- Diakinesis
- Leptotene
- Diplotene

Choose the **correct** answer from the options given below :

- (D), (B), (A), (E), (C)
- (A), (B), (D), (E), (C)
- (D), (A), (B), (E), (C)
- (A), (D), (B), (C), (E)

BCD155

NEET-UG 2024

50. Spindle fibers attach to kinetochores of chromosomes during
- Prophase
 - Metaphase
 - Anaphase
 - Telophase

BCD156

51. Given below are two statements :

Statement-I : Chromosomes become gradually visible under light microscope during leptotene stage.

Statement-II : The beginning of diplotene stage is recognized by dissolution of synaptonemal complex.

In the light of the above statements, choose the correct answer from the options given below :

- Both Statement-I and Statement-II are true
- Both Statement-I and Statement-II are false
- Statement-I is true but Statement-II is false
- Statement-I is false but Statement-II is true

BCD157

52. Match List I with List-II :

List-I (Sub Phases of Prophase-I)		List-II (Specific characters)	
A.	Diakinesis	I.	Synaptonemal complex formation
B.	Pachytene	II.	Completion of terminalisation of chiasmata
C.	Zygotene	III.	Chromosomes look like thin threads
D.	Leptotene	IV.	Appearance of recombination nodules

Choose the correct answer from the options given below:

- (1) A-IV, B-II, C-III, D-I
- (2) A-I, B-II, C-IV, D-III
- (3) A-II, B-IV, C-I, D-III
- (4) A-IV, B-III, C-II, D-I

BCD158

53. Following are the stages of cell division :

- A. Gap 2 phase
- B. Cytokinesis
- C. Synthesis phase
- D. Karyokinesis
- E. Gap 1 phase

Choose the correct sequence of stages from the options given below :

- (1) C-E-D-A-B
- (2) E-B-D-A-C
- (3) B-D-E-A-C
- (4) E-C-A-D-B

BCD159

RE-NEET-UG 2024

54. Recombination between homologous chromosomes is completed by the end of :

- (1) Diakinesis
- (2) Zygotene
- (3) Diplotene
- (4) Pachytene

BCD160

55. Match List-I with List-II.

List-I Event		List-II Stage of Prophase-I (Meiosis-I)	
A.	Chiasmata formation	I.	Pachytene
B.	Crossing over	II.	Diakinesis
C.	Synaptonemal complex formation	III.	Diplotene
D.	Terminalisation of chiasmata	IV.	Zygotene

Choose the **correct** answer from the options given below :

- (1) A-III, B-I, C-IV, D-II
- (2) A-II, B-I, C-III, D -IV
- (3) A-III, B-I, C-II, D-IV
- (4) A-II, B-III, C-IV, D-I

BCD161

56. Match List-I with List-II.

List-I		List-II	
A.	Cell are metabolically active and proliferate	I.	G ₂ phase
B.	DNA replication takes place	II.	G ₁ phase
C.	Proteins are synthesised	III.	G ₀ phase
D.	Quiescent state with metabolically active cells	IV.	S phase

Choose the **correct** answer from the options given below :

- (1) A-IV, B-II, C-III, D-I
- (2) A-I, B-III, C-IV, D-II
- (3) A-II, B-I, C-III, D-IV
- (4) A-II, B-IV, C-I, D-III

BCD162

EXERCISE-II (Previous Year Questions)

ANSWER KEY

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

Exercise - III

Master Your Understanding

(A) NCERT BASED QUESTIONS

- Which one is correct for G_0 stage ?
 - It is a quiescent stage.
 - In this phase cell cycle is stopped
 - G_0 cells do not proliferate but metabolically active
 - G_0 cells can divide in response to some stimulus

Options :-

- All are correct
- Only I, II, III are correct
- Only I, II are correct
- Only I and IV are correct

BCD106

- Which of the following is **not** correctly matches a phase of the cell cycle with its function ?

- | | |
|-------------------------|---|
| (1) Second gap phase | Period of cytoplasmic growth |
| (2) First gap phase | Most of the organelle duplication |
| (3) Interphase | Phase of preparation for cell division |
| (4) DNA synthesis phase | Doubling of number of chromosomes in cell |

BCD107

- Mark **incorrect** statements :-

- Meiosis involves only a single cycle of DNA replication
- Four haploid cells are formed at the end of meiosis-I
- Meiosis occurs in diploid cells
- In yeast, cell cycle takes about 90 minutes.

Options :-

- | | |
|-------------|---------------------|
| (1) A and B | (2) A and C |
| (3) Only B | (4) All are correct |

BCD108

- Prophase-I of meiotic division is typically longer and more complex, it is subdivided into five phases, on the basis of :-

- Staining
- Behaviour of chromosomes
- Duration
- Number of chromosomes

BCD109

- Arrange the following events of meiosis in the correct sequence -

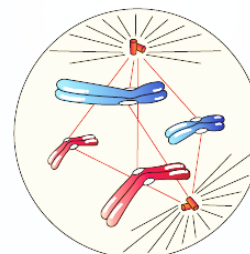
- Terminalisation of chiasmata
- Crossing over
- Synapsis
- Disjunction of chromosomes
- Dissolution of synaptonemal complex

The correct sequence is-

- $A \rightarrow B \rightarrow C \rightarrow D \rightarrow E$
- $E \rightarrow D \rightarrow C \rightarrow B \rightarrow A$
- $C \rightarrow B \rightarrow D \rightarrow E \rightarrow A$
- $C \rightarrow B \rightarrow E \rightarrow A \rightarrow D$

BCD110

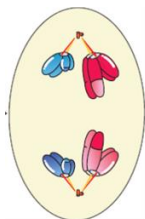
- Identify the following diagram-



- Transition to Metaphase
- Transition to Anaphase-II
- Transition to Metaphase-I
- Transition to Anaphase

BCD111

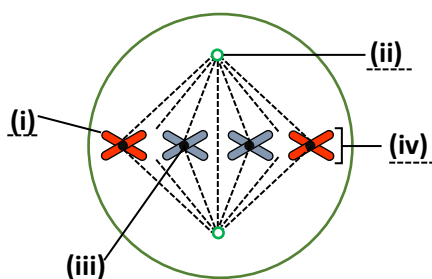
7. The drawing below shows a cell whose diploid chromosome number is four. This cell is in:-



- (1) Metaphase of mitosis
- (2) Anaphase of mitosis
- (3) First anaphase of meiosis
- (4) Second anaphase of meiosis

BCD112

8. Label the structures indicated by (i), (ii), (iii) and (iv) in below given diagram –



- | | |
|---------------------|------------------|
| (1) (i)-Chromatid, | (ii)-Centriole, |
| (iii)-Centromere, | (iv)-Chromosome |
| (2) (i)-Chromosome, | (ii)-Centriole, |
| (iii)-Centromere, | (iv)-Chromatid |
| (3) (i)-Chromatid, | (ii)-Centromere, |
| (iii)-Centriole, | (iv)-Chromosome |
| (4) (i)-Chromosome, | (ii)-Centromere, |
| (iii) Centriole, | (iv)-Chromatid |

BCD113

9. Interkinesis is stage between :-

- (1) Two mitotic divisions
- (2) Two phases of meiotic divisions
- (3) Anaphase and telophase
- (4) Leptotene and zygotene

BCD114

10. It is significant to note that in the 24 hour average duration of cell cycle of human cell, cell division proper lasts for only about:-

- | | |
|----------------|----------------|
| (1) Four hours | (2) 90 minutes |
| (3) An hour | (4) 10 hours |

BCD115

11. In which stage of mitotic division, cells do not show Golgi complex, ER, nucleolus and nuclear envelope ?

- | | |
|---------------|-------------------|
| (1) Metaphase | (2) Late prophase |
| (3) Anaphase | (4) All of these |

BCD116

12. Condensation of chromosomes is completed in:-

- | | |
|---------------|----------------|
| (1) Prophase | (2) Interphase |
| (3) Metaphase | (4) Anaphase |

BCD117

13. Regarding to cell cycle which of the following statements is wrong ?

- (1) Cytoplasm increase is a continuous process
- (2) DNA synthesis occurs only during one specific stage
- (3) Replicated chromosomes distributed to daughter nuclei by complex series of events
- (4) Events for replicated chromosomes distribution are not under genetic control

BCD118

14. About cell cycle, which of the following statements is correct ?

- (1) In G_0 phase cells are metabolically inactive
- (2) In G_0 phase cells are metabolically active
- (3) Diploid somatic cells of animals divide only by meiotic division
- (4) In plants only haploid cells can show mitotic divisions

BCD119

15. Chromatin condensation and movement of duplicated centrioles towards opposite poles can be observed during-

- | | |
|--------------|---------------|
| (1) Prophase | (2) Metaphase |
| (3) Anaphase | (4) Telophase |

BCD120

16. Regarding arrangement of chromosomes on equator during metaphase, which of the following statements is incorrect ?

- (1) Each chromatid remains connected by one spindle fibres from both poles
- (2) Each chromosome remains connected by spindle fibres from both poles
- (3) Spindle fibres remain attached on kinetochores of both the chromatids
- (4) Each chromatid remains connected at one pole by spindle fibres

BCD121

17. Match the following -

- | | |
|---------------|---|
| (a) Prophase | (I) Decondensation of chromosome |
| (b) Metaphase | (II) Division of centromere |
| (c) Anaphase | (III) Attachment of spindle fibres on kinetochores of chromosomes |
| (d) Telophase | (IV) Initiation of assembly of mitotic spindle |

Options :-

- (1) a-(IV) b-(III) c-(I) d-(II)
- (2) a-(IV) b-(III) c-(II) d-(I)
- (3) a-(III) b-(IV) c-(II) d-(I)
- (4) a-(III) b-(IV) c-(I) d-(II)

BCD122

18. Which of the following is not a significance of mitosis ?

- (1) Maintenance of identical genetic complement
- (2) Cell repair
- (3) Restore nucleo cytoplasmic ratio
- (4) Genetic variability

BCD123

19. Meiosis ensures the production of phase in life cycle of sexually reproducing organism, where as fertilisation restores phase.

- (1) diploid, haploid
- (2) haploid, triploid
- (3) diploid, triploid
- (4) haploid, diploid

BCD124

20. Regarding key features of meiosis select out the wrong one -

- (1) Meiosis involves two sequential cycles of nuclear and cell division called meiosis- I & meiosis- II
- (2) Meiosis is initiated after the parental chromosomes have replicated to produce identical sister chromatids at the S - Phase
- (3) Meiosis involves pairing of homologous chromosomes and recombination between non homologous chromosome
- (4) Four haploid cells are formed at the end of meiosis-II

BCD125

21. Select the odd one -

- (1) Zygotene – Synaptonemal complex appearance
- (2) Pachytene – Appearance of recombination nodule
- (3) Diplotene – Terminalisation of chiasmata
- (4) Diakinesis – Assembly of meiotic spindle

BCD126

22. A cell has 46 chromosomes at each pole in mitotic telophase. In this division the number of chromatids at the metaphase was :-

- (1) 23
- (2) 46
- (3) 92
- (4) 69

BCD127

23. Match the following :-

- | | |
|------------------|--|
| (a) Prophase-II | (I) Enclosure of chromosomes in nuclear envelope |
| (b) Metaphase-II | (II) Separation of sister chromatids |
| (c) Anaphase-II | (III) Chromosome alignment on equator |
| (d) Telophase-II | (IV) Disappearance of nuclear membrane |

Options :-

- | | | | |
|------------|----------|---------|---------|
| (1) a-(IV) | b -(III) | c-(I) | d-(II) |
| (2) a-(IV) | b-(III) | c-(II) | d-(I) |
| (3) a-(IV) | b-(II) | c-(III) | d-(I) |
| (4) a-(IV) | b-(I) | c-(II) | d-(III) |

BCD128

24. Which of the following is not a significance of meiosis ?

- (1) Helps in conservation of specific chromosome number in each species
- (2) Increase in genetic variability
- (3) Helps in evolution
- (4) Helps in growth of organism

BCD129

25. Number of chromatids in each chromosome at anaphase is-

- (1) One in mitosis, one in meiosis-I and two in meiosis-II
- (2) One in mitosis, two in meiosis-I and one in meiosis-II
- (3) Two in mitosis, one in meiosis-I and two in meiosis-II
- (4) Two in mitosis, two in meiosis-I and two in meiosis-II

BCD130

26. During meiosis how many cycles of nucleus division, DNA replication and division of centromere take place respectively ?

- | | |
|---------------------|-------------------|
| (1) Three, Two, One | (2) One, Two, Two |
| (3) Two, Two, One | (4) Two, One, One |

BCD131

27. Cell cycle includes :-

- | | |
|-------------------|----------------------|
| (1) Cell division | (2) DNA replication |
| (3) Cell growth | (4) All of the above |

BCD132

28. Interphase of an animal cell is differ from interphase of a plant cell :-

- (1) in having DNA replication
- (2) in having centrioles duplication
- (3) in having growth of cell
- (4) in having metabolically active cell

BCD133

29. Multinucleated condition in the liquid endosperm of coconut arises because :-

- (1) DNA replication not occurs during cell cycle
- (2) Separation of sister chromatids not occurs in anaphase
- (3) Condensation of chromosomal material not occurs in prophase
- (4) Karyokinesis is not followed by cytokinesis

BCD134

30. Which of the following phases can last for months or years in oocytes of some vertebrates ?

- | | |
|---------------|---------------|
| (1) Leptotene | (2) Zygotene |
| (3) Pachytene | (4) Diplotene |

BCD135

(B) ANALYTICAL QUESTIONS

31. Which of the following organelles can be observed in a cell even after completion of prophase?

- (1) Golgi complex
- (2) Mitochondria
- (3) Nucleus
- (4) Endoplasmic reticulum

BCD136

32. A mouse cell is treated with a chemical that interferes with the activity of actin protein. Which of the following will probably be affected the most?

- (1) Formation of spindle fibres
- (2) Division of cytoplasm
- (3) Chromosome duplication
- (4) Pairing of homologous chromosomes

BCD137

33. Number of chromosome pairs at equator in metaphase-I of a diploid plant cell (for which $n = 25$) shall be-

- (1) 50
- (2) 100
- (3) 75
- (4) 25

BCD138

34. In a diploid cell before S-phase if quantity of DNA is 20 pico gram (pg) then after meiosis I what will be the quantity of DNA in each daughter cell ?

- (1) 10 pg
- (2) 20 pg
- (3) 5 pg
- (4) 40 pg

BCD139

35. Diploid cell in human, where cell division does not occur :-

- (a) Heart cell
- (b) Muscle cell
- (c) Nerve cell

Options :-

- (1) Only c
- (2) b and c
- (3) a and c
- (4) a, b and c

BCD140

36. Given below are two statement -

Statement-I : M-phase is the most dramatic phase of cell cycle, involving a major reorganisation of virtually all component of cell.

Statement-II : Cells in G_0 -stage remain metabolically inactive but no longer proliferate unless called on to do so depending on the requirement of the organism.

In the light of the above statements, choose the correct answer from the options given below :-

- (1) Both statement I and statement II are correct
- (2) Both statement I and statement II are incorrect
- (3) Statement I is correct but statement II is incorrect
- (4) Statement I is incorrect but statement II is correct

BCD141

37. **Assertion (A) :** Meiosis ensures the production of haploid phase in the life cycle of sexually reproducing organism.

Reason (R) : Meiosis involve reduction in chromosome number to half as that of parent cell.

- (1) Both Assertion and Reason are True and the Reason is a correct explanation of the Assertion.
- (2) Both Assertion and Reason are True but Reason is not a correct explanation of the Assertion.
- (3) Assertion is True but the Reason is False.
- (4) Both Assertion and Reason are False.

BCD142

38. **Assertion (A) :** Cytokinesis in plant cell occur by cell plate formation method.

Reason (R) : Cytokinesis in animal cells occur by the formation of cell furrow.

- (1) Both Assertion and Reason are True and the Reason is a correct explanation of the Assertion.
- (2) Both Assertion and Reason are True but Reason is not a correct explanation of the Assertion.
- (3) Assertion is True but the Reason is False.
- (4) Both Assertion and Reason are False.

BCD143

39. Assertion (A) : No replication of DNA is needed between meiosis-I and meiosis-II.

Reason (R) : Chromosomes are already duplicated and they already have two sister chromatids.

- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- (2) (A) is correct but (R) is not correct.
- (3) (A) is incorrect but (R) is correct.
- (4) Both (A) and (R) are correct but (R) is the correct explanation of (A).

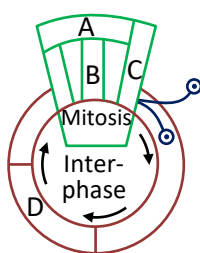
BCD144

40. What will be the ratio of number of chromosomes and amount of DNA in G_1 , S and G_2 phases for a somatic cell?

G_1	S	G_2
(1) 1 : 1	1 : 1	1 : 1
(2) 1 : 1	1 : 2	1 : 2
(3) 1 : 2	1 : 2	1 : 2
(4) 1 : 2	1 : 1	1 : 2

BCD145

41. 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?

- (1) A – Cytokinesis
- (2) B – Metaphase
- (3) C – Karyokinesis
- (4) D – Synthetic phase

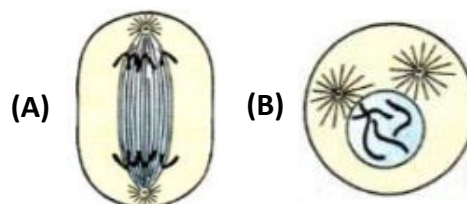
BCD057

42. During mitosis ER and nucleolus begin to disappear at :

- (1) Early prophase
- (2) Late prophase
- (3) Early metaphase
- (4) Late metaphase

BCD058

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



- (1) Prophase – Anaphase
- (2) Metaphase – Telophase
- (3) Telophase – Metaphase
- (4) Late Anaphase – Prophase

BCD059

44. Select the correct option with respect to mitosis

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

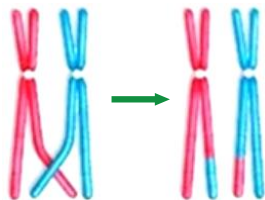
BCD060

45. At metaphase, chromosomes are attached to the spindle fibres by their :-

- (1) Centromere
- (2) Satellites
- (3) Secondary constrictions
- (4) Kinetochore

BCD061

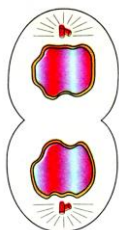
46. Given below is the representation of a certain event at a particular stage of a type of cell division. Which is this stage ?



- (1) Prophase of Mitosis
(2) Both prophase and metaphase of mitosis
(3) Prophase I during meiosis
(4) Prophase II during meiosis

BCD063

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



(1)	Telophase	Endoplasmic reticulum and nucleolus not reformed yet.
(2)	Telophase	Nuclear envelop reforms, Golgi complex reforms.
(3)	Late anaphase	Chromosomes move away from equatorial plate, Golgi complex not present.
(4)	Cytokinesis	Cell plate formed, mitochondria distributed between two daughter cells.

BCD065

Exercise - III

ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	4	3	2	4	1	3	1	2	3	4	3	4	2	1
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	1	2	4	4	3	3	3	2	4	2	4	4	2	4	4
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	2	2	4	2	4	3	1	2	4	2	4	2	4	4	4
Question	46	47													
Answer	3	2													

[illegible]

Important Notes