Cell Cycle & Cell Division

1. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis? **(2023)**
   (a) Pachytene
   (b) Diplotene
   (c) Diakinesis
   (d) Zygotene
2. Which of the following stages of meiosis involves division of centromere? **(2023)**
   (a) Telophase
   (b) Metaphase I
   (c) Metaphase II
   (d) Anaphase II
3. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis? **(2023)**
   (a) Diakinesis
   (b) Zygotene
   (c) Pachytene
   (d) Diplotene
4. Among eukaryotes, replication of DNA takes place in: **(2023)**
   (a) G_2 phase
   (b) M phase
   (c) S phase
   (d) G, phase
5. Match List-l with List-II:

List – I		LIst – II	
A	M Phase	(i)	Proteins are synthesized
B	G_2 Phase 2	(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 : **(2023)**
   (a) A-II, B-IV, C-I, D-III
   (b) A-III, B-II, C-IV, D-I
   (c) A-IV, B-II, C-I, D-III
   (d) A-IV, B-I, C-II, D-III
6. Select the correct statements.
   A. Tetrad formation is seen during Leptotene.
   B. During Anaphase, the centromeres split and chromatids separate.
   C. Terminalization takes place during Pachytene.
   D. Nucleolus, Golgi complex and ER are reformed during Telophase.
   E. Crossing over takes place between sister chromatids of homologous chromosome.
   Choose the correct answer from the options given below: **(2023)**
   (a) Band D only
   (b) A. C and E only
   (c) Band E only
   (d) A and C only
7. Given below are two statements:
   Statement I: During GO phase of cell cycle, the cell is metabolically inactive.
   Statement II: The centrosome undergoes duplication during S phase of interphase.
   In the light of the above statements, choose the most appropriate answer from the options given below: **(2023)**
   (a) Both Statement i and Statement II are incorrect
   (b) Statement I is correct but Statement Il is incorrect,
   (c) Statement I is incorrect but Statement. II is correct
   (d) Both Statement and Statement II are Correct
8. Doubling of the number of chromosomes can be achieved by disrupting mitotic cell division soon after: **(2023)**
   (a) Anaphase
   (b) Telophase
   (c) Prophase
   (d) Metaphase
9. During which stages of mitosis and meiosis, respectively does the centromere of each chromosome split? **(2023)**
   (a) Metaphase, Metaphase II
   (b) Prophase, Telophase
   (c) Telophase, Anaphase
   (d) Anaphase, Anaphase

10. Which stage of meiosis can last for months or years in the oocytes of some vertebrates? **(2022)**
    (a) Diakinesis
    (b) Leptotene
    (c) Pachytene
    (d) Diplotene
11. 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: **(2022)**
    (a) (a), (c), (d), (e), (b)
    (b) (a), (b), (c), (d), (e)
    (c) (b), (c), (d), (e), (a)
    (d) (b), (a), (c), (e), (d)
12. Bivalent or Tetrad formation is a characteristic feature observed during **(2022)**
    (a) Chiasmata in zygotene stage
    (b) Synaptonemal complex in zygotene stage
    (c) Chiasmata in Diplotene stage
    (d) Synaptonemal complex in Pachytene Stage
13. With respect to metaphase, which of the following statements is incorrect? **(2022)**
    (a) Chromosomes lie at the equator of the cell
    (b) Complete disintegration of nuclear envelope takes place
    (c) Chromosomes are highly condensed
    (d) Metaphase chromosomes are made up of four sister chromatids held together by centromere
14. Which one of the following never occurs during mitotic cell division **(2022)**
    (a) Spindle fibres attach to kinetochores of chromosomes
    (b) Movement of centrioles towards opposite poles
    (c) Pairing of homologous chromosomes
    (d) Coiling and condensation of the chromatids
15. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes: **(2022)**
    (a) Synaptonemal complex
    (b) Bivalent
    (c) Sites at which crossing over occurs
    (d) Terminalization
16. Match List-l with List-II:

List – I		LIst – II	
A	Metacentric chromosome	(i)	Centromere situated close to the end forming one extremely short and one very long arms
B	Acrocentric chromosome	(ii)	Centromere at the terminal end
C	Submetacentric	(iii)	Centromere in the middle forming two equal arms of chromosomes
D	Telocentric chromosome	(iv)	Centromere slightly away from the middle forming one shorter arm and one longer arm

    Choose the correct answer from the options given below: **(2022)**
    (a) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
    (b) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
    (c) (a)-(i), (b)-(ii), (c)-(iv), (d)-(i)
    (d) (a)-(1), (b)-(1), (c)-(iii), (d)-(iv)
17. Regarding Meiosis, which of the statements is incorrect? **(2022)**
    (a) There are two stages in Meiosis, Meiosis-I and II
    (b) DNA replication occurs in S phase of Meiosis-II
    (c) Pairing of homologous chromosomes and recombination occurs in Meiosis-l
    (d) Four haploid cells are formed at the end of Meiosis-II
18. Select the incorrect statement with reference to mitosis: **(2022)**
    (a) All the chromosomes lie at the equator at metaphase
    (b) 8 Spindle fibres attach to centromere of chromosomes
    (c) Chromosomes decondense at telophase

(d) Splitting of centromere occurs at Anaphase

19. Which of the following stages of meiosis involves division of centromere? **(2021)**
(a) Metaphase-II
(b) Anaphase-II
(c) Telophase-II
(d) Metaphase-I

20. Match List-1 with List-2 **(2021)**

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

21. The fruit fly has 8 chromosomes (2n) in each cell. During interphase of Mitosis if the number of chromosomes at G_1 phase is 8, what would be the number of chromosomes after S phase? **(2021)**
(a) 16
(b) 4
(c) 32
(d) 8

22. Which stage of meiotic prophase shows terminalization of chiasmata as its distinctive feature? **(2021)**
(a) Zygotene
(b) Diakinesis
(c) Pachytene
(d) Leptotene

23. The centriole undergoes duplication during: **(2021)**
(a) Prophase
(b) Metaphase
(c) G_2 phase
(d) S-phase

24. Match the following with respect to meiosis: **(2020)**

	Column -I		**Column -II**
1.	Zygotene	(i)	Terminalization
2.	Pachytene	(ii)	Chiasmata
3.	Diplotene	(iii)	Crossing over
4.	Diakinesis	(iv)	Synapsis

Select the correct option from the following:
(1) (2) (3) (4)
(a) (iv) (iii) (ii) (i)
(b) (i) (ii) (iv) (iii)
(c) (ii) (iv) (iii) (i)
(d) (iii) (iv) (i) (ii)

25. 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: **(2020)**
(a) G_1 phase
(b) S phase
(c) G_2 phase
(d) M phase

26. In a mitotic cycle, the correct sequence of phases is **(2020 Covid Re-NEET)**
(a) G_1, S, G_2, M
(b) M, G_1, G_2, S
(c) G_1, G_2, S, M
(d) S, G_1, G_2, M

27. Attachment of spindle fibers to kinetochores of chromosomes becomes evident in: **(2020 Covid Re-NEET)**
(a) Telophase
(b) Prophase
(c) Metaphase
(d) Anaphase

28. Match the following events that occur in their respective phases of cell cycle and select the correct option:
(2020 Covid Re-NEET)

1.	G_1 phase	(i)	Cell grows and organelle duplication
2.	S phase	(ii)	DNA replication and chromosome duplication
3.	G_2 phase	(iii)	Cytoplasmic growth
4.	Metaphase in M-phase	(iv)	Alignment of chromosomes

(1) (2) (3) (4)

(a) (iii) (iv) (i) (ii)
(b) (iv) (i) (ii) (iii)
(c) (i) (ii) (iii) (iv)
(d) (ii) (iii) (iv) (i)

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

30. Dissolution of the synaptonemal complex occurs during: **(2020)**
(a) Zygotene
(b) Diplotene
(c) Leptotene
(d) Pachytene

31. During Meiosis-I, in which stage synapsis takes place? **(2020 Covid Re-NEET)**
(a) Zygotene
(b) Diplotene
(c) Leptotene
(d) Pachytene

32. The correct sequence of phases of cell cycle is **(2019)**
(a) M → G1→ G2→ S
(b) G1→ G2→ S → M
(c) S → G1→ G2→ M
(d) G1→ S → G2→ M

33. Cell in G_0 phase **(2019)**
(a) Exit the cell cycle
(b) Enter the cell cycle
(c) Suspend the cell cycle
(d) Terminate the cell cycle

34. The stage during which separation of the paired homologous chromosomes begins is **(2018)**
(a) Pachytene
(b) Diplotene
(c) Diakinesis
(d) Zygotene

35. Which of the following statements is correct with respect to cell cycle? **(2017)**
(a) DNA content of cell remains constant during entire cell cycle
(b) A cell in G_1 phase has double the amount of DNA than a cell in G_2 phase
(c) Each chromosome has two chromatids in G_1 phase
(d) Nerve cells in adult human are in G_0 State

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

37. DNA replication in bacteria occurs: **(2017)**
(a) During S-phase
(b) Within nucleolus
(c) Prior to fission
(d) Just before transcription

38. At what phase of meiosis homologous chromosomes are separated? **(2017)**
(a) Anaphase-II
(b) Prophase-I
(c) Prophase-II
(d) Anaphase-I

39. During cell growth, DNA synthesis takes place in: **(2016 - II)**
(a) G_2 phase
(b) M phase
(c) S phase
(d) G_1 phase

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

41. 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: **(2016 - II)**

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

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

42. In meiosis, crossing over is initiated at: **(2016 - I)**
(a) Pachytene
(b) Leptotene
(c) Zygotene
(d) Diplotene

43. Select the correct option: **(2015)**

Column I		Column II	
A.	Synapsis aligns the 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-(iii) 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)

44. A somatic cell that has just completed the S phase of its cell cycle, as compared to gamete of the same species, has: **(2015 Re)**
(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

45. Arrange the following events of meiosis in correct sequence: **(2015 Re)**
A. Crossing over
B. Synapsis
C. Terminalisation of chiasmata
D. Disappearance of nucleolus
(a) (B), (A), (C), (D)
(b) (A), (B), (C), (D)
(c) (B), (C), (D), (A)
(d) (B), (A), (D), (C)

46. 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? **(2014)**
(a) G_2 and M
(b) G_0 and G_1
(c) G_1 and S
(d) Only G_2

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

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

49. A stage in cell division is shown in the figure. Select the answer which gives correct identification of the stage with its characteristics: **(2013)**

(a)	Telophase	Endoplasmic reticulum and nucleolus not reformed yet.

(b)	Telophase	Nuclear envelope reforms, Golgi complex reforms.
(c)	Late Anaphase	Chromosomes move away from equatorial plate, Golgi complex not present.
(d)	Cytokinesis	Cell plate formed, mitochondria

50. The complex formed by a pair of synapsed homologous chromosomes is called: **(2013)**
(a) Axoneme
(b) Equatorial plate
(c) Kinetochores
(d) Bivalent

Answer Key

S1. Ans. (a)

S2. Ans. (d)

S3. Ans. (c)

S4 Ans. (c)

S5. Ans. (d)

S6. Ans. (a)

S7. Ans. (c)

S8. Ans. (d)

S9. Ans. (d)

S10. Ans. (d)

S11. Ans. (d)

S12 Ans. (b)

S13. Ans. (d)

S14. Ans. (c)

S15. Ans. (c)

S16. Ans. (a)

S17. Ans. (b)

S18. Ans. (b)

S19. Ans. (b)

S20. Ans. (b)

S21. Ans. (d)

S22. Ans. (b)

S23. Ans. (d)

S34. Ans. (a)

S25. Ans. (a)

S26. Ans. (a)

S27. Ans. (c)

S28. Ans. (c)

S29. Ans. (b)

S30. Ans. (b)

S31. Ans. (a)

S32. Ans. (d)

S33. Ans. (a)

S34. Ans. (b)

S35. Ans. (d)

S36. Ans. (b)

S37. Ans. (c)

S38. Ans. (d)

S39. Ans. (c)

S40. Ans. (d)

S41. Ans. (c)

S42. Ans. (a)

S43. Ans. (d)

S44. Ans. (a)

S45. Ans. (a)

S46. Ans. (d)

S47. Ans. (b)

S48. Ans. (b)

S49. Ans. (b)

S50. Ans. (d)

Solutions

S1. Ans.(a)

Recombination nodules appear during the pachytene stage of prophase I in meiosis. These nodules are thought to be involved in crossing over, a process where homologous chromosomes exchange genetic material. This leads to genetic recombination, which is a significant source of genetic variation in sexually reproducing organisms.

S2. Ans.(d)

Splitting of centromere occurs during anaphase of mitosis or anaphase II of meiosis.

During Metaphase I and II, chromosomes align at the equator.

During telophase, chromosomes reach the respective poles.

S3. Ans.(c)

The process of recombination occurs at Pachytene stage of prophase I. This stage is characterised by the appearance of recombination nodules.

S4. Ans.(c)

Replication of DNA takes place in S-phase of cell cycle in eukaryotes. Most of the cell organelles duplicate in G, phase.

S5. Ans.(d)

M phase or mitosis is the phase where the actual cell division occurs. Mitosis is also called equational division.

During G_2 phase DNA synthesis stops but cell synthesis RNA, proteins, etc. for next phase.

Quiescent stage is inactive phase in which non-dividing cells enters.

G_1 phase is the interval between mitosis and initiation of DNA replication.

S6. Ans.(a)

1. Tetrad formation is seen during the Zygotene stage.

2. During Anaphase, the centromeres split and chromatids separate.

3. Terminalization of chiasmata takes place during Diakinesis.

4. Nucleolus, Golgi complex, and ER are reformed during Telophase.

5. Crossing over takes place between non-sister chromatids of homologous chromosomes.

S7. Ans.(c)

Statement I is incorrect. The GO phase is a state in the cell cycle in which cells exist in a quiescent or dormant stage. Statement II is correct. During the S phase (synthesis phase) of interphase, DNA replication occurs, and the centrosome, which plays a key role in cell division, also duplicates.

S8. Ans.(d)

The doubling of the number of chromosomes can be achieved by disrupting mitotic cell division soon after DNA replication has occurred and before the separation of sister chromatids. This stage of mitosis is the metaphase, where chromosomes align in the center of the cell, prior to separation in anaphase.

If mitosis is disrupted after this point, sister chromatids cannot separate, leading to a doubling of the chromosome number in the resulting cells.

S9. Ans.(d)

The centromere of each chromosome splits during the anaphase stage of both mitosis and meiosis.

In mitosis, this happens during anaphase, when sister chromatids separate and move to opposite poles of the cell.

In meiosis, the centromere splits during anaphase II, which is similar to anaphase of mitosis, and sister chromatids separate.

S10. Ans.(d)

In oocytes of some vertebrates, diplotene lasts for months or years. This stage is referred as dictyotene stage.

S11. Ans.(d)

Correct sequence of events during Prophase I of meiosis is: (b)→(a)→(c)→(e)→(d)

S12. Ans.(b)

Bivalent or tetrad formation is called synapsis which is accompanied by the formation of complex structure called synaptonemal complex.

S13. Ans.(d)

Metaphase chromosomes are not made up of four sister chromatids held together by the centromere. Instead, metaphase chromosomes consist of two sister chromatids held together by the centromere. The sister chromatids are identical copies of a single chromosome that have been replicated during the S phase of the cell cycle.

S14. Ans.(c)

Pairing of homologous chromosomes occurs during prophase I of meiosis.

Coiling and condensation of chromatids, spindle fibres attachment to the kinetochores and movement of centrioles towards opposite poles occur in both mitosis and meiosis.

S15. Ans.(c)

Pachytene stage of meiosis is characterized by the appearance of recombination nodules, the sites at which crossing over occurs between non sister chromatids of homologous chromosomes.

S16. Ans.(a)

In metacentric chromosome, centromere is in the middle of the chromosomes. Acrocentric chromosome has centromere close to the end of the chromosome. In submetacentric chromosome, centromere is slightly away from the middle of the chromosome. Telocentric chromosome has terminal centromere.

S17. Ans.(b)

Meiosis involves two sequential cycles of nuclear and cell division called meiosis-l and meiosis-II but only single cycle of DNA replication.

The stage between two meiotic divisions is called interkinesis and is generally short lived and involves no DNA replication.

S18. Ans.(b)

Spindle fibres attach to the kinetochores of chromosomes.

Kinetochores are the disc shaped structures present on sides of primary constriction or centromere of chromosomes.

S19. Ans.(b)

In anaphase-II, the centromeres separate and the sister chromatids—now individual chromosomes—move

toward the opposite poles of the cell. The centromeres separate, and the two chromatids of each chromosome

move to opposite poles on the spindle. The separated chromatids are now called chromosomes in their own

right.

S20. Ans.(b)

S21. Ans.(d)

During mitotic cell cycle if the chromosome number in G_1 phase is 8, is remains same till metaphase.

Hence, even after S phase same chromosome number 8 is maintained in the cell of fruit fly.

S22. Ans.(b)

Terminalization of chiasma takes place throughout diplotene, after crossing over at pachytene, and terminalization completion takes region in diakinesis.

Zygotene is the sub-stage where synapsis among homologous chromosomes begins.

S23. Ans.(d)

S24. Ans.(a)

Zygotene-The second stage of Prophase-I. Chromosomes starts pairing together in a process called synapsis.

Pachytene-The third stage of prophase-I, bivalent chromosomes clearly appears

as tetrads, crossing over between homologous chromosomes occurs.

Diplotene-The fourth stage of the prophase of meiosis, following pachytene, during which the

paired chromosomes begin to separate into two pairs

of chromatids and chiasmata becomes visible. Diakinesis-The fifth and last stage of the prophase of

meiosis, following diplotene, when the separation of

homologous chromosomes is complete and crossing over has occurred. Terminalization occurs as the

chiasmata move towards the ends of the tetrad. Thus, the correct answer is (A) - (a) - (iv), (b) - (iii),

(c) - (ii), (d) - (i)

S25. Ans.(a)

Some cells in the adult animals do not appear to exhibit division (e.g., heart cells) and many other cells divide only occasionally, as needed to replace

cells that have been lost because of injury or cell death. These cells that do not divide further exit G_1 phase to enter an inactive stage called quiescent

stage (G_0) of the cell cycle.

S26. Ans.(a)

During cell division, the cell cycle is divided into distinct phases. It is split into two sections. The M Phase is the time when a cell divides or undergoes

mitosis, while the interphase is the time between two successive M phases. G_1 (first gap), S (synthesis), and G_2 (interphase) are the three phases of interphase (second gap).

S27. Ans.(d)

All of the chromosomes are present in metaphase. Coming to rest near the equator, with one chromatid

of each chromosome attached to spindle fibres from one pole and its sibling chromatid joined to spindle

fibres from the opposing pole by its kinetochore.

S28. Ans.(c)

Cytoplasmic proliferation in the G1 phase Only DNA replication occurs during the S phase, and the chromosome number remains constant.

G2 phase - Cell division and duplication of organelles. In M-phase, the chromosomes are aligned.

Note: Although the actions described in the question may not perfectly correspond to the phases of the cell

cycle, the most accurate response is (c).

S29. Ans.(b)

The cell is metabolically active and expands continually during the G_1 phase, but it does not duplicate its DNA. The S phase, also known as the

synthesis phase, is the time when DNA is synthesised or replicated. M-Phase involves the reorganisation of all cell components.

S30. Ans.(b)

The breakdown of the synaptonemal complex, as well as X-shaped structures known as chiasmata, characterise the diplotene stage.

S31. Ans.(a)

During zygotene, homologous chromosomes are paired (synapsis).

S32. Ans.(d)

$G_1 \rightarrow S \rightarrow G \rightarrow M$ is the correct sequence of cell cycle phases.

S33. Ans.(a)

Cells in the G_0 phase are considered to have exited the cell cycle. They are in a dormant state and do not proliferate unless they are stimulated, yet they are

metabolically active.

S34. Ans.(b)

Diplotene is the fourth stage of prophase-I in meiosis, when the paired chromosomes begin to split

and appear as a 0 or 8-shaped structure under the microscope.

S35. Ans.(d)

Nerve cells in adult human do not divide further.

These cells exit G_1 phase to enter an inactive stage called quiescent stage of the cell cycle. Cells in this stage remain metabolically active but ni longer proliferate.

S36. Ans.(b)

The following is the right order of events during mitosis:

(i) During early to mid-prophase, DNA condenses, allowing chromosomes to be seen.

(ii) Disassembly of the nuclear membrane begins in late prophase or the transition to metaphase.

(iii) During metaphase, chromosomes are arranged along the equator, a process known as congression.

(iv) During anaphase, centromere division or splitting occurs, resulting in the formation of daughter chromosomes.

(v) During anaphase, daughter chromosomes divide and migrate to opposite poles, resulting in segregation.

(vi) The production of two daughter nuclei occurs during telophase.

S37. Ans.(c)

In bacteria, DNA replication occurs before fission. Because of their primordial origin, prokaryotes do not have a well-defined S-phase.

S38. Ans.(d)

The homologous chromosomes separate in anaphase -I, but sister chromatids stay connected at their centromeres.

S39. Ans.(c)

The S phase, also known as the synthesis phase, is the time when DNA is synthesised or replicated. The amount of DNA per cell doubles throughout this time.

S40. Ans.(d)

Only mitosis occurs in somatic cells. Meiosis, on the other hand, occurs in germ cells (sperm/ova). Chromosomes begin pairing together during the zygotene stage of meiosis-I, and this process is known as synapsis.

S41. Ans.(c)

Pachytene: With the help of an enzyme called recombinase, genetic material is exchanged between non-sister chromatids of two homologous chromosomes. Chromosomes align to the equatorial plate in Metaphase-I. Diakinesis is the process of the chiasmata being terminated.

Zygotene: A sophisticated structure called the synaptonemal complex helps similar chromosomes pair together (synapsis).

S42. Ans.(a)

- The exchange of genetic material between two non-sister chromatids of homologous chromosomes is known as crossing over.
- Crossing over is likewise an enzyme-Mediated process, with recombinase as the enzyme involved.

S43. Ans.(d)

A-(ii) B-(iii) C-(v) D-(iv)

S44. Ans.(a)

	Gametic	Somatic cell
Ploidy	n	2n
DNA	c	4C

S45. Ans.(a)

Synapsis - Zygotene

Pachytene - Crossing over

Diplotene - Chiasmata Termination

The nucleolus vanishes in diakinesis.

S46. Ans.(d)

	Ploidy level	Amount of DNA
G1	n	2C
S	n	4C
G2	n	4C
M	2n	2C

S47. Ans.(b)

The 'S' phase denotes the time when DNA is synthesised or replicated.

Per cell, the amount of DNA doubles.

S48. Ans.(b)

Crossing over is an enzyme-mediated process involving the recombinase enzyme. This can be found in pachytene.

S49. Ans.(b)

The nucleolus, Golgi complex, and ER reform during telophase.

S50. Ans.(d)

In the zygotene stage, bivalent or tetrad refers to paired homologous chromosomes.