

Kattar NEET 2026

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Cell Cycle and Cell Division

Q1 Identify the **correct** statements regarding phases of the cell cycle:

- A. Yeast can progress through the cell cycle in only about 90 minutes.
- B. Interphase includes cell growth and DNA replication.
- C. Interphase is also called resting phase.
- D. The M phase lasts less than 5% of the duration of cell cycle.
- E. The duration of cell cycle does not vary from cell type to cell type of same organism.

Choose the correct answer from the options given below:

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

Q2 Which of the following is exemplified by meiotic division?

- (A) Division of somatic cell
- (B) Division of meristematic cell
- (C) Gamete formation in human
- (D) Cell division in male drone bee

Q3 Identify the **incorrect** statement.

- (A) Diplotene can last for months or years in the oocytes of some vertebrates.
- (B) Recombinase is required in zygotene stage.
- (C) The complex formed by a pair of synapsed homologous chromosomes is called tetrad.
- (D) Dissolution of the synaptonemal complex occurs during diplotene.

Q4 Identify the **incorrect** statements about G_0 phase.

- A. This stage is also called quiescent stage.
- B. These cells have exited from the G_2 phase of

the cell cycle.

- C. Heart cells generally remain in this stage.
- D. Cells in this stage can proliferate when conditions require replacing cells that have been lost due to injury or cell death.
- E. Cells in this stage remain metabolically active.

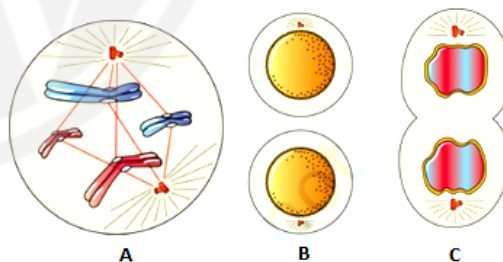
Choose the correct answer from the options given below:

- (A) A, B, C and E only
- (B) B only
- (C) A and B only
- (D) All except B

Q5 During which specific meiotic stage does the event responsible for genetic variation occur?

- (A) Diakinesis
- (B) Diplotene
- (C) Zygotene
- (D) Pachytene

Q6 Identify the stages of meiosis shown in the given diagrams **A**, **B**, and **C**.



- (A) A – Metaphase, B – Telophase, C – Interphase
- (B) A – Metaphase, B – Prophase, C – Telophase
- (C) A – Transition to metaphase, B – Interphase, C – Telophase
- (D) A – Anaphase, B – Prophase, C – Telophase

Q7 Given below are two statements:

Statement I: Fully condensed chromosomes are found in diplotene of prophase I.

Statement II: The disappearance of nucleolus and breakdown of nuclear envelope occur at the end of diakinesis.



In the light of the above statements, choose the *most appropriate* answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.
 (B) Statement I is incorrect but Statement II is correct.
 (C) Both Statement I and Statement II are correct.
 (D) Both Statement I and Statement II are incorrect.
- Q8** A cell with 48 chromosomes and 2C DNA content undergoes mitosis. What will be the chromosome number and DNA content in each daughter nucleus at telophase?
 (A) 48 chromosomes, 2C DNA
 (B) 96 chromosomes, 2C DNA
 (C) 96 chromosomes, 4C DNA
 (D) 48 chromosomes, 4C DNA
- Q9** A eukaryotic cell with 16 chromosomes undergoes mitosis. How many chromosomes and chromatids will be visible at metaphase?
 (A) 16 chromosomes, 16 chromatids
 (B) 16 chromosomes, 32 chromatids
 (C) 32 chromosomes, 32 chromatids
 (D) 8 chromosomes, 16 chromatids
- Q10** Which phase of mitosis has events that are reversed during telophase?
 (A) Metaphase (B) Prophase
 (C) Anaphase (D) Interphase
- Q11** Which of the following is true for mitosis in unicellular and multicellular organisms?
 (A) No difference exists between the two
 (B) Mitosis in unicellular organisms helps in repair
 (C) Mitosis in multicellular organisms leads to reproduction
 (D) Mitosis leads to growth in multicellular and reproduction in unicellular organisms
- Q12** The chromosomal makeup of a zygote is found to have two sets of autosomes with XXX sex chromosomes.
 (A)

- Failure of segregation of autosomes during gamete formation
 (B) Failure of segregation of sex chromosomes in female parent during gamete formation
 (C) Duplication of a sex chromosome during karyokinesis
 (D) Duplication of one X chromosome during fertilisation

- Q13** If the number of chromosomes in a root tip cell is 16 (2n), what will be the number of chromosomes in each cell formed after meiosis I and meiosis II?
 (A) 32 and 16 respectively
 (B) 8 and 8 respectively
 (C) 16 and 8 respectively
 (D) 16 and 16 respectively
- Q14** Which is **not** correct regarding the significance of meiosis?
 (A) It restores the diploid phase of sexually reproducing organisms.
 (B) It increases the genetic variability in the population of organisms from one generation to the next.
 (C) It is involved in gametogenesis in plants and animals.
 (D) It ensures the production of haploid phase in the life cycle of sexually reproducing organisms.
- Q15** Which of the following is **correct** regarding chiasmata?
 (A) It is formed at non crossing over site.
 (B) Terminalisation of chiasmata occur during pachytene.
 (C) It appears as X-shaped structure in diplotene phase.
 (D) It is also seen in metaphase I.
- Q16** Which of the following is **incorrect** regarding interkinesis?
 (A) Interkinesis is immediately followed by metaphase II.
 (B) It is generally short lived.
 (C)



No replication of DNA occurs during this stage.

(D) It is the stage between the two meiotic divisions.

Q17 Mitosis in haploid cells is seen in:

- (A) blood cell.
- (B) male honey bees.
- (C) all animals.
- (D) most of animals.

Q18 Identify the **correct** sequence of events during meiosis.

- A. Bivalent chromosomes align at the metaphase plate
- B. Chromosomes condense and homologous chromosomes pair
- C. Crossing over occurs between homologous chromosomes
- D. Nuclear envelope reforms
- E. Separation of homologous chromosomes

Choose the correct answer from the options given below:

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

Q19 The recombination nodules on homologous chromosomes during meiosis characterize

- (A) Sites at which crossing over occurs.
- (B) Synaptonemal complex.
- (C) Tetrad.
- (D) Non-crossing over sites.

Q20 Select the **incorrect** statement.

- (A) Four haploid cells are formed at the end of meiosis.
- (B) Synapsis is accompanied by the formation of synaptonemal complex.
- (C) Meiosis involves two sequential cycles of nuclear and cell division but only a single cycle of DNA replication.
- (D) Bivalents are more clearly visible at the zygotene.

Q21 Given below are two statements:

Statement I: Meiosis I results in dyads of cells, while meiosis II results in tetrads of cells.

Statement II: In many cases, during telophase I, the chromosomes do not reach the extremely extended state of the interphase nucleus.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

- (A) Both Statement I and Statement II are correct.
- (B) Statement I is correct but Statement II is incorrect.
- (C) Both Statement I and Statement II are incorrect.
- (D) Statement I is incorrect but Statement II is correct.

Q22 Identify the **incorrect** statement from the following:

- (A) Separated sister chromatids in anaphase are referred to as daughter chromosomes of the future daughter nuclei.
- (B) Mitotic apparatus is made up of two asters together with spindle fibres.
- (C) In prophase, duplicated centrosomes begins to move towards opposite poles of the cell.
- (D) In metaphase, nuclear membrane is clearly visible under microscope.

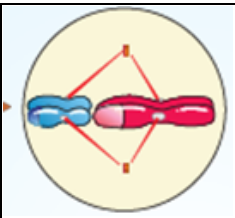
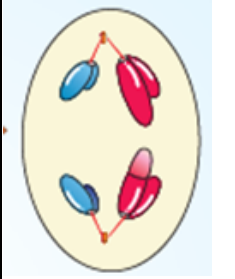
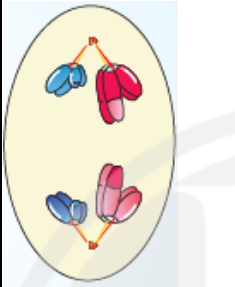
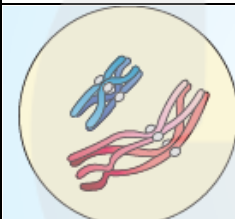
Q23 Which of the following is incorrect regarding cytokinesis?

- (A) In plant cell, cell-plate represents the middle lamella.
- (B) Cytokinesis in animal cells is achieved by the appearance of a furrow in the plasma membrane.
- (C) During cytoplasmic division, organelles like mitochondria and plastids get distributed between the two daughter cells.
- (D) In plant cells, wall formation starts from lateral walls and grows toward the centre of the cell.

Q24 Match List-I with List-II.

List-I	List-II
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(A)	Metaphase II	(I)	
(B)	Anaphase II	(II)	
(C)	Prophase I	(III)	
(D)	Anaphase I	(IV)	

Choose the correct answer from the options given below:

- (A) A-I, B-III, C-IV, D-II
 (B) A-I, B-II, C-IV, D-III
 (C) A-I, B-II, C-III, D-IV
 (D) A-I, B-IV, C-III, D-II

Q25 Match **List-I** with **List-II**.

List-I		List-II	
(A)	M phase	(I)	Proteins are synthesised in preparation for mitosis
(B)	S phase	(II)	Most of the organelle duplicates
(C)	G ₁ phase	(III)	Duplication of centrosome in animal cell

(D)	G ₂ phase	(IV)	Most dramatic period of the cell cycle
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Choose the **correct** answer from the options given below:

- (A) A-IV, B-III, C-II, D-I
 (B) A-II, B-I, C-IV, D-III
 (C) A-IV, B-III, C-I, D-II
 (D) A-IV, B-II, C-III, D-I

Q26 Which of the following correctly represents the structure of a bivalent during meiosis I?

- (A) Four chromatids and four centromeres
 (B) Two chromatids and two centromeres
 (C) Two chromatids and one centromere
 (D) Four chromatids and two centromeres

Q27 Syncytium is formed when:

- (A) Cytokinesis is not followed by interkinesis
 (B) Cytokinesis is not followed by karyokinesis
 (C) Fertilisation is not followed by nuclear division
 (D) Karyokinesis is not followed by cytokinesis

Q28 Which of the following processes results in the reduction of the number of chromosomes sets to half in daughter cells?

- (A) Synapsis
 (B) Splitting of centromere
 (C) Crossing over
 (D) Separation of homologous chromosomes

Q29 Which of the following cells is generally found in G₀ phase?

- (A) Heart cell
 (B) Cells of apical meristem
 (C) Epidermis cell
 (D) Cells of cambium

Q30 Which of the following acts as the precursor of the new cell wall in plant cells during cytokinesis?

- (A) Cell plate
 (B) Asters
 (C) Nuclear membrane
 (D) Cell wall of parent cell

Q31



In onion root tip cells ($2n = 16$, $2C$ DNA), what would be the DNA content and chromosome number during G_2 phase?

- (A) $2C$ DNA, 8 chromosomes
- (B) $4C$ DNA, 16 chromosomes
- (C) $4C$ DNA, 8 chromosomes
- (D) $2C$ DNA, 16 chromosomes

Q32 If mitotic division is inhibited after prophase, which of the following events will **not** occur?

- (A) Spindle fibre formation
- (B) Chromosome condensation
- (C) Chromosome alignment at equator
- (D) Centrosome movement to poles

Q33 Exchange of genetic material between non-sister chromatids of homologous chromosomes occurs in the ____ sub stage of meiotic prophase I.

- (A) second
- (B) third
- (C) fourth
- (D) fifth

Q34 Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**:

Reason (R):

Assertion (A): Telophase marks the reformation of the nuclear envelope around chromosomes.

Reason (R): Chromosomes condense and become indistinct during telophase.

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

- (A) A is true but R is false.
- (B) A is false but R is true.
- (C) Both A and R are true and R is the correct explanation of A.

- (D) Both A and R are true but R is NOT the correct explanation of A.

Q35 A diploid cell with 14 chromosomes enters meiosis. At anaphase I, how many chromosomes and chromatids will be present at each pole?

- (A) 7 chromosomes, 7 chromatids
- (B) 7 chromosomes, 14 chromatids
- (C) 14 chromosomes, 14 chromatids
- (D) 7 chromosomes, 28 chromatids

Q36 The following statements describe events in the cell cycle. Identify the correct sequence in which they occur:

- A. Chromatin condenses to form chromosomes
- B. DNA replicates
- C. Chromosomes align at the equator
- D. Nuclear envelope breaks down
- E. Sister chromatids separate and move to opposite poles

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

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

Q37 Why is meiosis II similar to mitosis in chromosomal behavior?

- (A) It ensures the doubling of DNA content for fertilization
- (B) It ensures the doubling of number of chromosomes as meiosis I
- (C) It separates sister chromatids, restoring the diploid condition
- (D) It ensures haploid cells have one chromatid per chromosome for gamete fusion

Q38 Given below are two statements:

Statement I: Each daughter chromatid has its own centromere in anaphase.

Statement II: At the end of anaphase, the number and types of chromosomes at each pole of cell is same as present in parent nucleus.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect.
- (B) Statement I is incorrect but Statement II is correct.
- (C) Both Statement I and Statement II are correct.
- (D) Both Statement I and Statement II are incorrect.

Q39



Which of the following events occur during prophase I of meiosis?

- A. Synapsis of homologous chromosomes
- B. Recombination nodules appear
- C. Terminalization of chiasmata
- D. Spindle formation begins
- E. Sister chromatids separate

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

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

Q40 In an adult human cell, all metabolic activities were occurring normally but it was neither undergoing karyokinesis, nor its DNA had replicated. Possibly, what is true for it?

- (A) It is preparing to enter the M phase
- (B) It will never be able to undergo division
- (C) It has exited the cell cycle at G_1 phase
- (D) In it recombination of genetic material is going on

Q41 Identify the **incorrect** statement about centrosome.

- (A) It radiates out microtubules in telophase
- (B) Asters are formed from it
- (C) It duplicates in the interphase
- (D) It moves towards opposite poles of the cell during prophase

Q42 A researcher adds a drug to actively dividing human cells that inhibits spindle fiber formation. What would be the immediate observable effect during mitosis?

- (A) DNA replication would stop
- (B) Chromosomes would not condense
- (C) Chromosomes would fail to align at the equator
- (D) Sister chromatids would separate prematurely

Q43 Match **List I** with **List II**.

	List I		List II
(A)	Prophase	(I)	Decondensation of

			chromosomes
(B)	Metaphase	(II)	Congression of chromosomes
(C)	Anaphase	(III)	Formation of two groups of chromosomes
(D)	Telophase	(IV)	Condensation of chromosomal material

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

- (A) A-IV, B-II, C-III, D-I
- (B) A-II, B-III, C-IV, D-I
- (C) A-III, B-IV, C-I, D-II
- (D) A-I, B-III, C-II, D-IV

Q44 The precursor of new cell wall that forms during cytokinesis in a plant cell;

- (A) grows centripetally.
- (B) is the secondary cell wall.
- (C) represents a layer present between the walls of two adjacent cells.
- (D) ultimately meets the parent cell membrane.

Q45 Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**:

Assertion (A): A cell in G_0 phase does not replicate its DNA.

Reason (R): In G_0 phase cell is metabolically active.

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

- (A) A is true but R is false
- (B) A is false but R is true
- (C) Both A and R are true and R is the correct explanation of A
- (D) Both A and R are true but R is NOT the correct explanation of A

Q46 Which of the following best explains why meiosis I is called a reductional division?

- (A) DNA content per chromosome is reduced by half

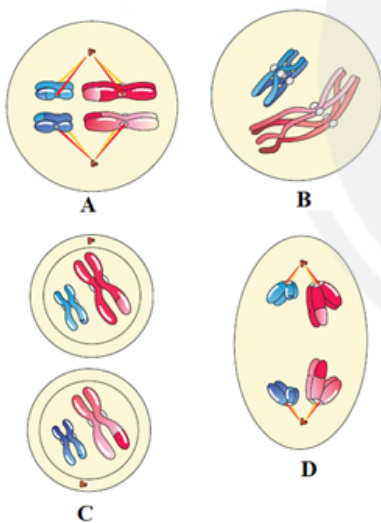


- (B) Number of chromatids is doubled in daughter cells
 (C) Chromosome number is reduced to half in daughter cells
 (D) It brings about genetic variability

Q47 Which of the following events occur during cytokinesis in plant cells?
 A. Cell plate begins to form in the center
 B. Cell furrow starts forming from the plasma membrane
 C. Mitochondria and plastids get distributed between the two daughter cells.
 D. Cell furrow grows towards center of the cell
 Choose the **correct** answer from the options given below:

- (A) A, B, C and D (B) C and D only
 (C) A and C only (D) B and D only

Q48 Arrange the following events of meiosis I in the **correct** order of their occurrence:



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

- (A) A → B → C → D
 (B) C → D → B → A
 (C) A → C → D → B
 (D) B → A → D → C

Q49 A cell when viewed under microscope shows:
 A. Homologous chromosomes paired as tetrads
 B. Sites of crossing over visible
 C. Chromosomes still inside an intact nucleus

Which sub-stage of prophase I is the cell in?

- (A) Leptotene (B) Zygotene
 (C) Pachytene (D) Diakinesis

Q50 Given below are two statements:

Statement I: Interphase is considered a resting phase of the cell cycle.

Statement II: No biochemical activity occurs during interphase.

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

- (A) Statement I is correct but Statement II is incorrect.
 (B) Statement I is incorrect but Statement II is correct.
 (C) Both Statement I and Statement II are correct.
 (D) Both Statement I and Statement II are incorrect.

Q51 During mitosis, the nuclear envelope is not observed in;

- (A) metaphase and anaphase.
 (B) early prophase and metaphase.
 (C) early prophase and anaphase.
 (D) early prophase and telophase.

Q52 The liquid endosperm in coconut;

- (A) has cells in quiescent stage of the cell cycle.
 (B) is formed due to failure of karyokinesis after cytokinesis.
 (C) does not exemplify syncytium.
 (D) has multinucleate condition.

Q53 Match List I with List II.

	List I		List II
(A)	Centrioles	(I)	Help in movement of chromosomes to and away from equator
(B)	Kinetochore	(II)	Formed for cytokinesis in animal cells
(C)	Spindle fibres	(III)	Radiate out astral rays



(D)	Cell furrow	(IV)	Site of attachment of spindle fibres to chromosomes
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Choose the **correct** answer from the options given below:

- (A) A-IV, B-I, C-II, D-III
 (B) A-II, B-III, C-IV, D-I
 (C) A-III, B-IV, C-I, D-II
 (D) A-I, B-III, C-II, D-IV

Q54 A yeast cell was cultured for 15 hours and allowed to undergo cell division. How many daughter yeast cells will be formed in this time, considering that only one of the two daughter cells divided further, after each cell division?

- (A) 10 (B) 1080
 (C) 11 (D) 256

Q55 If the action of the enzyme recombinase is inhibited during meiosis, which of the following consequences is immediately observe?

- (A) Chromosomes fail to align at the metaphase plate
 (B) No recombination occurs between homologous chromosomes
 (C) Cytokinesis does not occur after meiosis II
 (D) Sister chromatids separate prematurely

Q56 Which of the following statements are true regarding anaphase I of meiosis?

- A. Homologous chromosomes separate
 B. Centromeres remain undivided
 C. Sister chromatids move together to poles
 D. Chromosome number at poles becomes haploid
 E. Spindle fibres degrade to pull chromosomes

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

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

Q57 Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as

Reason (R):

Assertion (A): DNA replication occurs in both mitosis and meiosis.

Reason (R): DNA replication occurs during interkinesis in both mitosis and meiosis.

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

- (A) A is true but R is false.
 (B) A is false but R is true.
 (C) Both A and R are true and R is the correct explanation of A.
 (D) Both A and R are true but R is NOT the correct explanation of A.

Q58 If a cell has 32 chromosomes, how many bivalents will be formed during prophase I?

- (A) 32 (B) 8
 (C) 24 (D) 16

Q59 Match **List I** with **List II**:

	List I		List II
(A)	Zygotene	(I)	Formation of synaptonemal complex
(B)	Diakinesis	(II)	Elongated chromosomes are clearly visible but chromatids are not distinguishable
(C)	Leptotene	(III)	Meiotic spindle is assembled
(D)	Diplotene	(IV)	Can last for months or years in oocytes of some vertebrates

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

- (A) A-IV, B-I, C-II, D-III
 (B) A-II, B-III, C-IV, D-I
 (C) A-III, B-IV, C-I, D-II
 (D) A-I, B-III, C-II, D-IV



Q60 Given below are two statements:

Statement I: A tetrad of haploid cells is formed by cytokinesis after meiosis I.

Statement II: Interkinesis occurs after meiosis I but before meiosis II.

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

- (A) Statement I is correct but Statement II is incorrect.
- (B) Statement I is incorrect but Statement II is correct.
- (C) Both Statement I and Statement II are correct.
- (D) Both Statement I and Statement II are incorrect.



Answer Key

Q1 (A)
Q2 (C)
Q3 (B)
Q4 (B)
Q5 (D)
Q6 (C)
Q7 (B)
Q8 (A)
Q9 (B)
Q10 (B)
Q11 (D)
Q12 (B)
Q13 (B)
Q14 (A)
Q15 (C)
Q16 (A)
Q17 (B)
Q18 (C)
Q19 (A)
Q20 (D)
Q21 (A)
Q22 (D)
Q23 (D)
Q24 (B)
Q25 (A)
Q26 (D)
Q27 (D)
Q28 (D)
Q29 (A)
Q30 (A)

Q31 (B)
Q32 (C)
Q33 (B)
Q34 (A)
Q35 (B)
Q36 (A)
Q37 (D)
Q38 (C)
Q39 (A)
Q40 (C)
Q41 (A)
Q42 (C)
Q43 (A)
Q44 (C)
Q45 (D)
Q46 (C)
Q47 (C)
Q48 (D)
Q49 (C)
Q50 (A)
Q51 (A)
Q52 (D)
Q53 (C)
Q54 (A)
Q55 (B)
Q56 (A)
Q57 (A)
Q58 (D)
Q59 (D)
Q60 (B)



Hints & Solutions

Q1 Text Solution:

Duration of cell cycle can vary from organism to organism and also from cell type to cell type.

Q2 Text Solution:

In human, meiosis occur during gamete formation. The division of somatic cells, meristematic cells, and in male drone bees occurs through mitotic division, not meiotic division.

Q3 Text Solution:

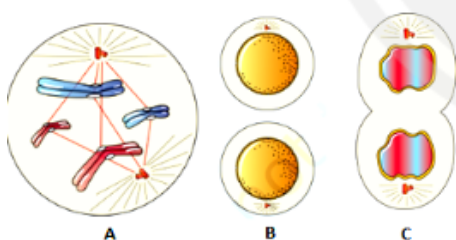
Recombinase is required for crossing over process in pachytene stage.

Q4 Text Solution:

Cells in G_0 phase have exited from the G_1 phase of the cell cycle.

Q5 Text Solution:

The exchange of genetic material between homologous chromosomes occurs during the pachytene stage. It takes place between non-sister chromatids of homologous chromosomes and leads to recombination of genetic material on the two chromosomes.

Q6 Text Solution:


A – Transition to metaphase, B – Interphase, C – Telophase

Q7 Text Solution:

Fully condensed chromosomes are found in diakinesis of prophase I.

Q8 Text Solution:

If a diploid cell at G_1 phase has 48 chromosomes and 2C DNA content, then after the S phase, it will have 48 chromosomes and 4C DNA. Mitosis being an equational division ensures that at

telophase, each daughter nucleus receives 48 chromosomes and 2C DNA, identical to the parent cell.

Q9 Text Solution:

During metaphase, all duplicated chromosomes (still considered as 16) line up at the equator. However, each chromosome is made of 2 chromatids, so total number of chromatids = $16 \times 2 = 32$.

Q10 Text Solution:

During prophase, chromosomes condense, the nuclear membrane dissolves, and spindle fibres form. In telophase, these events are reversed: chromosomes decondense, the nuclear membrane reforms, and spindle fibres disappear. Thus, telophase is the reverse of prophase.

Q11 Text Solution:

In unicellular organisms' mitosis is equivalent to growth and reproduction. In multicellular organisms, mitosis is responsible for growth, development, and repair of tissues.

Q12 Text Solution:

A zygote with XXX means it received two X chromosomes from the mother (due to failure of segregation of X chromosomes in her oogenesis) and one X from the father.

Q13 Text Solution:

Meiosis I is the reductional division since it reduces the chromosome number by half. So, after meiosis I, the chromosome number is halved \rightarrow from $2n$ (16) to n (8).

Meiosis II is similar to mitosis. The sister chromatids separate, but the chromosome number remains the same.

So, after meiosis II, each of the two haploid cells divides again but retains the chromosome number of n (8).

Q14 Text Solution:


Meiosis ensures the production of haploid phase in the life cycle of sexually reproducing organisms whereas fertilisation restores the diploid phase.

Q15 Text Solution:

Chiasmata is formed at the site of crossing over between non-sister chromatids of homologous chromosomes. Terminalisation of chiasmata occurs during diakinesis. Chiasmata are not seen in metaphase I; they disappear as terminalisation completes before metaphase I.

Q16 Text Solution:

The stage between the two meiotic divisions is called interkinesis. It is followed by prophase II.

Q17 Text Solution:

In animals, mitotic cell division is only seen in the diploid somatic cells. However, there are few exceptions to this where haploid cell divide by mitosis, for example, male honey bees. The plants can show mitotic divisions in both haploid and diploid cells.

Q18 Text Solution:

Chromosomes condense (leptotene) and homologous chromosomes pair (zygotene) → Crossing over occurs between homologous chromosomes (pachytene) → Bivalent Chromosomes align at the metaphase plate (Metaphase I) → Separation of homologous chromosomes (Anaphase I) → Nuclear envelope reforms (Telophase I)

Q19 Text Solution:

A recombination nodule forms on homologous chromosomes during the pachytene stage of prophase I in meiosis. These nodules are the sites where crossing over occurs, leading to genetic recombination.

Q20 Text Solution:

Bivalents are more clearly visible at the pachytene stage, not zygotene.

Q21 Text Solution:

Meiosis I results in dyads of cells, while meiosis II results in tetrads of cells. In many cases, during telophase I, the chromosomes do not reach the extremely extended state of the interphase nucleus.

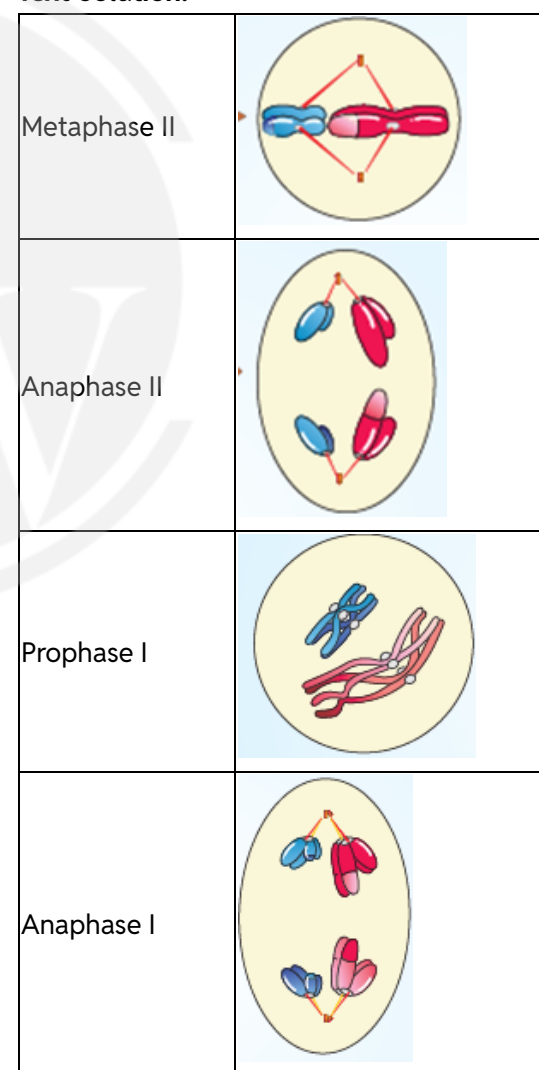
Q22 Text Solution:

The complete disintegration of the nuclear envelope marks the start of the metaphase of mitosis, thus it is not visible under microscope in metaphase and anaphase after disintegration.

Q23 Text Solution:

In plant cells, cell plate formation starts at the centre of the cell and grows outward toward the lateral walls.

Q24 Text Solution:



Q25 Text Solution:



The M phase is the most dramatic period of the cell cycle, involving a major reorganisation of virtually all cell components. In animal cells, DNA replication begins in the nucleus during the S phase, while centriole duplication occurs in the cytoplasm. Most organelle duplication takes place during the G_1 phase. During the G_2 phase, proteins are synthesised in preparation for mitosis, and cell growth continues.

Q26 Text Solution:

During prophase I of meiosis, homologous chromosomes pair to form a bivalent. Each homologous chromosome is already duplicated, so a bivalent contains two chromosomes, each with two chromatids — totalling four chromatids.

Q27 Text Solution:

Syncytium refers to a multinucleate condition where nuclear division is not followed by cytoplasmic division.

Q28 Text Solution:

During anaphase I of meiosis, homologous chromosomes (each consisting of two chromatids) are separated and pulled to opposite poles, reducing the diploid ($2n$) number to haploid (n) in daughter cells.

Q29 Text Solution:

Some cells in the adult animals do not appear to exhibit division (e.g., heart cells) and many other cells divide only occasionally. These cells exit G_1 phase to enter an inactive stage called quiescent stage (G_0) of the cell cycle.

Q30 Text Solution:

The formation of the new cell wall in plant cell begins with the formation of a simple precursor, called the cell-plate that represents the middle lamella between the walls of two adjacent cells.

Q31 Text Solution:

G_1 phase corresponds to the interval between mitosis and initiation of DNA replication. 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. During this time the amount of DNA per cell doubles. If the initial amount of DNA is denoted as $2C$ then it increases to $4C$. However, there is no increase in the chromosome number; if the cell had diploid or $2n$ number of chromosomes at G_1 , even after S phase the number of chromosomes remains the same, i.e., $2n$. In G_2 phase, DNA has replicated, so DNA content = $4C$.

Chromosome number remains same (no division yet) = 16 chromosomes.

Q32 Text Solution:

The chromosomal material becomes untangled during the process of chromatin condensation. The centrosome, which had undergone duplication during S phase of interphase, now begins to move towards opposite poles of the cell. Each centrosome radiates out microtubules called asters. The two asters together with spindle fibres forms mitotic apparatus. Chromosome alignment at equator occurs in metaphase.

Q33 Text Solution:

The first two stages of prophase I are relatively short-lived compared to the next stage that is pachytene. During this stage, the four chromatids of each bivalent chromosomes becomes distinct and clearly appears as tetrads. This stage is characterised by the appearance of recombination nodules, the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes. Crossing over is the exchange of genetic material between two homologous chromosomes.

Q34 Text Solution:

At the beginning of the final stage of karyokinesis, i.e., telophase, the chromosomes that have reached their respective poles decondense and lose their individuality. The individual chromosomes can no longer be seen and each set of chromatin material tends to collect at each of the two poles.



Q35 Text Solution:

Anaphase I: The homologous chromosomes separate, while sister chromatids remain associated at their centromeres. Since there is no separation of chromatids, 7 chromosomes each with 2 sister chromatids will be present at each pole at anaphase I.

Q36 Text Solution:

In animal cells, during the S phase, DNA replication begins in the nucleus, and the centriole duplicates in the cytoplasm. Prophase is marked by the initiation of condensation of chromosomal material (early prophase). Cells at the end of prophase (late prophase), when viewed under the microscope, do not show golgi complexes, endoplasmic reticulum, nucleolus and the nuclear envelope. The 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. Centromeres split and chromatids separate in anaphase.

Q37 Text Solution:

Meiosis I separates homologous chromosomes to form haploid cells. Meiosis II separates sister chromatids, like mitosis. This ensures gametes carry one chromatid per chromosome, ready for fertilization.

Q38 Text Solution:

Centromeres split and chromatids separate in anaphase. Thus, each daughter chromatid has its own centromere in anaphase. These daughter chromatids move to opposite poles. By the end of anaphase, the number and types of chromosomes at each pole of cell is same as present in parent nucleus.

Q39 Text Solution:

Sister chromatids separate in anaphase II.

Q40 Text Solution:

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. Cells in this stage remain metabolically active but no longer proliferate unless called on to do so depending on the requirement of the organism. Considering the given question, the cell seems to be in G_0 phase. Although it is presently unable to divide but it can do so if required.

Q41 Text Solution:

Centrosome which had undergone duplication during interphase, begins to move towards opposite poles of the cell. Each centrosome radiates out microtubules called asters. The two asters together with spindle fibres forms mitotic apparatus.

Q42 Text Solution:

Without spindle fibers, chromosomes cannot attach to kinetochores or align on the metaphase plate.

Q43 Text Solution:

In prophase, chromosomal material condenses to form compact mitotic chromosomes. The phenomenon of bringing the chromosomes on the equator of the spindle is called congression, this happens in metaphase. At the end of anaphase two groups of chromosomes are formed, one at each pole of the spindle. At the beginning of the final stage of karyokinesis, i.e., telophase, the chromosomes that have reached their respective poles decondense and lose their individuality.

Q44 Text Solution:

In plant cells during cytokinesis, wall formation starts in the centre of the cell and grows outward to meet the existing lateral walls. The formation



of the new cell wall begins with the formation of a simple precursor, called the cell-plate that represents the middle lamella between the walls of two adjacent cells.

Q45 Text Solution:

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. Cells in this stage remain metabolically active but no longer proliferate unless called on to do so depending on the requirement of the organism. In animal cells, during the S phase, DNA replication begins in the nucleus, and the centriole duplicates in the cytoplasm.

Q46 Text Solution:

In contrast to mitosis, meiosis occurs in the diploid cells, which are destined to form gametes. It is called the reduction division since it reduces the chromosome number by half while making the gametes.

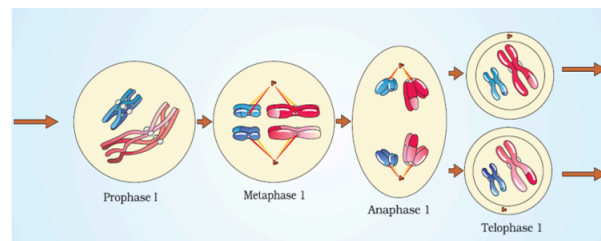
Q47 Text Solution:

Mitosis accomplishes not only the segregation of duplicated chromosomes into daughter nuclei (karyokinesis), but the cell itself is divided into two daughter cells by the separation of cytoplasm called cytokinesis at the end of which cell division gets completed. In an animal cell, this is achieved by the appearance of a furrow in the plasma membrane. The furrow gradually deepens and ultimately joins in the centre dividing the cell cytoplasm into two. Plant cells however, are enclosed by a relatively inextensible cell wall, therefore they undergo cytokinesis by a different mechanism. In plant cells, wall formation starts in the centre of the cell and grows outward to meet the existing lateral walls. The formation of the new cell wall begins with the formation of a simple precursor, called the cell-plate that represents

the middle lamella between the walls of two adjacent cells.

At the time of cytoplasmic division, organelles like mitochondria and plastids get distributed between the two daughter cells.

Q48 Text Solution:



Stages of Meiosis I

Q49 Text Solution:

The first two stages of prophase I are relatively short-lived compared to the next stage that is pachytene. During this stage, the four chromatids of each bivalent chromosomes becomes distinct and clearly appear as tetrads. This stage is characterised by the appearance of recombination nodules, the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes.

Q50 Text Solution:

The interphase, though called the resting phase, is the time during which the cell is preparing for division by undergoing both cell growth and DNA replication in an orderly manner.

Q51 Text Solution:

During early prophase, the nuclear envelope is still present. As prophase progresses into late prophase, the nuclear envelope breaks down. During metaphase and anaphase, the nuclear envelope is completely disintegrated. It reappears during telophase, helping to form the new nuclei.

Q52 Text Solution:

In some organisms karyokinesis is not followed by cytokinesis as a result of which multinucleate condition arises leading to the formation of syncytium (e.g.,



liquid endosperm in coconut).

Q53 Text Solution:

In the beginning of prophase, animal cells have two centrosomes or centriole pairs close together. The two begin to shift towards the opposite sides. Both the centriole pairs radiate out fine microtubular fibrils called astral rays. Each group of astral rays along with its centriole pair is called aster. Small disc-shaped structures at the surface of the centromeres are called kinetochores. These structures serve as the sites of attachment of spindle fibres to the chromosomes that are moved into position at the centre of the cell. Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles. In an animal cell, cytokinesis is achieved by the appearance of a furrow in the plasma membrane.

Q54 Text Solution:

Each yeast cell takes 90 minutes (1.5 hours) to complete one cell cycle.
 Time for 1 division = 1.5 hours
 So, number of divisions = $15 / 1.5 = 10$ divisions
 After 1 division, the original cell gives rise to 2 daughter cells.
 But in this case, only one daughter cell divides further.
 So, after each division, 1 new daughter cell is produced, and this happens 10 times.
 Thus, the original cell divides 10 times, producing 10 daughter cells, none of which divide further.

Q55 Text Solution:

Crossing over is also an enzyme-mediated process and the enzyme involved is called recombinase. Crossing over leads to recombination of genetic material on the two chromosomes. If recombinase is inhibited during meiosis, no recombination occurs between homologous chromosomes.

Q56 Text Solution:

At the onset of anaphase, each chromosome arranged at the metaphase plate is split simultaneously and the two daughter chromatids, now referred to as daughter chromosomes of the future daughter nuclei, begin their migration towards the two opposite poles. Simultaneously, the spindle elongates (does not degrade).

Q57 Text Solution:

DNA replication occurs during the S phase of interphase, which precedes both mitotic and meiotic divisions.

Q58 Text Solution:

The complex formed by a pair of synapsed homologous chromosomes is called a bivalent or a tetrad. This means in one bivalent, two chromosomes are present. Therefore, from 32 chromosomes, 16 bivalents will be formed.

Q59 Text Solution:

In leptotene, the chromatin fibres of interphase nucleus shorten and elongated chromosomes become clear. The chromosomes are replicated but the chromatids are not distinguishable due to the presence of nucleoprotein core between them. This is followed by the second stage of prophase I called zygotene. During this stage, chromosomes start pairing together and this process of association is called synapsis. Such paired chromosomes are called homologous chromosomes. Electron micrographs of this stage, indicate that chromosome synapsis is accompanied by the formation of complex structure called synaptonemal complex. The beginning of diplotene is recognised by the dissolution of the synaptonemal complex and the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at the sites of crossovers. These X-shaped structures, are called chiasmata. In oocytes of some vertebrates, diplotene can last for months or years. The final stage of meiotic prophase I is diakinesis. This is marked by terminalisation of chiasmata.



During this phase the chromosomes are fully condensed and the meiotic spindle is assembled to prepare the homologous chromosomes for separation.

Q60 Text Solution:

Telophase I: The nuclear membrane and nucleolus reappear, cytokinesis follows and this is called as dyad of cells.

Although in many cases the chromosomes do undergo some dispersion, they do not reach the extremely extended state of the interphase nucleus.

The stage between the two meiotic divisions is called interkinesis and is generally short lived. There is no replication of DNA during interkinesis. Interkinesis is followed by prophase II, a much simpler prophase than prophase I.



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