

BIOLOGY

NEET

CRASH COURSE

**CELL CYCLE
AND
CELL DIVISION**

SMART ACHIEVERS
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CELL CYCLE AND CELL DIVISION

1. According to the cell theory, cells arise from pre-existing cells. The process by which this occurs is called cell division.
2. Any sexually reproducing organism starts its life cycle from a single-celled zygote.
3. Cell division does not stop with the formation of the mature organism but continues throughout its life cycle.
4. The stages through which a cell passes from one division to the next is called the cell cycle.
5. Cell cycle is divided into two phases called (i) Interphase -a period of preparation for cell division, and (ii) Mitosis (M phase) -the actual period of cell division.
6. Interphase is further subdivided into G_1 , S and G_2 . G_1 -phase is the period when the cell grows and carries out normal metabolism. Most of the organelle duplication also occurs during this phase.
7. S-phase marks the phase of DNA replication and chromosome duplication.
8. G_2 -phase is the period of cytoplasmic growth.
9. Mitosis is also divided into four stages namely prophase, metaphase, anaphase and telophase.
10. Chromosome condensation occurs during prophase.
11. Simultaneously, the centrioles move to the opposite poles.
12. The nuclear envelope and the nucleolus disappear and the spindle fibres start appearing.
13. Metaphase is marked by the alignment of chromosomes at the equatorial plate.
14. During anaphase, the centromeres divide and the chromatids start moving towards the two opposite poles.
15. Once the chromatids reach the two poles, the chromosomal elongation starts, nucleolus and the nuclear membrane reappear. This stage is called the telophase.
16. Nuclear division is then followed by the cytoplasmic division and is called cytokinesis.
17. Mitosis thus, is the equational division in which the chromosome number of the parent is conserved in the daughter cell.
18. 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.
19. In sexual reproduction when the two gametes fuse the chromosome number is restored to the value in the parent.
20. Meiosis is divided into two phases -meiosis-I and meiosis-II. In the first meiotic division the homologous chromosomes pair to form bivalents, and undergo crossing over.
21. Meiosis I has a long prophase, which is divided further into five phases. These are leptotene, zygotene, pachytene, diplotene and diakinesis.
22. During metaphase-I, the bivalents arrange on the equatorial plate.
23. In anaphase-I, homologous chromosomes move to the opposite poles with both their chromatids. Each pole receives half the chromosome number of the parent cell.
24. In telophase-I, the nuclear membrane and nucleolus reappear.
25. Meiosis-II is similar to mitosis.
26. During anaphase-II, the sister chromatids separate. Thus at the end of meiosis, four haploid cells are formed.

EXERCISE

- Q.1 Division of nucleus is indirect in :-
 (1) Mitosis (2) Binary fission (3) Budding (4) Fragmentation
- Q.2 Meiosis not occurs in :-
 (1) Ovule (2) Anther (3) Microsporangia (4) Shoot tip
- Q.3 The phragmoplast is organised:-
 (1) At the beginning of anaphase (2) At the end of anaphase
 (3) At the beginning of telophase (4) At the end of telophase
- Q.4 In plants, meiosis can be observed in :-
 (1) Root tip (2) Leaf primordia (3) Sporangia (4) Spores
- Q.5 In meiosis, division of centromere occurs during:-
 (1) Interphase (2) Anaphase - I (3) Anaphase - II (4) Metaphase - I
- Q.6 Synaptonemal complex is characteristic of :-
 (1) Mitotic chromosomes (2) Leptotene chromosomes
 (3) Paired meiotic chromosomes (4) Metaphase
- Q.7 Each chromosome composed of one chromatid in:-
 (1) Anaphase - I (2) Anaphase - II (3) Metaphase - I (4) Metaphase - II
- Q.8 Which one of the following statements is correct ?
 (1) Cell divided by cytokinesis only in mitosis
 (2) DNA is replicated before the start of meiosis only
 (3) Spindles consisting of microtubule form only in mitosis
 (4) Exchange of genetic materials occurs only in meiosis
- Q.9 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
- Q.10 Genetic information is transferred from zygote to all body cell by:-
 (1) Meiosis (2) Amitosis (3) Endomitosis (4) Mitosis
- Q.11 Which one of the following is associated with cell division ?
 (1) Microsome (2) Microbody (3) Microtubule (4) Microfibril
- Q.12 Chiasmata appears during :-
 (1) Diakinesis (2) Synaptotene (3) Diplotene (4) Leptotene
- Q.13 What happens in crossing over :-
 (1) Duplication of chromosomes (2) Linkage in chromosomes
 (3) Minimization in genetic material (4) Exchange of genetic material
- Q.14 Spindle microtubules composed of:-
 (1) Actin filament (2) 95% dynein and 5% DNA
 (3) 95-97% tubulin and 3-5% RNA (4) Collagen and elastin protein
- Q.15 Cell plate which appears during cytokinesis, ultimately transforms in :-
 (1) Middle lamella (2) Primary wall (3) Sec. wall (4) Plasma membrane

- Q.16 During telophase :-
 (1) Nuclear membrane is formed (2) Nucleolus appears
 (3) Astral rays disappear (4) All the above
- Q.17 During cytokinesis in plants, which of the following secretes the middle lamella :-
 (1) Golgibody (2) SER (3) RER (4) Lysosomes
- Q.18 Synapsis found in between :-
 (1) Nonhomologous chromosome
 (2) Homologous chromosome
 (3) Nonhomologous and homologous chromosome
 (4) Chromatids
- Q.19 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
- Q.20 Crossing over takes place in :-
 (1) Zygotene (2) Diakinesis (3) Pachytene (4) Diplotene
- Q.21 Meiosis results in :-
 (1) Half number of chromosome (2) Same number of chromosome
 (3) Double number of chromosome (4) 1/4 number of chromosome
- Q.22 Longest phase of mitosis is :-
 (1) Prophase (2) Metaphase (3) Anaphase (4) Telophase
- Q.23 Crossing over takes place on :-
 (1) Two stranded stage (2) Three stranded stage
 (3) One stranded stage (4) Four stranded stage
- Q.24 Which of the following is called heterotypic division :-
 (1) Meiosis-I (2) Meiosis-II (3) Mitosis (4) Amitosis
- Q.25 Smallest phase of mitosis is -
 (1) Prophase (2) Metaphase (3) Anaphase (4) Telophase
- Q.26 The significance of Meiosis is that it -
 (1) Produce four cells having chromosomal number equal to mother cell
 (2) Occurs in all types of cells
 (3) Maintains the constant Chromosomes number to a particular species
 (4) Growth of animal body organs
- Q.27 Cell Cycle of an ordinary animal cell -
 (1) $2n \xrightarrow{\text{Mitosis}} n \xrightarrow{\text{Fertilization}} 2n \xrightarrow{\text{Meiosis}} 2n$
 (2) $n \xrightarrow{\text{Meiosis}} 2n \xrightarrow{\text{Fertilization}} 2n \xrightarrow{\text{Mitosis}} n$
 (3) $2n \xrightarrow{\text{Meiosis}} n \xrightarrow{\text{Fertilization}} 2n \xrightarrow{\text{Mitosis}} 2n$
 (4) $2n \xrightarrow{\text{Fertilization}} (n) \xrightarrow{\text{Mitosis}} 2n \xrightarrow{\text{Meiosis}} n$

- Q.28 Which is correct for meiotic metaphase-I :-
 (1) Bivalents are arranged at equator (2) Univalents are arranged at equator
 (3) Non-homologous chromosomes forms pair (4) Spindle fibers are attached at chromomere
- Q.29 Crossing over that results in genetic recombination in higher organisms occurs between –
 (1) Non-sister chromatids of a bivalent (2) Two daughter nuclei
 (3) Two different bivalents (4) Sister chromatids of a bivalents
- Q.30 In the somatic cell cycle :-
 (1) DNA replication takes place in S-phase
 (2) A short interphase is followed by a long mitotic phase
 (3) G_2 phase follows mitotic phase
 (4) In G_1 phase DNA content is double the amount of DNA present in the original cell
- Q.31 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
- Q.32 Many cells function properly and divide mitotically even through they do not have
 (1) Plasma membrane (2) Cytoskeleton (3) Mitochondria (4) Plastids
- Q.33 Centromere is required for –
 (1) Movement of chromosomes towards poles (2) Cytoplasmic cleavage
 (3) Crossing over (4) Transcription
- Q.34 At what stage of the cell cycle are histone proteins synthesized in a eukaryotic cell –
 (1) During telophase (2) During S-phase
 (3) During G_2 -stage of prophase (4) During entire prophase
- Q.35 Plasmodesmata are :-
 (1) Connections between adjacent cells
 (2) Lignified cemented layers between cells
 (3) Locomotary structures
 (4) Membranes connecting the nucleus with plasmalemma
- Q.36 Synapsis occurs between :-
 (1) Two homologous chromosomes (2) A male and a female gamete
 (3) mRNA and ribosomes (4) Spindle fibres and centromere
- Q.37 Cytoskeleton is made up of :-
 (1) Proteinaceous filaments (2) Calcium carbonate granules
 (3) Callose deposits (4) Cellulosic microfibrils
- Q.38 Syncytium formation occurs if :-
 (1) Karyokinesis is not followed by cytokinesis (2) Cytokinesis is not followed by karyokinesis
 (3) No karyokinesis take place (4) Both karyokinesis and cytokinesis are prevented

AIIMS Special

Instructions for following questions (Q.39 to Q.45).

- (1) If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).
- (2) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).
- (3) If Assertion is true statement but Reason is false, then mark (3).
- (4) If both Assertion and Reason are false statements, then mark (4).

- Q.39 **Assertion :** Endomitosis does not cause karyokinesis or cytokinesis.
Reason : In endomitosis, mitosis occurs within nucleus.
- Q.40 **Assertion :** Synaptonemal complex develops between two synapsed homologous chromosomes.
Reason : Mitosis cannot be completed without the synaptonemal complex.
- Q.41 **Assertion :** During anaphase-II, chromatids of a chromosome separate.
Reason : Centromere of a mitotic chromosome divides during anaphase.
- Q.42 **Assertion :** Dictyotene stage occurs in female only.
Reason : Gametogenesis rests for a long period at diplotene stage in female.
- Q.43 **Assertion :** Each chromosome of bivalent attaches with two spindles in metaphase.
Reason : In metaphase bivalents migrate towards metaphasic plate.
- Q.44 **Assertion :** The complete disintegration of the nuclear envelope marks the start of metaphase.
Reason : Chromosomes are distinct with two chromatids at this stage.
- Q.45 **Assertion :** Chiasmata counting stage is diplotene.
Reason : Dissolution of the synaptonemal complex occurs except at the sites of cross overs.

ANSWER KEY

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