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Chapter End Test

Date : _____ Duration : 1 Hour Max. Marks : 30	**Biology** **Topics :** Cell Cycle and Cell Division	**CLASS** **XI**

General Instructions:

1. All questions are compulsory.
2. Questions no. 1 to 3 carries 1 mark each.
3. Questions no. 4 to 6 carry 2 marks each.
4. Questions no. 7 carry 5 marks.

1. It is said that the one cycle of cell division in huamn cells (eukaryotic cells) takes 24 hours. Which phase of the cycle, do you think occupies the maximum part of cell cycle?

2. An another has 1200 pollen grains. How many pollen mother cells have been there to produce them?

3. At what state of cell cycle does DNA synthesis take place ?

4. It is observed that heart cells do not exhibit cell division. Such cells do not divide further and exist _____phase to enter an inactive stage called _____ of cell cycle. Fill in the blanks.

5. The following events occur during the various phases of the cell cycle. Name the phase against each of the events.

(a) Disintegration of nuclear membrane_____.

(b) Appearance of nucleolus _____.

(c) Division of centromere _____.

(d) Replication of DNA _____.

6. Both unicellular and multicellular organisms undergo mitosis. What are the differences, if any, observed in the process between the two?

7. How does gamete formation occurs in haloid and diploid organisms respectively.

8. In which phase of meiosis are the following formed ?

(a) Synaptonemal complex _____

(b) Recombination nodules _____

(c) Appearance/activation of enzyme recombinase _____

(d) Termination of chiasmata _____

(e) Interkineses _____

(f) Formation of dyad of cells_____

9. While examining the mitotic stage in a tissue, one finds some cells with 16 chromosomes and some with 32 chromosomes.

What possible reasons could you assign to this difference in chromosome number.

Do you think cells with 16 chromosomes could have arisen from cells with 32 chromosomes or vice versa ?

10. How does cytokinesis in plant differ from that in animal cells ?

11. Write briefly the significance of mitosis and meiosis in multicellular organisms.

12. What are various stages of meiotic prophase 1. Enumerate the chromosomal event during each stage.

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Hints/Solutions to Chapter End Test

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1. Interphase

2. Pollen mother cells = 300 (300 × 4 = 1200)

3. S. Phase

4. G_1 phase and enter G_0 phase.

5. (a) Disintegration of nuclear membrane-PROPHASE
(b) Appearance of nucleolus -TELOPHASE
(c) Division of centromere-ANAPHASE
(d) Replication of DNA-S PHASE

6. In unicellular organism mitosis result in asexual reproduction whereas in multicellular organism it is means of growth

7. In haploid organisms gamete formation occurs via mitosis whereas in diploid organisms gamete formation occurs via meiosis.

8. (a) Snaptonemal complex-Zygotene
(b) Recombination nodules-Pachytene
(c) Appearance/activation of enzyme recombinase-Pachytene
(d) Termination of chiasmata-Diakinesis
(e) Interkinesis-After Telophase-I/before Meiosis-II,
(f) Formation of dyad of cells- Telophase-I/After Meiosis-I.

9. The tissue must be involved in formation of gametes *e.g.,* spermatozoa in testis. Along with mitosis, certain products of mitosis undergo meiosis. Meiosis forms cells with half the number of chromosomes (Reduction division); 16 in this case.

10. Cytokinesis is different in plant cell as well as animal cell.

⇒ In animal cell, a central furrow formation occurs which grows from outside to inside

⇒ In plant cell, golgi derived vesicle align, themselves in the centre. These vesicles contain calcium pectate, which fuses to form middle lamella. Primary cell wall is cutt off on the either side of middle lamella.

11. ***Significance of mitosis***

(1) Help in growth in multicellular organisms
(2) Helps in asexual reproduction
(3) Helps in formation of gametes in haploid organisms (as gametes are always haploid)
(4) Helps in repair of wounded tissues and formation of cells (RBC, WBC)

Significance of meiosis

(1) Meiosis results in production of gametes with half the number of chromosomes.
(2) Meiosis helps in maintaining specific chromosomes number of species; as the gametes with half the number of chromosomes, fuse to form zygote.
(3) Meiosis results in variation which is raw material for evolution.

12. **Prophase I:** Prophase of the first meiotic division is typically longer and more complex when compared to prophase of mitosis. It has been further subdivided into the following five phases based on chromosomal behaviour, i.e., Leptotene, Zygotene, Pachytene, Diplotene and Diakinesis.

    During **leptotene** stage the chromosomes become gradually visible under the light microscope. The compaction of chromosomes continues throughout leptotene. 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 complex formed by a pair of synapsed homologous chromosomes is called a **bivalent** or a tetrad. However, these are more clearly visible at the next stage. The first two stages of prophase I are relatively short-lived compared to the next stage that is **pachytene**. During this stage bivalent chromosomes now 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. 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. Recombination between homologous chromosomes is completed by the end of pachytene, leaving the chromosomes linked at the sites of crossing over.

    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. By the end of diakinesis, the nucleolus disappears and the nuclear envelope also breaks down. Diakinesis represents transition to metaphase.

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