

**Each question from 1 to 5 carries 1 score.**

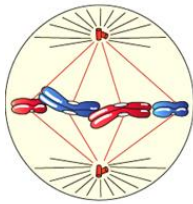
- 1) DNA replication takes place during the \_\_\_\_\_ stage of Interphase.
- 2) G<sub>0</sub> phase is called as the quiescent stage of the cell cycle. Why?
- 3) Where does the spindle fibres attach on to the chromosome?
- 4) Define the term bivalent.
- 5) The haploid cells that are formed after meiosis are called as \_\_\_\_\_.

**Each question from 6 to 10 carries 2 scores.**

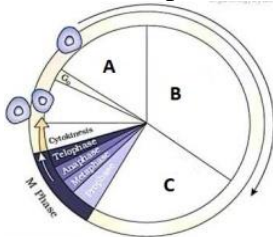
- 6) Define the term synapsis. In which phase a synaptonemal complex is formed during meiosis?
- 7) What is meant by syncytium? Name a tissue in which it is observed.
- 8) Which is the most prolonged stage during meiosis. Mention its sub stages.
- 9) In which stage of meiosis chiasmata is formed. Explain how it is formed.
- 10) Differentiate between the process of cytokinesis that takes in animal cell and plant cell.

**Each question from 11 to 15 carries 3 scores.**

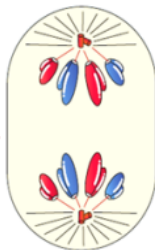
- 11) Identify the phase given below .Mention any two events that takes place during this phase.



- 12) Given below is a diagrammatic view of cell cycle. A, B & C represents the three phases of Interphase. Identify & comment upon what happens during each phase.



- 13) The diagram given below shows a phase during mitotic cell division.
  - a) Identify the phase. b) Points out the events that takes place during this phase.



- 14) Crossing over is a very important process that leads to genetic variability in a population.
  - a) What is crossing over? b) In which stage it occur? c) Name the enzyme that mediates crossing over.
- 15) Few phases of Meiosis are listed below. Assign them to their respective events in the table given below ( Prophase-I, Anaphase-II, Anaphase-I, Telophase-I, Metaphase-I, Telophase-II )

| Events takes place during Meiosis  | Phase |
|--|-------|
| Chromosomes fully condensed. Nucleolus disappears and the nuclear envelope breaks down.                                |       |
| Nuclear membrane and nucleolus reappear, cytokinesis follows and results in tetrad of cells.                           |       |
| Homologous chromosomes separate, sister chromatids remain associated at their centromeres.                             |       |
| Bivalent chromosomes align on the equatorial plate and the spindle fibre attach to the pair of homologous chromosomes. |       |
| Nuclear membrane and nucleolus reappear, cytokinesis follows and results in dyad of cells.                             |       |
| Centromere of the chromosome splits and the sister chromatids move toward opposite poles.                              |       |

## ANSWERS

- 1) S Phase.
- 2) In G<sub>0</sub> phase the cells do not divide and it enter an inactive stage.
- 3) Spindle fibres attach on to the kinetochores of the centromere.
- 4) The complex formed during zygotene by a pair of synapsed homologous chromosomes is called as bivalent.
- 5) Gametes.
- 6) During Zygotene chromosomes start pairing together and this process of association is called synapsis. Such paired chromosomes later forms a complex structure called synaptonemal complex.
- 7) In some organisms karyokinesis is not followed by cytokinesis as a result of which a multinucleate condition arises which leads to the formation of Syncytium. Liquid endosperm in coconut.
- 8) Prophase I. The sub stages are Leptotene, Zygotene, Pachytene, Diplotene, and Diakinesis.
- 9) During diplotene the dissolution of the synaptonemal complex takes place and the recombined homologous chromosomes of the bivalents try to separate from each other except at the sites of crossovers. This results in the formation of an X-shaped structures called as Chiasmata.
- 10) In an animal cell, cytokinesis starts 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. 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.
- 11) Metaphase.
  - Spindle fibres attach to kinetochores of chromosomes.
  - Chromosomes move to the equator and get aligned along metaphase plate.
- 12) A – G<sub>1</sub> phase During G<sub>1</sub> phase the cell is metabolically active and continuously grows.  
B – S phase DNA synthesis or replication takes place.  
During this phase the amount of DNA per cell doubles.  
C – G<sub>2</sub> phase. During this phase, proteins are synthesised in preparation for mitosis and cell growth continues.
- 13) Anaphase.
  - Centromeres split and chromatids separate.
  - Chromatids move to opposite poles.
- 14) a) Crossing over is the exchange of genetic material between the non-sister chromatids of two homologous chromosomes.  
b) Pachytene. c) Recombinase.
- 15)

| Events takes place during Meiosis  | Phase        |
|--|--------------|
| The chromosomes are fully condensed, nucleolus disappears and the nuclear envelope also breaks down.                   | Prophase I   |
| The nuclear membrane and nucleolus reappear, cytokinesis follows and results in the formation of tetrad of cells.      | Telophase II |
| Homologous chromosomes separate, while sister chromatids remain associated at their centromeres.                       | Anaphase I   |
| The bivalent chromosomes align on the equatorial plate the spindle fibre attach to the pair of homologous chromosomes. | Metaphase I  |
| The nuclear membrane and nucleolus reappear, cytokinesis follows and results in the formation of dyad of cells.        | Telophase I  |
| The centromere of the chromosome splits and the sister chromatids move toward opposite poles of the cell.              | Anaphase II: |

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