NCERT Exemplar Solutions of Class 11 Biology – Chapter 10: Cell Cycle and Cell Division

MULTIPLE CHOICE QUESTIONS

1. Meiosis in diploid organisms results in

a. Production of gametes

b. Reduction in the number of chromosomes

c. Introduction of variation

d. All of the above

Solution: Option (d) is the answer.

Enhanced Explanation: Meiosis is a specialized type of cell division that occurs in diploid organisms to produce haploid gametes. It serves multiple important functions:

- **Production of gametes:** Meiosis produces reproductive cells (sperm, eggs, pollen, ovules)
- **Reduction division:** Chromosome number is reduced from diploid (2n) to haploid (n)
- **Genetic variation:** Through crossing over and independent assortment, genetic diversity is introduced

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2. At which stage of meiosis does the genetic constitution of gametes is finally decided?

a. Metaphase I

b. Anaphase II

c. Metaphase II

d. Anaphase I

Solution: Option (d) is the answer.

Enhanced Explanation: During Anaphase I, homologous chromosomes separate and move to opposite poles. This is when the genetic constitution of gametes is finally determined because:

- Independent assortment occurs during this phase
- The combination of maternal and paternal chromosomes that each gamete receives is decided
- This determines which alleles will be present in each resulting gamete

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3. Meiosis occurs in organisms during

a. Sexual reproduction

b. Vegetative reproduction

c. Both sexual and vegetative reproduction

d. None of the above

Solution: Option (a) is the answer.

Enhanced Explanation: Meiosis is specifically associated with sexual reproduction because:

- It produces gametes required for sexual reproduction
- It reduces chromosome number from diploid to haploid
- Vegetative reproduction typically involves mitosis, not meiosis

- Fertilization restores the diploid condition

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4. Mitosis is characterised by

a. Reduction division

b. Equal division

c. Both reduction and equal division

d. Pairing of homologous chromosomes

Solution: Option (b) is the answer.

Enhanced Explanation: Mitosis is characterized by equal division because:

- Each daughter cell receives exactly the same number of chromosomes as the parent cell
- The genetic material is equally distributed
- It maintains the diploid chromosome number (2n → 2n)
- No reduction in chromosome number occurs (that's meiosis)

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5. (Question number appears to be missing in the original - Question 6 follows directly)

6. A bivalent of meiosis-I consists of

a. Two chromatids and one centromere

b. Two chromatids and two centromeres

c. Four chromatids and two centromeres

d. Four chromatids and four centromeres

Solution: Option (c) is the answer.

Enhanced Explanation: A bivalent (also called tetrad) consists of:

- Two homologous chromosomes paired together
- Each chromosome has two sister chromatids (after DNA replication)
- Total: 4 chromatids
- Each chromosome has one centromere, so total: 2 centromeres
- This structure is formed during prophase I of meiosis

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7. Cells which are not dividing are likely to be at

a. G_1

b. G_2

c. G_o

d. S phase

Solution: Option (c) is the answer.

Enhanced Explanation: G_o (G-zero) phase characteristics:

- Cells exit the normal cell cycle
- Metabolically active but not preparing for division
- Examples: nerve cells, heart muscle cells
- Can be temporary (quiescent) or permanent (terminally differentiated)

- Cells can re-enter the cycle under appropriate signals

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8. Which of the events listed below is not observed during mitosis?

a. Chromatin condensation

b. Movement of centrioles to opposite poles

c. The appearance of chromosomes with two chromatids joined together at the centromere

d. Crossing over

Solution: Option (d) is the answer.

Enhanced Explanation: Crossing over does not occur during mitosis because:

- Crossing over occurs only during prophase I of meiosis
- Mitosis involves sister chromatids, not homologous chromosomes
- Mitosis maintains genetic identity of daughter cells
- All other events (a, b, c) are characteristic features of mitosis

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9. Identify the wrong statement about meiosis

a. The pairing of homologous chromosomes

b. Four haploid cells are formed

c. At the end of meiosis, the number of chromosomes is reduced to half

d. Two cycles of DNA replication occurs

Solution: Option (d) is the answer.

Enhanced Explanation: DNA replication occurs only once in meiosis:

- DNA replication happens during S phase before meiosis I
- No DNA replication occurs between meiosis I and meiosis II
- This single replication is followed by two divisions
- Result: four haploid cells from one diploid cell

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10. Select the correct statement about G_1 phase

a. The cell is metabolically inactive

b. DNA in the cell does not replicate

c. It is not a phase of synthesis of macromolecules

d. Cell stops growing

Solution: Option (b) is the answer.

Enhanced Explanation: G_1 phase characteristics:

- **Correct (b):** No DNA replication occurs (that's S phase)
- **Wrong (a):** Cell is metabolically very active
- **Wrong (c):** Intensive synthesis of proteins, enzymes, and other macromolecules
- **Wrong (d):** Cell grows rapidly in size and mass