REV-01
MSB/05/10

2025/11

SET A

M.Sc. BOTANY
THIRD SEMESTER
CYTOGENETICS, PLANT BREEDING AND MOLECULAR BIOLOGY
MSB-304(A)

[USE OMR FOR OBJECTIVE PART]

Duration: 1.30 hrs. **Full Marks: 35**

Objective

Time: 15 min. **Marks: 10**

Choose the correct answer from the following: *1X10=10*

1. What is the basic structural unit of a chromosome?
   a. Centromere
   b. Nucleosome
   c. Histone
   d. Gene

2. Epistasis refers to
   a. Interaction between alleles at the same locus
   b. One gene masking the effect of another non-allelic gene
   c. Duplicate gene action
   d. Complementary gene action

3. Karyotyping is used to
   a. Measure DNA replication rate
   b Study protein synthesis
   c. Identify chromosome number and structure
   d Detect mutations only

4. Duplicate gene interaction produces which ratio?
   a. 9:3:3:1
   b 15:1
   c. 9:7
   d 12:3:1

5. Higher-order chromatin structure leads to:
   a. Formation of solenoids and metaphase chromosomes
   b. Protein synthesis
   b. Mutation
   d. DNA replication only

6. Linkage was first demonstrated in:
   a. Pea plants by Mendal
   b. Humans by Sutton
   c. Maize by Beadle
   d. Drosophila by Morgan

7. Chromosomes painting involves
   a. Fluorescent probes binding to entire chromosomes
   b. Silver staining of nucleolus
   c. Giemsa staining only
   d. Protein labeling

8. A linkage map is constructed using
   a. Physical length of chromosomes
   b. Protein structures

c. DNA sequencing data only

d. Recombination frequencies between genes

9. G-banding is based on

a. Fluorescent dyes

b. Giemsa stain producing characteristic banding patterns

c. Silver staining

d. Radioactive labeling

10. Correlation between genetic and physical maps is important because:

a. It validates recombination-based distances with actual DNA sequence data

b. It eliminates the need for cytogenetics

c. It proves Mendel's laws

d. It avoids QTL mapping

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(Descriptive)

Time : 1 hrs. 15 min. **Marks : 25**

[Answer question no.1 & any two (2) from the rest]

1. Define a nucleosome. Describe its structure and function in DNA packaging. **1+4=5**

2. Explain the concept of multiple alleles with examples. Discuss how multiple alleles contribute to genetic diversity. **4+6=10**

3. Define gene interaction. Compare and contrast epistasis, supplementary, complementary, and duplicate gene interactions. **2+8=10**

4. Discuss the process and applications of karyotyping in biology and medicine. **10**

5. Discuss a linkage map. How is it constructed using recombination frequencies? **3+7=10**

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