

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7232

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Unique Paper Code : 2163010021

Name of the Paper : Advances in Genetics, Genomics and Plant Breeding

Name of the Course : **B.Sc. (Hons.) Botany**

Semester : VIII

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question 1 is compulsory.
3. Only **four** questions are required to be attempted in all.
4. Attempt all parts of every question together.

Q.1. (a) Define the following (*any five*):

(1X5=5)

- i. Haplotype
- ii. Ideogram
- iii. Apomixis
- iv. Cistron
- v. Metagenome
- vi. Molecular marker
- vii. Mutagenesis

(b) Expand (*any five*):

(1X5=5)

- i. GISH
- ii. SNP
- iii. ChIP
- iv. CRISPR
- v. QTL
- vi. GWAS
- vii. ELIS

(c) Fill in the blanks (*any five*): (1X5=5)

- (i) DNA methylation commonly occurs at _____ bases.
- (ii) CRISPR-Cas9 is a _____ editing tool.
- (iii) Metagenomics helps in studying _____ communities.

P.T.O.

- (iv) Male sterility is useful in _____ production.
- (v) The basic unit of chromatin is _____
- (vi) Complementation test distinguishes between _____ and _____ mutations.
- (vii) Drought resistance is an example of _____ stress.

Q2. Differentiate between the following (*any three*): (5×3=15)

- (i) Primary and Secondary gene pool
- (ii) Heterochromatin and Euchromatin
- (iii) Conventional breeding and MAS
- (iv) Addition line and Nullisomic line
- (v) Bisulfite sequencing and ChIP-Seq

Q3. Write short notes on the following (*any three*): (5×3=15)

- (i) CRISPR-Cas9
- (ii) Clonal Selection
- (iii) Metagenomics
- (iv) Bulk Segregation Analysis
- (v) Mating Systems in plant

Q4. (a) Briefly explain molecular cytogenetic techniques (FISH, GISH, Fibre-FISH) and their applications in gene mapping and introgression studies. (8)

(b) Describe chromatin organization and DNA packaging in eukaryotes. (7)

Q5. (a) Discuss epigenetic mechanisms (DNA methylation, histone modification, chromatin remodelling) and their role in gene regulation in plants. (8)

(b) Describe different types of chromosomal aberrations and discuss their evolutionary significance in plants. (7)

Q6. (a) Discuss the strategies used in mapping different agronomic traits in any one of the crops - tomato, cotton, rice, wheat. (supplement answer with flow charts). (10)

(b) Discuss in brief the regulatory framework for genome editing in agriculture and medicine citing suitable examples. (5)