RAMAKRISHNA MISSION VIVEKANANDA EDUCATIONAL AND RESEARCH INSTITUTE
NARENDRAPUR CAMPUS
(Deemed-to-be University declared by Govt. of India under Section 3 of UGC Act, 1956)
Head Quarter: Belur Math, Howrah, West Bengal: 711202
(Accredited by NAAC with A++ Grade)
Division of Genetics and Plant Breeding | School of Agriculture and Rural Development
Ramakrishna Mission Ashrama, Narendrapur, Kolkata-700103

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Question Nos.	Max. Marks	Marks Obtained
SECTION-A: A.01—A.15 (Page Nos. 03-05)	**30**	
SECTION-B: B.01—B.06 (Page Nos.06-08)	**30**	
TOTAL	**60**	

ENTRANCE EXAMINATION FOR

ADMISSION TO M.Sc. (Ag.) in GENETICS AND PLANT BREEDING – 2026

(Model Question)

Maximum Marks: 60 **SECTION-A:** 2 marks each
Duration: 2 Hours **SECTION-B:** 5 marks each

INSTRUCTIONS

1. ALL questions are COMPULSORY.
2. The question paper consists of two sections: Section-A (Short Answer Type Questions) and Section-B (Descriptive Type Questions).
3. Section-A carries 2 marks each. Answers should be brief and precise -not exceeding 60–80 words per answer.
4. Section-B carries 5 marks each. Write focused, organized answers -not exceeding 200–250 words per answer.
5. Question Distribution: Section-A includes 15 short-answer questions, and Section-B includes 6 descriptive questions.
6. Candidates must write their answers only in the space provided. **No additional sheets will be supplied**.
7. The use of **calculators, electronic devices, or any reference materials is strictly prohibited**.
8. Marks will be awarded based on: Clarity of expression, Relevance of content, Use of appropriate examples (where applicable) and Correct terminology.

(To be filled by the Candidates)

Name	
Signature	
Application ID	

Invigilator's Signature:

SPACE FOR ROUGH WORK

SECTION-A: SHORT ANSWER QUESTIONS

A.01. What is the specific phenotypic F2 segregation ratio for complementary gene action (duplicate recessive epistasis)?

A.02. If the frequency of a recessive allele (q) in a random mating population is 0.4, calculate the expected frequency of heterozygotes according to the Hardy-Weinberg principle.

A.03. Which specific structural chromosomal aberration results in semi-sterility and typically forms a cross-shaped configuration during meiosis?

A.04. State the fundamental difference between broad-sense heritability and narrow-sense heritability.

A.05. Which specific breeding method is best utilized to improve a well-adapted, high-yielding variety for a single specific defect, such as disease susceptibility?

A.06. Name the specific type of male sterility system predominantly used for commercial hybrid seed production in pearl millet (Bajra) and rice.

A.07. What does the term "pleiotropy" mean in the context of quantitative genetics?

A.08. Define a "test cross" and state its primary diagnostic purpose in plant genetics.

A.09. In an ANOVA table for a Completely Randomized Design (CRD) with *t* treatments and *r* replications, what is the formula to calculate the error degrees of freedom?

A.10. Name one specific co-dominant molecular marker system that is highly suitable for distinguishing between heterozygous and homozygous plants.

A.11. What is the fundamental difference between Foundation Seed and Certified Seed in terms of the colour of their certification tags?

A.12. In self-pollinated crops, what is the exact percentage by which heterozygosity is reduced in each successive generation of selfing?

A.13. Identify the primary center of origin for Maize (*Zea mays*).

A.14. PBW 343 is a historically significant variety of which specific crop, and what major biotic vulnerability led to its decline?

A.15. Name the enzyme responsible for joining Okazaki fragments during the replication of the lagging DNA strand.

SECTION-B: DESCRIPTIVE QUESTIONS

B.01. Differentiate between Mass Selection and Pure Line Selection. Provide at least four key differences regarding their genetic basis, application, and the resulting population structure.

B.02. Outline the sequential steps involved in the Pedigree method of breeding, starting from the initial hybridization (F_1) up to the release of a new variety. Under what circumstances is this method most effective?

B.03. Define Self-Incompatibility in plants. Distinguish between sporophytic and gametophytic self-incompatibility mechanisms, explaining how pollen recognition differs between the two.

B.04. Explain the concepts of Heterosis and Inbreeding Depression. Briefly outline the standard steps involved in developing a commercial single-cross hybrid in a highly cross-pollinated crop like maize.

B.05. Define Marker-Assisted Selection (MAS). Briefly explain how MAS provides a distinct advantage over conventional phenotypic selection, particularly when breeding for traits like resistance to multiple diseases (gene pyramiding).

B.06. Define mutation breeding. Describe the role of physical and chemical mutagens in creating novel genetic variation, and briefly mention the mechanism of action of any one common chemical mutagen (e.g., EMS).