Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. Sc. (Second Semester)

(NEP) EXAMINATION, 2025-26

BOTANY

(Plant Breeding and Elementary Biostatistics) (Elective)

Paper Code							
B	0	4	0	8	0	5	T

Questions Booklet Series
A

Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.

3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।

3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page) **(शेष निर्देश अन्तिम पृष्ठ पर)**

(Only for Rough Work)

1. Cleistogamy ensures :

(A) Cross-pollination

(B) Self-pollination

(C) Apomixis

(D) Vegetative propagation

2. Dioecious plants promote :

(A) Self-pollination

(B) Geitonogamy

(C) Cross-pollination

(D) Apomixis

3. Which is an example of a self-pollinated crop ?

(A) Maize

(B) Pearl millet

(C) Wheat

(D) Sunflower

4. Dichogamy prevents :

(A) Fertilization

(B) Self-pollination

(C) Seed formation

(D) Fruit formation

5. Herkogamy refers to :

(A) Temporal separation of sex organs

(B) Spatial separation of sex organs

(C) Male sterility

(D) Self-incompatibility

6. Self-incompatibility promotes :

(A) Inbreeding

(B) Apomixis

(C) Cross-pollination

(D) Vegetative reproduction

7. Monoecious plants bear :

(A) Only male flowers

(B) Only female flowers

(C) Both male and female flowers on same plant

(D) Perfect flowers only

8. Pure line selection is suitable for :

(A) Cross-pollinated crops

(B) Self-pollinated crops

(C) Vegetatively propagated crops

(D) Apomictic crops

9. Backcross breeding is used for :

(A) Improving quantitative traits

(B) Transferring one specific trait

(C) Developing hybrids

(D) Mass selection

10. Polyploidy breeding is commonly induced by :

(A) EMS

(B) X-rays

(C) Colchicine

(D) Gamma rays

11. Pedigree method is used in :

(A) Cross-pollinated crops

(B) Self-pollinated crops

(C) Apomictic crops

(D) Vegetatively propagated crops

12. Self-pollinated crops are generally :

(A) Heterozygous

(B) Homozygous

(C) Sterile

(D) Polyploid

13. Pure line selection results in :

(A) Heterogeneous population

(B) Heterozygous plants

(C) Genetically uniform progeny

(D) Hybrid vigor

14. Hybrid seed production in cross-pollinated crops requires :

(A) Selfing

(B) Isolation

(C) Vegetative propagation

(D) Mutation

15. Male sterility refers to :

(A) Absence of ovules

(B) Non-functional pollen grains

(C) Failure of fertilization

(D) Sterile seeds

16. Male sterility helps to :

(A) Increase inbreeding

(B) Avoid emasculation

(C) Promote apomixis

(D) Prevent pollination

17. In self-compatible crops, variability decreases due to :

(A) Mutation

(B) Recombination

(C) Inbreeding

(D) Polyploidy

18. Heterosis refers to :

(A) Inbreeding depression

(B) Superiority of F_1 over parents

(C) Mutation

(D) Polyploidy

19. The term heterosis was coined by :

(A) Mendel

(B) Darwin

(C) Shull

(D) Vavilov

20. Dominance hypothesis explains heterosis due to :

(A) Accumulation of dominant genes

(B) Recessive genes

(C) Cytoplasmic inheritance

(D) Mutation

21. Overdominance hypothesis suggests :

(A) Homozygote is superior

(B) Heterozygote is superior

(C) Recessive genes dominate

(D) No genetic control

22. Epistasis hypothesis involves :

(A) Interaction between non-allelic genes

(B) Dominance only

(C) Mutation

(D) Cytoplasmic inheritance

23. Inbreeding depression is the phenomenon opposite to :

(A) Mutation

(B) Heterosis

(C) Apomixis

(D) Selection

24. The primary cause of inbreeding depression is :

(A) Expression of deleterious recessive alleles

(B) Dominant gene action

(C) Environmental factors

(D) Cytoplasmic sterility

25. Which generation shows maximum inbreeding depression after selfing ?

(A) F_1

(B) F_2

(C) F_3

(D) None of the above

26. Polyploidy refers to :

(A) Loss of chromosomes

(B) Presence of more than two sets of chromosomes

(C) Mutation in one gene

(D) Haploid condition

27. Polyploidy is commonly induced by :

(A) EMS

(B) Gamma rays

(C) Colchicine

(D) X-rays

28. Colchicine induces polyploidy primarily by :

(A) Fragmenting or breaking DNA strands

(B) Inhibiting spindle fiber formation during cell division

(C) Increasing the overall mutation frequency

(D) Promoting crossing over between homologous chromosomes

29. Polyploidy helps in :

(A) Breaking species barrier

(B) Reducing chromosome number

(C) Increasing mutation

(D) Inbreeding

30. Polyploidy is useful in forage crops because it :

(A) Increases biomass

(B) Reduces vigor

(C) Decreases leaf size

(D) Causes sterility

31. A triploid plant is seedless because :

(A) It has no ovules

(B) Meiosis is irregular due to unpaired chromosomes

(C) It lacks pollen

(D) It is haploid

32. Allopolyploids are more stable than autopolyploids because :

(A) They have fewer chromosomes

(B) They show bivalent pairing instead of multivalents

(C) They are haploid

(D) They lack crossing over

33. The major breeding advantage of polyploidy is :

(A) Reduced gene expression

(B) Increased genetic buffering and variability

(C) Haploid production

(D) Loss of fertility

34. Biotechnology applied to crop improvement primarily refers to :

(A) Improvement of crops through conventional breeding methods alone

(B) Utilization of living organisms, cells, or their biomolecules to enhance crop traits

(C) Induction of mutations as the only improvement strategy

(D) Chromosome doubling through polyploidy alone

35. The most commonly used vector in plant genetic engineering is :

(A) Plasmid

(B) Virus only

(C) Ribosome

(D) Mitochondria

36. CRISPR-Cas9 is used for :

(A) Random mutation

(B) Targeted genome editing

(C) Polyploidy

(D) Hybridization

37. RNA interference (RNAi) works by :

(A) Increasing gene expression

(B) Silencing specific genes

(C) DNA replication

(D) Chromosome doubling

38. Transgenic plants contain :

(A) Mutated genes

(B) Foreign DNA inserted artificially.

(C) Polyploid chromosomes

(D) Haploid genome

39. A selectable marker gene is essential because it :

(A) Increases gene expression

(B) Induces mutation

(C) Identifies transformed cells

(D) Doubles chromosome number

40. If a herbicide-resistant gene is overexpressed in a crop, the plant survives herbicide application due to :

(A) Increased heterozygosity

(B) Mutation in cytoplasm

(C) Polyploidy

(D) Detoxification or insensitivity mechanism

41. Somatic hybridization is particularly useful when :

(A) Parents are sexually compatible

(B) There is sexual incompatibility barrier

(C) Mutation rate is high

(D) Chromosome doubling is required

42. A GM crop shows unstable expression across generations. The most probable cause is :

(A) Stable integration

(B) Position effect or gene silencing

(C) Haploidy

(D) Polyploidy

43. Golden Rice was developed to :

(A) Increase yield

(B) Provide herbicide resistance

(C) Improve vitamin A content

(D) Increase protein

44. The major advantage of biotechnology over conventional breeding is :

(A) Complete elimination of variability

(B) Precise and targeted trait introduction

(C) Removal of meiosis

(D) Avoidance of selection

45. The primary function of Cry1Ac protein is :

(A) Herbicide detoxification

(B) Insect gut membrane disruption

(C) Viral RNA degradation

(D) Fungal cell wall inhibition

46. Gene pyramiding ensures :

(A) Single resistance gene

(B) Multiple resistance genes combined

(C) Reduced heterozygosity

(D) Haploid production

47. The success of the Green Revolution in wheat cultivation in India is primarily credited to :

(A) Dr. M. S. Swaminathan

(B) Dr. Norman E. Borlaug

(C) Dr. B .P. Pal

(D) Dr. N. I. Vavilov

48. The dwarfing genes (Norin-10) used in Indian wheat improvement originated from :

(A) USA

(B) Japan

(C) Mexico

(D) India

49. The first maize hybrid released in India was :

(A) Ganga-1

(B) Kalyan Sona

(C) Jaya

(D) Sonalika

50. Quality Protein Maize (QPM) contains higher levels of :

(A) Lysine and Tryptophan

(B) Methionine

(C) Vitamin A

(D) Iron

51. In India, the major institutional contributions toward Basmati rice improvement have been made by :

(A) Indian Agricultural Research Institute (IARI)

(B) Punjab Agricultural University (PAU)

(C) Central Rice Research Institute (CRRI)

(D) Both (A) and (B)

52. Swarna Sub1 rice is tolerant to :

(A) Salinity

(B) Flooding

(C) Drought

(D) Heat

53. The principal centre responsible for sugarcane breeding and improvement in India is :

(A) Indian Agricultural Research Institute (IARI)

(B) Sugarcane Breeding Institute (SBI) , Coimbatore

(C) Central Rice Research Institute (CRRI)

(D) Indian Institute of Horticultural Research (IIHR)

54. Sugarcane is propagated mainly by :

(A) Seed

(B) Tissue culture only

(C) Vegetative setts

(D) Hybridization

55. The All India Coordinated Pulses Improvement Project started in :

(A) 1956

(B) 1967

(C) 1972

(D) 1980

56. Pusa-372 is a variety of :

(A) Chickpea

(B) Pigeonpea

(C) Lentil

(D) Mungbean

57. The Yellow Revolution in India is associated with :

(A) Wheat

(B) Rice

(C) Oilseeds

(D) Pulses

58. In India, national-level research and improvement programs for potato are coordinated by :

(A) Indian Agricultural Research Institute (IARI)

(B) Central Potato Research Institute (CPRI) , Shimla

(C) Central Rice Research Institute (CRRI)

(D) Indian Institute of Horticultural Research (IIHR)

59. Kufri Jyoti is a variety of :

(A) Wheat

(B) Rice

(C) Potato

(D) Barley

60. The first Bt cotton approved in India was :

(A) 1998

(B) 2002

(C) 2005

(D) 2010

61. The Central Institute for Cotton Research (CICR) is located at :

(A) Ludhiana

(B) Coimbatore

(C) Nagpur

(D) Kanpur

62. Mustard improvement in India mainly targets :

(A) Erucic acid reduction

(B) Fiber strength

(C) Sugar content

(D) Polyploidy

63. The Green Revolution in India was mainly successful due to :

(A) Mutation breeding

(B) Hybrid breeding only

(C) High-yielding semi-dwarf varieties supported by fertilizers and irrigation

(D) Polyploidy

64. The cultivated potato (*Solanum tuberosum*) is predominantly :

(A) Diploid (2n)

(B) Triploid (3n)

(C) Tetraploid (4n)

(D) Haploid (n)

65. The major objective of wheat improvement during Green Revolution was :

(A) Increase oil content

(B) Reduce plant height and increase yield

(C) Improve fiber

(D) Increase sugar

66. Sugarcane is genetically complex due to :

(A) Diploid genome

(B) Polyploid and aneuploid nature

(C) Haploid genome

(D) Self-pollination

67. The National Food Security Mission (NFSM) emphasizes improvement of :

(A) Cotton

(B) Pulses

(C) Sugarcane

(D) Potato

68. Pusa Basmati-1121 is famous for :

(A) High protein

(B) Extra-long grains

(C) Drought tolerance

(D) High oil

69. A variable that takes only numerical values is called :

(A) Qualitative variable

(B) Quantitative variable

(C) Nominal variable

(D) Ordinal variable

70. Mean, median and mode are measures of :

(A) Dispersion

(B) Central tendency

(C) Skewness

(D) Correlation

71. Standard deviation is a measure of :

(A) Central tendency

(B) Probability

(C) Dispersion

(D) Regression

72. The null hypothesis (Ho) generally states :

(A) There is a significant difference

(B) There is no significant difference

(C) Data are skewed

(D) Variance is zero

73. Type I error occurs when :

(A) True null hypothesis is rejected

(B) False null hypothesis is accepted

(C) Both hypotheses are true

(D) Data are normally distributed

74. Probability value always lies between :

(A) 0 and 10

(B) –1 and +1

(C) 0 and 1

(D) 1 and 100

75. Binomial distribution is used when :

(A) Data are continuous

(B) Only two possible outcomes exist

(C) Sample size is infinite

(D) Data are paired

76. Normal distribution is :

(A) Skewed

(B) Bell-shaped

(C) Rectangular

(D) Random

77. Cluster sampling is commonly used when :

(A) Population is widely scattered

(B) Population is homogeneous

(C) Sample size is fixed

(D) Probability is zero

78. Chi-square test is mainly used for :

(A) Comparing means

(B) Testing association between categorical variables

(C) Regression analysis

(D) Correlation

79. Chi-square test requires data to be :

(A) Continuous

(B) Categorical

(C) Paired

(D) Normally distributed

80. t-test is used to compare :

(A) Variances

(B) Means of two groups

(C) Probabilities

(D) Correlations

81. Student's t-test assumes :

(A) Data are normally distributed

(B) Data are categorical

(C) Variance is zero

(D) Data are skewed

82. ANOVA is used when :

(A) Comparing two means

(B) Comparing more than two means

(C) Calculating probability

(D) Measuring dispersion

83. In ANOVA, F-ratio is :

(A) Variance between groups / Variance within groups

(B) Mean / SD

(C) Correlation coefficient

(D) Probability value

84. In an ANOVA test, when the calculated F-value exceeds the critical (table) F-value, the appropriate conclusion is to :

(A) Accept the null hypothesis (Ho)

(B) Reject the null hypothesis (Ho)

(C) Conclude that there is no significant difference

(D) Consider the data invalid

85. Correlation coefficient (r) ranges from :

(A) 0 to 10

(B) -1 to +1

(C) 0 to 1 only

(D) -10 to +10

86. When the correlation coefficient (r) is equal to +1, it signifies :

(A) Absence of any relationship between variables

(B) A perfect positive linear relationship between variables

(C) A perfect negative linear relationship between variables

(D) A random association with no definite pattern

87. Regression analysis is used to :

(A) Compare means

(B) Test variance

(C) Predict dependent variable

(D) Test frequency

88. In regression equation $Y = a + bX$, b represents :

(A) Slope

(B) Intercept

(C) Mean

(D) Variance

89. SPSS software is primarily used for :

(A) DNA sequencing and genomic analysis

(B) Statistical data management and analysis

(C) Gene editing applications

(D) Crop breeding experiments

90. The abbreviation SPSS stands for :

(A) Statistical Program for Social Studies

(B) Statistical Package for the Social Sciences

(C) Scientific Processing and Statistical System

(D) Software Package for Statistical Solutions

91. R software is :

(A) Hardware

(B) Statistical programming language

(C) Database only

(D) Spreadsheet

92. MS Excel is commonly used for :

(A) Advanced genome editing

(B) Basic statistical calculations

(C) Mutation breeding

(D) DNA sequencing

93. Minitab is primarily used for :

(A) Data analysis & quality control

(B) Polyploidy

(C) Hybridization

(D) Mutation breeding

94. If p-value < 0.05, we :

(A) Accept Ho

(B) Reject Ho

(C) Increase sample size

(D) Reduce variance

95. If correlation is zero, it means :

(A) No linear relationship

(B) No relationship at all

(C) Perfect negative relation

(D) Perfect positive relation

96. Z-test is preferred when :

(A) $n < 30$

(B) $n > 30$

(C) Paired data

(D) ANOVA

97. In a perfectly symmetrical distribution :

(A) Mean > Median

(B) Mean > Median

(C) Mean = Median = Mode

(D) Mode = Mean

98. If p-value < 0.01, the result is :

(A) Not significant

(B) Significant

(C) Highly significant

(D) Invalid

99. Degrees of freedom in paired t-test is :

(A) n

(B) n-1

(C) n-2

(D) 2n

100. The formula for arithmetic mean (ungrouped data) is :

(A) ΣX

(B) $\Sigma X/n$

(C) $\sqrt{\Sigma X}$

(D) ΣX^2

(Only for Rough Work)

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।