Test Booklet Series

A

Test Booklet
(Biotechnology)

Test Booklet No.

Name of Applicant ..... Answer Sheet No. .....

Applicant ID/Roll No. : ..... Signature of Applicant : .....

Date of Examination : ..... Signature of the Invigilator(s)

Time of Examination : ..... 1. .....

2. .....

Duration : 2 Hour] **[Maximum Marks : 100**

IMPORTANT INSTRUCTIONS

(i) The question paper is in the form of Test-Booklet containing **100 (Hundred)** questions. All questions are compulsory. Each question carries four answers marked (A), (B), (C) and (D), out of which only one is correct. Choose the correct option or the most appropriate option.

(ii) On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **100** questions. Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.

(iii) A separate Answer-Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are **100** rows containing four circles each. One row pertains to one question.

(iv) The candidate should write his/her Application ID/Roll number at the places provided on the cover page of the Test-Booklet/Question Paper and on the Answer-Sheet and NOWHERE ELSE.

(v) No second Test-Booklet/Question Paper and Answer-Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.

(vi) For every correct answer of the question **One (1) mark will be awarded**.

(vii) Marking shall be done only on the basis of answers responded on the Answer-Sheet.

(viii) To mark the answer on the Answer-Sheet, candidate should darken the appropriate circle in the row of each question with Blue or Black pen.

(ix) For each question only **one** circle should be **darkened** as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries any mark, the answer will be treated as incorrect.

(x) The candidates should not remove any paper from the Test-Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.

(xi) Rough work may be done on the blank space provided in the Test-Booklet/Question Paper only.

(xii) *Mobile phones (even in Switch-off mode) and such other communication/programmable devices are not allowed inside the examination hall.*

(xiii) No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO.

PART–A

1. Research is
   (A) Searching again and again
   (B) Finding a solution to any problem
   (C) Working in a scientific way to search for the truth of any problem
   (D) None of the above

2. The conceptual framework in which research is conducted is called a
   (A) Synopsis of research
   (B) Research design
   (C) Research hypothesis
   (D) Research paradigm

3. What are the main characteristics of Scientific Research?
   (A) Empirical
   (B) Theoretical
   (C) Experimental
   (D) All the above

4. Which research design will be most appropriate to study the relationship between the level of aspirations and achievement of rural children?
   (A) Experimental Research Design
   (B) Ex Post Facto Research Design
   (C) Historical Research Design
   (D) Survey Research Design

5. The principles of fundamental research are used in:
   (A) action research
   (B) applied research
   (C) philosophical research
   (D) historical research

6. A shift in attitude in respondents between two points during data collection is called
   (A) Reactive effect
   (B) Maturation effect
   (C) Regression effect
   (D) Conditioning effect

7. Ethical Norms in research do not involve guideline for:
   (A) Thesis Format
   (B) Copyright
   (C) Patenting Policy
   (D) Data sharing Policy

8. The primary objective of an experimental research design is to:
   (A) Explore an unknown topic.
   (B) Establish cause-and-effect relationships.
   (C) Describe a population or situation.
   (D) Examine the relationship between variables without manipulation.

9. The research that aims at immediate application is:
   (A) Action Research
   (B) Empirical Research
   (C) Conceptual Research
   (D) Fundamental Research

10. A null hypothesis is
   (A) when there is no difference between the variables
   (B) the same as research hypothesis
   (C) subjective in nature
   (D) when there is difference between the variables

11. When the researcher rejects a true null hypothesis a ---------- error occurs.
   (A) Type I
   (B) Type A
   (C) Type II
   (D) Type B

12. The researcher is usually interested in supporting ..... when he or she is engaging in hypothesis testing:
   (A) The alternative Hypothesis
   (B) The null Hypothesis
   (C) Both alternative and null Hypothesis
   (D) Neither the alternative or null Hypothesis

13. A research design is often described as the "blueprint" for a research project. This emphasizes its role in:
   (A) Collecting data
   (B) Analysing data
   (C) Providing a strategy and framework for the study
   (D) Presenting findings

14. What is a cross-sectional research design?

(A) A design in which a data is collected at one point of time.

(B) A design in which data is collected over a period of time.

(C) A design in which data is collected from a representative sample of the population.

(D) A design in which data is collected from a non-representative sample of the population.

15. Match the measurement scale to the given variables:

Scale of measurement	**Variable**
(a) Nominal	(i) Height of student
(b) Ordinal	(ii) Time of day
(c) Interval	(iii) Caste
(d) Ratio	(iv) Rank of Army Personnel

Choose the correct answer from the options given below:

(A) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)

(B) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

(C) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)

(D) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)

16. Which is the simplest form of Measurement?

(A) Ordinal (B) Nominal

(C) Ratio (D) Interval

17. The data is obtained through a survey conducted is called:

(A) Primary data (B) Secondary data

(C) Continuous data (D) Qualitative data

18. A survey in which the information is collected from each and every individual of the population is known as:

(A) Sample survey (B) Pilot survey

(C) Biased survey (D) Census survey

19. Interview is an example of which data?

(A) Primary data (B) Secondary data

(C) Both (A) and (B) (D) None of the above

20. What is the process of organizing raw data into rows and columns for systematic analysis called?
(A) Compilation
(B) Presentation
(C) Tabulation
(D) Classification

21. The graphical representation of a frequency distribution is called
(A) Bar chart
(B) Line chart
(C) Histogram
(D) Pie char

22. Identify the correct sequence of research steps:
(A) Selection of topic, review of literature, data collection, interpretation of findings
(B) Review of literature, selection of topic, data collection, and interpretation of findings
(C) Selection of topic, data collection, review of literature, interpretation of findings
(D) Selection of topic, review of literature, interpretation of findings, data collection

23. When a research problem is related to heterogeneous population, the most suitable sampling method is:
(A) Cluster Sampling
(B) Stratified Sampling
(C) Convenient Sampling
(D) Lottery Method

24. A researcher wants to study the long-term effects of a new teaching method on student performance over several years. Which research design would be most appropriate?
(A) Cross-sectional design
(B) Case study design
(C) Longitudinal design
(D) Survey design

25. From the list given below identify those which are called non-probability sampling procedures:
(i) Simple random sampling
(ii) Dimensional sampling
(iii) Snowball sampling
(iv) Cluster sampling
(v) Quota sampling
(vi) Stratified sampling
Choose the correct option
(A) (i), (ii) and (iii)
(B) (ii), (iv) and (v)
(C) (i), (iii) and (v)
(D) (ii). (iii) and (v)

26. Among the following types of sampling techniques, which one is also known as 'Judgmental' sampling?

(A) Quota sampling
(B) Convenience Sampling
(C) Cluster Sampling
(D) Purposive Sampling

27. The primary objective of an experimental research design is to:

(A) Explore an unknown topic.
(B) Establish cause-and-effect relationships.
(C) Describe a population or situation.
(D) Examine the relationship between variables without manipulation.

28. "Students from the pure mathematics background can crack a bank recruitment test"—Which type of hypothesis is this?

(A) Relational Hypothesis
(B) Descriptive hypothesis
(C) Two tailed Hypothesis
(D) Null Hypothesis

29. Parametric tests make assumptions on:

(A) The population size
(B) The underlying distribution
(C) The sample size
(D) The mean sample

30. If the researcher has a nominal data, which non parametric test will he/she can use:

(A) T-test
(B) Z-test
(C) Chi square test
(D) All the above

31. If a researcher needs to verify whether there is a significant difference between the means of two groups to test a hypothesis, which statistical method would he/she employ?

(A) Chi-square test
(B) Correlation coefficient
(C) Sign-test
(D) Student's t-test

32. Chi-square is used to analyse:

(A) Scores (B) Ranks

(C) Frequencies (D) None of these

33. On which of the following does the critical value for a chi-square statistic rely?

(A) The degrees of freedom (B) The sum of the frequencies

(C) The row totals (D) The number of variables

34. Calculated value of chi-square is always.....

(A) Positive (B) Negative

(C) Zero (D) None of these

35. Which of the following best describes the purpose of using ANOVA in research?

(A) ANOVA is used to compare the means of two groups.

(B) ANOVA is use to compare the means of more than two groups.

(C) ANOVA is used to determine the correlation between two variables.

(D) ANOVA is used to determine the interaction effect between dependent variables.

36. What do ANOVA calculate?

(A) T-Ratio (B) Chi-square

(C) Z-Ratio (D) F-Ratio

37. What is the primary goal of factor analysis?

(A) To predict a dependent variable from multiple independent variables.

(B) To reduce a large number of variables into a smaller set of underlying factors.

(C) To determine the causal relationship between variables.

(D) To calculate the correlation between two variables.

38. Which assumption is required for factor analysis?

(A) Extreme collinearity exists among variables.

(B) Variables have a skewed distribution.

(C) A linear relationship exists among variables.

(D) There are many outliers in the data.

39. When using Principal Component Analysis (a common method for factor analysis), what does the first principal component capture?
(A) The minimum variance.
(B) The mean deviation.
(C) The maximum variance.
(D) The average variance.

40. Which statistical measure is used to assess the sampling adequacy for conducting factor analysis?
(A) Kaiser-Meyer-Olkin (KMO) measure.
(B) Bartlett's test of sphericity.
(C) Eigenvalue.
(D) All of the above.

41. The process by which we estimate the value of dependent variable on the basis of one or more independent variable is called:
(A) Correlation
(B) Regression
(C) Residual
(D) Slope

42. The major characteristic of correlation analysis is to seek out
(A) Differences among variables
(B) Variations among variables
(C) Association among variables
(D) Regression among variables

43. A correlation coefficient (r) of –1.0 indicates a:
(A) Perfect positive correlation
(B) Weak positive correlation
(C) No correlation
(D) Perfect negative correlation

44. The statistical tool that studies the degree of association between two variables is called:
(A) Regression
(B) Standard error
(C) Index numbers
(D) Correlation

45. Which type of correlation analysis is appropriate for examining the relationship between variables with non-linear relationships?
(A) Pearson's correlation
(B) Spearman's rank correlation
(C) Both Pearson's and Spearman's
(D) Neither Pearson's nor Spearman's

46. What is the primary goal of cluster analysis?
(A) Classifying data into predefined groups.
(B) Predicting a continuous value.
(C) Grouping similar data points together based on their characteristics.
(D) Reducing the number of variables in a dataset.

47. The primary purpose of conjoint analysis is to:
(A) Identify which customer segments are most profitable.
(B) Determine the price elasticity of demand for an existing product.
(C) Quantify the value that consumers place on different features of a product or service.
(D) Predict sales volume for a new product with absolute certainty.

48. The most common type of conjoint analysis, which presents respondents with sets of product profiles and asks them to choose the one they prefer most, is known as:
(A) Adaptive Conjoint Analysis (ACA).
(B) Choice-Based Conjoint (CBC).
(C) Full-Profile Conjoint Analysis.
(D) Self-Explicated Conjoint Analysis.

49. Which statement is an accurate representation of a "trade-off" in conjoint analysis?
(A) A decision to buy a product from one brand over another.
(B) A decision to delay a purchase until a later date.
(C) A customer choosing a larger screen over longer battery life for a phone.
(D) A customer buying a product with all the most desired features.

50. What is the primary purpose of discriminant analysis?
(A) To determine the effect of independent variables on a continuous dependent variable.
(B) To identify the underlying structure or dimensions within a set of variables.
(C) To classify cases into two or more distinct, pre-defined groups based on a set of predictor variables.
(D) To cluster data points into a specific number of groups based on their similarities.

PART–B
(Biotechnology)

51. What is the fundamental unit of eukaryote chromosome organisation?

(A) Chromatin
(B) Solenoid
(C) Nucleosome
(D) Unineme

52. During alternate pathway of complement system C3, convertase is —

(A) C3b
(B) C3b Bb
(C) Factor-D
(D) Factor-B

53. Select the correct definition of Expressed Sequence Tags in the context of HGP.

(A) A method to identify all genes that are expressed as RNA.
(B) A method to identify all gene that are expressed as proteins.
(C) Genes that are expressed as introns.
(D) Genes that are expressed as enzymes.

54. Which complex is involved in the insertion and assembly of proteins into the outer mitochondrial membrane?

(A) TOM complex
(B) TIM complex
(C) Ribosome
(D) SAM complex

55. Which of the following mutagen is most likely to cause a frameshift mutation?

(A) 2-aminopurin
(B) 5-bromouracil
(C) Methane sulphonate
(D) Proflavin

56. What is the function of Cdk-2/Cyclin E?

(A) G2 phase transition
(B) G2/M transition
(C) G1/S transition
(D) M phase transition

57. The random loss or fixation of alleles in a small population due to chance events is called—

(A) Genetic drift
(B) Natural selection
(C) Mutation
(D) Gene flow

58. Which of the following is also termed as death receptor?

(A) TNFR4
(B) TNFR2
(C) TNFR3
(D) TNFR1

59. Which of the following is an anti-apoptotic protein from Bcl-2 family?

(A) Bcl-Xs
(B) Bim
(C) NOXA
(D) Bcl-xL

60. Which of the following actions does Amylin perform to help regulate blood sugar?

(A) Prevents overheating by promoting satiety.
(B) Triggers the release of stored glycogen.
(C) Increase the production of insulin.
(D) Stimulates glucose uptake by cells.

61. What is the function of Tus protein?

(A) It synthesises the DNA ligase.
(B) It triggers the termination of replication.
(C) It initiates DNA replication.
(D) It separates DNA strands.

62. Innate immunity is provided by —

(A) T-Lymphocytes
(B) Antibodies
(C) B-Lymphocytes
(D) Phagocytes

63. Which of the following statement is NOT True for the plasmid pBR322?

(A) It contains an origin of replication.

(B) It has single cloning site.

(C) It has ampicillin resistance as selectable marker.

(D) It has tetracycline resistance as selectable marker.

64. Which of the following can be a problem when immobilising mammalian cells in gel beads within a bioreactor.

(A) The pH can not be maintained.

(B) Small bead size for the cells to grow on.

(C) Lack of oxygen supply to all the beads.

(D) Accumulation of toxic metabolic products.

65. Which of the following can not be used as an adsorbent in Column Adsorption Chromatography?

(A) Potassium permanganate (B) Magnesium oxide

(C) Silica gel (D) Activated alumina

66. Conidia are formed in which group of fungi?

(A) Basidiomycota (B) Zygomycota

(C) Chytridiomycota (D) Ascomycota

67. Which of the following technique involves direct uptake of naked DNA by a recipient cell?

(A) Protoplast fusion (B) Transformation

(C) Transduction (D) Conjugation

68. Shine-Dalgarno sequence is present in —

(A) tRNA (B) cDNA

(C) mRNA (D) RNA polymerase

69. Which of the following is a classical example of point mutation?

(A) Haemophilia
(B) Thalassaemia
(C) Phenylketonuria
(D) Sickle cell anaemia

70. Which of the following spores are formed by budding?

(A) Blastospores
(B) Conidiospores
(C) Arthrospores
(D) Chlamydospores

71. Which of the following is a common method for inducing random mutation to develop microbial strains?

(A) Chemical or physical mutagens
(B) Directed mutagens
(C) Protoplast fusion
(D) Gene editing with CRISPR

72. Which of the following fermenters are characterised by height to diameter ratio?

(A) Hollow fibre chamber
(B) Airlift fermenter
(C) Tower fermenter
(D) Perfusion bioreactor

73. In GLC, when films are used in the interior of the capillary column, the value of Eddy diffusion is —

(A) Zero
(B) Greater than 1
(C) Less than 1
(D) Equal to 1

74. Choose the INCORRECT pair out of the following:

(A) DNA polymerase : Amplification of DNA in PCR
(B) Restriction enzyme : Production of RFLPs
(C) DNA ligase : Joining of DNA strands
(D) Reverse transcriptase : Cleaves DNA to form sticky ends

75. What is the name of the hyper- variable region of immunoglobulin which is responsible for diversity?

(A) Epitope
(B) Hinge region
(C) CDR
(D) Agretope

76. Which of the following are non-professional antigen presenting cells?

(A) Macrophages
(B) Dendritic cells
(C) B-Lymphocytes
(D) Fibroblasts

77. Which of the following is NOT the transcription inhibitor in eukaryotes?

(A) Actinomycin-D
(B) Rifampcin
(C) Rho factor
(D) Acridine dye

78. Which type of gene regulation are enhancers and silencers primarily involved in?

(A) Transcriptional regulation
(B) Post-transcriptional modification
(C) Translational regulation
(D) Post-translational modification

79. Which of the following is a key epigenetic mechanism?

(A) Mutation of DNA bases
(B) DNA methylation and histone modification
(C) DNA replication
(D) In born errors of metabolism

80. In a population, the frequency of dominant allele 'D' is 0.8 and that of recessive allele 'd' is 0.2. What will be the expected number of heterozygous individuals in a population of 300, assuming it is in Hardy-Weinberg equilibrium?

(A) 96
(B) 32
(C) 116
(D) 110

81. Which of the following acts as a GAP during translation?

(A) eIF5B
(B) eIF4F
(C) eIF2B
(D) eIF1a

82. Which of the following moves in consecutive blocks of three nucleotides?

(A) RNA polymerase
(B) DNA polymerase
(C) Endoplasmic reticulum
(D) Ribosome

83. What is the primary function of DNA polymerase?

(A) To ligate Okazaki fragments.

(B) To synthesize RNA primers.

(C) To add nucleotides in 3' to 5' direction.

(D) To add nucleotides in 5' to 3' direction.

84. Where are located the upstream sequences in transcription?

(A) After the start point.

(B) Prior to the start point.

(C) Right border of DNA.

(D) In the middle of DNA

85. Name the Sigma factor which is needed for promoter recognition.

(A) Sigma 70

(B) Sigma 40

(C) Sigma 32

(D) Sigma 60

86. What is the primary advantage of Next Generation Sequencing over Sanger sequencing?

(A) Longer read length

(B) Simpler data

(C) Lower cost per base

(D) Higher accuracy

87. Which of the following polypeptide is important for the expression of MHC 1 on the cell membrane?

(A) Interferon

(B) Interleukins

(C) Lymphokines

(D) Beta-2 microglobulin

88. Which of the following statement is INCORRECT regarding TA cloning?

(A) It results in a low yield of recombinants.

(B) It is used for cloning of PCR products.

(C) It is often preferred over blunt-end ligation.

(D) The PCR product has an 'A' overhang at its 3' end.

89. Which of the following describes the mixing conditions in an ideal CSTR?

(A) Complete back-mixing.
(B) Segregated flow
(C) Plug flow
(D) Laminar flow

90. Which of the following is NOT TRUE about solvent programming in HPLC?

(A) It provides fast overall separation.
(B) It provides unequal bandwidths.
(C) It provides maximum sensitivity.
(D) It provides maximum resolution.

91. Binary fission does not involve which of the following?

(A) Cell elongation
(B) Spindle formation
(C) Cytokinesis
(D) DNA duplication

92. Which of the following is not the composition of N-agar plates/slants?

(A) NaCl
(B) Peptone
(C) Dextrose
(D) Yeast extract

93. Which of the following is used to grow bacterial culture continuously?

(A) Haemostat
(B) Turbidostat
(C) Chemostat
(D) Coulter-counter

94. Biomass can be measured with the help of —

(A) Nephelometer
(B) Mass-spectrometry
(C) Rheometry
(D) Spectrometer

95. Which of the following is a core component of a bioprocess automation system?

(A) Controllers
(B) Actuators
(C) Sensors
(D) Bioreactor

96. What is the carrier gas used in Gas Chromatography?

(A) Methane
(B) Oxygen
(C) Carbon dioxide
(D) Helium

97. What does the acronym DDC stand for in the context of bioprocess control?

(A) Data Driven Computation
(B) Dynamic Device Calibration
(C) Digital Data Capture
(D) Direct Digital Control

98. The most useful technique to identify and quantify a known impurity in a drug is —

(A) MS
(B) IR
(C) HPLC
(D) NMR

99. In which of the following phase secondary metabolites are produced during growth?

(A) Log phase
(B) Lag phase
(C) Death phase
(D) Stationary phase

100. The process by which particular antigens are rendered more susceptible to phagocytosis is known as —

(A) Necrosis
(B) Opsonisation
(C) Prophylaxis
(D) Anaphylaxis

ROUGH WORK

ROUGH WORK