Test Booklet Series

A

Test Booklet
(Microbiology)

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

(Microbiology)

51. Chemical modification of substrate during uptake is referred to as

(A) Facilitated diffusion (B) Active transport

(C) Group translocation (D) Symport

Case Study : A bacterial culture was grown in medium A for 10 h. The inoculum was kept at 10^2 cells/ml. After the incubation, the final cell count was 10^7 cells/ml. If incubation continued further, there was no increase in cell count. If the medium was supplemented with glucose, after 2 hours, cell count increased to 10^9 cells/ml. Answer the following questions 52 to 54 based on this.

52. What is the generation time for the culture?

(A) 1 hr (B) 0.6 h

(C) 16.5 h (D) 1.65 h

53. The method of supplementing glucose for increasing cell number is an example of

(A) Diauxic growth (B) Fed batch growth

(C) Sequential growth (D) None of the above

54. The specific growth constant for the bacterial culture is

(A) 0.5 (B) 0.4

(C) 0.6 (D) 0.2

55. The term diderm refers to

(A) Prokaryote (B) Gram negative bacteria

(C) Gram positive bacteria (D) Archaea

56. Which of the following impeller can pump fluid radially?

(A) Open impeller (B) Pitched blade impeller

(C) Rushton impeller (D) None of the above

57. Baffles cannot be used in fermentation tanks used for

(A) Bacterial cell culture
(B) Plant cell culture
(C) Fungal cell culture
(D) Animal cell culture

58. SCOBY stands for

(A) Single cell obtained from bacteria and yeast
(B) Symbiotic culture of bacteria and yeast
(C) Standard cell count of bacteria and yeast
(D) None of the above

59. Woronin bodies are seen in the cells of

(A) Fungi
(B) Actinomycetes
(C) Yeasts
(D) Protists

60. Reannealing of denatured DNA with complementary RNA molecule results in

(A) Heteroduplex formation
(B) R-loop formation
(C) T-loop formation
(D) Fuzzy loop

61. Acridine curing refers to

(A) Production of defective virus
(B) Suppression of episome replication
(C) Removal of plasmids
(D) All of the above

62. Plasmid incompatibility may arise due to

(A) Sharing the same par functions
(B) Belonging to different Inc. groups
(C) Same mechanism of replication control
(D) All of the above

63. The uptake of DNA and its integration into the bacterial genome is carried out by

(A) Transformasome

(B) Transformation pilus

(C) DNA uptake transport protein

(D) All of the above

64. Identify the component in bacterial cell wall which retains colour in acid fast staining test

(A) Teichoic Acid

(B) Phosphatidic acid

(C) Mycolic acid

(D) Ergosterol

65. Restriction of Z-ring to the middle region of bacterial cell is brought about by

(A) Fts Z

(B) Fts A

(C) Par M

(D) Min C and D

66. To trigger the M phase of mitosis, which cyclin and CdK complex is necessary

(A) Cyclin D and CdK4

(B) Cyclin A and CdK2

(C) Cyclin B and CdK1

(D) Cyclin E and CdK2

67. Calculate the initial volume and dilution rate in a fed batch reactor if the final volume after 4 h is 1200 ml with a flow rate of 150 ml/hr.

(A) 200 ml, 0.125/h

(B) 400 ml, 0.2/h

(C) 400 ml, 0.125/h

(D) 800 ml, 0.2/h

68. What is the role of a kinetochore :

(A) Binding to chromatid

(B) Binding to microtubule

(C) Binding to cohesion

(D) Binding to centrosome

69. Metamorphosis in frog is induced by

(A) Increase in thyroid hormone

(B) Apoptosis

(C) Cell breakdown in tadpole tail due to caspases

(D) All of the above

70. Which of the following is a part of next generation sequencing technique?

(A) SBX

(B) Nanopore

(C) PacBio SMRT

(D) All of the above

71. Fueling reactions in a cell include all

(A) Catabolic reactions

(B) Anabolic reactions

(C) Where reducing power are used

(D) All the above

72. Out of the following, whose genome was first sequenced

(A) *Oryza sativa*

(B) *Drosophila melanogaster*

(C) *Saccharomyces ceravisiae*

(D) *Hemophilus influenzae*

73. Binding of protein to DNA fragment leads to

(A) Enhancement in gel mobility

(B) Retardation in gel mobility

(C) Reduction in visualization quality

(D) None of the above

74. The fermentor which uses both immobilized particles with gas flow is

(A) Packed bed ferementor

(B) Fluidized bed reactor

(C) Airlift fermentor

(D) Bubble reactor

75. Which of the following can be used in MEOR?

(A) Dehydrogenases (B) Levan

(C) Surfactin (D) All of the above

76. Oxaloacetate is the precursor of

(A) Aspartate family (B) Glutamate family

(C) Serine family (D) Aromatic amine family

77. Organisms which can grow using light as energy for assimilation of carbon dioxide and organic compounds are called as

(A) Organotrophs (B) Photoorganotrophs

(C) Phototrophs (D) Photolithoautotrophs

78. Spitzenkörper is a term to identify

(A) Cluster of apical vesicles in fungal hyphae

(B) Resting structure in fungi

(C) Proteins used in DNA packaging

(D) None of the above

79. Tertiary treatment does not include the step of

(A) Deammonification (B) UCT process

(C) Activated charcoal treatment (D) Sludge stabilization

80. Mineralization refers to

(A) Complete degradation of organic molecules

(B) Formation of inorganic minerals

(C) Generation of chelates

(D) Only (B) and (C)

81. The following is an example of primary waste water treatment

(A) Bar screen (B) Shredder

(C) Circular sedimentation tank (D) Grit chamber

82. BOD testing was carried out for a water sample. The initial DO reading was 124 mg/l and the DO reading after 7 days was only 122 mg/l/. The water can be described to have

(A) Very low BOD

(B) Presence of negligible organic matter

(C) Can be considered potable

(D) All of the above

83. Biofortification in rice aims at elevated levels of

(A) Vitamin A

(B) Protein

(C) Zinc

(D) Only (B) and (C)

84. Identify the component in MacConkey agar that makes it selective for gram negative bacteria

(A) Crystalline violet

(B) Bile salts

(C) Both (A) and (B)

(D) Lactose

85. Growth under high osmotic pressure changes bacterial cell morphology from rod to

(A) Filamentous

(B) Round

(C) Irregular

(D) Elongated

86. In which of the following steps of waste water treatment, maximum oxidation of organic components occur

(A) Tertiary

(B) Aerobic secondary

(C) Anaerobic secondary

(D) Primary

87. Identify the microbe responsible for causing canned meat tin to bloat

(A) *Lactobacillus*

(B) *Clostridium botulinum*

(C) *Coliforms*

(D) *Micrococci*

88. The yeast used as source of microbial protein is

(A) *Candida utilis* (B) *Saccharomyces cerevisiae*

(C) *Pichia pastoris* (D) *Streptococcus thermophilus*

89. Presence of IgE in tears is an indicative of

(A) Ocular Allergy (B) Severity of disease symptom

(C) Both (A) and (B) (D) IgE is absent in tears

90. Avidity refers to

(A) Specificity between antigen and antibody

(B) Overall strength of antigen- antibody reaction

(C) It is weaker than affinity

(D) None of the above

91. Upon infection, which cell is first used

(A) Basophil (B) Eosinophil

(C) Neutrophil (D) Macrophages

92. Hinge region in antibodies is rich in

(A) Proline (B) Glycine

(C) Lysine (D) Tyrosine

93. Identify the option which works exclusively as a signaling receptor

(A) MBL (B) LPS

(C) Toll like receptor (D) CRP

94. Who developed the steam sterilizer?

(A) Charles Chamberland (B) Louis Pasteur

(C) Nicolas Appert (D) Joseph Lister

95. Robert Koch was awarded the Nobel Prize for his work on

(A) Cholera
(B) Anthrax
(C) Tuberculosis
(D) Leprosy

96. Polymyxin control bacterial growth by disrupting

(A) Cell wall
(B) Cell membrane
(C) Nucleic acids
(D) Proteins

97. Identify the type of plate used for screening recombinants obtained after insertional inactivation of the lac Z gene on a plasmid

(A) IPTG only
(B) Tetracycline only
(C) IPTG and X-Gal
(D) Tetracycline and ampicillin

98. Cosmids can contain cloned DNA inserts upto

(A) 15 kb
(B) 25 kb
(C) 30-45 kb
(D) More than 60 kb

99. ..... can oxidize nitrite to nitrate

(A) Nitrobacter
(B) Nitrosomonas
(C) Nitrosococcus
(D) Nitrosospira

100. The att site of E.coli lies between

(A) Gal and niacin genes
(B) Gal and Biotin genes
(C) Gal and Att B genes
(D) Gal and integrase genes

ROUGH WORK

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