

Seat No.	
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PD - 08

Total No. of Pages : 12

Ph.D Entrance Examination March - April, 2026

MICROBIOLOGY

Subject Code : 58797

Day and Date : Wednesday, 07-10-2026

Total Marks : 100

Time : 01.00 p.m. to 03.00 p.m.

Instructions :

- 1) All questions are compulsory.
- 2) Each question carries 2 marks.
- 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
- 4) Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR answer sheet.
- 5) Follow the instructions given on OMR Sheet.
- 6) Rough work shall be done on the sheet provided at the end of question paper.
- 7) Only non-programmable calculators are allowed.

SECTION I

1. is a section of research paper that consolidates and connects results with other findings.
A) Conclusion
B) Discussion
C) Results
D) Summary
2. The optical theory underlying microscope design was developed by the German physicist
A) Ernst Abbe
B) Antonie van Leeuwenhock
C) Ernst Ruska
D) Max Knoll
3. Newton gave three basic laws of motion. This research is categorized as....
A) Sample Survey
B) Applied Research
C) Descriptive Research
D) Fundamental Research

4. Oil immersion objective lens has an NA value of
A) 0.65
B) 0.85
C) 1.33
D) 1.00
5. Which anaerobic culturing technique provides the highest recovery rate for strict anaerobes from environmental samples?
A) Use of cooked meat broth
B) Anaerobic jars with gas packs
C) Shake tube method with thioglycolate medium
D) Serial dilution in anaerobic chambers
6. Which of the following actions is considered a form of plagiarism?
A) Citing other's work properly
B) Paraphrasing another author's work with attribution
C) Using someone else's data or ideas without acknowledgment
D) Discussing general knowledge without citation
7. is the most recent and dependable source of information on a broad scientific topic.
A) Research paper
B) Bibliography
C) Review article
D) New textbook
8. The diameter of industrial Waldhof fermenter was
A) 6.0 cm
B) 7.8 cm
C) 7.9 m
D) 9.7 m
9. is recommended for the handling of samples suspected of *Mycobacterium tuberculosis*.
A) BSL-1
B) BSL-2
C) BSL-3
D) BSL-4

10. Knowing should be enough to find the required entry from database quickly.
A) publication date
B) accession number
C) publication date
D) properties
11. claimed that oxygen balance technique is suitable for only small-scale fermenters.
A) Cooper
B) Humphrey
C) Wang
D) Taguchi
12. The F-test is
A) essentially a two-tailed test
B) essentially a one-tailed test
C) one-tailed as well as two-tailed depending on the hypothesis
D) can never be a one-tailed test
13. is essential for creating and managing bibliographies in research papers.
A) Statistical software
B) Reference management software
C) Spreadsheet software
D) Project management software
14. A fed-batch fermentation strategy is preferred when
A) The product is growth-associated only
B) The substrate is toxic at high concentration
C) Oxygen demand is low
D) Continuous culture is impossible

15. Listing of the authors other than corresponding author is in the order of their.....
- A) Age
B) Seniority
C) Contributions
D) Affection
16. is a better strategy in ion exchange chromatography that provides the highest resolution for closely related charged species.
- A) Isocratic elution at constant salt concentration
B) Stepwise increase in pH
C) Gradient elution with increasing salt concentration
D) Elution by temperature gradient
17. In the acid-fast stain, the term "acid-fast" refers to the ability of certain bacteria to
- A) Grow rapidly in acidic environments
B) Produce acid as a metabolic byproduct
C) Resist decolorization by acid-alcohol
D) Survive exposure to strong acids
18. The value of volumetric mass transfer coefficient (KLa) increases with in agitation speed (rpm).
- A) Decrease
B) Increase
C) Constancy
D) Zero
19. can be integrated with classical isolation techniques to ensure culture-purity in slow-growing environmental bacteria.
- A) Serial dilution in liquid broth
B) Gram staining and light microscopy
C) Use of selective antibiotics
D) Real-time PCR screening for contaminant DNA

Section - II

26. The CD40-CD40L interaction between a B cell and a helper T cell is absolutely critical for
- A) The initial recognition of native antigen by the B cell receptor (BCR)
 - B) Delivering the "co-stimulatory signal" required for B cell activation
 - C) The direct killing of the antigen-presenting B cell by the T cell
 - D) The production of interleukin-2 (IL-2) by the B cell
27. The primary function of Toll-like receptors (TLRs) is to
- A) Recognize and bind to specific antigens
 - B) Serve as receptors for cytokines
 - C) Recognize pathogen-associated molecular patterns (PAMPs)
 - D) Present peptides to T cells
28. Co-metabolism refers to the process where
- A) A consortium of microbes works together to degrade a compound
 - B) A compound is degraded by an enzyme produced by the microbe for the metabolism of a different substrate
 - C) The pollutant is used as the sole source of carbon and energy by the microbe
 - D) The degradation pathway is encoded on a plasmid
29. The Hardy-Weinberg principle describes a theoretical population that is not evolving. A key assumption of this model is
- A) A high mutation rate
 - B) No natural selection
 - C) Non-random mating
 - D) A small population size

30. The evolutionary "molecular clock" is a technique that uses
- A) The constant rate of chromosome duplication events
 - B) The predictable rate of decay of radioactive isotopes within fossils
 - C) The constant rate of neutral mutations accumulating over time to estimate the divergence
 - D) The rate of change in chromosome number
31. A "pseudogene" is best described as
- A) A gene that codes for a pseudo-enzyme
 - B) A non-functional relic of a gene that has been inactivated by mutations
 - C) A gene that is only expressed during pseudopod formation
 - D) A viral gene integrated into a host genome
32. The Henderson-Hasselbalch equation is used in biochemistry to
- A) Calculate the free energy change (ΔG) of a reaction
 - B) Calculate the pH of a buffer solution
 - C) Determine the redox potential of a half-cell
 - D) Predict the secondary structure of a protein from its sequence
33. The first stage of fatty acid oxidation is called
- A) Activation
 - B) Beta-oxidation
 - C) Glycolysis
 - D) Lipogenesis
34. Kurtosis of a frequency distribution is a measure of
- A) The symmetry of the distribution
 - B) The peakedness or flatness relative to a normal distribution
 - C) The spread or dispersion of the data points
 - D) The relationship between two variables

35. is often used to model the number of rare events occurring in a fixed interval of time.
A) Normal distribution
B) Binomial distribution
C) Poisson distribution
D) Chi-square distribution
36. The main purpose of a histogram is to graphically represent the
A) Mean and median of a dataset
B) Relationship between two variables
C) Frequency distribution of a continuous variable
D) Proportion of categories in a dataset
37. ANOVA (Analysis of Variance) is a statistical test used to compare
A) The means of two groups
B) The variances of two groups
C) The means of three or more groups
D) The correlation between two variables
38. The Zika virus is a significant public health concern primarily because of its link to
A) Hemorrhagic fever
B) Congenital microcephaly and other birth defects
C) Rapidly progressive encephalitis
D) Myocarditis in young adults
39. A cosmid vector is a hybrid that combines features of
A) A plasmid and a yeast artificial chromosome (YAC)
B) A plasmid and the cos sites from a phage
C) An adenovirus and a plasmid
D) M13 phage and a Ti plasmid

40. Golden Rice is a famous example of a genetically modified crop. The goal of its development was to
- A) Increase resistance to herbicides
 - B) Produce higher yields in drought conditions
 - C) Biosynthesize beta-carotene in the rice endosperm
 - D) Produce a vaccine within the edible part of the plant
41. Waste from the pulp and paper industry is often characterized by
- A) High concentrations of lignin and organic chemicals
 - B) Very low suspended solids and dark colour
 - C) Being completely inorganic
 - D) A neutral pH and low color
42. An irreversible inhibitor typically
- A) Forms weak ionic bonds with the enzyme
 - B) Binds non-covalently to the active site
 - C) Forms a stable covalent bond with the enzyme
 - D) Lowers the K_m value of the enzyme
43. The Monod-Wyman-Changeux (MWC) model for allosteric enzymes proposes
- A) That subunits undergo sequential conformational changes
 - B) A concerted transition where all subunits change shape simultaneously
 - C) That the substrate binds only to the T-state of the enzyme
 - D) That inhibition occurs only through competitive inhibitors

44. The MALDI-TOF MS technology identifies microorganisms by analyzing
- A) Their carbohydrate fermentation patterns
 - B) Unique protein fingerprints, primarily ribosomal proteins
 - C) Their DNA sequences
 - D) Their resistance patterns to antibiotics
45. Serum Creatinine level is a more reliable indicator of kidney function than Blood Urea Nitrogen (BUN) because creatinine levels are
- A) Affected by liver disease
 - B) Less influenced by diet and protein metabolism
 - C) Much casier to measure
 - D) More sensitive to early kidney damage
46. A signal peptide sequence on a newly synthesized protein primarily directs it to
- A) The nucleus
 - B) The mitochondria
 - C) The endoplasmic reticulum
 - D) The cytosol
47. The concept of the "pathogen continuum" suggests that
- A) All microbes are equally pathogenic
 - B) Pathogenicity is a fixed, unchanging trait of a microbe
 - C) Pathogenicity varies with host factors
 - D) Diseases always progress from acute to chronic states
48. The MHC genes are located on in humans.
- A) Chromosome 6
 - B) Chromosome 12
 - C) Chromosome 1
 - D) Chromosome 2

49. The Hill coefficient is a measure of
- A) The molecular weight of a protein
 - B) Cooperativity in ligand binding
 - C) The isoelectric point of a protein
 - D) The catalytic efficiency (k_{cat}/K_m) of an enzyme
50. Bioavailability of a pollutant refers to
- A) The total concentration of the pollutant in the soil
 - B) The pollutant fraction accessible to microbes for degradation
 - C) The toxicity of the pollutant to plants
 - D) The rate at which the pollutant leaches into groundwater



- Rough Work -