

Roll No.

Question Booklet Number

O. M. R. Serial No.

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M. Sc. (Biotechnology) (Fourth Semester)
(NEP) EXAMINATION, 2025-26
MICROBIAL BIOTECHNOLOGY

Paper Code							
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Questions Booklet Series
C

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. The primary microorganism utilized in beer fermentation is :
 - (A) *Saccharomyces cerevisiae*
 - (B) *Lactobacillus spp.*
 - (C) *Escherichia coli*
 - (D) *Bacillus subtilis*
2. Whisky is produced by fermenting :
 - (A) Grapes
 - (B) Barley or other cereal grains
 - (C) Rice exclusively
 - (D) Potatoes
3. Wine is produced through the fermentation of :
 - (A) Apples
 - (B) Barley
 - (C) Grapes
 - (D) Corn
4. Alcoholic fermentation results in the formation of :
 - (A) Acetic acid
 - (B) Lactic acid
 - (C) Ethanol and carbon dioxide
 - (D) Propionic acid
5. A typical fermentation medium for industrial alcohol production must contain :
 - (A) Inert gases such as nitrogen
 - (B) Carbon-rich substrates such as fermentable sugars
 - (C) Broad-spectrum antibiotics
 - (D) Steroidal growth enhancers
6. The optimal temperature range for yeast-mediated alcoholic fermentation is generally :
 - (A) 0-5°C
 - (B) 25-30°C
 - (C) 35-60°C
 - (D) Above 80°C

7. In wine production, the term “must” refers to :
- (A) A specific strain of fermentative yeast
 - (B) The freshly crushed, unfermented grape juice containing skins and seeds
 - (C) The final clarified wine product
 - (D) The ethanol concentration of the beverage
8. Which equipment is most commonly used during the distillation stage of whisky production ?
- (A) Alcohol oxidase reactors
 - (B) Fermentation bioreactors
 - (C) Copper pot stills or column stills
 - (D) Lyophilization units
9. Beer production typically involves which sequence of processing steps ?
- (A) Malting → Mashing → Fermentation → Maturation
 - (B) Drying → Acidification → Freezing
 - (C) Blending → Heating → Pasteurization
 - (D) Culturing → Frying → Distillation
10. Alcoholic beverages primarily differ based on :
- (A) Their visual color only
 - (B) The microbial strain used exclusively
 - (C) The nature of raw materials and fermentation processes employed
 - (D) Their final pH values

11. In industrial alcohol production, distillation is primarily employed to :
- (A) Sterilize the fermented product
 - (B) Increase the water content of the mixture
 - (C) Reduce residual sugar concentration
 - (D) Separate and concentrate ethanol from fermentation broth
12. During alcoholic fermentation, yeast metabolizes sugars to produce :
- (A) Ethanol exclusively
 - (B) Carbon dioxide exclusively
 - (C) Both ethanol and carbon dioxide
 - (D) Neither ethanol nor carbon dioxide
13. Which of the following alcoholic beverages undergoes distillation after fermentation ?
- (A) Wine
 - (B) Beer
 - (C) Whisky
 - (D) Cider
14. The effervescence observed during fermentation is primarily due to the release of :
- (A) Molecular oxygen
 - (B) Nitrogen gas
 - (C) Methane gas
 - (D) Carbon dioxide
15. During whisky production, the conversion of starch to fermentable sugars is mainly facilitated by :
- (A) Lactic acid bacteria
 - (B) Enzymes from malt or microorganisms such as *Aspergillus oryzae*
 - (C) Enteric bacteria such as *E. coli*
 - (D) Thermophilic archaea

16. Aging (maturation) of wine primarily contributes to :
- (A) Increase in ethanol concentration
 - (B) Development of complex flavor and aroma profiles
 - (C) Enhanced microbial proliferation
 - (D) Acceleration of fermentation rate
17. Glucose from starch can be produced by :
- (A) Protease
 - (B) Cellulase
 - (C) Amylase
 - (D) Lipase
18. Alcoholic fermentation in wine production is typically carried out using :
- (A) Mixed wild microbial consortia exclusively
 - (B) Commercial strains of *Saccharomyces cerevisiae*
 - (C) Purified alcohol dehydrogenase enzyme
 - (D) Thermophilic bacterial cultures
19. Which of the following pairs correctly matches beer type with its fermentation category ?
- (A) Lager-Bottom-fermented beer
 - (B) Ale-Bottom-fermented beer
 - (C) Stout-Bottom-fermented beer
 - (D) Pilsner-Top-fermented beer
20. Microbial cultures employed in industrial alcohol fermentation should ideally be :
- (A) Pathogenic strains with rapid growth rates
 - (B) Strict thermophiles requiring high temperatures
 - (C) Highly tolerant to ethanol accumulation
 - (D) Obligate aerobes dependent solely on oxygen

21. In microbial enzyme production, submerged fermentation refers to :
- (A) Growing microbes in solid media
 - (B) Using high temperatures
 - (C) Liquid medium-based cultivation
 - (D) Use of desiccators
22. Enzyme cocktails used for plant biomass degradation often include :
- (A) Amylases and cellulases
 - (B) DNA polymerases
 - (C) Ligases and helicases
 - (D) Catalase and oxidase
23. The industrial production of penicillin requires :
- (A) Anaerobic conditions
 - (B) Organic nitrogen sources and lactose
 - (C) High temperatures
 - (D) Photoactivation
24. The main purpose of microbial enzyme purification is to :
- (A) Increase biomass
 - (B) Remove DNA
 - (C) Enhance enzyme activity and specificity
 - (D) Inhibit competition
25. Microbial cultures for industrial enzyme production are selected based on :
- (A) Color
 - (B) Spore shape
 - (C) Enzyme yield and stability
 - (D) Size of colonies

26. Amylases are typically sourced from :
- (A) *Saccharomyces cerevisiae*
 - (B) *Bacillus species and fungi*
 - (C) *Cyanobacteria*
 - (D) *Algae*
27. Proteases hydrolyze peptide bonds in :
- (A) Lipids
 - (B) Proteins
 - (C) Sugars
 - (D) Nucleic acids
28. Which of the following enzymes is most associated with plant materials degradation ?
- (A) Cellulase
 - (B) Urease
 - (C) Lipase
 - (D) Amylase
29. Exoglucanase is classified as a :
- (A) Peptidase
 - (B) Nuclease
 - (C) Cellulase
 - (D) Protease
30. The main advantage of using microbial enzymes is :
- (A) High cost
 - (B) Thermolability
 - (C) High specificity and eco-friendliness
 - (D) Requirement of heavy metal cofactors
31. Microbial product recovery is a part of :
- (A) Upstream processing
 - (B) Downstream processing
 - (C) Sterilization
 - (D) Genomic annotation

32. Proteases are widely used in :

- (A) Brewing
- (B) Detergent and leather industries
- (C) Photography
- (D) Fuel cells

33. Which of the following is NOT a microbial enzyme ?

- (A) Protease
- (B) Amylase
- (C) Cellulase
- (D) Cellobiose

34. β -glucosidase functions to :

- (A) Break down starch
- (B) Release glucose from cellobiose
- (C) Cleave DNA strands
- (D) Inhibit protein folding

35. Cellobiose is :

- (A) A monomer
- (B) A disaccharide of glucose units
- (C) An amino acid
- (D) A lipid

36. Cellobiohydrolase is a type of :

- (A) Protease
- (B) Amylase
- (C) Cellulase
- (D) Lipase

37. Endoglucanases act on :

- (A) Non-reducing ends of cellulose
- (B) Internal bonds within cellulose chains
- (C) RNA strands
- (D) Protein-protein bonds

38. Cellulases are used for the degradation of :
- (A) Pectin
 - (B) DNA
 - (C) Cellulose
 - (D) Keratin
39. Amylases break down :
- (A) Starch into maltose
 - (B) Starch into fructose
 - (C) Starch into galactose
 - (D) Starch into ribose
40. Penicillin G is produced by :
- (A) *Streptomyces griseus*
 - (B) *Bacillus subtilis*
 - (C) *Escherichia coli*
 - (D) *Penicillium chrysogenum*
41. Viral integrase enzymes are primarily involved in :
- (A) Hydrolysis of complex polysaccharides
 - (B) Integration of viral DNA into host genomes
 - (C) Lipid biosynthesis pathways
 - (D) Protein folding and chaperone activity
42. Which of the following is a classical example of an extremophile exploited in biotechnology ?
- (A) *Bacillus subtilis*
 - (B) *Escherichia coli*
 - (C) *Lactobacillus acidophilus*
 - (D) *Thermus aquaticus*
43. Polyketides are classified as :
- (A) Growth-associated primary metabolites
 - (B) Non-growth-associated secondary metabolites
 - (C) Simple carbohydrate molecules
 - (D) Structural components of microbial cell walls

44. Biofilms exhibit increased resistance to antimicrobial agents primarily due to :
- (A) Elevated metabolic activity of constituent cells
 - (B) Absence of quorum sensing mechanisms
 - (C) Presence of a protective EPS matrix coupled with altered gene expression
 - (D) Complete lack of cell wall structures
45. Lantibiotics are predominantly produced by :
- (A) Photosynthetic cyanobacteria
 - (B) Filamentous actinomycetes
 - (C) Lactic acid bacteria
 - (D) Hyperthermophilic archaea
46. The viral enzyme reverse transcriptase is primarily utilized for :
- (A) DNA repair mechanisms
 - (B) De novo RNA synthesis
 - (C) Synthesis of complementary DNA (cDNA) from RNA templates
 - (D) Detection of antibiotic resistance genes
47. Microbial bioremediation primarily facilitates the removal of :
- (A) Intracellular enzymes
 - (B) Therapeutic antibiotics
 - (C) Toxic pollutants, xenobiotics, and recalcitrant compounds
 - (D) DNA polymerases
48. A major global concern associated with antibiotic resistance is :
- (A) Enhancement of organoleptic properties of food
 - (B) Increased rates of DNA hybridization
 - (C) Overproduction of micronutrients
 - (D) Horizontal transfer of resistance genes among microbial populations

49. Probiotics are most extensively used in the management of :
- (A) Malignant neoplasms
 - (B) Systemic metabolic disorders
 - (C) Gastrointestinal dysbiosis and related disorders
 - (D) Skeletal injuries such as fractures
50. The principal structural component of microbial biofilms is :
- (A) Crystalline cellulose microfibrils
 - (B) Membrane-associated lipid microdomains
 - (C) Extracellular polymeric substances (EPS) composed of polysaccharides, proteins, and nucleic acids
 - (D) Siliceous exoskeletons
51. Which of the following is NOT a typical application of microbial biofilms ?
- (A) Bioremediation of contaminated environments
 - (B) Biological water purification systems
 - (C) Increased susceptibility of microbes to antimicrobial agents
 - (D) Wastewater treatment processes
52. Microbially synthesized nanomaterials have significant applications in :
- (A) Enhancing DNA replication kinetics
 - (B) Bioremediation, targeted drug delivery, and diagnostics
 - (C) Transcriptional regulation of RNA
 - (D) Peptidoglycan biosynthesis

53. Probiotics are defined as :
- (A) Opportunistic pathogenic microorganisms
 - (B) Antimicrobial compounds derived from fungi
 - (C) Regulatory molecules involved in nucleic acid synthesis
 - (D) Live microorganisms that confer health benefits to the host when administered in adequate amounts
54. Which of the following microorganisms is widely utilized in xenobiotic biodegradation ?
- (A) *Escherichia coli*
 - (B) *Pseudomonas putida*
 - (C) *Bacillus subtilis*
 - (D) *Saccharomyces cerevisiae*
55. Lantibiotics are classified as :
- (A) Ribosomally synthesized and post-translationally modified peptide antibiotics
 - (B) Complex lipid-derived antimicrobial compounds
 - (C) Viral-encoded catalytic proteins
 - (D) Non-functional DNA fragments
56. Extremophilic enzymes (extremozymes) are industrially valuable because they :
- (A) Undergo rapid denaturation under process conditions
 - (B) Retain catalytic activity under extreme physicochemical environments
 - (C) Function independently of substrate specificity
 - (D) Require radioactive labeling for activation
57. Extremophiles are microorganisms that :
- (A) Survive exclusively under aseptic laboratory conditions
 - (B) Grow only on chemically defined synthetic media
 - (C) Thrive under physicochemically extreme conditions such as high temperature, salinity, or pH
 - (D) Induce highly virulent disease states in hosts

58. Antibiotic resistance in microorganisms most commonly arises due to :
- (A) Transient environmental pH fluctuations
 - (B) Increased oxygen availability in culture systems
 - (C) Genetic mutations and/or horizontal acquisition of resistance determinants
 - (D) Presence of eukaryotic organelles such as chloroplasts
59. Polyketide synthases (PKSs) primarily catalyze the biosynthesis of :
- (A) Complex polysaccharides via glycosidic linkages
 - (B) Structurally diverse secondary metabolites including antibiotics
 - (C) Nucleotide polymers through phosphodiester bonds
 - (D) Ribosomally synthesized proteins
60. Microbial biofilms are best described as :
- (A) Planktonic microbial cells freely suspended in aqueous environments
 - (B) Monolayer cultures of plant-derived cells
 - (C) Structured, surface-associated microbial communities embedded in a self-produced extracellular matrix
 - (D) Crystalline aggregates of nucleic acids
61. One of the main goals of synthetic biology is to :
- (A) Study protein folding
 - (B) Create standardized genetic parts for predictable behavior
 - (C) Purify microbial DNA
 - (D) Design synthetic ribosomes
62. Comparative genomics can be used to :
- (A) Determine gram staining pattern
 - (B) Predict virulence genes
 - (C) Replace mitochondria
 - (D) Remove toxins

63. The genome of a bacterium is typically :
- (A) Circular, double-stranded DNA
 - Linear, double-stranded RNA
 - (B) Linear, double-stranded RNA
 - (C) Fragmented RNA
 - (D) Histone-wrapped DNA
64. In metagenomic analysis, DNA is typically extracted from :
- (A) Pure cultures
 - (B) Single cells only
 - (C) Environmental samples
 - (D) Protein gels
65. A core concept in synthetic genomics is the use of :
- (A) Restriction enzymes only
 - (B) RNA microarrays
 - (C) Traditional PCR
 - (D) Computer-aided gene design
66. The purpose of functional annotation in genomics is to :
- (A) Add mutations to genes
 - (B) Determine DNA melting point
 - (C) Identify repeat sequences only
 - (D) Predict gene functions and pathways
67. Shotgun sequencing is primarily used in :
- (A) Protein purification
 - (B) Pathogen screening
 - (C) Whole-genome sequencing
 - (D) Antibiotic resistance testing
68. Which database is commonly used for storing and comparing genome sequences ?
- (A) PubChem
 - (B) PDB
 - (C) NCBI GenBank
 - (D) UniProt

69. A plasmid is :
- (A) A small extrachromosomal DNA
 - (B) A small circular genomic DNA
 - (C) A bacterial flagellum
 - (D) A type of phage
70. Comparative genomics helps in understanding :
- (A) RNA folding patterns
 - (B) Metabolic reactions only
 - (C) Similarities and differences in genome content among organisms
 - (D) Protein translation
71. The process of sequencing entire microbial communities is called :
- (A) Transcriptomics
 - (B) Proteomics
 - (C) Metagenomics
 - (D) Genotyping
72. A key difference between bacterial and eukaryotic genomes is that bacterial genomes generally lack :
- (A) DNA
 - (B) Genes
 - (C) Introns
 - (D) Regulatory elements
73. Which organism is commonly used as a model in microbial genomics ?
- (A) *Homo sapiens*
 - (B) *Bacillus anthracis*
 - (C) *Escherichia coli*
 - (D) *Drosophila melanogaster*
74. Which of the following is NOT a goal of comparative genomics ?
- (A) Identify conserved genes across species
 - (B) Understand evolutionary relationships
 - (C) Predict gene function
 - (D) Produce antibiotics directly

75. Synthetic genomics involves :
- (A) Assembling genomes from chemically synthesized DNA fragments
 - (B) Deleting introns from eukaryotic DNA
 - (C) Analyzing natural mutations
 - (D) Studying RNA processing
76. Which of the following technologies is central to metagenomics ?
- (A) Western blotting
 - (B) Microscopy
 - (C) High-throughput DNA sequencing
 - (D) Thin-layer chromatography
77. The human microbiome project primarily focuses on :
- (A) Mapping viral pathogens
 - (B) Studying non-human species
 - (C) Cataloging microbial communities associated with the human body
 - (D) Developing antibiotics
78. Bacterial metagenomics involves :
- (A) Culturing rare bacterial strains
 - (B) Studying mixed microbial communities via DNA sequencing
 - (C) Only viral genome sequencing
 - (D) Human cell DNA profiling
79. The term “chromid” refers to :
- (A) A bacterial plasmid with essential genes
 - (B) A protein coding enzyme
 - (C) A viral capsid protein
 - (D) A DNA fragment used in CRISPR
80. Prokaryotic genome organization is typically :
- (A) Linear and histone-packed
 - (B) Circular and nucleoid-based
 - (C) Found in a membrane-bound nucleus
 - (D) Polyploid and RNA-based

81. **Assertion (A)** : MEGA software is commonly used for phylogenetic analysis of microbial sequences.

Reason (R) : It allows construction of evolutionary trees based on sequence alignment data.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

82. **Assertion (A)** : Penicillin is classified as a secondary metabolite.

Reason (R) : It is not essential for microbial growth but provides ecological advantage.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

83. **Assertion (A)** : Primary metabolites are mainly produced during the exponential phase of growth.

Reason (R) : They are directly linked to biosynthetic processes required for cell division.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

84. **Assertion (A)** : Microbial biotechnology improves taste, texture, and shelf-life of food products.

Reason (R) : Microorganisms produce enzymes and metabolites that modify food properties.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

85. **Assertion (A)** : Genome annotation involves identifying coding regions and assigning gene functions.

Reason (R) : Annotation helps in interpreting raw sequence data into biologically meaningful information.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

86. **Assertion (A)** : Ribosomal RNA sequencing is widely used for classification of food spoilage organisms.

Reason (R) : rRNA genes evolve rapidly and are highly variable across species.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

87. **Assertion (A)** : The RDP database provides curated ribosomal RNA sequence data.

Reason (R) : Ribosomal RNA sequences are ideal for studying microbial diversity and taxonomy.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

88. **Assertion (A)** : Both 16S rRNA and 18S rRNA genes are used as phylogenetic markers.

Reason (R) : These genes are highly conserved across all domains of life with species- specific variations.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

89. **Assertion (A)** : Microchip synthesis is a major application of microorganisms in healthcare.

Reason (R) : Microorganisms are primarily used for producing biological molecules like antibiotics and hormones.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is false but **R** is true
- (D) **A** is false and **R** is false

90. **Assertion (A)** : Microbial genomics involves sequencing and analysis of entire microbial genomes.

Reason (R) : It helps in understanding gene function, evolution, and metabolic potential.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

91. **Assertion (A)** : Fermented foods like yogurt and cheese are products of microbial activity.

Reason (R) : Microorganisms convert substrates into desirable products through metabolic processes.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

92. **Assertion (A)** : Secondary metabolites have applications such as antibiotics and pigments.

Reason (R) : These compounds are primarily involved in microbial growth and reproduction.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

93. **Assertion (A)** : Microbial biotechnology contributes to biofuel production, pharmaceuticals, and agriculture.

Reason (R) : Microorganisms can be engineered to perform diverse biochemical transformations.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

94. **Assertion (A)** : 18S rRNA sequencing is commonly used for phylogenetic studies in eukaryotic microorganisms.

Reason (R) : 16S rRNA is absent in eukaryotic cytoplasmic ribosomes.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

95. **Assertion (A)** : Primary metabolites are produced in large quantities and are essential for cell survival.

Reason (R) : They are synthesized only under stress conditions to enhance microbial adaptability.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

96. **Assertion (A)** : The Ribosomal Database Project (RDP) is used for comparative analysis of microbial sequences

Reason (R) : RDP primarily focuses on ribosomal RNA gene sequences such as 16S rRNA.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

97. **Assertion (A):** 16S rRNA sequencing is a standard method for phylogenetic classification of prokaryotes

Reason (R) : The 16S rRNA gene contains both conserved and variable regions useful for evolutionary analysis.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

98. **Assertion (A) :** Penicillin is widely used as a therapeutic agent in healthcare.

Reason (R) : Penicillin is a secondary metabolite produced during active microbial growth.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

99. **Assertion (A) :** Secondary metabolites are typically synthesized during the stationary phase of microbial growth.

Reason (R) : Nutrient limitation and stress conditions trigger the biosynthesis of non-growth-associated compounds.

- (A) Both **A** and **R** are true and **R** is the correct explanation
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

100. **Assertion (A) :** Ethanol is classified as a primary metabolite in microbial fermentation.

Reason (R) : Primary metabolites are directly associated with active growth and are produced during the exponential phase.

- (A) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (B) Both **A** and **R** are true but **R** is not the correct explanation
- (C) **A** is true but **R** is false
- (D) **A** is false but **R** is true

(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 छँटना 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।