R2812

Sub. Code
530201

M.Sc. DEGREE EXAMINATION, APRIL – 2025

Second Semester

Microbiology

MOLECULAR BIOLOGY AND MICROBIAL GENETICS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following questions by choosing the correct option.

1. Nucleoside is composed of (CO1, K2)
   (a) Base + sugar + phosphate
   (b) Base + phosphate
   (c) Base + sugar
   (d) Sugar + phosphate

2. Which of the following has the highest percentage of modified bases? (CO1, K3)
   (a) tRNA (b) hnRNA
   (c) snRNA (d) mRNA

3. Ames test is based on a reversion of mutation in the _____ operon in the genetically altered strains of *Salmonella typhimurium*. (CO2, K2)
   (a) Lactose (lac) (b) Tryptophan (trp)
   (c) Arabinose (ara) (d) Histidine (his)

4. X-rays causes mutation by (CO2, K3)
   (a) Deletion (b) Transition
   (c) Transversion (d) Base substitution

5. Which of the following is incorrect feature of mRNA processing? (CO3, K3)

(a) 5 ‘ Capping

(b) Exons are removed and introns are ligated

(c) Polyadenylation

(d) Histone mRNAs lack 5’ cap

6. Which of the following snRNAs pair to form the catalytic active site during pre- mRNA splicing (CO3, K4)

(a) U1 – U2 (b) U6 – U4

(c) U6 – U2 (d) U5 – U4

7. On the ribosomes mRNA binds (CO4, K3)

(a) Between the subunits

(b) To the larger subunits

(c) To the smaller subunit

(d) None of the above

8. Protein synthesis rates in prokaryotes are limited by the rate of mRNA synthesis. If RNA synthesis occurs at the rate 50 nucleotides/ second, then rate of protein synthesis approximately occurs at (CO4, K4)

(a) 10 amino acids/second

(b) 17 amino acids/second

(c) 25 amino acids/second

(d) 50 amino acids/second

9. Which of the following is true for an Hfr × F cross (CO5, K3)

(a) Frequency of recombination high, transfer of F factor high

(b) Frequency of recombination high, transfer of F factor low

(c) Frequency of recombination low, transfer of F factor high

(d) Frequency of recombination low, transfer of F factor low

10. Which phase of growth does the recipient cell take up the donor DNA (CO1, K4)

(a) Lag phase

(b) Early logarithmic phase

(c) Late logarithmic phase

(d) Stationary phase

Part B ($5 \times 5 = 25$)

Answer **all** the following questions not more than 500 words each.

11. (a) Explain briefly the structure of DNA. (CO1, K2)

Or

(b) Elucidate how the structure of prokaryotic ribosome is adopted for protein synthesis. (CO1, K3)

12. (a) Describe causes of DNA damage (CO2, K2)

Or

(b) Write a brief note on chemical mutagens. (CO2, K2)

13. (a) Analyse the events in leading and lagging strands of DNA at replication fork. (CO3, K3)

Or

(b) What are the objective and inferences of Meselson and Stahl's experiment? (CO3, K2)

14. (a) Explain post translational modification of polypeptides (CO4, K2)

Or

(b) Describe the role of tRNA in protein synthesis. (CO4, K3)

15. (a) Differentiate Homologous and site specific recombination. (CO4, K3)

Or

(b) Briefly describe types of natural genetic recombination. (CO5, K2)

Part C (5 × 8 = 40)

Answer **all** the questions, not more than 1000 words each

16. (a) Elaborate properties and types of plasmids. (CO1, K2)

Or

(b) Explain types, forms and properties of DNA. (CO1, K3)

17. (a) Discuss base substitution mutation. (CO2, K2)

Or

(b) Explain different DNA repair mechanism in prokaryotes (CO2, K2)

18. (a) Explain in detail the process of transcription in prokaryotes. (CO3, K3)

Or

(b) Describe replication in plasmid by rolling circle and theta mode. (CO3, K3)

19. (a) What is an operon? Discuss its regulatory role in Lac operon. (CO4, K3)

Or

(b) Polypeptide synthesis is interplay of mRNA, tRNA, rRNA and ribosomes. Justify the statement. (CO4, K5)

20. (a) Explain generalised and specialised transduction. (CO5, K2)

Or

(b) Write an essay on Holliday model of recombination. (CO5, K2)

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R2813

Sub. Code
530202

M.Sc. DEGREE EXAMINATION, APRIL – 2025

Second Semester

Microbiology

rDNA TECHNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Lambda PL promoter is used in which vectors? (CO1, K3)
   (a) Cloning vector
   (b) Expression vector
   (c) Both cloning and expression vector
   (d) Bacteriophage Mu

2. T7 promoter is specific for the (CO1, K3)
   (a) Mutant strains (b) Bacteriophage
   (c) RNA polymerase (d) DNA polymerase

3. Which of the following vectors are widely used in HGP? (CO2, K2)
   (a) Pasmid and cosmid
   (b) Lambda phage and M13 vectors
   (c) Phagemid and shuttle vectors
   (d) BAC and YAC

4. According to HGP, genetic similarity between all human is (CO2, K2)

(a) 90% (b) 95%

(c) 99.5% (d) 99.99%

5. Why Vent polymerase and Pfu polymerase is more efficient than the *Taq* polymerase? (CO3, K4)

(a) Proof reading ability

(b) Efficient polymerase activity

(c) Thermostability

(d) None of the above

6. Automated DNA sequencing is an improvement of Sanger's method where (CO3, K3)

(a) ddNTPs are used for chain termination

(b) PCR is used for making sequencing templates

(c) Fluorescently labelled dNTPs are used for chain termination

(d) Fluorescently labelled ddNTPs are used for chain termination

7. The mel gene for melanin biosynthesis in *E. coli* were derived from (CO4, K2)

(a) *Curvularia lunata*

(b) *Rhizobium etli*

(c) *Klebsiella pneumoniae*

(d) *Pseudomonas stutzeri*

8. A bioplimer is a polimer that is which steroid is used for microbial transformation (CO4, K1)

(a) Always biodegradable

(b) Always non biodegradable

(c) Made directly from animals

(d) A plastic

9. Introduction of new gene through Ti plasmid should be done in _____. (CO5, K2)

(a) Fully grown plant (b) Callus

(c) Sapling (d) Germ cells

10. What is introduced into lymphocytes to cure ADA deficient SCID? (CO5, K3)

(a) ADA DNA (b) RNA

(c) ADA cDNA (d) ADA mRNA

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Write a note on plasmid vector pBR 322. (CO1, K2)

Or

(b) Explain the role of SV 40 as a gene cloning viral vector for animals. (CO1, K2)

12. (a) Explain how genomic DNA libraries are created using rDNA. (CO2, K2)

Or

(b) Discuss principle, method and applications of western blotting. (CO2, K3)

13. (a) How primers are designed for PCR? (CO3, K4)

Or

(b) Explain Sanger's method of gene sequencing. (CO3, K2)

14. (a) Describe method of producing human insulin through rDNA technology. (CO4, K2)

Or

(b) How xanthum gum are produced using *Xanthomonas* species. (CO4, K2)

15. (a) Write a note on the role of Ti plasmids in generation of herbicide and insect resistant plant (CO5, K2)

Or

(b) Describe gene therapy methods (CO5, K2)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Write a detailed description of DNA modifying enzymes. (CO1, K2)

Or

(b) Explain what shuttle vectors are? Add a note on phasmids and cosmids. (CO1, K2)

17. (a) Describe in brief about construction and applications of cDNA libraries. (CO2, K3)

Or

(b) Describe principle, method and applications of Southern and Northern blotting. (CO2, K3)

18. (a) Elaborate the different variants of PCR. (CO3, K3)

Or

(b) Discuss automated sequencing and Microarray techniques. (CO3, K4)

19. (a) Describe how HBsAg is produced in yeast by recombinant technique. (CO2, K2)

Or

(b) Explain in detail biosteroid transformation. (CO4, K2)

20. (a) Write an essay on direct DNA delivery method. (CO5, K2)

Or

(b) What is antisense RNA? What is its role in recombinant DNA technology? (CO3, K4)

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R2814

Sub. Code
530203

M.Sc. DEGREE EXAMINATION, APRIL – 2025

Second Semester

Microbiology

FOOD MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. What is the primary cause of food spoilage in moist environments? (CO1, K1)

   (a) Airborne bacteria

   (b) Mold growth

   (c) Psychrotrophic microorganisms

   (d) Enzymatic activity

2. What is a common factor influencing contamination by microorganisms in the atmosphere and soil? (CO1, K1)

   (a) Nutrient content

   (b) Temperature

   (c) Proximity to exposed food surfaces

   (d) Water activity

3. Which intrinsic factor affects microbial growth by determining the availability of hydrogen ions? (CO2, K2)

(a) Nutrient content (b) Water activity

(c) pH (d) Redox potential

4. Which of the following combinations would be most effective in controlling microbial growth in processed foods? (CO2, K2)

(a) High pH and low water activity

(b) Low temperature and reduced oxygen atmosphere

(c) High nutrient content and high relative humidity

(d) High redox potential and high temperature

5. What is the primary role of chemical preservatives in food preservation? (CO3, K4)

(a) Reduce food pH

(b) Enhance flavor

(c) Inhibit microbial growth

(d) Increase food temperature

6. Which standard is most comprehensive for ensuring microbiological quality in food production? (CO3, K4)

(a) AGMARK (b) ISI

(c) HACCP (d) FDA

7. What is the main microorganism used in the production of yogurt? (CO4, K5)

(a) *Lactobacillus acidophilus*

(b) *Streptococcus thermophilus*

(c) *Leuconostoc mesenteroides*

(d) *Saccharomyces cerevisiae*

8. Which group of bacteria is primarily responsible for spoilage in raw milk stored at low temperatures? (CO4, K5)

(a) Mesophilic bacteria

(b) Psychrotrophic bacteria

(c) Thermophilic bacteria

(d) Thermoduric bacteria

9. Which foodborne pathogen is most commonly associated with foodborne illness outbreaks linked to unpasteurized dairy products? (CO5, K6)

(a) *Salmonella* (b) Norovirus

(c) *E. coli* (d) Hepatitis A virus

10. Which microorganism is primarily responsible for the spoilage of fruits and vegetables? (CO5, K6)

(a) *Salmonella*

(b) *Penicillium*

(c) *Lactobacillus*

(d) *Clostridium botulinum*

Part B ($5 \times 5 = 25$)

Answer **all** questions not more than 500 words each.

11. (a) Explain the principles of food preservation methods used to prevent microbial growth. (CO1, K3)

Or

(b) Outline the factors contributing to food spoilage. (CO1, K2)

12. (a) Explain briefly on the buffering capacity and water activity to determine microbial growth in specific food types. (CO2, K3)

Or

(b) Critically analyze the temperature variations which influence the microbial survival and growth during food processing and storage. (CO2, K3)

13. (a) Define aseptic packaging and list its primary advantages in food preservation. (CO3, K1)

Or

(b) Summarize the principles behind mano-thermo-sonication in microbial inactivation. (CO3, K2)

14. (a) Describe the microbial process involved in the production of kefir. (CO4, K2)

Or

(b) Analyze the prevention of microbial contamination during the storage and transportation of raw milk. (CO4, K3)

15. (a) Describe the impact of *Clostridium botulinum* on food safety and the methods used for its prevention. (CO5, K2)

Or

(b) Examine the effects of aflatoxicosis and its sources in food. (C05, K4)

Part C (5 × 8 = 40)

Answer **all** questions, not more than 1000 words each

16. (a) Compare and contrast the roles of soil and water microorganisms in food spoilage. (CO1, K2)

Or

(b) Discuss the importance of microbiological quality assurance in ensuring food safety. (CO1, K2)

17. (a) Summarize the relationship between pH, nutrient content and antimicrobial barriers in microbial growth. (CO2, K2)

Or

(b) Compare the roles of relative humidity and gaseous atmosphere in controlling microbial activity in foods. (CO2, K2)

18. (a) Explain in detail on the different heat processing methods used in food preservation and their impact on microbial inactivation. (CO3, K3)

Or

(b) Elaborate the role of FDA and HACCP standards in ensuring microbiological quality in food production. (CO3, K4)

19. (a) Discuss the morphological and biochemical characteristics of psychrotrophic, mesophilic, thermoduric, and thermophilic bacteria found in raw milk. (CO4, K2)

Or

(b) Explain the microbial fermentation process involved in cheese production and describe its types. (CO4, K3)

20. (a) Categorize the microbial causes of food spoilage in meat and meat products. (CO5, K4)

Or

(b) Summarize the role of viral pathogens in foodborne diseases with their symptoms and prevention. (CO5, K2)

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R2815

Sub. Code
530503

M.Sc. DEGREE EXAMINATION, APRIL – 2025

Second Semester

Microbiology

Elective : AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective questions by choosing the correct option.

1. The process of converting atmospheric nitrogen into usable form by plants is called: (CO1, K1)
   (a) Nitrification (b) Denitrification
   (c) Nitrogen fixation (d) Ammonification
2. Arbuscular mycorrhizal fungi (AMF) benefit plants by: (CO1, K3)
   (a) Fixing nitrogen
   (b) Protecting roots from pathogens
   (c) Breaking down organic pollutants
   (d) Producing growth hormones
3. The mode of action of *Bacillus thuringiensis* (Bt) toxins involves : (CO2, K3)
   (a) Paralyzing the insect nervous system
   (b) Disrupting the insect gut lining
   (c) Inhibiting insect reproduction
   (d) Attracting predatory insects

4. Which plant pathogen causes late blight in potatoes? (CO2, K3)

(a) *Phytophthora infestans*

(b) *Fusarium oxysporum*

(c) *Rhizoctonia solani*

(d) *Pseudomonas syringae*

5. Which process in the nitrogen cycle converts nitrates into nitrogen gas? (CO3, K3)

(a) Nitrogen fixation (b) Nitrification

(c) Denitrification (d) Ammonification

6. In the sulfur cycle, the process of releasing sulfur dioxide into the atmosphere primarily occurs through: (CO3, K2)

(a) Photosynthesis (b) Volcanic activity

(c) Nitrogen fixation (d) Decomposition

7. Which marine organism is a key species in maintaining the health of coral reefs? (CO4, K3)

(a) Sharks (b) Sea turtles

(c) Coral polyps (d) Jellyfish

8. In which aquatic habitat are mangrove forests typically found? (CO4, K3)

(a) Freshwater lakes (b) Rivers

(c) Coastal wetlands (d) Deep ocean trenches

9. The method to control sludge bulking in wastewater treatment plants is: (CO5, K2)

(a) Chlorination (b) Coagulation

(c) Aeration (d) Denitrification

10. Which of the following is NOT a product of pyrolysis? (CO5, K3)

(a) Char (b) Syngas

(c) Bio-oil (d) Compost

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Explain Commensalism with example. (CO1, K2)

Or

(b) Illustrate Mycorrhiza with examples. (CO1, K2)

12. (a) Elaborate symptoms and control measures of bacterial diseases on Citrus plants. (CO2, K5)

Or

(b) Give a detailed note on Trichoderma as a bioinsecticide. (CO2, K2)

13. (a) Illustrate the importance of Carbon Cycle with diagrams. (CO3, K3)

Or

(b) Elaborate Phosphorus Cycle. (CO3, K5)

14. (a) Explain the factors affecting the microbial growth in aquatic habitats. (CO4, K5)

Or

(b) Write a note on the vertical zonation of marine ecosystem. (CO4, K3)

15. (a) List out the methods in treating solid waste management. (CO5, K4)

Or

(b) Give a detailed note on Biological waste treatment. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Comment on the positive microbial interaction on Microbes. (CO1, K4)

Or

(b) Give a detailed account on the microbial interactions with plants. (CO1, K4)

17. (a) Elaborate the chemical defence mechanism in plants against pathogens. (CO2, K5)

Or

(b) List out the various bioinsecticides used in agriculture. (CO2, K4)

18. (a) Explain Sedimentary Cycles in nature with diagrams. (CO3, K4)

Or

(b) Describe the molecular mechanism of biological nitrogen fixation. (CO3, K5)

19. (a) Differentiate the abiotic factors determining the aquatic and marine ecosystem. (CO4, K4)

Or

(b) Give a detailed account on the biotic and abiotic components of Estuaries and its ecological importance. (CO4, K6)

20. (a) Explain in detail on liquid waste treatment. (CO5, K4)

Or

(b) Elaborate on various methods followed in solid waste treatment. (CO5, K6)

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R2816

Sub. Code
530401

M.Sc. DEGREE EXAMINATION, APRIL – 2025

Fourth Semester

Microbiology

APPLIED MICROBIOLOGY – II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective questions by choosing the correct option.

1. What is the primary source of mineral water? (CO1, K1)

   (a) Lakes

   (b) Oceans

   (c) Underground springs

   (d) Rivers

2. Which government body regulates mineral water quality in many countries? (CO1, K3)

   (a) FDA (b) WHO

   (c) EPA (d) Local Municipalities

3. What is the purpose of a biological indicator in sterilization? (CO2, K1)

   (a) Monitor the pH of a solution

   (b) Test for preservative effectiveness

   (c) Validate sterilization processes

   (d) Enumerate microorganisms

4. Which test evaluates the total microbial load in a product? (CO2, K3)

(a) Sterility Testing

(b) Microbial Enumeration Test

(c) Antimicrobial Effectiveness Testing

(d) HACCP Validation

5. Which of the following methods is used to detect endotoxins? (CO3, K3)

(a) Chromatography

(b) Gel clot assay

(c) Mass spectrometry

(d) ELISA

6. Mycoplasma contamination in cell culture is primarily detected by: (CO3, K4)

(a) Gram staining (b) Turbidimetric methods

(c) PCR-based assays (d) Antibiotic disc diffusion

7. Which equipment is used for generating high-intensity light pulses? (CO4, K4)

(a) LED panels (b) Xenon flash lamps

(c) Fluorescent bulbs (d) Mercury vapor lamps

8. Which of the following is an automated method for microorganism detection in food? (CO4, K4)

(a) Plate count method

(b) ELISA

(c) Microscopic observation

(d) Gram staining

9. Which of the following is a rapid method for assessing microbial quality in marine foods? (CO5, K5)

(a) Plate counting (b) Flow cytometry

(c) Serial dilution (d) Membrane filtration

10. What does the LAL (Limulus Amebocyte Lysate) test detect in food samples? (CO5, K5)

(a) DNA contamination

(b) ATP content

(c) Endotoxins

(d) Radioactive elements

Part B ($5 \times 5 = 25$)

Answer **all** questions not more than 500 words each.

11. (a) List the Faecal indicator organisms present in water. (CO1, K2)

Or

(b) Differentiate between MPN test and membrane filtration technique for mineral water quality assessment. (CO1, K4)

12. (a) List the key components of an HACCP plan. (CO2, K5)

Or

(b) Explain the role of chemical preservatives in raw materials and finished products. (CO2, K2)

13. (a) Describe the procedure of the disc diffusion assay for antibiotic susceptibility testing. (CO3, K3)

Or

(b) Explain the risk assessment process for endotoxin activity in parenteral manufacturing. (CO3, K4)

14. (a) List and describe two conventional and two automated methods for detecting microorganisms in food. (CO4, K3)

Or

(b) How is quality control maintained in the processing of fruits and vegetables? (CO4, K3)

15. (a) Describe the working principle of reflective calorimetry in assessing microbial quality in marine foods. (CO5, K4)

Or

(b) Explain the applications of additives in food. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Define the water quality analysis and explain the chemical parameters of water quality analysis. (CO1, K4)

Or

(b) Explain the stages of mineral water production. (CO1, K6)

17. (a) What is a microbial risk assessment, and how is it implemented in an HACCP plan? (CO2, K3)

Or

(b) Explain sterility testing, antimicrobial effectiveness testing, and their importance in product safety. (CO2, K6)

18. (a) Describe the method and significance of a vitamin assay in biological testing. (CO3, K4)

Or

(b) Discuss the principles and applications of chromogenic methods. (CO3, K5)

19. (a) Explain the risk assessment methods in food industry. (CO4, K4)

Or

(b) Elaborate the effect of light pulses on foods and microorganisms. (CO4, K3)

20. (a) Explain how barcodes enhance efficiency in the food industry's supply chain. (CO5, K4)

Or

(b) Discuss the DNA-based methods for microbial detection, and why are they significant? (CO5, K4)

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