S.S. Jain Subodh P.G. College, Jaipur (Autonomous)
M. Sc. Microbiology Semester I
Assignment Oct. 2025

Paper-I
General Microbiology

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q.1 Write a detailed note on the contribution of Louis Pasteur, Robert Koch, Paul Ehrlich, and Alexander Flaming in the field of microbiology.

Q. 2 Write short notes on:

a. Applications of Microbiology in various fields.
b. Martinus Beijerinck and Sergei Winogradsky

UNIT-II

Q. 3. Write notes on: (Any Two)

a. Numerical and Polyphasic Taxonomy
b. Biochemical, Serological and Molecular characters used in Taxonomy
c. Nucleic acid hybridization

Q.4. Write notes on: (Any Two)

a. Five Kingdom Classification
b. 16 S rRNA Sequencing
c. % G+C Content

UNIT-III

Q. 5. Explain general characteristics of eukaryotic microorganism.

Q.6. Write notes on: (Any two):

a. Viroids and virusoids
b. General characters of Protozoa
c. Archaea

UNIT-IV

Q. 7. Write a note on general characteristics and economic importance of algae.

Q. 8 Write notes on:

a. Rhizopus and Penicillium
b. Saccharomyces and Agaricus.

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Paper-II
Bioinstrumentation and Microbial Techniques

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Write a detail note on various types of sterilization methods with diagram.

Q2. Write short note on the following:

(a) Method for Isolation of Pure culture
(b) Autoclave and Laminar air flow hood

UNIT-II

Q3. What do you mean by staining? Write detail note on various microbial staining methods in detail.

Q4. Write short note on the following:

(a) Maintenance and preservation of Culture
(b) PCR and RAPD

UNIT-III

Q5. What do you mean by centrifugation? Write detail note on various types of centrifugation methods.

Q6. Write short note on the following:

(a) SEM & TEM (Electron microscope).
(b) Spectrophotometer and its applications

UNIT-IV

Q**7** What do you mean by chromatography technique? Write detail note on various types of chromatography methods and its applications.

Q8. Write short note on the following:

(a) GCMS and its applications
(b) Electrophoresis and its applications

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Paper-III
Microbial Biochemistry and Physiology

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Explain the mechanisms of nutrient transport in microbes, including diffusion, active transport, and group translocation. How do these processes differ in energy requirement and specificity?

Q2. Write short note on:
(a) Triglycerides
(b) Nutritional categories of microbes.

UNIT-II

Q3. What are amino acids and its classification with structures in details.

Q4. Explain the classification and properties of enzymes. Compare the lock-and-key and induced-fit models of enzyme action.

UNIT-III

Q5. Explain the light and dark reactions in bacterial photosynthesis. How is the photosynthetic electron transport system organized in these organisms?

Q6. Write short note on the following:
(a) Gluconeogenesis
(b) Oxidative Phosphorylation

UNIT-IV

Q**7.** Explain the mechanisms of nitrogen fixation in symbiotic and free-living bacteria. How are oxygen and hydrogen regulated during this process?

Q8. Write short note on the following:

(a) Formation of bacterial spores
(b) Ammonifying bacteria

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Paper-IV
Food and Dairy Microbiology

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Explain the types of food spoilage. Discuss the microorganisms involved in food microbiology.

Q2. Write short note on:
(a.) Spoilage of milk
(b.) Extrinsic and Intrinsic factors.

UNIT-II

Q3. Explain in detail the production of Sauerkraut and bread.

Q4. Describe different enzymes of microbial origin.

UNIT-III

Q5. Explain the microbiology of raw milk and processed milk.

Q6. Write short note on the following:
(a.) Starter culture of Fermented milk
(b.) Probiotics and prebiotics

UNIT-IV

Q**7.** Describe in detail about the control and treatment of dairy waste.

Q8. Write short note on the following:

(a.) MBRT
(b.) SPC

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Paper-I

Virology

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Give a detailed account of the replication cycle of viruses. Compare replication strategies of DNA and RNA viruses with examples.

Q2. Explain the methods of cultivation of viruses with emphasis on embryonated eggs and cell culture systems.

UNIT-II

Q3. Explain the lytic and lysogenic cycles of bacteriophages in detail. .

Q4.What is bacteriophage typing? Explain its principle, methodology, and applications in bacterial genetics.

UNIT-III

Q5. Write a detailed note on the histological, physiological, and cytological changes caused by plant viruses

Q6. Discuss the life cycle, pathogenicity, and treatment of human RNA and DNA viruses.

UNIT-IV

Q7. Explain the principle and applications of serological methods in viral diagnosis with special reference to hemagglutination and complement fixation tests.

Q8. Describe various physical, chemical, and biological methods used for assay of viruses. Discuss plaque assay and end point dilution method in detail.

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Paper-II

Environment and Agricultural Microbiology

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Give a detailed account of the Microbial degradation of herbicides and pesticides.

Q2. Write short note on:

a) GMO and their impact
b) Biodeterioation of buildings and monuments

UNIT-II

Q3. Explain the process of wastewater treatment. .

Q4. Explain the monitoring of environmental process with biosensors & biological indicators.

UNIT-III

Q5. Write a detailed note on the microbial fertilizers.

Q6. Discuss the commercial production of bio pesticides with reference to *Bacillus thuringenesis*.

UNIT-IV

Q7. Explain the pathology, etiology and control of wheat (Rust, smut) and and paddy (Blast).

Q8. Describe various methods of management and storage of agricultural products.

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Paper III Elective -A

Genetic Engineering

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

Unit-I

Q 1. Write a detailed note on enzymes used in recombinant DNA technology.

Q 2. Write short note on the following:
(a) Linkers and their application.
(b) Homo-polymer tailing.

Unit-II

Q 3. Explain screening of genomic library by shot gun approach.

Q 4. Write short notes on the following:
(a) Promoters and expression cassettes.
(b) YAC vectors

Unit-III

Q 5. Write a note on medical and agricultural applications of genetic engineering.

Q 6. Write short note on the following:
(a) Plaque hybridization.
(b) CRISPAR-Cas technology and its application.

Unit-IV

Q 7. Write a detailed note on Sanger method of DNA sequencing.

Q **8**. Write short note on the following:
(a) Polymerase Chain Reaction
(b) DNA microarrays.

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Paper-III Elective B

Pharmaceutical Microbiology

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Explain the importance and scope of pharmaceutical microbiology.

Q2. Write short note on:

a. Antibiotics: types and modes of action
b. Disinfectant and antiseptics

UNIT-II

Q3. What do you mean by antibiotic resistance? Write detail note on the development of antibiotic resistance.

Q4. Write short note on the following:

a) Inhibitors of cell wall synthesis
b) How antimicrobial substance reach the targets.

UNIT-III

Q5. Explain the microbial production of streptokinase and streptodornase.

Q6. Write short note on the following:

a. DNA vaccines
b. Spoilage of pharmaceutical products.

UNIT-IV

Q7. What are the quality assurance and quality management in pharmaceuticals?

Q8. Write short note on the following:

a. D- value and Z value
b. Algal biomas

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Paper-IV Elective A

Microbes in Sustainable Development

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Explain the concept of induced systemic resistance (ISR) and how it contributes to plant disease management. List examples of microorganisms known to induce ISR in plants.

Q2. Write short note on:

a) Bioinsecticides and bio weedicides
b) Soil as microbial habitat

UNIT-II

Q3. What do you mean by greenhouse gases? Write detail note on the production and control of methane gas**.** .

Q4. Write short note on the following:

a) Mineralization of Lignocellulose
b) Role of nitrifying and denitrifying bacteria in nitrogen cycle.

UNIT-III

Q5. Compare and contrast symbiotic and non-symbiotic biofertilizers in terms of their mechanisms of action, benefits to plants, and application methods. Discuss with examples.

Q6. Write short note on the following:

a) GM crops
b) Biotech feed

UNIT-IV

Q7. What do you mean by xenobiotic compounds? Write detail note on the role of microbes in the removal of xenobiotics from the contaminated sites.

Q8. Write short note on the following:

a) Bioethanol Production
b) Algal biomass

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Paper-IV Elective B

Fungal Biotechnology and Bioprospecting

Students are required to attempt 4 questions (one question from each unit). Write answers in at least 500 words with good presentation. Each question carries **7.5** marks.

UNIT-I

Q1. Explain primary and secondary metabolites of fungi. Classify secondary metabolites with examples.

Q2. Discuss industrially important fungal strains and their applications.

UNIT-II

Q3. Explain fungal biotechnological processes. Describe the principles of fermenter design and operation. .

Q4. Explain the formulation of fermentation medium and analysis of fermentation products.

UNIT-III

Q5. Write a detailed account on mycoproteins.

Q6. Discuss agriculture applications of fungi with special reference to fungal biofertilizers and biopesticides

UNIT-IV

Q7. Explain the production of citric acid from fungi

Q8. Describe the production of antibiotics from fungi.