

**S.S. Jain Subodh P.G. College, Jaipur (Autonomous)**  
**M. Sc. Microbiology Semester II**

**Assignment March 2026**

**Paper-I**

**Bacteriology**

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 an explanatory note on cell wall of gram positive and gram negative bacteria with detail diagram. **7.5**
- Q. 2** Write short notes on - **(3.5+4=7.5)**
- a) Capsule: structure and function.
  - b) Bergey's Manual of Bacteriology.

**UNIT-II**

- Q.3** Explain the general and special characteristics of archaeal cell structure and compare it with eubacteria cell. **7.5**
- Q. 4** Write detailed account of thermophiles and methanogens. **7.5**

**UNIT-III**

- Q.5** Explain in detail account of oxygenic and anoxygenic photosynthetic bacteria with suitable examples. **7.5**
- Q.6** Write an explanatory note on magnetotactic, budding, gliding bacteria. Also write about chemolithotrophs. **7.5**

**UNIT-IV**

- Q. 7** Write a detail note on growth curve and various factors influencing growth of microorganisms. **7.5**
- Q. 8** Write detail note on various mode of reproduction in bacteria. **7.5**

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**Paper-II**

**Molecular Biology and Microbial Genetics**

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**

1. Describe the structure and biochemical composition of DNA and RNA with suitable diagrams. **7.5**
2. Discuss the nature, properties and replication of plasmids, and describe types of bacterial transposons and their applications. **7.5**

**UNIT-II**

3. Describe transcription in prokaryotes and eukaryotes and discuss post-transcriptional modifications. **7.5**
4. Explain the classes of RNA molecules and their processing. **7.5**

**UNIT-III**

5. Describe the regulation of the trp operon. Explain the mechanism of repression and attenuation. **7.5**
6. Describe molecular basis of mutation and outline DNA damage and repair mechanisms. **7.5**

**UNIT-IV**

7. Describe bacterial transformation in detail. Also, explain the concepts of competency. **7.5**
8. Describe bacterial conjugation. Explain the role of the sex factor (F factor) and describe  $F^+ \times F^-$  and Hfr transfer. **7.5**

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**Paper-III**

**Microbial Ecology**

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. Define plant succession? Give a detailed account of the sequential stages of a typical hydrosere. **7.5**

Q. 2. Write notes on: **(3+4.5 =7.5)**

- a. Ecological pyramid.
- b. Food chain and food web.

**UNIT-II**

Q3. Write notes on: **(3+4.5 =7.5)**

- a. Gause's and Hardin's principles of competition.
- b. Lichens.

Q. 4. Write a detail note on beneficial interaction of microbes with plants. **7.5**

**UNIT-III**

Q.5. Write notes on: **(3.5+4 =7.5)**

- a. Algal bloom, their effects and toxicity.
- b. Nitrogen cycle.

Q. 6. What is Eutrophication? Write about the causes of eutrophication. And also mention the microbial changes in eutrophic bodies of water induced by various inorganic pollutants. **7.5**

**UNIT-IV**

Q7. What are the various water-borne diseases arising due to faecal pollution? Mention the indicator organisms. **7.5**

Q.8. Explain aeroallergy and aeroallergens. Write a detailed note on various factors affecting microbial community in soil. **7.5**

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**Paper- IV**

**Medical 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. Discuss the Normal microbial flora of skin and mouth with their role in detail. **7.5**

Q2. Write short notes on following: **(4+3.5=7.5)**

- a) Principles of classification of medically important microorganisms.
- b) Antimicrobial host defense mechanisms.

**UNIT-II**

Q3. Describe about general characteristic, morphology, pathogenicity, diagnosis and treatment of disease caused by *Treponema pallidum*. **7.5**

Q4. Write short notes on following: **(4+3.5=7.5)**

- a) *Vibrio*
- b) *Shigella*

**UNIT-III**

Q5. Discuss the structure, reproduction, pathogenicity, diagnosis and treatment of disease caused by *Trychophyton*. **7.5**

Q6. Write short notes on following: **(4+3.5=7.5)**

- a) *Sporothrix schenckii*.
- b) *Cryptococcus neoformans*.

**UNIT-IV**

Q7. Write a detailed note on pathogenesis, diagnosis, epidemiology and treatment of Herpes Virus. **7.5**

Q8. Write short note on following: **(4+3.5=7.5)**

- a). Rubella virus
- b). Hepatitis B virus

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**Paper I**  
**Immunology**

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 Active and passive immunity in detail. **7.5**

Q2. Write short notes on following: **(4+3.5=7.5)**

- a). Phases of Immune response
- b). Hematopoiesis

**UNIT-II**

Q3. Discuss the production of monoclonal Antibodies and their applications. **7.5**

Q4. Write short notes on following: **(4+3.5=7.5)**

- a). ELISA
- b). Western Blotting

**UNIT-III**

Q5. Write a detailed note on Major Histocompatibility Complex. **7.5**

Q6. Write short notes on following: **(4+3.5=7.5)**

- a). Recombinant vaccines
- b). Pathogen Recognition Receptors.

**UNIT-IV**

Q7. Describe in detail about properties, receptors and diseases related to Cytokines. **7.5**

Q8. Write short note on following: **(4+3.5=7.5)**

- a). Grave's disease
- b). T Cell deficiencies

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**Paper II**

**Industrial 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.** Explain in detail about the fermenter design, parts and their functions with suitable diagrams. **7.5**
- Q. 2.** Explain the process of media sterilization. Write a detailed note on Batch culture and continuous culture **7.5**

**UNIT-II**

- Q. 3.** Write detail note on cell harvesting and cell disruption process with diagram. **7.5**
- Q. 4.** Explain various types of chromatography techniques in detail. **7.5**

**UNIT-III**

- Q. 5** Describe in detail the process of industrial production of ethanol. **7.5**
- Q.6.** Write a detail note on immobilization of microbial cell and enzyme and its applications. **7.5**

**UNIT-IV**

- Q.7.** Explain a detailed the production of recombinant vaccine and write its applications. **7.5**
- Q.8.** Give a detail account on industrial applications of microorganism. **7.5**

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**M. Sc Microbiology Semester IV**

**Assignment March- 2026**

**Paper III Elective -A**

**Bioethics, Biosafety and IPR**

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.** Define bioethics. Discuss the moral values and ethical considerations in the use of experimental animals. How do international guidelines regulate animal experimentation? **7.5**
- Q2.** Write short note on the following: **7.5**
- (a) Ethical Implications on Biological Weapons
  - (b) Ethical issues associated with embryonic stem cell research and cloning.

**UNIT -II**

- Q3.** Describe the different biosafety levels (BSL-1 to BSL-4). Provide examples of microorganisms handled at each level. **7.5**
- Q4.** Write short note on the following: **7.5**
- (a) Objectives and significance of the Cartagena Protocol on Biosafety
  - (b) risk management issues related to cross-border movement of germplasm.

**UNIT - III**

- Q5.** Write a note on IPR and its importance with reference to India. **7.5**
- Q6.** Write short note on the following: **7.5**
- (a) Assessment and management risks associated with GMO.
  - (b) Role of regulatory bodies in biosafety committee

**UNIT - IV**

- Q7.** Give a detailed account on Intellectual Property Management. **7.5**
- Q8.** Write short note on the following: **7.5**
- (a) Methods of application of patents
  - (b) Forms of protection (Copyright, Industrial /design and Trademark)

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**M. Sc. Microbiology Semester IV**

**Assignment Mar. 2026**

**Paper-III Elective B**

**Clinical 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.** Discuss the basic principles of specimen collection for microbiological examination, with special reference to blood, sputum, urine, stool, CSF, and vaginal smears. **7.5**

**Q2.** Write short note on: **(4+3.5= 7.5)**

- a) Importance of documentation in specimen collection.
- b) Methods of preservation, storage, and transport of clinical specimen.

**UNIT-II**

**Q3.** Discuss the applications of molecular diagnostics in clinical microbiology. compare nucleic acid hybridization and amplification techniques. **7.5**

**Q4.** Write short note on the following: **(4+3.5= 7.5)**

- a) How do biochemical tests contribute to species-level identification
- b) Role of microbiological diagnosis in infection control.

**UNIT-III**

**Q5.** Discuss the etiology, pathogenesis, and laboratory diagnosis of emerging viral infections: Hantavirus, Ebola, and Mad cow disease. **7.5**

**Q6.** Write short note on the following: **(4+3.5=7.5)**

- a) skin and soft tissue infections- impetigo, folliculitis and furuncle.
- b) clinical and laboratory diagnosis of anthrax.

**UNIT-IV**

**Q7.** Write detail note on safety and quality control in medical microbiology laboratories. **7.5**

**Q8.** Write short note on the following **(4+3.5=7.5)**

- a) Antimicrobial chemotherapy
- b) Safety and quality control in medical microbiology laboratories.

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**Paper-IV Elective A**

**Enzymology and Fermentation Technology**

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. Discuss the effect of physicochemical factors on enzyme activity. Explain the influence of temperature, pH, substrate concentration, enzyme concentration and inhibitors. **7.5**
- Q2. Describe allosteric enzymes and isoenzymes. How do enzyme inhibitors regulate enzyme activity. **7.5**

**UNIT-II**

- Q3. Derive the Michaelis-Menten equation and explain its significance in enzyme kinetics. **7.5**
- Q4. Discuss industrial, diagnostic, and therapeutic applications of enzymes. **7.5**

**UNIT-III**

- Q5. Define bioreactors. Explain the packed bed reactor, fluidized bed reactor, trickle bed reactor and bubble column reactor with their applications. **7.5**
- Q6. Describe media formulation and process optimization in fermentation. **7.5**

**UNIT-IV**

- Q7. Discuss downstream processing and product recovery. Explain regulatory requirements and safety aspects. **7.5**
- Q8. Write short notes on: **(4+3.5= 7.5)**
- a) Biosensors
  - b) Bioleaching

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**Paper-IV Elective B**

**Microbial Pathogenicity**

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 role of resistance genes and resistance mechanisms in plants. How do plants defend themselves against fungal, bacterial, and viral pathogens. **7.5**
- Q2.** Write short note on: **7.5**
- a) Phytoalexins: their nature, biosynthesis, and role in plant defense mechanisms
  - b) Effect of microbial infections on photosynthesis and respiration.

**UNIT-II**

- Q3.** Write an essay on Crown gall disease. How does *Agrobacterium tumefaciens* induce tumor formation in plants. **7.5**
- Q4.** Write short note on the following: **(4+3.5= 7.5)**
- a) Red Rot of Sugarcane.
  - b) Potato virus X and Y.

**UNIT-III**

- Q5.** Describe in detail quantitative measures of pathogenicity: minimal lethal dose (MLD), LD50, ID50, and TCID50. **7.5**
- Q6.** Write short note on the following: **(4+3.5= 7.5)**
- a) Concept of Molecular Koch's postulates.
  - b) Facultative and obligate intracellular pathogens.

**UNIT-IV**

- Q7.** Discuss in detail on emerging and re-emerging pathogens. Why are they considered as global health challenge? **7.5**
- Q8.** Write short note on the following: **(4+3.5= 7.5)**
- a) Dengue hemorrhagic fever
  - b) How does drug resistance complicate tuberculosis control