

# **Department of Microbiology**

## **Syllabus**

### **Pre -PhD Microbiology**



**Maharshi Dayanand University**  
**Rohtak 124001**

**Examination scheme of Pre-PhD Microbiology w.e.f. the academic session 2011-12**

Paper No.	Nomenclature of the paper	Theory	Internal Assessment	Seminar (if any)	Max. Marks
MB-501	Fermentation and Enzymology	80	20*	--	100
MB-502	Molecular Biology and Immunology	80	20*	--	100
MB-503	Research Methodology	80	20*	--	100
MB-504	Review writing & Presentation/Seminar	50	--	50**	100
<b>Grand Total</b>					<b>400</b>

**\*Internal Assessment:**

Two assignments of 10 marks each.

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**\*\*Seminar**

Division of Marks:

Participation	:	10
Seminar report:	:	10
Presentation	:	15
Discussion	:	15
Total	:	50

**Pass percentage will be 50% in each paper.**

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**Note:** The candidate shall be required to present seminar related to the topic of research problem under the guidance of the Faculty in the Department. The evaluation will be based on the presentation of the seminar jointly by the faculty members of the department.

**Paper MB-501: Fermentation and Enzymology**

**MM: 80**

The total eight questions will be set from all units selecting two questions from each unit. The students are required to attempt 4 questions selecting one from each unit.

**Unit I**

Fermentation: Submerged and solid state fermentations, Scale up of bioprocess. Type of fermenters, Design and operation of Fermenters, Basic concepts for selection of a reactor, Packed bed reactor, Fluidized bed reactor, Trickle bed reactor, Bubble column reactor, Scale up of Bioreactor.

**Unit II**

Down Stream processing. Recovery of particulate matter, product isolation, distillation, centrifugation, whole broth processing, filtration, aqueous two-phase separation, solvent extraction, chromatography and electrophoresis. Production of acids, alcohols and antibiotics.

**Unit III**

Introduction: Brief Enzyme Overview, Classification & Nomenclature, General Characteristics. Kinetics of single substrate enzyme-catalysed reactions: Michaelis Menton Equation Lineweaver-Burk plot, Eadie-Hofstee and Hanes plot. Calculations of  $K_m$ ,  $K_{cat}$  and  $V_{max}$ .

**Unit IV**

Inhibitors of Enzymatic Activity—Irreversible, Reversible, Competitive, Noncompetitive, Uncompetitive, substrate and allosteric inhibitors. Enzyme stability and activity - Effect of pH, temperature, water activity, freezing, ionic strength. Industrial applications of enzymes such as amylases, proteases, xylanase and cellulases only.

The total eight questions will be set from all units selecting two questions from each unit. The students are required to attempt 4 questions selecting one from each unit.

**Unit I**

DNA and RNA: Types, structure and functions. Genetic code, Detailed account of replication, transcription and translation. Maturation and processing of RNA. Regulation of gene expression in prokaryotes and eukaryotes. A general account of transformation, conjugation and transduction.

**Unit II**

Molecular cloning; techniques and their importance, cloning vectors; properties and uses, selection and characterization of clones, gene probes, labeling. PCR: principle, types and role in molecular biology. Brief account of Bioinformatics.

**Unit III**

Immune response: Cell mediated and humoral responses. Innate and acquired immunity. Concept of antigen, opsonization, hapten and adjuvants. Antibody and its types. Interferon and complement system. Hypersensitivity and immunosuppression.

**Unit IV**

Human gut and Intestinal microflora. Emerging and re-emerging pathogens. Common human diseases: Brief account of TB, Leprosy, Malaria, Food poisoning, AIDS. Different types of Vaccines. Detailed account of Biofertilizers, Biotransformation and Biopesticides

The total eight questions will be set from all units selecting two questions from each unit. The students are required to attempt 4 questions selecting one from each unit.

**Unit I**

Overview of bacterial cell structure, (size, shape, arrangement membrane, cell wall, cytoplasmic inclusions, mesosomes, flagella and motility, slime, capsule, pili, chemotaxis, endospore) The brief account of fungi, structure, physiology and classification, brief account of virus (bacteriophages) structure, life cycle (lytic and lysogenic).

**Unit II**

The brief account of bacteria and fungi: structure, physiology and classification, brief account of virus (bacteriophages) structure, life cycle (lytic and lysogenic). Microscopy: Principles and applications in microbiology, brightfield microscopy, darkfield microscopy, fluorescence and immuno fluorescence microscopy, phase contrast and electron (transmission and scanning) microscopy. Staining of microorganisms.

**Unit III**

Theory and applications of chromatographic techniques: Paper chromatography, thin layer and column chromatography, ion exchange and affinity chromatography, reverse-phase chromatography, GC, HPLC and FPLC. MALDI-TOF analysis, Protein sequencing

**Unit IV**

Theory and application of analytical and preparative centrifugation. Concept of continuous and zonal rotors, analytical centrifuge. Introduction to radioisotopes and their monitoring concepts of counting efficiency and auto radiography. Theory and application of polyacrylamide gel electrophoresis, isoelectric focusing, pulse field gel electrophoresis.