

**Gujarat University**  
**Syllabus M.Sc. Part-I (Microbiology, 1993-1998)**

There shall be 3 theory papers each of 3 hours duration and 3 practical each of 7 hours duration. Each theory paper shall carry 100 marks and each practical shall carry 50 marks. 15 marks from each practical shall be reserved for term work and viva-voce examination. Each theory paper is divided into five units. Each unit will have equal weight age while setting question paper. Question or its sub-question including the options will be set from the same unit.

**Systematic Bacteriology and Mycology.**

1. **Bacterial Classification.**  
N.A. and genetic methods, serology and chemotaxonomy, identification and preservation Kingdom prokaryotes its division and section.
2. **Systematic bacteriology**  
Azospirillum, Pseudomonas, Azotobacter, Rhizobium, Bradyrhizobium, Acetobacteriaceae, Enterobacteriaceae, Ricettsiae, Chlamydae, Streptococcus, Leuconostoc, Bacillus, Lactobacillus, Corynebacterium
3. **Mycoplasma, Micrococcus, Staphylococcus, Streptococcus, Leuconostoc, Bacillus, Lactobacillus, Corynebacterium.**
4. **Archaeobacteria, chemolithotrophs, Phototrophs.**  
Actinomycetes : growth and examination, generic identification, Streptomyces.
5. **Fungi**  
Mastigomycotina, zygomycotina, ascomycotina, basidiomycotina, deuteromycotina  
Growth requirement, Lab. Cultures and culture maintenance.

**Reference :**

- Bergy's Manual of Systematic Bacteriology vol. I-IV by Kreig and Holt
- The Prokaryotes, vol. I,II by Starr and others
- Smith's Introduction to Industrial Mycology by Onions et.al
- Moulds and Filamentous Fungi In Technical Microbiology by O. Fassatiova
- Biology of Fungi by I.K. Rose
- A Guide to Identifying and Classifying Yeasts by Burnet et.al
- Biology of conidial fungi by E. Moore-Landecker
- The Yeasts by Rose and Harrison

**Paper-II : Advances in Microbial Physiology**

1. **Microbial growth**  
Mathematical models for batch and continuous cultures and their use  
Continuous culture as a research tool  
Synchronous cultures, cell cycle and cell division in prokaryotes  
Yeast budding, Fungal growth and cell differentiation
2. **Microbial metabolism**  
Metabolism of Cl compounds, hydrocarbon, and aromatic compounds unnatural carbohydrates, Oxygen and other gases.  
Pathways of nitrogen fixation  
Secondary metabolism  
Citric acid cycle  
Transport of nutrients  
Generation and utilization of energy during growth
3. **Cellular biosynthesis and metabolic regulation**  
Biosynthesis of lipids, exopolysaccharides, teichoic acids, antibiotics  
Catabolic repression and other control mechanisms in carbohydrate utilization  
Regulation of N.A., protein synthesis, cell division, eucaryotic metabolism, respiration and anaerobiosis
4. **Micro organism-environment interaction**  
Physiology of acidophiles, halophiles, osmophiles, thermophiles, psychrophiles, growth under high pressure, growth under water stress  
Antibiosis and drug resistance, Radiation resistance
5. **Methods for studying microbial metabolism**  
Determination of growth and molar growth yields  
Chemical analysis of microbial cells  
Extraction, purification, assay and kinetics of microbial enzymes  
Methods for studying microbial metabolism  
Separation and purification of sub-cellular components

**Reference :**

- General Microbiology by Stanier et.al
- Bacterial Metabolism by Gottschalk
- Microbial Physiology by Dawes and Sutherland
- Growth of Bacterial cell by Ingraham et.al

- Biochemistry of Bacterial Growth by Mandelstam et.al
- Experimental Ecology by Atlas R.M.
- The Microbial Cell Cycle by Edwards C.
- Principles and Practice of Disinfection, Preservation and sterilization by Russel et.al
- Methods in Microbiology by Norris and Ribbons
- Energetics of Microbial Growth by Batiley E.H.
- Bacterial Respiration and Photosynthesis by Jones C.W.
- Advances in Microbial Physiology volumes
- Scientific American volumes
- Microbiology by Atlas R.M.
- Quantitative Problems in Biochemistry by Dawes E.A.

### Paper-III : Microbial Genetics

1. **Molecular genetics**  
 Fine structure of bacterial and phage genes  
 Gene mutation, mutagenesis, suppressor mutations  
 Molecular mechanism of DNA repair.  
 Extrachromosomal elements, transposomes, Phage mu, Plasmids
2. **DNA reaction and gene expression**  
 Replication of DNA, synthesis of RNA upon DNA, involvement of RNA in protein synthesis,  
 Regulation of protein synthesis  
 Catabolic controlled operon lac.  
 Attenuated controlled operon tryp  
 Arabinose operon
3. **Phage and fungal genetics**  
 Genetics of virulent phages T4, T7  
 Development and regulation of phage lambda  
 Genetics of SS DNA phages OX174  
 Genetics of RNA phages  
 Specialized genetic system of fungi-tetrad analysis, mitotic recombination
4. **Recombinant DNA technology**  
 Microbial PPF, in vivo gene manipulation  
 In vitro gene manipulation, sources of gene, host vector systems, structural and functional analysis  
 of cloned DNA sequences
5. **Biostatistics**  
 Principles, distribution, standard deviation and errors, t-test, analysis of variance, regression  
 analysis, statistics applied to genetics

### **Reference, :**

- Gene Function by Glass R.E.
- Molecular Biology of the Gene by Watson, J. D.
- Genetics as a Tool in Microbiology by Glover and Hopwood
- Microbial Genetics Applied to Biotechnology by Saunders and Saunders
- Genetics of Bacteria by Senife et.al
- The Genetics of Bacteria and their Viruses by Hayes W.

### Microbiology practical

#### **Practical-I**

- Isolation and Identification of Bacteria
- Isolation and Identification of Industrially Important fungi
- Study of Distribution, Standard deviation and variance

#### **Practical-II**

- Determination of growth and growth inhibition
- Determination of Enzyme Kinetics
- Estimation of carbohydrates and proteins
- Chemical analysis of bacterial cells

#### **Practical-III**

- Ultraviolet irradiation survival curve
- Induction and Isolation of mutants
- Isolation of phages, study of one-step growth curve
- Transformation and Conjugation in bacteria
- Statistics applied to genetics