

M S E L I I Microbiology

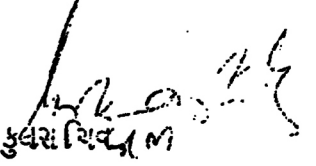
ગુજરાત યુનિવર્સિટી

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નં. ચેકેડે મિક-બી/ ૧૩૦૧૪ /૧૯૯૯
ગુજરાત યુનિવર્સિટી કાયદેસર.
અમદાવાદ-૯. તા. ૩ ૬.૯૯

પ. રિ. પ. પ્ર. ૧૩

યુનિવર્સિટી વિજ્ઞાનવિદ્યાલયના અધ્યક્ષશ્રી તથા માયક્રોબાયોલોજી વિભાગ
શિબવ્રતા યુનિવર્સિટી કેન્દ્રના વડાશ્રીને જણાવવાનું કે, એમ. એસસી. ભાગ-૧ અને ૨-નો
માયક્રોબાયોલોજીનો અભ્યાસક્રમ આ સમયેના પરિવિષ્ટ સુજનોના સુધારવામાં આવ્યો છે,
જેનો અમલ જુન-૧૯૯૯થી કરવાનો રહેશે.


કુલસચિવશ્રી

રિક્કાફો: ઉપર મુજબ

પ્રતિ,

૧. યુનિ. વિજ્ઞાનવિદ્યાલયન

માયક્રોબાયોલોજી વિભાગ,
ગુજ. યુનિ. અમદાવાદ

૨. માયક્રોબાયોલોજી વિભાગ શીબવ્રતા યુનિવર્સિટી કેન્દ્રના
વડાશ્રી.

૩. પરીક્ષા નિયામકશ્રી,
પરીક્ષા વિભાગ
ગુજ. યુનિ. અમદાવાદ

૪. મદદનીશ કુલસચિવશ્રી,
પરીક્ષા વિભાગ,
ગુજ. યુનિ. અમદાવાદ

૫. શ્રીમતી પ્રફુલ્લાબેન ત્રિવેદી
પરીક્ષા વિભાગ
ગુજ. યુનિ. અમદાવાદ

GUJARAT UNIVERSITY

SYLLABUS FOR M.SC.(PART-I) MICROBIOLOGY

(IN FORCE FROM JUNE-1999)

There shall be 3 theory papers each of 3 hours duration and 3 Practicals 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.

THEORY

- Paper- I . Microbial : Taxonomy and Diversity
Paper - II : Microbial : physiology and Biochemistry
Paper-III : Microbial Genetics and Biostatistics.

Every theory paper is divided in to five units. Each unit will have equal weightage while setting the question - paper. Questions or its sub-questions including the options will be set from the same unit.

The last date for submission of term work will be 1st March.

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M. SC. PART - I

PAPER - I MICROBIAL : TAXONOMY AND DIVERSITY

Unit - I

Microbial evolution and principles of taxonomy

- * Evolution of life forms, fossil records and extraterrestrial life
- * Chronometer, rRNA sequencing and evolution
- * Species concept and microbial nomenclature.
- * Theories and methods of microbial classification : structural, biochemical and molecular
- * Phylogenetic relationships of microorganisms

Unit - II

Prokaryotic diversity (a)

- * Principles of Biodiversity, characterization, magnitude and distribution of biodiversity.
- * Generation, maintenance and conservation strategies, loss of economic value.
- * Diversity of Archea : limit of microbial existence and archea as earliest life forms, extremely halophilic, hyperthermophilic, thermoplasma, methanogenes.

Unit - III

Prokaryotic diversity (b)

Diversity of Bacteria : Purple and green bacteria, cyanobacteria, chemolithotrophs, methanotrophs and methylotrophs, sulphur and sulphate reducing bacteria, gliding, sheathed and budding bacteria, pseudomonads, ~~and methylotrophs~~ Gram positive rods and cocci, Gram negative rods and cocci, lactic, propionic and acetic acid bacteria, actinomycetes.

Unit - IV

Metabolic diversity among microorganisms :

- * Energy - yielding metabolism, photosynthesis, autotrophy, aerobic and anaerobic respiration, fermentation.
- * Diversity of various major substrate utilization.

Unit - V

Diversity of eukaryotic microorganisms : An overview :

- * Fungi
- * Algae
- * Slime molds
- * Protozoa

PAPER-II MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY

Unit - I Microbial growth

- * Microbial growth and growth kinetics
- * Continuous culture as research tool
- * Sporulation, spore germination, cell cycles, cell division
Synchronous cultures
- * Yeast budding
- * Fungal growth and cell differentiation

Unit - II Microbial metabolism

- * Metabolism of carbohydrates, C_1 compounds, aromatic and aliphatic hydrocarbons, amino acids and lipids

Unit - III Biosynthesis and regulation

- * Biosynthesis of purines, pyrimidines and major cellular metabolites
- * Biosynthesis and biochemical regulation of antibiotics
- * Co-ordinated control of amino acids synthesis
- * Antibiosis and drug resistance

Unit - IV Physiology and enzyme kinetics

- * Physiology and metabolism of N_2 fixation, bioluminescence signal transduction, chemotaxis, membrane structure and transport of solutes.
- * Mechanism of enzyme action, enzyme kinetics, activation and inhibition of enzyme, influence of various factors on enzyme activity.
- * Co-enzyme, isoenzymes, allosteric enzymes, ribozyme and abzyme.

Unit - V Biochemical techniques:

- * Principles and application of gel filtration, ion exchange and affinity chromatography, GLC, HPLC, TLC, column chromatography, electrophoresis, ultra centrifugation.
- * Principles of biophysical methods.
- * Principles and application of Tracer techniques in microbiology, NMR spectrophotometric and polarographic techniques.
- * Analysis of macromolecules; carbohydrates, nucleic acids, lipids, proteins.
- * Analysis of elements C, N, P, H, O, S.

PAPER-III MICROBIAL GENETICS AND BIOSTATISTICS

Unit - I Molecular genetics

- * Principles of Mendelian inheritance
- * Chromosome structure and function
- * Genome organization
- * Fine structure of prokaryotic and eukaryotic gene
- * Extrachromosomal inheritance; plasmids, transposons, phage, mitochondria and chloroplast
- * Mutation
- * DNA Damage and repair
- * Oncogenes

Unit II Genetics of selected microorganisms

- * T4 T7 and λ phages (LAMBDA PHAGES)
- * Φ_{22} , Φ_{174} , MS₂ phages
- * Viroids and prions
- * Yeast and fungal genetics
- * Genetics of Streptomyces

Unit III Recombination and regulation of gene

- * Gene transfer : transformation, transduction and conjugation
- * Recombination; general and non-homologous
- * DNA replication, amplification and rearrangement
- * Transcription and translation; process and control.
- * Environmental factors of gene regulation
- * Operon concept; lac, ana, trp, his operons.
- * Heterochromatization.

Unit IV Principles and methods of genetic engineering

- * Protoplast fusion
- * Principles of gene cloning, rDNA; characterization and expression.
- * Shotgun, cot curves, sequencing of proteins and nucleic acids, Southern, Western, Northern and South-Western blotting techniques, PCR techniques, RFLP analysis.
- * Genomic library
- * Application of genetic engineering.

Unit V Biostatistics

- * Principles
- * Data representation and measures
- * Population, samples and inference
- * Probability and distributions; binomial, Poisson and normal
- * Significance tests.
- * Estimation and analysis of variance
- * Regression analysis
- * Principles of experimental designs
- * Simple factorial experiments
- * Applications

M.SC. PART - I : PRACTICALS

Paper. I.

- 1 to 5 Isolation and identification of economically important bacteria.
- 6 to 10 Isolation and identification of economically important Fungi.
- 11 to 14. Biodiversity study of two, isolates from bacteria from bacteria and fungi.
15. Effect of water activity on microbes of different environment.
16. Enzyme activity from soil.

PAPER-II

1. Evaluation of bacterial growth in liquid media
2. Estimation of the D - period in exponentially growing microbial culture.
3. Enzyme kinetic study.
4. Estimation of carbohydrate
5. Estimation of proteins
- 6 Estimation of lipids
- 7 Chromatography
8. Electrophoresis
- 9 Demonstration of various equipments
10. Spectrophotometric examination of Prodigiosin.

PAPER-III

1. Isolation of Nucleic acids
2. Isolation of Plasmids
3. Isolation of antibiotic resistance mutants
4. Isolation of pigment variant mutants
4. Characterization of mutants with altered pigmentation.
5. Induction of mutant by radiation
- 6 Induction of mutant by chemicals
- 7 Gene transfer experiments
- 8 One step growth curve of bacteriophage
- 9 Application of statistical analysis
10. Determination of S.D and significance test for the data.

Besides these practicals, other practicals of relevance shall be introduced as per the need.

REFERENCES: M. SC. PART. I

Bergey's Manual of Systematic Bacteriology	Krieg and Holt
Volum - I-IV	
The Procaryotes Vol I and II	Ed. Starr & others
Smith's Introduction to Industrial Mycology	Onions et.al
Moulds & Filamentous Fungi in	O. Fassatiya
Technical Microbiology	
Biology of the Fungi	I.K. Ross
A guide to identifying and classifying yeasts	Burnet et.al
Biology of the Conical Fungi	Cole & Kendrick
Fundamentals of Fungi	E. Moore & Landecker
The Yeasts	Rose & Harrison
Brooks Biology of Microorganisms 8th Edition.	M.T. Madigan, T.M. Michael, M.M. John
General Microbiology	Stanier et.al
Bacterial Metabolism	Gottschalk, G.
Microbial Physiology	Dawes & Sutherland
Growth of Bacterial Cell	Ingraham et.al
Biochemistry of Bacterial Growth	Mandelstam et.al
Experimental Ecology	R.M. Atlas
The Microbial cell Cycle	C. Edwards
Principles And Practice of Disinfection,	Russel et.al
Preservation and Sterilization	
Methods in microbiology	Norris and Ribbons
Energetics of microbial growth	E. H. Battley
Bacterial respiration & photosynthesis	C. W. Jones
Advances in microbial physiology	Volumes
Annual review of microbiology	Volumes
Scientific American	Volumes
Microbiology	R.M. Atlas
Quantitative problems in biochemistry	E. A. Dawes
Harper's Biochemistry	Murray et.al.
Gene function	Robert Glass
Molecular Biology of gene	J. D. Watson
Genetics as a tool in microbiology	Golver & Hopwood
Genetics of Bacteria	Scaife et.al
The genetics of bacteria & their viruses	Hayes W.
Biostatistics	Lewis A. E.
General Genetics	L. Synder, D. Friedfelder,
	D. Hartl.

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M. Sc. Part-I Reference conted....

Gene V.	Benjamin Lewin
Molecular Genetics of Bacteria	Snyder & Champness
Laboratory exercise in Microbiology	Harley & Prescott
Molecular Biotechnology	Prinrose
Gene cloning & manipulation	Christopher Howe
Statistics & Experimental Design	G.M. Clarke
Analytical biochemistry	D.J. Holme & H. Peck
Practical biochemistry	Wilson & Goulding
Statistical methods in biology	N.T.J. Bailey
Introduction of to Biostatistics	R.N. Forthofer & Lee
Current references will be added whenever necessary	

For each topic the current references will be given as and when needed.