

बरकतउल्ला विश्वविद्यालय,भोपाल
Barkatullah University, Bhopal

As per model syllabus of U.G.C. New Delhi, Approved by Board of
Studies Biotechnology



जीव विज्ञान संकाय
Faculty of Life Science
पाठ्यक्रम एवं निर्धारित पुस्तकें
Syllabus & Prescribed Books

एम.एस.सी. (बायोटेक्नोलॉजी) प्रथम सेमेस्टर

M.Sc. (Biotechnology) First Semester

प्रकाशक
कुलसचिव
बरकतउल्ला विश्वविद्यालय,भोपाल

BARKATULLAH UNIVERSITY, BHOPAL
M.Sc. – Biotechnology

Code	Title of the Paper	Theory	Practical
SEMESTER I:			
BT-101	Cell Biology	100	
BT-102	Structure, function & Metabolism of Biomolecules	100	
BT-103	General & Applied Microbiology	100	
BT-104	Bioinstrumentation	100	
BT-105	Laboratory-I		100
SEMESTER II:			
BT-201	Molecular Genetics	100	
BT-202	Basic Enzymology & Enzyme Technology	100	
BT-203	Molecular Biology	100	
BT-204	Immunology & Animal Cell Culture	100	
BT-205	Laboratory-II		100
SEMESTER III:			
BT-301	Genetic Engineering	100	
BT-302	Biostatistics and Bioinformatics	100	
BT-303	Plant Biotechnology	100	
BT-304	Bioprocess & Biochemical Engineering	100	
BT-305	Applied Biotechnology	100	
BT-306	Laboratory-III		100

SEMESTER IV:

BT-401	Project Work/Dissertation	300
	Training in a National Lab/Private industry/parent department for six months	
	Evaluation, presentation skill and defence	200

Total: 2100**SEMESTER -IV**

BT-401	Advance in Fermentation and Food Biotechnology	100
BT-402	Applied Immunology and Immunodiagnostics	100
BT-403	Principles of Drug Designing	100
BT-404	Training/Survey/Visit in a private industry/ treatment plant or lab at national or regional level for one month 50 marks for report 50 marks for presentation before external examiner	100
BT-405	Laboratory-IV	100

TOTAL 500**GRAND TOTAL 2100**

BARKATULLAH UNIVERSITY, BHOPAL

M.Sc. (Biotechnology)

First Semester Examination Scheme

1. Course Code	:		6. Maximum Theory Marks	:	500
2. Course Name	:	M.Sc. Biotechnology	7. Minimum Passing Percentage	:	36
3. Total Paper	:	04	8. Laboratory	:	100
4. Compulsory Paper	:	04	9. Laboratory Passing Percentage	:	36
5. Laboratory	:	01			

Title of the Paper	Theory		CCE		Total Marks		Practical		Total Marks	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Cell Biology	85	31	15	05	100	36	---	---	100	36
Structure, function & Metabolism of Biomolecules	85	31	15	05	100	36	---	---	100	36
General & Applied Microbiology	85	31	15	05	100	36	---	---	100	36
Bioinstrumentation	85	31	15	05	100	36	---	---	100	36
Laboratory-I	---	---	---	---	---	---	100	36	100	36

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-101 CELL BIOLOGY**
Semester - **First**

MM : 85

UNIT-I: General structure of Cell. Historical origins of cell biology: The discovery of cell, development of the cell theory. The molecular evolution. Chemical bonds and functional groups in biological molecules.

UNIT-II: The structural and functional organization of cell membrane, ionic transport (Passive and active transport) the extra cellular matrix of eukaryote's cell wall.

UNIT-III: Structure and functions of endoplasmic reticulum, golgi complex, ribosome lysosomes, peroxisomes (glyoxysomes), plastids and mitochondria. Biogenesis of mitochondria and chloroplast.

UNIT-IV: Steps in cell cycle, cell cycle check points, yeast as model system, cell division control and regulation yeast *cdc* gene. Genes for social control of cell, proto-oncogenes.
Cell signaling: Exocrine, Endocrine, Paracrine and Synaptic strategies of chemical signaling, surface receptor mediated transduction (G-Proteins, Tyrosine kinases, steroid receptor and mediators: DAG, Ca⁺², c-AMP)

UNIT-V: Cytoskeleton and cell motility: Microtubules, microfilaments and intermediate elements. Nuclear ingredients: Nuclear membrane, Organization of Chromatin: chromosome structure. Nature of the genetic material, proteins associated with nuclei. Packaging of genetic material: nucleosome model,

RECOMMENDED BOOKS:

1. Molecular Biology of Cells, (2002), 4th Edition; Albert's *et al.*
2. Molecular Cell Biology (2004), Lodish *et al.*
3. Cell and Molecular Biology; Concepts & Experiments (2004). Karp, G.
4. The Cell: A molecular Approach (2004), Cooper, G.M
5. Cell & Molecular biology, de Robertis & df Robertis.
6. Cell proliferation and apoptosis (2003); Hughes & Mehnet.
7. Biochemistry & Molecular Biology of plants (2004); Buchanan *et al.*
8. Lehninger Principles of Biochemistry, (2005) Nelson & Cox.

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-102 Structure, Function & Metabolism of Biomolecules**
Semester - **First**

MM : 85

UNIT-I: Some important properties of water: The law of Mass action; Dissociation of water and its ion product. pH, Bronsted Acids, ionization of weak acids and bases; Henderson-Hasselbalch equation, Titration curves and buffering action, physiological buffers. Principle of Thermodynamics.

UNIT-II: Carbohydrates: Classification, structure, function and properties of sugars, storage polysaccharides and cell walls. Glycolysis, gluconeogenesis, HMP shunt and glycogen metabolism. Synthesis of cellulose and starch. Oxidative phosphorylation, compartmentation of respiratory metabolism. Regulation of carbohydrate metabolism.

UNIT-III: Proteins- Amino Acids: essential and non essential amino acids; common, rare and non-protein amino acids; acid base properties and chemical reactions of amino acids; stereochemistry and absorption spectra of amino acids. Biosynthesis and degradation of following amino acids: alanine, serine, lysine cysteine, arginine, methionine, tryptophan, phenylalanine glutamine. Proteins: Primary,

secondary, tertiary and quaternary structure of proteins. Optical and chemical properties of peptides and small proteins. Hydrolysis of proteins: Action of different proteases. Regulation of amino acid metabolism.

UNIT-IV: Nucleic acids: general structure and functions of purines, pyrimidines, nucleosides, nucleotides; hydrolysis of nucleic acids. Biosynthesis of purines and pyrimidines, nucleosides and nucleotides. Degradation of purines and pyrimidines. Salvage pathway.

UNIT-V: Lipids: Classification, nomenclature and structure of fatty acids, triacylglycerols, sphingolipids and phospholipids, waxes, glycolipids and sterols. Beta-oxidation of fatty acids, biosynthesis of fatty acids and triacylglycerols. Lipid proteins system and transport of lipoproteins of blood plasma. Regulation of lipid metabolism.

RECOMMENDED BOOKS:

1. Lehninger Principles of Biochemistry (2005), Nelson & Cox.
2. Biochemistry (2004); Stryer, L.
3. Text book of Biochemistry (1997), Devlin, Thomas, M.
4. Biochemistry (1993) Zubay, G.
5. Biochemistry Fundamentals, Voet *et al.*
6. Biochemistry, Friedlander, D.
7. Practical Biochemistry, Plummer.

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-103 General & Applied Microbiology**
Semester - **First**

MM : 85

UNIT-I: Introduction to Microbiology: Historical background & scope, Difference between prokaryotic and eukaryotic organisms, structure of cell wall and peptidoglycan, Methods of Microbiology: Pure culture techniques, sterilization techniques, principle of microbial nutrition, preparation of culture media, enrichment culture techniques for isolation of microbes.

UNIT-II: Classification of Bacteria: Basic principle and techniques used in bacterial classification. Phylogenetic polyphasic taxonomy and numerical taxonomy. New approaches of bacterial taxonomic classification including genetic methods, Ribotyping, Ribosomal RNA sequencing, characteristic of primary domains.

UNIT-III: Viruses: General characteristics, Morphology, Classification and structure of plant, animal and bacterial viruses, Cultivation of viruses, a brief account of Adenoviruses, Herpes, Retrovirus, Viroids and prions.

Microbial Growth: The definition of growth, bacterial generation and doubling time, specific growth rate and yield measurement, Monoauxic, Diauxic and synchronized growth curve. Factors affecting microbial growth. Culture collection & maintenance of culture. Sporulation in bacteria.

UNIT-IV: Control of Microorganism by Physical & chemical agents: Antimicrobial agents, Sulfa drugs, Antibiotics (penicillin and cephalosporin) Broad Spectrum antibiotics, antibiotics from prokaryotes, Anti fungal antibiotics, Mode of action (a brief account), resistance of antibiotics (a brief account)

UNIT-V: Microbial Ecology: Microbial flora of soil, Interaction among soil microorganisms. Nitrogen fixation (a brief account), Symbiotic association-types, functions and establishment of symbiosis. *A. niger*, *yeast*, *Pseudomonas putida*,

RECOMMENDED BOOKS:

1. Alcamo's Fundamental of Microbiology, (2004); Pommerville *et al.*
2. Microbiology (1996); Prescott, Harley & Klein
3. Microbiology (2004); Tortora, F.
4. Foundation in Microbiology (1996); Talaro & Talora.
5. Food Microbiology (2004); Adam, M.R.
6. Principles of Microbiology (1994); Atlas, R.M.
7. Pharmaceuticals Microbiology (2003); Purohit & Saluja.
8. Microbiology: A Lab Manual, Cappuccino *et al.*
9. Brock Biology of Microbiology, Martinko, M.T & Parker, J.

BARKATULLAH UNIVERSITY, BHOPAL

Class - **M.Sc.**
Subject - **Biotechnology**
Paper Name - **BT-104 Analytical Techniques in Biotechnology**
Semester - **First**

MM : 85

UNIT-I: Microscopic Techniques: Principles and Applications of Light, Phase Contrast, Fluorescence Microscopy, Scanning and Transmission Electron Microscopy, Confocal Microscopy, Cytophotometry and Flow Cytometry, patch clamping, advances of microscopy. Microtomy and its application.

Centrifugation: Preparative and Analytical Centrifuges, Sedimentation analysis RCF, Density Gradient Centrifugation.

UNIT-II: Chromatography Techniques: Theory and Application of Paper Chromatography, TLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, GLC and HPLC.

UNIT-III: Electrophoretic Techniques: Theory and Application of PAGE (SDS and native), Agarose Gel Electrophoresis 2 Dimensional Electrophoresis, Iso-electric Focusing, Immuno diffusion, Immuno Electrophoresis, ELISA, RIA. Southern, Northern and Western Blotting.

UNIT-IV: Spectroscopic Techniques: Theory and Application of UV and Visible Spectroscopy, Fluorescence Spectroscopy, MS, NMR, ESR, Atomic Absorption Spectroscopy, X-ray Spectroscopy, LASAR, Raman Spectroscopy. MALDI.

UNIT-V: Radio-isotopic Techniques: Introduction to Radioisotopes. Radioactive Decay – Types and Measurement, Principles and Applications of GM Counter, Solid and Liquid Scintillation Counter, Autoradiography, RIA, Radiation Dosimetry. Biological Applications of Radioisotopic techniques,

RECOMMENDED BOOKS:

1. Physical Biochemistry: Application to Biochemistry and Molecular Biology – Freilder.
2. Biochemical Technique : Theory and Practice , - Robyt & White
3. Principle of Instrumental Analysis – Skoog & West
4. Principle & Technique – Practical Biochemistry 5th Ed. (2000) - Walker J. & Wilson K.
5. Biochemical Technique Theory & Practical- White, R.
6. Principle of Instrumental Analysis – Skoog *et al.*
7. Microbiology – Fundamental & Application (1995) -Atlas, R.M.
8. Biophysical Chemistry – Upadhyay & Nath.