

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) द्वितीय सेमेस्टर

**M.Sc. (Biotechnology) Second Semester**

प्रकाशक  
कुलसचिव  
बरकतउल्ला विश्वविद्यालय,भोपाल

# **BARKATULLAH UNIVERSITY, BHOPAL**

## **M.Sc. (Biotechnology)**

### **Second 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 |
| Molecular Genetics                   | 85     | 31  | 15  | 05  | 100         | 36  | ---       | --- | 100         | 36  |
| Basic Enzymology & Enzyme Technology | 85     | 31  | 15  | 05  | 100         | 36  | ---       | --- | 100         | 36  |
| Molecular Biology                    | 85     | 31  | 15  | 05  | 100         | 36  | ---       | --- | 100         | 36  |
| Immunology & Animal Cell Culture     | 85     | 31  | 15  | 05  | 100         | 36  | ---       | --- | 100         | 36  |
| Laboratory-II                        | ---    | --- | --- | --- | ---         | --- | 100       | 36  | 100         | 36  |

## BARKATULLAH UNIVERSITY, BHOPAL

**Class** - **M.Sc.**  
**Subject** - **Biotechnology**  
**Paper Name** - **BT-201 Molecular Genetics**  
**Semester** - **Second**

**MM : 85**

**UNIT-I:** History, Scope of genetics, Mendelian law of inheritance, Variations of mendelian analysis, Linkage and crossing over, Linkage mapping, Sex determination and Sex linked inheritance, Gene Mapping.

**UNIT-II: Microbial Genetics:** gene transfer mechanism in microbe transformation, transduction, conjugation and recombination, Horizontal gene transfer, genetics of model organism- Neurospora, Yeast and *E.coli*.

**UNIT-III: Mutation:** Types of mutation, molecular mechanism of mutation, chromosomal mutations changes-changes in the structure and number of chromosomes, polyploidy, types of DNA repair.

**UNIT-IV: Gene concept:** Classical concept, molecular concept of the gene. Jumping genes, Split genes, Pseudo genes, overlapping gene, repeated gene, natural gene amplification. molecular basis of cancer - oncogene, tumor suppressor genes,.

**UNIT-V:** Lytic and Lysogenic cycles, IS, and Tn elements in bacteria, Bacterial plasmids, gene regulation during development, *E coil* recombination system.

**RECOMMENDED BOOKS:**

1. Genetics: Strickberger, M. W.
2. Principle of Genetics (2001) 8<sup>th</sup> Ed. - Gardener *et al.*
3. Microbial Genetics (1994) 2nd Ed. - Maloy *et al*
4. Concept of Genetics 7<sup>th</sup> Ed. (2003) - Klug & Cummings.
5. Microbial Genetics-Fridfelder
6. Advanced Genetics (2002) - Miglani , G. S.
7. Bacterial Genetics (2004) – Nancy Trun

## BARKATULLAH UNIVERSITY, BHOPAL

**Class** - **M.Sc.**  
**Subject** - **Biotechnology**  
**Paper Name** - **BT-202 Basic Enzymology & Enzyme Technology**  
**Semester** - **Second**

**MM : 85**

**UNIT-I: Introduction to Enzymes:** Enzyme nomenclature, enzyme commission numbers, and classification of enzymes. Isolation and purification of enzymes, preparation of purification chart, Enzyme activity, Specific activity and turn over number, Marker enzymes.

**UNIT-II: Enzyme Kinetics:** Steady state, pre-steady state, equilibrium kinetics, Michaelis and Menten Equation and its derivation, Different methods to calculate the  $K_m$  and  $V_{max}$  and their significance.

**UNIT-III: Factor affecting enzyme activity and catalysis:** pH, substrate and enzyme concentration, temperature, coenzyme and cofactors, Mechanism of action of enzymes involving two/more substrates. Role of metal ions in enzyme catalysis. Enzyme inhibition, different types of inhibitors and activators.

**UNIT-IV: Structure and function of enzymes:** Lysozyme, chymotrypsin, DNA polymerase, RNase, proteases. Enzyme

regulation and control of their activity. Introduction to allosteric enzymes and isozymes.

**UNIT-V: Enzyme Technology:** Immobilization of enzymes and their application, commercial production of enzymes, RNA-catalysis, Catalytic antibodies-abzymes, Protein and Enzyme engineering: Design and construction of novel enzymes. Structure and Application of protease, lipases, papain.

**RECOMMENDED BOOKS:**

1. Enzyme Kinetics (1995) – Palmer
2. Enzyme Kinetics - Dixon
3. Fundamental of Enzymology – Price & Steven
4. The Enzymes Vol. 1 & 2 – Boyer
5. Enzyme Structure & Mechanism – Alan Fersht
6. Enzyme Biotechnology – Tripathi, G.
7. Industrial Enzyme & their Application (1998) –Uhlig, H.
8. Enzyme 3<sup>rd</sup> Ed. (1979) – Dixon M. & Webb, E.C.
9. Enzyme Kinetics –Voet & Voet

## **BARKATULLAH UNIVERSITY, BHOPAL**

**Class** - **M.Sc.**  
**Subject** - **Biotechnology**  
**Paper Name** - **BT-203 MOLECULAR BIOLOGY**  
**Semester** - **Second**

**MM : 85**

**UNIT-I: Nucleic Acid Structure:** DNA as genetic material, Chemical structure and base composition of nucleic acids, Double helical structures. Different forms of DNA, Forces stabilizing nucleic acid structure. DNA Supercoiling. Properties of DNA, Renaturation and denaturation of DNA - T<sub>m</sub> and Cot curves. RNA – structure, types and function.

**UNIT-II: DNA Replication:** General features of DNA replication, Enzymes and proteins of DNA replication. Models of replication – Conservative, semi-conservative and dispersive. Regulations of DNA replication, Prokaryotic and eukaryotic replication mechanism. Replication in phages. Reverse transcription

**UNIT-III: Transcription:** Mechanism of transcription in prokaryotes and eukaryotes. RNA polymerases and promoters. Post-transcriptional processing of tRNA, rRNA and mRNA (5' capping, 3' polyadenylation and splicing). RNA as an enzyme- Ribozyme.

**UNIT-IV: Translation:** Genetic code, General features, Deciphering of genetic code, Code in mitochondria, Translational mechanism in prokaryotes and eukaryotes, Post translational modifications (acetylation, glycosylation, phosphorylation etc.) and transport, Protein targeting, Non ribosomal polypeptide synthesis - Antibiotic inhibitors and translation.

**UNIT-V: Regulation of Gene Expression in Prokaryotes and Eukaryotes:** Operon concept, Positive and negative control, Structure and regulation of lac, trp and arb operon, regulation of gene expression in eukaryotes (a brief account), anti-sense RNA, RNAi

**RECOMMENDED BOOKS:**

1. Gene VIII (2005) - Benjamin Lewin
2. Molecular Biology- Turner *et al*
3. The Biochemistry of Nucleic Acid 11<sup>th</sup> Ed. (1992) – Adams *et al*
4. Molecular Biology of Gene (2004) – Watson *et al*.
5. Microbial Genetics – Friedflelder
6. Molecular Cell Biology 5<sup>th</sup> Ed. (2004) – Lodish *et al*.
7. Human Molecular biology (2004) – Stefan, S.
8. Biochemistry & Molecular Biology of Plants (2000) – Buchanan *et al*
9. Plant Biochemistry & Molecular Biology – Lea & Leegood.
10. Cell & Molecular Biology- Karp G.



## **BARKATULLAH UNIVERSITY, BHOPAL**

**Class** - **M.Sc.**  
**Subject** - **Biotechnology**  
**Paper Name** - **BT-204 Immunology and Animal Cell Culture**  
**Semester** - **Second**

**MM : 85**

**UNIT-I: Immunology:** An introduction and historical perspective , antigens and antigenicity , adjuvants , immune system organs , tissues & cell lymphocytes , lymphoid organs , mono nuclear phagocytic system , myeloid system , immunity – active & passive , Natural humoral and cellular immunity.

**Immunoglobulins:** Structure of IgG (b) , various classes of antibodies , Antibodies diversity - theories and molecular mechanism, class-switching, monoclonal antibodies (hybridoma technology) , recombinant antibodies, antigen-antibody interaction.

**UNIT-II: Complement System:** Classical, alternative and lectin pathways and their regulations.

**Immunological Responses:** Cell mediated immune response, Major Histo-compatibility Complex, Cellular interactions in the immune response – antigen processing and presentation. recognition of antigens by T & B cells, T – cell receptor complex, B – cells receptor complex.

Dendritic cells and N cells. cytokines, immunological tolerance, hypersensitivity, anti-immune diseases & AIDS.

**UNIT-III: Autoimmunity:** Mechanism and therapeutic approaches, immunodeficiency syndrome and their diagnosis, vaccines-active and passive immunization, whole organism vaccines, macromolecules as vaccines, recombinant vector vaccines, synthetic peptide vaccines and subunit vaccines, DNA vaccines, Immunodiagnostic: precipitation techniques, agglutination, fluorescence techniques.

**UNIT-IV: Animal cell culture:** An introduction, concept of aseptic techniques, animal tissue culture media, cell propagation, preservation and storage of cells, detection of contamination, safety consideration in laboratory cell culture.

**General cell culture techniques:** Dispersion and disruption of tissue, monolayer culture technique, measurement of growth and viability of cell, determination of 50% end point titer, Bulk culturing of animal cells, Concept of bioreactors for mass culture of mammalian cell, Micro carrier culture, harvesting and purification methods for end products recovery.

**UNIT-V: Specialized Techniques:** Cell immobilization techniques, cell transmission, Amniocentesis, CEA production and its clinical application, Interferons derived from human cells, 3-D animal cell culture and tissue engineering, FISH and application of animal cell culture.

## **RECOMMENDED BOOKS:**

1. Essentials of Immunology – Roitt
2. Immunology 3<sup>rd</sup> Ed. (1997) – Kuby J.
3. Immunology – An Introduction (2004) –Tizard, I.R., Thompson Pub.
4. Immunology – Roitt.
5. Principle & Practice of Immunoassay 2<sup>nd</sup> Ed. – Christopher & David
6. Animal Cell Culture (1987) – Freshney, R.T.
7. Culture of Animal Cell (2003) – Freshney, R.T.
8. Animal Cell Culture & Technology – Basic from Background to Bench (2004) Taylor & Francis.