SYLLABUS

BIOTECHNOLOGY

(UNDER GRADUATE COURSE)

B. Sc. PART II

2022-23

Department of Botany

JAI NARAIN VYAS UNIVERSITY JODHPUR

B.Sc. Part – II

BIOTECHNOLGOY 2023

Theory

Course	Nomenclature	Number of Papers	Number of Periods per week	Maximum marks	Minimum marks
Paper I	Molecular Biology	1	2	50	54
Paper II	Biophysics	1	2	50	
Paper III	Immunology and Cell Culture	1	2	50	
PRACTICAL COURSE			6	75	27

Duration of examination of each theory papers 3 hours
Duration of examination of practicals 5 hours

PAPER I: MOLECULAR BIOLOGY

Max Marks: 50

Unit 1: Molecular basis of life, Structure of DNA, DNA replication in prokaryotes and eukaryotes. Concepts of genomics and proteomics.

Unit 2: DNA recombination-molecular mechanism in prokaryotes and eukaryotes. Insertion elements and transposons. Structure of prokaryotic genes.

Unit 3: Prokaryotic transcription, prokaryotic translation, prokaryotic gene expression (lac, his, trp, catabolic repression).

Unit 4: Structure of eukaryotic genes- transcription, eukaryotic translation, eukaryotic gene expression and transcription factors.

Unit 5: Gene expression in yeast, post translation regulation of gene expression. Developmental and environmental regulation of gene expression.

PAPER II: BIOPHYSICS

Max Marks: 50

Unit I: Law of thermodynamics, Enthalpy, Free Energy, Heat dissipation and heat conservation. Primary events in Photosynthesis.

Unit II: Strategies of light reception in microbes, plants and animals. Electrical properties of biological components.

Unit III: Generation and reception of sonic vibrations. Hearing aids, Intra and intermolecular interactions in biological system.

Unit IV: Physical methods applied to find out molecular structure: X-ray crystallography and NMR. General Spectroscopy, Lambert-Beer Law, Spectrophotometry & Colorimetery, UV-VIS, Fluorescence, AAS, IR, Raman Spectra

Unit V: Physical methods of imaging intact structure: Ultra sound, Optical filters, X-ray, CAT scans, ECG, EEG, NMR imaging.

PAPER III: IMMUNOLOGY AND CELL CULTURE

Max. Marks: 50

Unit I: The immune system along with historical perspectives. Non-specific & specific immune mechanism, organs and cells of immunity and their function. Concept of Acquired and innate immunity and antigen.

Unit II: Structure and function of various classes of immuno-globulins Humoral Immunity – Mechanism involved.

Cell mediated immunity, role of MHC, mechanism and cells involved.

Vaccines – Dead, live attenuated, recombinant, edible and chimeric vaccines.

Unit III: History of animal cell cultures. Biology of cultured Cells-the culture environment, Cell adhesion, Cell proliferation, energy metabolism.

Culture Vessels: The substrate, choice of culture vessels. Laboratory requirements and sterilization techniques.

Simulating natural condition for growing animal cells- Importance of growth factor is serum.

Unit IV: Primary cultures: Isolation of tissue, primary explants cell line– Nomenclature, Subculture & Propagation, finite and continuous cell lines.

Commonly used cell lines: their origin and characteristics, growth kinetic and cell lines.

Unit V: Application of animal cell culture

Cell Separation, characterization and differentiation

Transformation–Characteristics and applications Transfection of animal cell & selectable markers.

Practical Exercises

1. Separation of molecules in cellular extract in aqueous buffer
   (a) Gel Filtration
   (b) Ion exchange chromatography
   (c) TLC of extracted material
   (d) Isolation of chromosomal and plasmid DNA from bacteria
   (e) Restriction digestion of DNA and assigning restriction sites (demonstrations)
2. Making competent cells of E-coli
3. Transfection cells of plasmid DNA and selection for transformants.
4. Purification of antigens and antibodies
   (a) Raising polyclonal antibodies
   (b) Enzyme Linked Immunoassay
5. Radio immunoassay
   (a) Diagnosis of an infectious disease by an immunoassay
6. Spots related to Spectrophotometry and Spectroscopy

Book Recommended

Buchanan, Gruissem& Jones: Biochemistry and molecular biology of plants –American Society of Plant Physiologist, Maryland USA
Peter Paolella: Introduction to molecular biology. Tata McGraw Hill
Alberts, Bray, Lewis, Raff, Roberts & Watson: Molecular Biology of the cell. Garland Publishing Inc.
Darnell, Lodish & Baltimore: Molecular cell Biology –Scientific American Books Roitt, Male & Brostoff: Immunology. Mobey, London
Roitt: Essential Immunology – Blackwell Scientific
Lewin: Gene VIII, Oxford University Press
Kuby J: Immunology –Understanding of immune system Wiley Liss NY
VolKenshtein: Biophysics, Russian Press
Deniel, M: Basic biophysics for biologists, Agrobios
Van HoIde: Principles of Physical biochemistry, Prentice Hall

Practical Scheme

Time: 5.00 Hrs Max Mark: 75
Min Mark: 27

1.	Perform and explain the given Molecular Biology experiment. Show the result to the examiner	12
2.	Perform and explain the given Biophysics experiment.	12
3.	Perform and explain the given immunology and/or cell culture Experiment	12
4.	Identify and Comment upon the spots (1 to 7)	21
5.	Viva-Voce	10
6.	Practical Record	08