

B.Sc- III Year, Semester –V
PAPER-V
Molecular biology and r-DNA technology

UNIT – I

- 1.1 . Transcription in prokaryotes: Enzymatic Synthesis of RNA, Basic features of RNA synthesis, E.coli RNA polymerase, Classes of RNA molecules. Transcription mechanism in prokaryotes- Promoter, initiation, elongation, proof reading and Rho dependent and Rho independent termination.
- 1.2 . Transcription in Eukaryotes: Polymerases of eukaryotes, Promoters of eukaryotes,
- 1.3 . Synthesis of hn RNA, Splicing mechanisms-Self splicing, protein mediated splicing, alternative splicing, Capping and polyadenylation.
- 1.4 .The Genetic Code, properties of genetic code, Wobble hypothesis. Translation mechanism in prokaryotes and eukaryotes

UNIT – II

- 2.1. Regulation in Prokaryotes: General aspects of Regulation
- 2.2. Transcription level regulation-positive, negative, auto and coordinated regulation
- 2.3. Operon concept – lac, trp, operons.
- 2.4. Translation regulation in Eukaryotic and prokaryotic organism

UNIT – III

- 3.1. Enzymes used in gene cloning: restriction endonucleases, ligases, phosphatases, methylases, kinases.
- 3.2. Cloning vehicles, plasmids, cosmids, phage vectors..
- 3.3. Construction of genomic and cDNA libraries. Identification of cloned genes
- 3.4. Expression vectors: Bacterial, Yeast

UNIT – IV

- 4.1. Principle, Methodology and application of PCR Technology
- 4.2. DNA fingerprinting technique and its application in forensic medicine.
- 4.3. Principles involved in blotting techniques- southern, northern and western.
- 4.4. Genome sequencing: Sanger model of sequencing

PRACTICAL PAPER – V

1. Isolation of DNA from plant, animal/bacterial cells
2. Isolation of plasmid DNA
3. Analysis of DNA by agarose gel electrophoresis
4. Restriction digestion of DNA
5. PCR
6. Competent cell preparation, transformation and selection.

SPOTTERS

1. Spliceosome
2. RNAP
3. t – RNA
4. Lac Operon
5. 5 – cap
6. PBR 322
7. Reverse transcriptase
8. Shine – Dalgarno sequence
9. Taq DNA polymerase
10. YAC

REFERENCE BOOKS

1. Molecular Biology of the Gene - By Watson, Hopkins, Goberts, Steitz and Weiner (Pearson Education)
2. Cell and Molecular Biology - By Robertis&Robertis, Publ: Waverly
3. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
4. Gene Structure & Expression - By J.D. Howkins, Publ: Cambridge
5. Genetic Engineering - By R. Williamson, Publ: Academic Press
6. Principles of Gene Manipulation - By R.W. Old & S.B. Primrose, Publ: Blackwell
7. Genes - By B. Lewin - Oxford Univ. Press
8. Molecular Biology & Biotechnol. - By H.D. Kumar, Publ: Vikas
9. Methods for General & Molecular Bacteriology - By P. Gerhardt et al., Publ: ASM
10. Molecular Biotechnology - By G.R. Click and J.J. Pasternak, Publ: Panima
11. Genes and Genomes – By Maxine Singer and Paul Berg
12. Principles of Gene Manipulation - By R.W. Old & S.B. Primrose, Publ: Blackwell
13. Genes - By B. Lewin - Oxford Univ. Press
14. Molecular Biology & Biotechnol. - By H.D. Kumar, Publ: Vikas
15. Molecular Biology - By D. Freifelder, Publ: Narosa

B.Sc- III Year, Semester –V
ELECTIVE PAPER-(A)
PLANT BIOTECHNOLOGY

UNIT – I.

- 1.1. Historical perspectives of plant tissue culture, and Basic requirement for tissue culture laboratory
- 1.2 .Culture mediums for plant tissue culture- MS medium and B5 Medium. Sterilization of media-steam, dry and filter sterilization- Explants sterilization
- 1.3. Plant growth regulators and differentiation.
- 1.4. Method of tissue culture-formulation of medium explants collection, surface sterilization, inoculation, Callus induction, subculture and regeneration of plants

UNIT - II.

- 2.1. Suspension cultures- growth and subculture, types and synchronization of suspension cultures.
- 2.2. Immobilization of cells and the effect of elicitors on the production of secondary metabolites of commercial value
- 2.3. Meristem culture and its uses in production of virus free plants
- 2.4. Clonal propagation, Micro propagation of plants – medicinal plants and endangered plants –method and advantages

UNIT - III:

- 3.1. Somatic embryogenesis- Principle, protocol and importance. Artificial seed production, applications and limitations and importance of embryo rescue
- 3.2. Anther culture and production of androgenic haploids.
- 3.3. Somaclonal variations; - Applications of somaclonal variations in crop improvement.
- 3.4. Cryopreservation of plant tissues and its application in plant tissue culture .

UNIT - IV:

- 4.1. Protoplast – properties of protoplast ,Protoplast – Isolation (mechanical and enzymatic methods), Culturing and regeneration of protoplasts
- 4.2. Somatic hybridization through protoplast fusion (mechanical fusion, chemo fusion, electro fusion) and Selection of somatic hybrids and cybrids.
- 4.3 Introduction to *Agrobacterium tumefaciens*, Features of Ti Plasmid, molecular mechanism of T-DNA transfer.
- 4.4. Physical gene transfer methods – Particle Bombardment, Electrophoration and Microinjection.

PRACTICAL PAPER VII

1. Preparation of medium for tissue culture. (MS or B5)
2. Sterilization methods of explants (seed leaf, inter node & root), medium
3. Establishment of callus cultures –from carrot.
4. Cell suspension cultures.
5. Protoplast isolation and culture.
6. Synthetic seed production.

SPOTTERS

1. Callus
2. Somatic embryos
3. Rhizogenesis
4. Multiple shoots
5. Green house
6. Somatic hybrids
7. Synthetic seeds
8. GUS gene
9. Gene gun
10. Ti-Plasmid

REFERENCE BOOKS

1. Plant Tissue Culture and its Biotechnological Applications By W. Barz, E. Reinhard, M.H. Zenk
2. Plant Tissue Culture By Akio Fujiwara
3. Frontiers of Plant Tissue Culture By Trevor A. Thorpe
4. In vitro Haploid Production in Higher Plants by S. Mohan Jain, S.K. Sopory, R.E. Veilleux
5. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan
6. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects By Y.P.S. Bajaj and A. Reinhard

**SEMESTER V
ELECTIVE THEORY (B)
MEDICAL BIOTECHNOLOGY**

Unit I:

- 1.1 Karyotyping of human chromosomes
- 1.2 Chromosome banding– G banding and R-banding technique
- 1.3 Inheritance patterns in Man– Pedigree analysis
- 1.4 Diagnosis using monoclonal antibodies- ELISA

Unit II

- 2.1 Chromosomal disorders caused due to structural chromosomal abnormalities (Deletions, duplications, Translocations)
- 2.2 Chromosomal disorders caused due to numerical chromosomal abnormalities (autosomal and allosomal)
- 2.3 Monogenic disorders (autosomal and X-linked diseases)
- 2.4 Mitochondrial diseases – LHON, MERRF

Unit III

- 3.1 Gene therapy – exvivo and *in vivo* gene therapy; somatic and germline gene therapy;
- 3.2 Strategies of gene therapy: gene augmentation – ADA deficiency; Prodrug therapy/ suicide gene – glioma
- 3.3 Stem cells – potency definitions; embryonic and adult stem cells; applications of stem cells – cell based therapies and regenerative medicine
- 3.4 Encapsulation technology and therapeutics-Diabetes

UNIT IV

- 4.1 Cancer – Types, Molecular basis of colon cancer and breast cancer.
- 4.2 Mitochondrial diseases – LHON, MERRF
- 4.3 DNA/RNA based diagnosis- HBV, HIV
- 4.4 Genetic counselling for human disorder.



B. Sc. Biotechnology Syllabus, Kakatiya University (CBCS)

Chair Person
Board of Studies in Biotechnology
Kakatiya University
Warangal - 506 009 (A.P.) INDIA




ELECTIVE (B): PRACTICALS

1. Karyotyping of normal and abnormal human chromosome sets
2. Human pedigree analysis
3. Estimation of C-reactive protein
4. Dot ELISA
5. Genotyping of candidate genes for diseases by RFLP
6. Encapsulation of mammalian cells

SPOTTERS

1. Pedigree
2. Monoclonal antibodies
3. ELISA
4. Oncogenes
5. Cri du Chat syndrome
6. Trisomy
7. Diabetes Mellitus
8. SCID
9. Stemcells
10. HBV

REFERENCE BOOKS

1. Medical Biotechnology-PratibhaNallari, V.VenugopalRao-Oxford Press
2. Introduction to Human Molecular Genetics – J.J Pasternak, John Wiley Publishers
3. Human Molecular Genetics –Tom Strachen and A P Read, Bios Scxientific Publishers
4. Human Genetics Molecular Evolution, McConkey
5. Recombinant DNA Technology, AEH Emery
6. Principles and Practice of Medical Genetics, I, II, III Volumes by AEH Edts. Emery
7. Molecular Biotechnology, Glick and Pasternak