

Paper 10a BIOTECHNOLOGY, TISSUE CULTURE AND BIOINFORMATICS

B.Sc. va (Candidates admitted from the academic Year 2008-2009)

**1
Core Theory**

UNIT I

Introduction to Biotechnology: Definition, branches of biotechnology, history and scope. Current demands from biological resources for food, fodder, feed, timber oil, perfumes, pigments, biofertilisers, therapeutic agents, fermentation etc.

Terminology: bioprospecting, biofertilizers, alkaloid, terpenoid, phenols, flavinols.

UNIT II

Enzyme Biotechnology: Basic concepts. Isolation, purification, production, concentration and package of enzymes. Immobilization and industrial preparation of enzymes.

Terminology: biocatalyst, enzyme immobilization.

UNIT III

DNA Technology: Introduction to DNA molecules. Isolation of genomic DNA and Plasmid. Recombinant DNA technology - restriction enzymes, vectors and DNA delivery systems. Transgenic plants. Ethical issues in production of genetically modified organisms (GMOs).

Terminology: genome, cosmid, vector, gene gun, rDNA, microinjection, electroporation.

UNIT IV

Bioinformatics: Introduction to bioinformatics. Biological Database – Protein and DNA sequence data base, Structure database, literature database, (Pubmed, Medline). Sequence Alignment, Database similarity searching; FASTA; BLAST, Proteomics – protein structure prediction (primary, secondary & tertiary), Human Genome Project.

UNIT V

Plant Tissue culture: Introduction. Concepts of totipotency. Design and plan of R & and commercial tissue culture laboratory. **Sterilisation Procedures:** Fumigation, wet and dry sterilisation, UV sterilisation, ultra filtration and surface sterilisation. Maintenance of axenic condition. **Media and Explants in *In vitro* cultures:** Micro and macronutrients, vitamins, natural adjuvants like coconut milk and fruit juices. Auxin, cytokinin and other PGRs and other components of media. Solid, liquid and prepacked media. Explants - shoot tip, axillary buds, leaf disc, cotyledons, inflorescence and floral organs.

Terminology: Totipotency, Fumigation, ultra filtration, explant, surface sterilisation, surfactant, axenic culture, primordiomorph, endogenous hormone.

UNIT VI

***In vitro* cultures:** Callus culture - Initiation and maintenance of callus. Micropropagation -direct and indirect morphogenesis, somatic embryogenesis and synthetic seed production. Embryo culture and Anther culture . Cryopreservation and germplasm storage.

Cell and Protoplast Culture: Culture systems, isolation of single and aggregate cells and regeneration of plants. Isolation of protoplast, somatic cell hybridization, selection and regeneration of plants.

Terminology: Callus, meristamoid, micropropagation, masspropagation, Caulogenesis, rhizogenesis, direct morphogenesis, indirect morphogenesis, somatic embryogenesis, androgenesis, embryo resque.. Protoplast, auxophyton, Steward apparatus, agitator, shaker, osmoticum, fusogen, DMSO, somatic cell hybridization, electroporation, microinjection.

Suggested Reading

BALASUBRAMANIAN, D., BRYCE, C. F. A., DHARMALINGAM, K., GREEN, J. AND KUNTHALA JAYARAMAN. (Edts.) 1996. *Concepts in Biotechnology* University Press (India) Ltd.

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- GEORGE E.F., AND P.D.SHERINGTON. 1984. *Plant Propagation by Tissue Culture*. Exegectics Ltd. England.
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- MARX, F.L. 1989. *A Revolution in Biotechnology*. Cambridge Univerisity Press. Cambridge. New York.
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