Lesson Plan For Session 2023-24

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Department - Biotechnology

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| **Month** | **Class and Paper** | **Topic** |
| August | B. Sc. 5th sem XI Animal Biotechnology | UNIT – I Animal Cell & Tissue Culture: Introduction, Principles & practice. History and Development of animal cell culture. Scope and Applications.Culture Media: Media components, Serum containing and serum free media. Natural media-Plasma clot, biological fluids, tissue extracts. Growth factors required for proliferation of animal cells. Chemically defined media, balanced salt solutions. Physical requirements for growing animal cells in culture. Washing, drying, sterilization practices, various instruments and their uses in animal cell culture practices. Primary Cell Culture techniques: Initiation of cell culture-substrates (glass, plastic, metals) their preparation and sterilization. Isolation of tissue explants, disaggregation- enzyme disaggregation and mechanical disaggregation of the tissue.development of primary culture and cell lines. Subculture. Contamination.. Suspension culture, Growth curve of animal cells in culture. Secondary cell culture – transformed cell and continuous cell lines. Finite and infinite cell lines.Cell lines: Insect and animal cells. Commonly used cell lines- their organization and characteristics. Cell repositories and their function. Karyotyping, biochemical and geneticcharacterization of cell lines.Organ Culture: technique, advantages, application and limitation.Artificial skin. |
| September | B. Sc. 5th sem XI Animal Biotechnology | Transfection of animal cells: transfection methods. Methods for cell fusion, Selectable markers,HAT selection and Antibiotic resistance. Cloning and expression of foreign genes in animal cells: Expression vectors. Over productionand preparation of the final product i.e. expressed proteins.Production of vaccines in animal cells.Hybridoma Technology: Production of monoclonal antibodies and their applications.Embryo transfer technology- technique, its applications. Artificial insemination. Animal clones. Transgenic Animals: transgenic sheep, cow, pig, goat etc.Production of transgenic mice, ES cells can be used for gene targeting in mice, applications of gene targeting.Therapeutic products through genetic engineering – blood proteins, insulin, growth hormone etc. Gene Therapy: introduction, types of gene therapy, vectors in gene therapy, major achievements, problems and prospects |
| October | B. Sc. 5th sem XII Plant Biotechnology | UNIT – I Plant Tissue Culture: Introduction/Concept, History, Scope and Applications along with major achievements. Plant Tissue Culture Laboratory: Layout and organization, different work areas, infrastructure/equipments and instruments and other requirements.Aseptic Techniques: General sanitation/cleanliness of PTC laboratory and precautions regarding maintenance of aseptic conditions, Washing, drying and sterilization of glassware, sterilization of media, surface sterilization, aseptic work station. Culture Media: Nutritional requirements for plant tissue culture, role of different media components, plant growth regulators, different culture media viz. MS, B 5 Nitsch and White’s medium, Preparation of culture media. In-vitro methods in plant tissue culture: Explants, their cellular characteristics, dedifferentiation and redifferentiation, cellular totipotency, organogenesis and somatic embryogenesis.cropropagation/clonal propagation of elite species (different routes of multiplication-axillary bud proliferation, somatic embryogenesis, organogenesis), Synthetic seeds (a brief account) Callus and suspension culture techniques: Introduction, principle, methodology, applications and limitations. Somaclonal variation. 16Organ culture: Anther & Pollen culture, ovary, ovule, embryo and endosperm culture – concept, technique, applications and limitations. Embryo rescue. Protoplast culture: Protoplast isolation, viability test, protoplast culture. Somatic hybridization – protoplast fusion techniques (chemical and electro-fusion), selection of hybrids, production of symmetric and asymmetric hybrids and cybrids. Practical applications of somatic hybridization and cybridization. |
| November | B. Sc. 5th sem XII Plant Biotechnology | UNIT - II Production of secondary metabolites in vitro: introduction, technique and utilities. Biotransformation (a brief account only). Plant germ plasm conservation and cryopreservation. Genetic Engineering in plants: Introduction, Plant transformation by Agrobacterium tumefaciens and A. rhizogenes. Ti plasmid. Strategies for gene transfer to plant cells. Binary and cointegrate vectors. Gene targeting in plants. Use of plant viruses as vectors (brief account only). Direct DNA transfer/Physical methods of gene transfer in plants - micro projectile bombardment, electroporation, liposome mediated, Calcium phosphate mediated etc. Transgenic Plants: Introduction and applications. Developing insect resistance, bacterial and fungal disease resistance, virus resistance and abiotic stress tolerance in plants. Improving food quality – nutritional enhancement of plants (carbohydrates, seed storage proteins and vitamins). Plants as Bioreactors: antibodies, polymers, industrial enzymes. Edible vaccines. |
| August | B. Sc. 3rd sem  VII Molecular Biology | UNIT – 1 Molecular Biology: Introduction to molecular aspects of life. DNA as the genetic material – experiments proving DNA and RNA as genetic material.Nucleic acids: Structure, function and properties of DNA and RNA. Watson and Crick model of DNA. DNA forms (A, B and Z), their characteristic. Different types of RNA, their structure andfunction. Organization of Genomes – bacterial, viral, human, organelles. Eukaryotic genomes: Chromosomal organization and structure. Euchromatin, heterochromatin,centromere, telomere. |
| September | B. Sc. 3rd sem  VII Molecular Biology | Chromatin structure (nucleosome), histone and non-histone proteins.Insertion elements and transposons; IS elements, transposable elements of Maize and P elements of Drosophila. Extra chromosomal DNA in prokaryotes – plasmids.DNA Replication: Central dogma of molecular biology. Semi-conservative mode of DNA replication, experimental proof. Unidirectional and bidirectional mode of DNA replication, theta model and rolling circle model. DNA replication in prokaryotes and eukaryotes, different stages, proteins and enzymes involved. DNA damage and repair: causes of DNA damage, mutations. Repair mechanisms- photo reactivation, excision repair, mismatch repair, SOS repair. |
| October | B. Sc. 3rd sem  VII Molecular Biology | UNIT II Genetic Code: concept, elucidation or cracking of genetic code, features of genetic code, Wobble hypothesis. Structure of gene- introns/exons, regulatory sequences, structure ofprokaryotic gene.Transcription in prokaryotes and eukaryotes, diff. stages, mechanism, promoters, transcription factors, RNA polymerases. Post transcriptional modifications- 5’ cap formation, 3’-end processing/polyadenylation and gene splicing and generation of mature mRNA. Inhibitors of transcription. |
| November | B. Sc. 3rd sem  VII Molecular Biology | Translation/Protein synthesis: Mechanism of initiation, elongation and termination of protein synthesis in prokaryotes and eukaryotes. Inhibitors of translation. Post-translationalmodifications. Regulation of Gene Expression in prokaryotes and eukaryotes, induction and repression,positive and negative regulation. Operon model- lac, ara, trp, catabolite repression, transcription attenuation. Molecular mechanisms of DNA recombination in eukaryotes – SiteSpecific and Homologousrecombination. Recombination in prokaryotes – Transformation, transduction and conjugation. |





