

**M.Sc. Botany**

**(Semester-III)**

**MBOTCC-10: Cell Biology & Cytogenetics (5 Credits)**

**Time: 3hrs**

**Marks: 70**

The question paper will consist of 7 questions divided into 3 sections.

Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2:20 marks).

Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5:20marks).

Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10:30 marks).

**Unit I**

Cell theory and organization of the cell (Prokaryotic and Eukaryotic). Ultrastructure chemical composition of the following: Cell wall, Plasma membrane, Cytoplasm and cytoplasmic organelles (origin, ultrastructure & function: Plastids, Mitochondria, Endoplasmic reticulum, ribosomes, Golgi complex, Lysosomes and Peroxisomes.

**Unit-II**

Nucleus: Nuclear membrane, nuclear pore, nucleolus and karyolymph. Cell division, Cell cycle and apoptosis, Control mechanism, cytokinesis and cell plate formation

**Unit-III**

Chromosome: Organization and special types. Mendelian genetics. Gene interaction. Sex determination

**Unit-IV**

Extranuclear inheritance. Chromosomal aberration, polyploidy-Upes and role in speciation. Mutations- Molecular mechanism, induction by physical and chemical mutagens

**Unit- V**

Population Genetics. Microscopy: Phase contrast microscopy, Electron microscopy (SEM and TEM), Fluorescence microscopy, Microdensitometry

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**MBOTCC-II: Molecular Biology (5 Credits)**

**Time: 3hrs**

**Marks: 70**

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Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5:20marks).

Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10:30 marks).

**Unit I**

Organization of DNA: Nucleic acids as hereditary material; Structure and forms of DNA and RNA, double helix, supercoiling of DNA

**Unit II**

DNA replication: DNA replication models; Mechanism of DNA replication. DNA damage and repair mechanism: Different types of DNA damage and repair mechanisms; Diseases caused due to impairment in repair mechanism

**Unit III**

Transcription: Importance of DNA binding Proteins, RNA polymerase-types, structure and functions; Mechanism of Transcription in prokaryotes & Eukaryotes; Genetic code: Cracking of code; characteristics

**Unit IV**

Translation: Machinery and mechanism in prokaryotes and eukaryotes; role of t RNA & ribosome; post translational modification of proteins such as phosphorylation, adenylation, acylation and glycosylation

**Unit-V**

Regulation of gene expression: Prokaryotes- Positive and negative control, inducible and repressible operons, lac operon, trp operon. Eukaryotes- Regulation at DNA, transcription, translation and post translational level. Antisense technology: Molecular mechanism of antisense molecules, application of antisense technologies.

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**MBOTCC-II: Recombinant DNA Technology (5 Credits)**

**Time: 3hrs**

**Marks: 70**

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Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5:20marks).

Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10:30 marks).

**Unit I**

rDNA technology: Techniques used in RDT: Polyacrylamide and agarose gel electrophoresis Blotting techniques: Southern, Northern and Western blouing Polymerase chain reaction and its applications, DNA sequencing: Various methods of DNA sequencing

**Unit II**

Core techniques and essential enzymes; Restriction enzymes-types and cleavage pattern; DNA ligase- types and ligation of DNA molecule *in vitro* Cloning vectors: Plasmids (natural, pBR322, Ti plasmid vectors), phages, cosmid, Shuttle vectors; Expression vector

**Unit III**

Passenger DNA: Different strategies used for isolation/synthesis of gene; Organ chemical synthesis of gene; Construction of genomic and cDNA libraries. Construction of rDNA: Different strategies for construction of rDNA (Use of restriction and enzymes, Linkers)

**Unit IV**

Selection strategies: Different methods for selection of clone (antibiotic resistant markers, colony hybridization, plaque hybridization, immuno screening). Methods of DNA transfer in suitable host: electroporation, electrofusion, microinjection and particle gun method, Expression of foreign gene

**Unit V**

Application of rDNA technology: In medicine, agriculture and environment protection  
DNA finger printing: Methodology and its application. Safety of recombinant DNA technology:  
Restriction and regulation for the release of GMOs; Social and ethical issue

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**(Semester-III)**

**MBOTCC-13: Plant Ecology and Environmental Biology (5 Credits)**

**Time: 3hrs**

**Marks: 70**

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Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).

Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).

Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

**Unit- I**

Organism and population concept; Natality; Mortality; Density; Rate of population increase; r and k selection; Age and sex ratio; Aggregation Interactions among populations: Commensalism, Amensalism, Mutualism, protocooperation and Symbiosis, predation and parasitism, competition Intraspecific and interspecific. Plant adaptations

**Unit- II**

(i) Community Structure: Qualitative character : Physiognomy, phenology, Sociability, vitality, Raunkiaer's life forms. Quantitative Character : Frequency, Density, Abundance, Cover and basal area. Synthetic character : Presence and constance, Fidelity, Importance value Index. Methods of studying plant community: quadrates, Transects, Bisect, Plotless method. Classification of communities: Physiognomic classification, Floristic classification, Dynamic system, Continuum concept

(ii) Community dynamics: Concept of Succession, Nudation, Invasion, Competition and reaction, Stabilization and Climax, Xerosere and Hydrosere and their seral stage

**Unit-III**

Ecosystem: Abiotic and biotic components; Ecological pyramids; Structural organization of grassland, forest and aquatic ecosystem. Ecosystem energetic: laws of thermodynamics, Productivity, energy food chain and ecosystem budget; Biogeochemical cycles

**Unit-IV**

Environmental Pollutions: Air, Water, Soil, waste radioactive and noise pollution; Global warming; green house effect; O<sub>3</sub> depletion; Climate change

**Unit-V**

Environmental Awareness: Man and Biosphere (MAB); International Union for Conservation of Nature and Natural Resources (IUCN); United Nations Environment Programme (UNEP); World Environmental Day; Wildlife Preservation Act(1972); Indian Forest Conservation Act (1989)

**MBOTCC-14: Practical3 (Based on MBOTCC 5,6,7, g & 9) (5 Credits)**

**Time: 5 hrs**

**Marks: 70**

1. Principle and use of different modern instruments used in Botany.
2. Cytological techniques: Preparation of cytological stains, fixation of sample etc.
3. Mitotic slide preparation of common plant.
4. Meiotic slide preparation of common plant.
5. Karyotype analysis.
6. Calculation of chiasma frequency.
7. Isolation of antibiotic resistant mutant by auxanography technique.
8. Isolation of genomic DNA from cauliflower.
9. Spectrophotometric estimation of DNA by diphenyl method.
10. Separation of DNA by agarose gel electrophoresis.
11. Demonstration of amplification of DNA using pCR.
12. Study of local vegetation by quadrat method.
13. Study of ecological adaptations (Morphological and anatomical) in plants.
14. Water analysis for pollution studies (Dissolved Oxygen, BOD, and Dissolved Carbon dioxide. Chloride, Alkalinity etc.