

# 6S Botany

## SEMESTER VI – MOLECULAR BIOLOGY AND BIOTECHNOLOGY

### Unit-I : DNA the genetic material :

- 1.1 Historical account – Giffith's Expt, Hershy and Chase Expt.
- 1.2 DNA– Chemical composition and Double Helical model ,
- 1.3 DNA replication in Eukaryotes;
- 1.4 DNA Packaging - Nucleosome and Solenoid
- 1.5 Satellite, Repetitive DNA and Transposable element in plants (AC-DS system)

### Unit-II : Gene Structure and Expression -

- 2.1 Concept of gene, Fine structure of Gene
- 2.2 Gene Expression – Central Dogma, Types of RNA, Genetic code, Ribosome as a translation machine
- 2.3 Transcription in Eukaryotes – Mechanism of Transcription and RNA Processing
- 2.4 Translation in Eukaryotes.
- 2.5 Endomembrane system (Flow of Peptide)

### Unit – III : Regulation of Gene Expression

- 3.1 Regulation of Gene Expression in Prokaryotes – Operon concept with special reference to Lac Operon
- 3.2 Regulation of gene expression of Eukaryotes – Britton Davidson Model
- 3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)
- 3.4 Protein Sorting – Targeting to proteins to organelles
- 3.5 Protein Trafficking

### Unit-IV : Genetic Engineering -

- 4.1 Tools and techniques of recombinant DNA technology,
- 4.2 Restriction Enzymes – Nomenclature and Types
- 4.3 Cloning vectors – Plasmids, Phages, Cosmids
- 4.4 Gene Source- Genomic and c-DNA library
- 4.5 Gene Transfer Techniques – Direct - (1) Chemical method, (2) Electroporation, (3) Gene gun method Indirect – Agrobacterium mediated gene transfer
- 4.6 Gene Amplification - \_Polymerase Chain Reaction (PCR)

### Unit-V : Plant Tissue Culture -

- 5.1 Basic aspects of plant tissue culture
- 5.2 Laboratory Requirement – Infrastructure, Instruments (laminar air flow, autoclave, growth chamber),  
Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques
- 5.3 Tissue Culture Technique - Cellular totipotency, differentiation and morphogenesis; Callus Culture; Micro propagation

### Unit-VI : Applications of Biotechnology -

- 6.1 Agriculture – Haploid plant production (Anther and Pollen Culture); Protoplast Culture and Somatic Hybridization; Transgenic Plant - BT Cotton, Synthetic seed. Salient achievements of crop biotechnology
- 6.2 Industry – Fermentation Technology- Bakery Products and Alcohol Productions.
- 6.3 Health Care – Edible Vaccines
- 6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons

## **LABORATORY EXERCISE**

### **1) Molecular biology (Major) (Any One)**

1. Isolation of DNA by crude method
2. Estimation of DNA by Diphenylamine method
3. Estimation of RNA by Orcinol method

### **2) Molecular biology (Minor) (Any One)**

1. Demonstration of DNA Electrophoresis,
2. Demonstration of double helical model of DNA
3. Demonstration of AC-DS System in Maize kernel
4. Demonstration of Centrifugation

### **3) Biotechnology (Any Six)**

1. Working Principle and application of Autoclave
2. Working Principle and application of Laminar Air Flow
3. Cleaning and Sterilization of Glassware
4. Sterilization of Explant
5. Inoculation of Explant
6. Demonstration of in vitro culture techniques – anther and pollen culture
7. Isolation of Protoplast by Mechanical Method
8. Isolation of Protoplast by Enzymatic Method
9. Demonstration of technique of Micropropagation
10. Preparation of Artificial Seed
11. Demonstration of hardening of tissue culture plant
12. Preparation of Tissue culture media
13. Pollen viability test.

**Note:** Visit to molecular biology, biotechnological research institute/industry

## **PRACTICAL EXAMINATION**

**Time : 4 hours.**

**Marks : 50**

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|---|----------|
| Que.1 : To perform given Molecular Biology experiment | 15 Marks |
| Que.2 : Comment on minor molecular Biology Experiment | 05 Marks |
| Que.3 : To perform given Biotechnology experiment     | 15 Marks |
| Que.4 : Comment on any one Biotechnology Experiment   | 05 Marks |
| Que.5 : Visit report                                  | 05 Marks |
| Que.6 : Class record/ and viva-voce                   | 05 Marks |