

## 8. BOTANY (OPTIONAL)

**B.Sc. VI Semester**

**(w.e.f 2016-17)**

**Botany paper- I**

**50 Hrs**

**Objectives:** This paper has topics on Cell Biology, Genetics and Evolution to study the fundamental units of heredity and variations.

### **Unit 1 Cell Biology:**

**10 Hrs.**

**The cell:** General organization of prokaryotic and Eukaryotic cells. Ultra-structure & functions of Nucleus, Plastids, Mitochondria, Golgi complex, Endoplasmic reticulum, Lysosomes, Peroxisomes & Vacuoles. Ultra structure & functions of Plasma membrane & Cell wall.

**Unit 2: Morphology of Chromosomes:** Number, size, shape, types, centromere, SAT-chromosomes, Ultra structure of giant Chromosomes, Ploidy and chromosomal aberrations.

**06 Hrs.**

**Unit 3: Cell division:** Mitosis and Meiosis. **Cell cycle:** regulation of cell cycle. **06 Hrs.**

### **Unit 4: Genetics:**

**22 Hrs.**

Mendelism (Laws of inheritance, Monohybrid, Dihybrid Experiments). Gene interaction (Allelic - incomplete dominance, co-dominance Non - allelic - Complementary, Supplementary, Epistasis) Linkage & crossing over, Alleles, Multiple alleles, Sex determination, Sex linked inheritance, Mutations, Problems related to the above topics.

## **Unit 5: Evolution :**

**06 Hrs**

Origin of life, Lamarckism, Darwinism, Mutational and Modern concepts of evolution.

### **Practicals:**

1. Study of Microscopes – Light microscope, phase contrast microscope & electron microscope.
2. Cytological techniques (Pre-treatment, fixation, preservation, cytological stains, squash preparation, smear preparation, mounting media and permanent slides preparation).
3. Mitosis preparation (Squash)-onion root tips.
4. Meiosis preparation (Smear)-. Onion/Rheo Flower buds.
5. Micrometry.
6. Karyotype & Idiogram – *Allium cepa*.
7. Polytene chromosomes – *Drosophila/ Chironomas*
8. Heterozygotic translocation in *Rheo-discolor*
9. Genetic problems.
10. Genetic problems.

### **Suggested Reading:**

1. Gupta P.K.- A Text Book of Cell and Molecular Biology- Rastogi Publication Meerut
2. Strick Burger M. – Genetics - Mc Millan Publishing Co.
3. Sinnot Dunn & Dobzhanasky – Principles of Genetics-Tata Macgrow Hill
4. Tamarin – Principles of Genetics -
5. Sharma A.K. and Sharma A: - Plant Chromosomes Analysis Manipulation and Engineering – Harward Academic Publishers, Australia.

6. L.R. Patki, B.L.Bhalachandra & I.H.Jeewaji- Genetics- S. Chand Publications.

7. P.S. Verma & Agarwal - Cell Biology & Genetics -

1. Benjamin Lewen – Gene VI & VII – New York Oxford University Press, USA.

**Semester-VI**  
**Botany Practical-I**  
**(Cell Biology and Genetics)**

**Time: 4 Hours**

**Max Marks: 40**

- |      |  |           |
|------|--|-----------|
| Q.1  | Make a temporary micro preparation of the squash/smear of the specimen <b>A</b> . Draw labelled diagrams of any two stages of cell division seen in your preparation and show to the examiner. | <b>08</b> |
| Q.2. | Determine the length and breadth of the given material <b>B</b> , by micrometric method.   | <b>06</b> |
| Q.3. | Solve the genetic problems <b>C &amp; D</b> .  | <b>08</b> |
| Q.4. | Identify and describe the cytological features with diagrams in slides <b>E, F, G</b> and <b>H</b> .   | <b>08</b> |
|      | Submission of 3 mitosis and 2 meiosis slides.  | <b>05</b> |
|      | Journal  | <b>05</b> |

**B.Sc VI Semester Practical Examination**

**Subject: Botany Paper- I**

**Instructions to Examiners.**

**Time: 4Hours**

**Max Marks: 40**

- |      |  |                |
|------|--|----------------|
| Q.1. | Squash/Smear preparation of the specimen -A  | <b>8 marks</b> |
|      | (Preparation-4 marks, diagrams-2 marks, oral-2 marks).   |                |
| Q.2. | Specimen - <b>B</b> (onion peeling cells or any permanent slide of algal specimen. Calibration-3 marks, diagram-1 mark, measurement of length and breadth -2 marks ) | <b>6 marks</b> |

**Q.3. Genetic problems – C and D** **8 marks**

**Q.4. Cytological Slides - D, E, F and G** **8 marks.**

(one slide from mitosis, two slides from meiosis and one specimen/slide from polytene chromosomes/heterozygotic translocation/karyotype and idiogram. Identification-1/2mark, diagram-1/2 mark,description -2 mark).

Submission of permanent slides of 3 mitosis and 2 meiosis. **5 marks**

**Journal** **5 marks.**

## **B.Sc.VI Semester Theory Examination**

### **Sub: BOTANY Paper – I**

#### **Pattern of Question Paper**

**Time: 03 hours**

**Max. Marks: 80**

**All questions are compulsory**

**Q. I Answer any ten out of twelve (01 to 12 sub questions)**

**10 X 2 = 20**

From Unit 1: Cell Biology: 02 sub questions.

From Unit 2: Morphology of Chromosomes: 02 sub questions.

From Unit 3: Cell division: 02 sub questions.

From Unit 4: Genetics: 05 sub questions.

From Unit 5: Evolution: 01 sub question.

**Q. II Answer any six out of eight (13 to 20 sub questions)**

**6X 5 = 30**

From Unit 1: Cell Biology: 02 sub questions.

From Unit 2: Morphology of Chromosomes: 01 sub question.

From Unit 3: Cell division: 01 sub question.

From Unit 4: Genetics: 03 sub questions.

From Unit 5: Evolution: 01 sub question.

### Q. III Descriptive Answers

21. From Unit 1: Cell Biology: 01 sub question. 1 X 10 = 10  
OR  
From Unit 2: Morphology of Chromosomes-01 sub question.
22. From Unit 3: Cell division: 01 sub question. 1 X 10 = 10  
OR  
From Unit 4: Genetics: 01 sub question.
23. From Unit 4: Genetics: 01 sub questions. 1 X 10 = 10  
OR  
From Unit 5: Evolution: 01 sub question.

**B.Sc VI semester**

**(w.e.f 2016 -17)**

**Botany paper -II**

**(Molecular Biology, Biotechnology & Immunology)**

**50 hrs**

**Objectives:** - Molecular Biology, Biotechnology and Immunology has some recent trends in the concern fields. This will help students to pursue research in concerned fields.

**Unit 1: Nucleic Acids:** DNA & RNA, occurrence, types and chemical compositions,

Experimental evidences for DNA as genetic material. Structure of DNA, Replication, semiconservative method, RNA and types, post transcription changes.

**10 Hrs.**

**Unit 2: Gene Expression:** Gene concept, Genetic code & protein synthesis. Regulation of gene expression in prokaryotes & eukaryotes.

**08Hrs.**

### **Unit 3: Recombinant DNA technology and Bioinformatics:**

Enzyme, vector (plasmid PBR 322), marker gene, Steps of cloning technique, PCR and its application, Genomic DNA and cDNA library, Brief concept on Genomics and proteomics.

**08 Hrs.**

### **Unit 4: Biotechnology and Genetic engineering of plants:**

Basic concepts, principles and scope. Aims, strategies for development of transgenic plants (with suitable example). Agrobacterium-The natural genetic engineer. T-DNA and transposon mediated Gene tagging, intellectual. Property rights, possible ecological risks and ethical concerns.

**12Hrs.**

### **Unit 5: Microbial genetic manipulation and Immunology:**

**Microbial genetic manipulation:** Bacterial transformation, selection of recombinant and transformants, genetic improvement of industrial microbes, nitrogen fixers & fermentation technology.

**Immunology:** Immuno-systems, Immunotechniques in Agriculture, ELISA method to detect Plant diseases & Monoclonal antibodies.

**12 Hrs.**

#### **Practicals:**

1. DNA estimation by DPA diphenyl amine method.
2. RNA estimation by orcinol method.
3. Extraction and estimation of protein from plant source.  
1) Salt precipitation method    2) solvent method
4. Culturing of Rhizobium-YEMA media.
5. Culturing of Azatobacteria-ASHBY'S media.
6. Demonstration of Electrophoresis technique
7. Agarose gel electrophoresis.
8. Demonstration and comparison of GM Plants with Non GM Plants (BT- Cotton, BT-Brinjal, BT Tomato).
9. **Visit to Biotechnology Research Laboratory.**

### **Suggested Reading:**

1. Cell & Molecular Biology -- By E.D.F. De Robertis -- ISE Publication
2. Basic Biotechnology -- Colin Rateledge  
& Bjorn Kristianses -- Cambridge Uni. Press.
3. A Text Book of Biotechnology – R.C. Dubey – S. Chand Publication
4. Cell Biology, Genetics Molecular Biology, Evolution & Ecology -- P.S. Verma & V. K. Agarwal
5. Casida L.E. (1984)- Industrial Microbiology, Wiley Easterbs, New Delhi.
6. Roitt- Immunology
7. Kubey – Immunology.
8. Fatima – Immunology

### **B.Sc. VI Semester**

### **Practical Paper-II**

### **(Molecular Biology, Biotechnology & Immunology)**

**Time: 4 Hours**

**Max Marks: 40**

- |      |  |          |
|------|--|----------|
| Q.1. | Estimation of DNA/RNA from the given sample A.   | 10 Marks |
| Q.2. | Estimation of Protein from the unknown sample B. | 10 Marks |
| Q.3. | Identify and comment C and D.                    | 5 Marks  |

**Project report submission and Viva voce.** 10 Marks.

Journal. 05 Marks

## **B.Sc VI Semester Practical Examination**

### **Subject: Botany Paper- I**

#### **Instructions to Examiners.**

**Time: 4Hours**

**Max Marks: 40**

**Q.1.** Sample A- Plant resource (Procedure- 05 marks, Preparation- 03 marks, Tabulation- 02 marks) **10 marks**

**Q.2.** Unknown Sample B- (Procedure- 05 marks, Observation and results- 05 marks) **10 marks**

**Q.3.** Specimen C-GM/Non GM plant Material may be given  
Specimen D- Any biotech instrument/ any bacterial culture may be given **05 marks**

Project report submission and Viva voce. **10 Marks**

**Journal** **05 marks.**

## **B.Sc.VI Semester Theory Examination**

### **Sub: BOTANY Paper – II**

#### **Pattern of Question Paper**

**Time: 03 hours**

**Max. Marks: 80**

All questions are compulsory

**Q. I Answer any ten out of twelve ( 01 to 12 sub questions) 10 X 2 = 20**

From Unit 1: Nucleic Acids: 02 sub questions.

From Unit 2: Gene Expression: 02 sub questions.

From Unit 3: Recombinant DNA technology and Bioinformatics: 02 sub questions.

From Unit 4: Biotechnology and Genetic engineering of plants: 03 sub questions.



From Unit 5: Microbial genetic manipulation and Immunology: 03 sub questions.

**Q. II Answer any six out of eight (13 to 20 sub questions)**

**6X 5 = 30**

From Unit 1: Nucleic Acids: 02 sub questions.

From Unit 2: Gene Expression: 01 sub question.

From Unit 3: Recombinant DNA technology and Bioinformatics: 02 sub questions.

From Unit 4: Biotechnology and Genetic engineering of plants: 02 sub questions.

From Unit 5: Microbial genetic manipulation and Immunology: 01 sub question.

**Q. III Descriptive Answers.**

21. From Unit 1: Nucleic Acids: 01 sub question.

**1 X 10 = 10**

**OR**

From Unit 1: Nucleic Acids: 01 sub question.

22. From Unit 2: Gene Expression: 01 sub question.

**1 X 10 = 10**

**OR**

From Unit 3: Recombinant DNA technology and Bioinformatics: 01 sub question.

23. From Unit 4: Biotechnology and Genetic engineering of plants: 01 sub question.

**1 X 10 = 10**

**OR**

From Unit 5: Microbial genetic manipulation and Immunology: 01 sub question.