**Aim of the Course:**
The Degree of Master of Science in Plant Science aims to introduce the students to various aspects of plant biology. At the end of the course, the students are expected to have good working knowledge in the field of Plant Science.

**Eligibility for Admission:**
Candidates for admission to M.Sc. Plant Science shall be required to have passed B.Sc. in Plant Science/ Botany conducted by the Universities approved by UGC, New Delhi with Chemistry/ zoology as allied subject(s) of study or an examination accepted as equivalent thereto and 40 percentage of marks in Part III (aggregate / Part - III), subject to such conditions as may be prescribed therefore.

**Lateral Entry (if applicable)**
Candidates who have passed Diploma in First cycle (10*3 years of Study) are eligible to apply for the lateral entry to the 2nd year of the course subject to availability of seats, but limited to 10% of the sanctioned intake.

**Duration of the course:**
The Course shall be of two years duration spread over four semesters. The maximum duration to complete the course shall be four years (including completion of arrears, if any).

**Eligibility for admission to Examination:**
Sixty (60) percentage of attendance for theory Eighty (80) percentage of attendance for Practicals (i.e., % attendance required prescribed if any)

**Medium:**
The medium of instruction shall be English

**Passing Minimum:**
Passing eligibility & classification for the award of the Degree is as follows: Passing Minimum - 50%; II Class - 50 to 60%; I Class - 60 to 75%; Distinction - above 75%
PONDICHERRY UNIVERSITY
NORMS FOR AFFILIATION FOR M.Sc, PLANT SCIENCE COURSE

(Minimum requirements regarding infra structure, Faculty, library, student
teacher ratio, equipment etc.)

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Requirement</th>
<th>Specification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>STUDENT STRENGTH</td>
<td>The intake of Students should not exceed 15 (fifteen) per class.</td>
<td></td>
</tr>
</tbody>
</table>
4. **STAFF ROOM**

There shall be a very big enough room to accommodate the faculty members. The size of the room should be determined by multiplying the number of faculty members with 2 sq. meters. This room should be partitioned into cubicles so that each faculty member has a cubicle and some privacy. A separate room should be provided for the HOD with attached toilet facilities and bookshelf facilities.

1. Attached toilet facilities should be provided for Staff.
2. Each cube should be provided with rack facilities.

5. **LABORATORIES**

**MAIN LABS:** There should be a minimum of Two main laboratories; 1. For I Year M.Sc, students 2. For II Year M.Sc, students.

Each Lab should have enough space to accommodate 15 worktables of size of 1.219 meters (4ft) x 1.524 meters (5ft) to be arranged in rows with interspace of 1.219 meters (4ft). Approximately 0.743 Sq.meters per student and space equipments.

1. All labs should be provided with three phase electrical connections with facilities to operate heavy voltage equipments.
<table>
<thead>
<tr>
<th>Microbiology Lab</th>
<th>AU Labs</th>
<th>Plan Physiology &amp; Biochemistry Lab</th>
<th>Instrumentation Lab</th>
<th>Research/Project Research Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>This lab should</td>
<td>should be</td>
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<td>fully air conditioned to</td>
<td>For at least three</td>
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<td>provided with interconnecting</td>
<td>with exhaust fans and</td>
<td>accommodate sensitive equipments.</td>
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<td>Tissue Culture Lab</td>
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<td>MICROBIOLOGY LAB: This</td>
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<tr>
<td>be completely airtight/air conditioned</td>
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<td>and should be provided with air filters</td>
<td>LAB: This</td>
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<td>to avoid</td>
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<td>contamination during inoculation</td>
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<td>interconnecting door and should</td>
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<td>be air-conditioned.</td>
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<td>0.743 sq. meters tabletop area per</td>
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<td>Instrumentation Lab:</td>
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<tr>
<td>Research/Project Research Lab:</td>
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<td>accommodate 15 research students and projects of the Dept.</td>
<td>hours in case of power disruption to be installed.</td>
<td>5. all labs should be provided</td>
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<tr>
<td>5.</td>
<td>STUDENT-TEACHER RATIO</td>
<td>1. For Theory classes: 1:15. 2. For Practical classes: 1:15.</td>
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<td>6.</td>
<td>EQUIPMENT</td>
<td>1. One compound Microscope and one Dissection Microscope per student (Olympus/Weswox make) 2. Binocular research microscopes - 2 nos. 3. Trinocular research microscope with digital camera and computer attachment accessories - 2 nos. 4. Computers with printer and all other accessories and internet connection - 10 nos. 5. Laminar air flow (for Microbiology &amp; Biotechnology labs) - 2 nos. 6. Autoclaves - 2 nos. 7. Spectrophotometers-U.V. range with computer and printer facilities - 2 nos. 8. Digital Balances - 2 nos. 9. Hot air ovens - - 2 nos. 9. Gel Electrophoresis apparatus with Gel doc equipment and computing facilities - 1 no.</td>
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</table>
|   | II . Refrigerators - 2nos.  
12. Microtome with all accessories - 2nos.  
13. pH meter (Digital) - 2 nos.  
15. 0HP - 2 nos.  
16. LCD Projectors - 2 nos.  
|   | In addition to the above-specified equipment, necessary glassware, chemicals and other equipment as required for the conduct of practicals as per syllabus should be provided. |
| 7. | STORE ROOM  
Store room with rack facilities to accommodate the equipment, glasswares, chemicals etc., and good lighting & ventilating facilities. |
PONDICHERY UNIVERSITY  
M.Sc. PLANT SCIENCE - SEMESTER SYSTEM

Details of papers and scheme of examination

Effective from the academic year 2010-11

<table>
<thead>
<tr>
<th>Semester</th>
<th>Title of Papers</th>
<th>University Examinations</th>
<th>Internal Assessment</th>
<th>Total Marks</th>
</tr>
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<tbody>
<tr>
<td>III</td>
<td>Paper-VII Biochemistry &amp; Plant Physiology</td>
<td>75</td>
<td>25</td>
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<tr>
<td></td>
<td>Paper-VIII Cell Biology &amp; Genetics</td>
<td>75</td>
<td>25</td>
<td>100</td>
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<tr>
<td></td>
<td>Paper-IX Microbiology &amp; Plant Pathology</td>
<td>75</td>
<td>25</td>
<td>100</td>
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<td></td>
<td>Practical - III (Covering above three papers)</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>IV **</td>
<td>Paper-X Plant Molecular Biology &amp; Bioinformatics</td>
<td>75</td>
<td>25</td>
<td>100</td>
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<tr>
<td></td>
<td>Paper-XI Plant Biotechnology</td>
<td>75</td>
<td>25</td>
<td>100</td>
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<tr>
<td></td>
<td>Paper-XII Project* (Individual)</td>
<td>75 (Project report)</td>
<td>25 (Viva Voce)</td>
<td>100</td>
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<td>Practical IV</td>
<td>75</td>
<td>25</td>
<td>100</td>
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<td>1200</td>
<td>400</td>
<td>1600</td>
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</tbody>
</table>

- Project to be valued by both examiners (internal and examiner) power point presentation.
Course Objectives:

1. To understand the structure and function of the Biomolecules.
2. To understand the physiological processes in plants.

Unit I
Monosaccharides and the glycosidic bond. Structure of starch and cellulose.
Protein and non-protein amino acids - reductive amination and transamination - glutamate pathway; structure and biosynthesis of Glutamic acid, serine, cysteine - Shikimic acid pathway: structure and biosynthesis of phenylalanine, tyrosine and tryptophan. Molecular configuration and conformation of proteins - primary, secondary, tertiary and quaternary structures - properties and types of proteins - simple, complex and derived proteins.

Unit II

Unit III

Unit IV

**Unit V**

Practicals
1. Preparation of titration curve and pKa value determination.
2. Determination of isoionic pH of amino acid.
3. Determination of isoelectric pH of Protein.
4. Estimation of Protein, free amino acids, carbohydrate contents in plant sources.
5. Estimation of Vitamin C in fruits - titrimetric method.
7. Water potential by gravimetric and falling drop methods.
8. Osmotic potential by Plasmolytic method.
11. Differentiation of C$_3$ and C$_4$ plants by starch test.
14. UV-B effect on nitrate reductase.

Text Books:
Objective of course is to understand the basic theoretical concepts and techniques of Cell Biology and Genetics

Theory:

CELL BIOLOGY

Unit I
Structural organization of plant cell, structure and function of major cellular organelles—chloroplast, mitochondria, ribosome, Endoplasmic reticulum, golgi body and microbodies, cell wall structure and function, modern concept of plasma membrane structure and functions, ion carriers & receptors, structure and role of plasmodesmata in movement of molecules. Tonoplast membrane and transporters

Unit II
Nucleus structure, nuclear pore complex, nucleosome organization, DNA structure and its different forms, chromosome structure and packaging of DNA, molecular organization of centromere and telomere, nucleolus structure and function, special types of chromosomes, sex chromosome, cytoskeleton and its organization

GENETICS

Unit III
Genetics of prokaryotes and eukaryotic organelles—Mapping the bacteriophage genome, genetic transformation, conjugation and transduction in bacteria, genetics of mitochondria and chloroplast, cytoplasmic male sterility, genetic recombination and genetic mapping-concepts of linkage and crossing over, molecular mechanism of recombination, role of Rec A, B, C and D proteins in recombination, genetic markers, construction of genetic and physical map of chromosomes.
Unit IV
Physical and chemical mutagens and their mode of action, molecular basis of gene mutation, transposable elements in prokaryotes and eukaryotes, mutations induced by transposons, structural and numerical alterations in chromosome - origin, cytology and breeding behavior of duplication, deficiency, inversion and translocation heterozygotes, origin, production and meiosis of haploid and aneuploids. origin, production and significance of polyploidy, induction and characterization of trisomies & monosomes, Robertsonian and B-A translocation

Unit V
Molecular cytogenetics- nuclear DNA content, c- value paradox, cot-curve and its significance, concept and techniques of restriction mapping, multigene family and their evolution, computer assisted chromosome analysis, transfer of whole genome, transfer of individual chromosome and segments, methods for alien chromatin production, characterization and utility of alien addition and substitution lines, genetic basis of inbreeding and heterosis
Practicals:
1. Colorimetric estimation of DNA using diphenylamine
2. Colorimetric estimation of RNA using orcinol
3. Estimation of total RNA from plant tissues and its colorimetric estimation
4. Study of cytological cell division stages in onion root tip tissues
5. Feulgen staining of nucleic acids in onion root tissues
6. Induction of polyploidy using colchicines

Text Books:
Course Objectives:
1. To understand the classification, nutrition, and growth of microorganisms
2. To acquire knowledge about soil, water and food microorganisms
3. To understand the development of a disease, host-pathogen interaction, and the reasons for an epidemic disease.
4. To imbibe the knowledge of different control methods of plant diseases and etiology of selective plant diseases.

Theory:

Unit I
General account of microbes: Whitaker's five kingdom concept - Prokaryotic and Eukaryotic microbes - Bacteria: classification (Bergey's manual of systematic Bacteriology)- general account of Archaebacteria, Eubacteria and Cyanobacteria. Viruses: general structure -classification - transmission - multiplication (Bacteriophage) - Viroids and Prions -Phytoplasma (including Mycoplasma).

Unit II

Unit III

Unit IV
Unit V
Control methods: Cultural practices. Quarantine, chemical control (Pesticide, Fungicide and Antibiotics), Biological control of pest and pathogens - Diseases: Symptoms, causative organism, disease cycle and control of following diseases.
a) ALGAE
b) FUNGI
Red rust of tea
Practicals
1. Preparation of media.
2. Isolation and maintenance of pure culture.
3. Acid fast staining.
4. Gram staining.
5. Negative staining.

10. Isolation of plant pathogens from infected plant materials.
11. Study of diseased plant materials - Rust by Puccinia.
12. Red rust and white rust.
13. Leaf spot of groundnut.
15. Canker and Red rot.
16. Collection of plant pathology specimens - 10 sheets to be valued externally.

Text Books:
Objective of course is to understand the basic theoretical concepts and techniques of Molecular Biology and Bioinformatics

**Theory:**

**PLANT MOLECULAR BIOLOGY**

**Unit I.**
Basic concept and scope of molecular biology, molecular organization of euchromatin and heterochromatin, chromosomal organization of genes and non-coding DNA, cellular DNA organization into chromosomes, mode and mechanism of DNA replication, DNA damage and repair, transcription mechanism in prokaryotes and eukaryotes, plant promoters and transcription factors, post-transcriptional processes, mRNA transport and stability, introns and their significance, Structure and role of nuclear pore complex, nucleolus organization, and ribosomal RNA genes, rRNA biosynthesis, tRNA genes and biosynthesis of tRNA.

**Unit II.**

**Unit III.**
Mechanism of protein sorting to mitochondria and chloroplast, translocation of secretory proteins across ER, structure and role of microtubules and microfilaments in muscle and flagellar movement, site of ATPases on plasmamembrane, ion- carriers, channels and pumps, introduction of stem cell and RNAi technology, Structural and Functional Genomics, Micro array technology, Overview of extracellular signaling

**BIOINFORMATICS**

**Unit IV.**
History and scope of bioinformatics, biological databases, sequence comparison using dynamic proframing, significance of alignment scores and database scores, multiple sequence alignment, profiles, motifs and feature identification- phylogeny

**Unit V.**
Bioinformatics in genomics and proteomics, introduction to molecular force field drug design, computational ligand designing, site directed ligand generation, overall functioning of the building process, network bioinformatics, bioinformatics role in microarray technology and proteome analysis
Practicals

1. Colorimetric estimation of DNA using diphenylamine
2. Colorimetric estimation of RNA using orcinol
3. Isolation of plant DNA and its quantification by a spectrophotometric method
4. Isolation of plant RNA and its quantification by a spectrophotometric method
5. Separation of plant DNA by agarose gel electrophoresis and visualization by EtBr staining
6. Separation of plant RNA by agarose gel electrophoresis and visualization by EtBr staining
7. Biological sequence (Nucleic acids and Protein) searching using appropriate software.

Text Books:

5. 6.David Freifelder. Essentials of Molecular Biology, Narosa Publishing House, New Delhi
PAPER - XI PLANT BIOTECHNOLOGY

Course Objectives:
1. To understand the concepts of plant biotechnology
2. To enhance the knowledge of the students in wide array of plant based industries.

Unit I
Brief history of plant tissue culture - Regeneration and totipotency - Tissue culture lab, designs, Green houses - media preparation - MS Medium - organic and inorganic constituents - growth regulators - gelling agents, Sterilization methods: Steam, dry and filter sterilization - Explant types. Callus cultures. Somatic embryogenes-is and Synthetic seed, Protoplast culture and Hybridization, Organogenesis - direct and indirect -meristem culture for virus-free plants- Apical and Axillary bud culture - Micropropagation - anther and embryo culture - Hardening - applications. Germplasm conservation, Gene bank, Seed bank, Pollen bank. Plant tissue culture industry in India.

Unit II
Gene transfer in Plants: Marker genes, Reporter genes, Organization of Ti plasmid, Gene transfer methods, Agrobacterium mediated DNA transformation: -\text{\textasciitilde gro6acfen\textasciitilde w/M} vectors, Transformation techniques using Agrobacterium, Agrobacterium mediated Virus infection - Agroinfection. Viruses mediated gene transfer; Caulimoviruses and Gemini viruses.

Unit III

Unit IV

Unit V
Intellectual Property rights (IPR) and Protection (IPP): Biosafety, Biosafety guidelines and regulation. Protection of intellectual properly. Copyright, Trademark, patent, Patenting of

**Practicals:**
1. Study of cultured cells - Datura, Daucas. Nicotiana
2. Induction of Callus
3. Shoot initiation from Datura callus
4. Root initiation from in vitro formed shoots of Datura.
5. Demonstration of technique of anther culture.
6. Isolation of N2 fixing Rhizobium, Azntubacter.Azospirillum and Phosphate solubilizing bacteria from soil
7. Demonstration of PCR techniques - RAPD analysis in plants.
8. Demonstration of Agrobactehum mediated DNA transfer
9. Vermicomposting
10. Effect of Vermicompost, Neem pesticide and Panchakavya on plants.
11. Effect of seaweed-liquid fertilizer on seed germination.

**Text Books:**
BLUE PRINT OF QUESTION PAPER FOR M.Sc. PLANT SCIENCE
(Effective from the academic year 2010-11)

Time - 3 hrs. Max. Marks - 75

Section - A
Answer all the questions. Each answer should not exceed 50 words.
Two questions from each unit (10 x 2 = 20 marks)
1. Unit I 6. Unit III
2. Unit I 7. Unit IV
3. Unit II 8. Unit IV
4. Unit II 9. Unit V
5. Unit III 10. Unit V

Section — B
Answer all the questions. Each answer should not exceed 200 words.
Two questions from each unit (5 x 5 = 25 marks)
11 a) Unit I or
11b) Unit I
12a) Unit II
or
12b) Unit II
13a) Unit III
or
13b) Unit III
14a) Unit IV
or
14b) Unit IV
15a) Unit V
or
15 b) Unit V

Section - C
Answer any three questions. Each answer should not exceed 600 words.
One question from each unit (10 x 3 = 30 marks)
16.Unit I
17.Unit II
18.Unit III
19.Unit IV
20.Unit V
BLUE PRINT OF PRACTICAL QUESTION PAPER FOR M.Sc. PLANT SCIENCE

(Effective from the academic year 2010-11)

PRACTICAL PAPER - 1 (Covering Theory Papers 1, 11 & III)

Time - 4 Hrs. Max. Marks - 75

1. Make a suitable micropreparations of A, B, C & D. Draw labeled sketches and identify them giving reasons. Leave the slide for valuation.
   (Slide - 2 marks, Identification - 1 mark, Sketch - 1 mark, Notes - 1 mark) 4x5 = 20 Marks.

   (Slide - 2 marks, Identification - 1 mark, Sketch - 1 mark, Notes - 1 mark) 1x5 = 05 Marks.

   (Slide - 2 marks, Identification - 1 mark, Sketch - 1 mark, Notes - 1 mark) 1x5 = 05 Marks.

4. Identify, draw and write notes on G, H, I & J.
   (Identification - 1 mark, Sketch - 1 mark, Notes - 1 mark) 4x3 = 12 Marks.

5. Identify, draw and write notes on K, L, M, N, O & P.
   (Identification - 1 mark, Sketch - 2 marks, Notes - 2 marks) 5x6 = 30 Marks.

6. Comment on Q.
   (Identification - 1 mark, Notes - 2 marks) 1x3 = 03 Marks.

KEY

<table>
<thead>
<tr>
<th>A</th>
<th>ALGAE</th>
<th>SECTION</th>
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<tbody>
<tr>
<td>B</td>
<td>FUNGI</td>
<td>SECTION</td>
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<td>C</td>
<td>PTERIDOPHYTE</td>
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<td>D</td>
<td>GYMNOSPERMS</td>
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<td>E</td>
<td>ANATOMY</td>
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<td>F</td>
<td>EMBRYOLOGY</td>
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<tr>
<td>G</td>
<td>ALGAE</td>
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<td>H</td>
<td>FUNGI</td>
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<td>I</td>
<td>LICHENS</td>
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<tr>
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<td>K</td>
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<td>SLIDE/SECTION</td>
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<td>O</td>
<td>EMBRYOLOGY</td>
<td>SLIDE/SECTION</td>
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<tr>
<td>P</td>
<td>LAB TECHNIQUES</td>
<td>APPARATUS</td>
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<tr>
<td>Q</td>
<td>BRYOPHYTES</td>
<td>MACRO SPECIMEN</td>
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BLUE PRINT OF PRACTICAL QUESTION PAPER FOR M.Sc. PLANT SCIENCE
(Effective from the academic year 2010-11)
PRACTICAL PAPER – II (Covering Theory Papers IV, V & VI)

Time – 4 Hrs. Max. Marks – 75

1. Describe the given specimens A & B in technical terms and assign them to their respective families giving reasons. Draw flower. L.S. & Floral diagram. Write Floral formula. (identification – 1, Technical description -2, Flower L.S – 1, Floral diagram – 1, Floral formula – 1, Rason - 1) 2x7 = 14 Marks

2. Using the given plant specimens A, B, C, D & E prepare a taxonomic key for identification. 1x5 = 05 Marks

3. Determine frequency, abundance and density of the given vegetation in F by using quadrat methods. Estimate Importance Value Index. (Frequency -2, abundance – 2, density – 2, IV-2) 1x8 = 08 Marks

4. Performs simple test for tannin/alkaloid/oil/starch/protein in G (Procedure 4, setup 2, result 1) 1x7 = 07 Marks

5. Solve the given problem H 1x10 = 10 Marks

6. Tabulate and graphically represent the given scientific data in I using MS-Excel 1x10 = 10 Marks

7. Identify, draw and write notes on J, K and L (Identification – 1, Diagram – 2, notes -2) 3x5 = 15 Marks

8. Submission of herbarium sheets = 06 Marks

KEY

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<tr>
<th></th>
<th>TAXONOMY</th>
<th>SPECIMEN</th>
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<tbody>
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BLUE PRINT OF PRACTICAL QUESTION PAPER FOR M.Sc. PLANT SCIENCE

(Effective from the academic year 2010-11)

PRACTICAL PAPER - III (Covering Theory Papers VII, VIII & IX)

Time -4 Hrs. Max. Marks – 75

1. Set up the experiment A. Write the procedure, tabulate and infer the results (Set up -3, Procedure - 3, Results 2, inference -1, Sketch/graph-1).
   
   1x10=10 Marks

2. Set up the experiment B. Write the procedure, tabulate and infer the results (Set up -4, Procedure - 4 Results - 3, inference -2, Sketch/graph-2).

   1x15=15 Marks

3. Prepare squash/smear of the material C. Identify with reason any two stages. (Slide -3, Notes-2).

   1x5=05 Marks

4. Solve the given problem D

5. Stain the given bacterial specimen E. Write the procedure identify and draw submit the slide for valuation. (Slide - 3, Procedure - 4, Identification -1, diagram -2).

   1x10=10 Marks

6. Identify, draw and write notes on F, Q, H, I and J (Identification -1, diagram-2, notes-2)

   5x5= 25 Marks

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BLUE PRINT OF PRACTICAL QUESTION PAPER FOR M.Sc. PLANT SCIENCE
(Effective from the academic year 2010-11)
PRACTICAL PAPER - IV (Covering Theory Papers X & XI)
Time -4 Hrs. Max. Marks – 75

1. Isolate DNA/RNA from the given material A using spectrophotometric method. (Set up-5, Procedure-6, Results-3, Diagram-2, Calculation-4) 1x20 = 20 Marks.
2. Demonstrate the technique of an! her culture/Inoculate an explant B in the medium. (Set up-10, Procedure-6, Results-2, Diagram-2) 1x20 = 20 Marks.
3. Solve the given problem C & 1). 2x5 = 10 Marks.
(Identification-1, Notes-2, Diagram-2)

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