MDS UNIVERSITY, AJMER

SCHEME OF EXAMINATION

M.SC.BOTANY SEMESTER SCHEME

2015-2016 AND 2016-2017

FIRST SEMESTER

FOUR THEORY PAPERS [TIME: 3 HOURS DURATION, EACH]

S.NO.	COURSE	PAPER	MARKS
1.	I - PAPER	CELL AND MOLECULAR BIOLOGY	100
2.	II - PAPER	MICROBIOLOGY AND MYCOLOGY	100
3.	III - PAPER	ALGAE, BRYOPHYTES AND PTERIDOPHYTES	100
4.	IV - PAPER	PLANT PHYSIOLOGY	100

SECOND SEMESTER

FOUR THEORY PAPERS [TIME: 3 HOURS DURATION, EACH]

S.NO.	COURSE	PAPER	MARKS
1.	V- PAPER	GENETICS AND CYTOGENETICS	100
2.	VI - PAPER	GYMNOSPERMS AND PALEOBOTANY	100
3.	VII - PAPER	TAXONOMY OF ANGIOSPERMS	100
4.	VIII - PAPER	PLANT BIOCHEMISTRY AND GROWTH PHYSIOLOGY	100

COMBINED PRACTICAL FOR FIRST AND SECOND SEMESTERS = 400 MARKS*

{* Exercises based on Experimental work 250 marks

Seminar and Project work based on field studies 90 marks

Record 30 marks

Viva-voce 30 marks}

GRAND TOTAL OF MARKS FOR FIRST AND SECOND SEMESTERS = [400 + 400 + 400 =1200]

THIRD SEMESTER

FOUR THEORY PAPERS{ THREE CORE AND ONE ELECTIVE} [TIME: 3 HOURS DURATION, EACH]

S.NO.	COURSE	PAPER	MARKS
1.	IX- PAPER	PLANT DEVELOPMENT	100
2.	X - PAPER	ENVIRONMENTAL BIOLOGY	100
3.	XI- PAPER	PLANT BIOTECHNOLOGY	100
4.	XII - PAPER	(A) ADVANCED PLANT PATHOLOGY: PRINCIPLES AND TECHNIQUES (B) ADVANCED PLANT PHYSIOLOGY: SECONDARY METABOLITES (C) ADVANCED PLANT ECOLOGY: ENVIRONMENT AND ARID ZONE ECOLOGY	100

FOURTH SEMESTER

FOUR THEORY PAPERS { THREE CORE AND ONE ELECTIVE} [TIME: 3 HOURS DURATION, EACH]

S.NO.	COURSE	PAPER	MARKS
1.	XIII- PAPER	PLANT REPRODUCTION	100
2.	XIV - PAPER	PLANT RESOURCES: CONSERVATION AND UTILISATION	100
3.	XV- PAPER	GENETIC ENGINEERING OF PLANTS AND MICROBES	100
4.	XVI - PAPER	(A) ADVANCED PLANT PATHOLOGY: PLANT DISEASES (B) ADVANCED PLANT PHYSIOLOGY: GROWTH PHYSIOLOGY (C) ADVANCED PLANT ECOLOGY: ECOSYSTEM AND ECOSYSTEM ANALYSIS	100

COMBINED PRACTICAL FOR THIRD AND FOURTH SEMESTERS = 400 MARKS*

{* Exercises based on Experimental work 250 marks

Seminar and Project work based on field studies 90 marks

Record 30 marks

Viva-voce 30 marks}

GRAND TOTAL OF MARKS FOR FIRST AND SECOND SEMESTERS = [400 + 400 + 400 =1200]

NOTE ON THEORY EXAMINATION SCHEME (M. SC. BOTANY):

Syllabus of each question paper is divided into three units. The paper is divided into three parts: Part –A, Part –B and Part – C. (Total 100 marks; Duration 3 hours).

PART – A (30 Marks) is compulsory and contains 10 Questions (50 words each). At least three questions will be set from each unit and each question is of 3 marks.

PART – B (25 Marks) 9 questions (100 words each) will be set taking 3 from each unit and candidate is required to attempt 5 questions taking at least one question from each unit but not more than 2 from any unit. Each question carries 5 marks.

PART – C (45 Marks) contains 6 questions two from each unit. Candidate is required to attempt three questions taking one from each unit. Each question carries 15 marks (400 words).

NOTE ON PRACTICAL EXAMINATION SCHEME (M. SC. BOTANY):

I. Combined Practical examination shall be of 10 hours duration In two days time period of 5 hours each day for M.Sc. Semester (I and II)and (III and IV) separately.
II. Regarding seminars assessment, each student shall orally present 2 seminars of 30 minutes duration each per session in the presence of Head of the Department or Faculty members appointed by him and also submit a write up for each seminar. The seminar evaluation record and project work record be placed by the H.O.D. before the external and internal practical examiners for the purpose of final evaluation by them at the time of practical examination.

WORKLOAD

Each theory paper must be given 4 hours per week for theory. Practicals must be given 20 hrs. per week per batch. Each laboratory batch for practicals must not be of more than10 students.

Criteria to pass: The number of papers and the maximum marks for each paper/practical are shown in the scheme above. It will be necessary for a candidate to pass in theory and practicalpart of a paper/subject separately.

In order to pass, a candidate, shall be required to obtain in each semester examination:

i. At least 36% marks in the aggregate of all the papers prescribed for the examination* and
ii. At least 36% marks in combined practical examination each year* provided that if a candidate fails to secure at least 25 % marks in each individual paper at the examination and also the project work/seminar, where ever prescribed, he/she shall be deemed to

have failed at the examination, not withstanding his/her having obtained the minimum percentage of marks required in the aggregate for the examination.

iii. Division shall be awarded only at the end of the examination of the final semester on the combined marks obtained in all semesters, taken together, as noted below:
    a. First Division : on >60% marks and
    b. Second Division : on >48% marks

iv. Due Paper: if a candidate passes only in 2 papers in Semester I or III or in 3 papers in Semester II or IV, he/she will be allowed to appear in the due paper only with the students appearing in the same paper next year.

v. Division after Due Paper: If a candidateclears any paper(s), prescribed for a semester's examination after a continuous period of three years, then for the purpose of working out his/her division the minimum passing marks only viz. 25% (365 in case of practicals) shall be taken into account in respect of such paper(s)/practical(s) cleared after expiry of the afore said period of three years; provided that in case where a candidate requires more than 25% marks in order to reach the minimum aggregate asmany marks out of those actually secured by him/her will be taken into account as would enable him/her to make up the deficiency in the requisite minimum aggregate.

Note: Non collegiate candidates are not eligible to appear in the examination, where practical is involved.

COURSE DETAILS: FIRST SEMESTER

PAPER - I: CELL AND MOLECULAR BIOLOGY

UNIT I

Cell organelles: Ultra structure and functions of Mitochondria, Plastid, Golgi body, Vacuole,Introsome, Microbodies and Ribosome.

Techniques in cell biology: Immuno-techniques; in situ hybridization to locate transcripts in cell types; FISH, GISH; confocal microscopy.

UNIT II

Chromatin Organization: Chromosome structure and packaging of DNA,molecular organization of centromere and telomere; nucleolus and ribosomal RNA genes; euchromatin and heterochromatin; karyotype analysis; banding patterns; karyotype evolution; specialized types of chromosomes; polytene, lampbrush, B-chromosomes and sex chromosomes; molecular basis of chromosome pairing.

UNIT III

Structural and numerical alterations in chromosomes: Origin, meiosis and breeding behavior of duplication, deficiency, inversion and translocation; structural heterozygotes; complex translocation heterozygotes; translocation tester sets; Robertsonian translocations; B-A translocations.

Mutation: Spontaneous and induced mutation; physical and chemical mutagens; molecular basis of gene mutations; transposable elements in prokaryotes and eukaryotes; mutations induced by transposons; site-directed mutagenesis; DNA damage and repair mechanisms; inherited human diseases and defects in DNA repair; initiation of cancer at cellular level; protooncogenes and oncogenes.

Suggested Laboratory Exercises

1. **Isolation and purification of nuclei and their staining with Feulgen stain or DAPI.**
2. **Isolation of mitochondria and their visualization with Janus green B and mitotracker.**
3. **Isolation of chloroplasts and determination of number of chlorophyll molecules per chloroplast.**
4. **To study the effect of inhibitors and uncouplers on the activity of succinic dehydrogenase, a marker enzyme of mitochondria.**
5. ***In situ* visualization of microfilaments and microtubules by fluorescent labeling.**
6. **Isolation of plant DNA and its quantization by a spectrophotometric method.**
7. **Isolation of DNA and preparation of cot curve.**
8. **Restriction digestion of plant DNA, its separation by agarose gel electrophoresis and visualization by ethidium bromide staining.**
9. **Isolation of RNA and quantization by a spectrophotometric method.**
10. **Separation of plant RNA by agarose gel electrophoresis and visualization by EtBr staining.**

Suggested Readings:

Lewin, B. 2000. Genes VII. Oxford University Press. New York.

Alberts, B., Bray D., Lewis. J., Raff, M., Roberts, K., and Watson, J.D. 1999.Molecular Biology of the Cell. Garland Publishing, Inc., New York.

Wolfe, S.L.1993. Molecular and Cellular Biology. Wadsworth Publishing Co., California,USA.

Rost 1 et al. 1998. Plant Biology; Wadsworth Publishing Co., California, USA

Krishnamurthy, K.V. 2000. Methods in cell wall Cytochemistry. CRC Press,Boca Raton, florida.

PAPER - II: MICROBIOLOGY AND MYCOLOGY

UNIT I

Archaebacteria and eubacteria: General account; ultra-structure, nutrition and reproduction; biology and economic importance; cyanobacteria-salient features and biological importance.

Viruses: Characteristics and ultra-structure of virions; isolation and purification of viruses; chemical nature, replication, transmission of viruses; economic importance.

Phytoplasma: General characteristics and role in causing plant diseases.

UNIT II

General characters of fungi; substrate relationship in fungi; cell ultra-structure; unicellular and multicellular organization; cell wall composition, nutrition (saprobic, biotrophic, symbiotic); reproduction (vegetative, asexual, sexual); heterothallism; parasexuality; recent trends in classification.

UNIT III

Phylogeny of fungi; general account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina; Fungi in industry, medicine and as food; Fungal diseases in plants and humans; Mycorrhizae; fungi as biocontrol agents.

Suggested Laboratory Exercises

Morphological study of representative members of fungi and bacteria.

Albugo, mucor, Pilobolus, yeast, Emericella,Chaetomium, Pleospora,Morchella, Alelampspora, Phallus, Polyporus, Drechslera, Phoma, Penicillium, Aspergillus,

Symptomology of some diseased specimens: White rust, downy mildew, powdery mildew rusts. smuts, ergot groundnut leaf spot, red rot of sugarcane, wilts, paddy blast, citrus canker, bacterial blight of paddy, angular leaf spot of cotton, tobacco mosaic. Little leaf of brinjal, seasame phyllody mango malformation.

Gram's staining of bacteria. Identification of fungal cultures: Rhizopus, Aspergillus, Emericella, Chaetomium, Drechslera, Curvularia, Fusarium, Phoma, Coletotrichum, Graphium_

Sterilization methods, preparation of media and stains.

Suggested Readings

Alexopoulus, C.J. Mims, C.W. and Blackwel, M. 1996. Introductory Mycology.John Wiley & Sons Inc.

Clifton, A.1958. Introduction to the Bacteria. McGraw-Hill Book Co., New York

Mandahar, C.L. 1978. Introduction to Plant Viruses. Chand & Co. Ltd., Delhi.

Mehrotra, R.S. and Aneja, R.S. 1998. An Introduction to Mycology. New Age Intermediate Press.

Rangaswamy, G. and Mahadevan, A. 1999. Diseases of Crop Plants in India (40 edition). Prentice Hall of India Pvt. Ltd., New Delhi.

Webster. J. 1985. Introduction to Fungi. Cambridge University press.

PAPER - III: ALGAE, BRYOPHYTES AND PTERIDOPHYTES

UNIT I

Phycology: Algae in diversified habitats (terrestrial, freshwater, marine);thallus organization; cell, ultra-structure; reproduction (vegetative, asexual, sexual); criteria for classification of algae: pigments, reserve food, flagella; classification, salient features of protochlorophyta, Cholrophyta, Charophyta,Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta; algal blooms, algal biofertilizers; algae as food, feed and uses in industry.

UNIT II

Bryophyta: Morphology, structure, reproduction and life history; distribution; classification; general account of Marchantiales; Jungermaniales, Anthocerotales, Sphagnales, Funariales and Polytrichales; economic and ecological importance.

Unit III

Pteridophyta: Morphology, anatomy and reproduction; classification; evolution of stele; heterospory and origin of seed habit; general account of fossil pteriodophytes ; introduction to Psilopsida, Sphenopsida and Pteropsida.

Suggested Laboratory Exercises

Study of thallus structures of different groups of algae through preparation of whole mounts and sections.

Study of morphology and anatomy of thalloid and leafy forms of Bryophytes; Study of Protonema

Study of fern gametophyte and soral variations

Morphological study of representative members of algae, bryophytes and pteridophytes: microcystis, Aulosira, Oocystis, Pechastrum, Hydrodictyon, Ulva, Pithophora Stigeoclonium, Draperanaldiopsis, Closterium, Chara, Nitella Stenionitis, Peronospora, Colletotrichum.

Marchantia, Anthoceros, Polytrichum, Funaria.

Lycopodium, Selaginella, Equiseium, Gleichenia, Pteris, Ophioglosum, Isoetes.

Suggested Readings

Kumar,H.D. 1988. Introductory phyocogy. Affiliated East-West Press Ltd.,New Delhi.

Morris, I. 1986. An Introduction to the Algae. Cambridge University Press,U.K.

Parihar, N.S. 1991. Bryophyta. Central Book Depot, Allahabad.

Parihar, N.S. 1996. Biology & Morphology of Pteridophytes. Central Book Depot, Allahabad.

Puri, P. 1980. Bryophytes. Atma Ram & Sons, Delhi.

Round, F.E. 1986. The biology of Algae. Cambridge University Press, Cam-bridge.

Sporne, K.R. 1991. The Morphology of Pteridophytes. B.I. Publishing Pvt. Ltd., Bombay.

Stewart, W N. and Rathwe11, GW 1993. Paleobotany and the Evolution of Plants. Cambridge University Press.

PAPER - IV: PLANT PHYSIOLOGY

UNIT I

Membrane transport and translocation of water and solutes: Plant water relations mechanism of water transport through xylem, root-microbe interactions in facilitating nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport, membrane transport proteins.

Signal transduction: Overview, receptors and G-proteins, phospholipid signaling, role of cyclic nucleotides, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, specific signaling mechanisms, e.g. two-component sensor-regulator system in bacteria and plants, sugar-sensing mechanism.

UNIT II

Photochemistry and photosynthesis: General concepts and historical back-ground, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, photo-oxidation of water, mechanisms of electron and proton transport, carbon assimilation-the Calvin cycle, photorespiration and is significance, the C4 cycle, the CAM pathway, biosynthesis of starch and sucrose, physiological and ecological considerations.

Respiration: Overview of plant respiration, glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway, glyoxylate cycle, alternative oxidase system.

UNIT III

Sensory photobiology: History of discovery of phytochromes and cryptochromes, and their photochemical and biochemical properties, photo-physiology of light-induced responses, cellular localization, molecular mechanism of action of photomorphogenic receptors, signaling and gene expression.

Stress physiology: Plant responses to biotic and abiotic stress, mechanisms of biotic and abiotic stress tolerance, HR and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress,oxidative stress.

Suggested laboratory exercises:

1. Extraction of chloroplast from leaves and preparation of the absorption spectrum of chlorophylls and carotenoids.
2. To determine the chlorophyll a/chlorophyll b ratio in C3 and C4 plants.
3. Isolation of intact chloroplasts and estimation of chloroplast proteins by spot protein assay.
4. Qualitative and quantitative analysis of photosynthetic pigments and anthocyanins by spectrophotometric and chromatographic techniques

Suggested Readings:

Buchanan, B.B., Gruissem, W. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.

Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th edition) Wadswoth Publishing Co., California, USA.

Singhal, GS., Renger, G, Sopory, S.K., Irrgang, K.D. and Govindjee 1999. Concepts in Photobiology: Photosynthesis and Photo morphogenesis. Narosa publishing house, New Delhi.

Taiz, L. and Zeiger, E. 1998. Plant Physiology (2nd edition). Sinauer Associates,Inc., Publishers, Maddachusetts, USA.

Thomas, B. and vince-Prue, D. (1997) Photoperiodism in Plants (second edition). Academic press, San Diego, USA.

COURSE DETAILS: SECOND SEMESTER

PAPER -V: GENETICS AND CYTOGENETICS

UNIT I

Genetics of prokaryotes and eukaryotic organelles: Mapping the bacteriophage genome; phage phenotypes; genetic recombination in phage; genetic transformation, conjugation and transduction in bacteria; genetics of mitochondria and chloroplasts; cytoplasmic male sterility.

Gene structure and expression: Genetic fine structure; cis-trans test; fine structure analysis of eukaryotes; introns and their significance; RNA splicing; regulation of gene expression in prokaryotes and eukaryotes.

Genetic recombination and genetic mapping: Recombination; independ ent assortment and crossing over; molecular mechanism of recombination; role of RecA and RecBCD enzymes; site-specific

recombination; chromosome mapping, linkage groups, genetic markers, construction of molecular maps, correlation of genetic and physical maps; somatic cell genetics; an alternative approach to gene mapping.

UNIT II

Origin, occurrence, production and meiosis of haploids, aneuploids and euploids; Effect of aneuploidy on phenotype in plants; origin and production of autopolyploids; chromosome and chromatid segregation; allopolyploids, type, genome constitution and analysis; evolution of major crop plants; induction and characterization of trisomics and monosomics; transmission of monosomics and trisomics and their use in chromosome mapping of diploid and polyploid species;.

UNIT III

Molecular cytogenetics: Nuclear DNA content; C-value paradox; cot-curve and its significance; restriction mapping — concept and techniques; multigene families and their evolution; in situ hybridization — concept and techniques; physical mapping of genes on chromosomes; computer assisted chromosome analysis; chromosome micro-dissection and microcloning; flowcytometry and confocal microscopy in karyotype analysis.

Alien gene transfer through chromosome manipulations: Transfer of whole genome, examples from wheat, Arachis and Brassica tinder of individual chromosomes and chromosome segments; methods for detecting alien chromatin; production, characterization and utility of alien addition and substitution lines; genetic basis of inbreeding and heterosis; exploitation of hybrid vigour.

Suggested Laboratory Exercises

1. Linear differentiation of chromosomes through banding techniques, such as 0-banding and Q-banding.

2. Orcein and Feulgen staining of the salivary gland chromosomes of Chironomas and Drosophila.

3. Characteristics and behavior of B chromosomes using maize or any other appropriate material.

4. Construction of a linkage map using available data.

5. Induction of polyploidy using colchicine; different methods of the application of colchicine.

6. Effect of induced and spontaneous polyploidy on plant phenotype, meiosis, pollen and seed fertility and fruit set.

7. Effect of translocation heterozygosity on plant phenotype, chromosome pairing and chromosome disjunction. Pollen and seed fertility.

8. Meiosis of complex translocation heterozygotes.

9. Isolation of chlorophyll mutants following irradiation and treatment with chemical mutagens.

10. Estimation of nuclear DNA content through microdensitometry and flow cytometry.

Suggested Readings:

Buchanan, B.B., Gruissem, W. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants: American Society of Plant Physiologists, Maryland, USA.

De, D.N. 2000. Plant Cell Vacuoles: An Introduction. CSIRO Publication,Collingwood, Australia. Kleinsmith, L.J. and Kish, V.M. 1995. Principles o f Cell and Molecular:Biology(2" edition). Harper Collins College Publishers, New York, USA.

Lodish, H., Berk, A., Zipursky, S.1., Matsudaira, P., Baltimore, D. and Darnell. J. Molecular Cell Biology (4th edition) W.H. Freeman and Co., New York, USA.

See the following Review JournalsAnnual Review of Plant Physiology and Molecular Biology.Current Advances in Plant Sciences.Trends in Plant Sciences.Nature Reviews: Moleculard Cell Biology

PAPER VI: GYMNOSPERMS AND PALEOBOTANY

UNIT I

Introduction: Gymnosperms, the vessel-less and fruitless seed plants varying in the structure of their sperms, pollen grains, pollen germination and the complexity of their female gametophyte: evolution of gymnosperms.

Classification of Gymnosperms and their distribution in India.

UNIT II

Brief account of the families of pteridospermales (Lyginopteridaceae, Medullosaceae. Caytoniaceae and Glossopteridaceae). General account of Cycadeoidales and Cordaitales

Structure and reproduction in Cycadales, Ginkgoales, Coniferales. Ephedrales, Welwistschiales.

UNIT III

Paleobotany: History of paleobotany, Formation and types of fossils, Techniques of study of fossils, Geological time-scale.

Paleobotany and evolution of vascular plants. Applied aspects of paleobotany used in coal and petroleum exploration.

Suggested Laboratory Exercises

1. Comparative study of the anatomy of vegetative and reproductive parts of Cycas, Ginkgo, Cedrus, Abies, Picea, Cupressus, Araucaria, Cryptomeria, Taxodium, Podocarpus, Agathis, Taxus, Ephedra and Gnetum.

2. Study of vascular elements in gymnosperms by maceration.

3. Study of important gymnosperms from prepared slides and specimens.

Suggested Readings:

Bhatnagar,S.P and Moitra, A. 1996. Gymnosperms, New Age International Pvt. Ltd., New Delhi

Singh, H. 1978. Embryology of Gymnosperms. Encyclopedia of Plant Anatomy X. Gerbruder Bortraeger, Berlin.

PAPER VII: TAXONOMY OF ANGIOSPERMS

Unit I

Origin of intra population variation: Population and the environment: Ecads and ecotypes; evolution and differentiation of species-various models.

The species concept: Taxonomic hierarchy, Species, Genus, Family and other categories: principles used in assessing relationship, delimitation of taxa and attribution of rank.

Salient features of the international code of botanical nomenclature.

Unit II

Taxonomic evidence: Morphology anatomy palynology, embryology cytology: phytochemistry; genome analysis and nucleic acid hybridization.

Taxonomic Tools: Herbarium; floras; histological, cytological, phytochemical, serological, biochemical and molecular techniques; computers and GIS.

Unit III

Systems of angiosperm classification: Phenetic versus phylogenetic systems: cladistics in taxonomy; relative merits and demerits of major systems of classification; relevance of taxonomy to conservation, sustainable utilization of bio-resources and ecosystem research.

Suggested laboratory exercises:

1. Description of a specimen from representative, locally available families.
2. Description of a species based on various specimens to study intraspecific variation: a collective exercise.
3. Description of various species of a genus; location of key characters and preparation of keys at generic level.
4. Location of key characters and use of keys at family level.
5. Field trips within and around the campus; compilation of field notes and preparations of herbarium sheets of such plants, wild or cultivated, as are abundant.

6. Training in using floras and herbaria for identification of specimens described in the class.
7. Demonstration of the utility of secondary metabolites in the taxonomy of some appropriate genera.
8. Comparison of different species of a genus and different genera of a family to calculate similarity coefficients and preparation of dendrograms.

Suggested Readings:

Cole, AJ 1969 . Numerical Taxonomy. Academic Press , London

Davis, P.H and Heywood. VH 1973. Principles of Angiosperms Taxonomy Robert E. Kreiger Pub. Co. NewYork

Grant, V. 1971. Plant Specification. Columbia University Press, New York

Grant W.F 1984 Plant Biosystematics. Academic Press, London

Harrison, H.J 1971 New Concepts of Flowering Plant Taxonomy. Hieman Educational Books Ltd., London

Heslop — Harrision J. 1969 Plant Taxonomy. English Language Book Soc. & Edward Arnold Pub. Ltd. UK

Heywood, VH and Moore, D. M. 1984. Current Concept in Plant Taxonomy. Academic Press, London

Jones, A.D and Willbins. A.D.1971 Variations and Adaptations in Plant &#pecies.Hieman & Co. Educational Books Ltd.. London.

Jones.S.B Jr, and Luchsinger. A.F 1986. Plant Systematics (II edition) McGraw Hill Book Co. New York

Nordenstam, B., EI Gazaly, G and Kassas, M. 2000 Plant Systematics For 21st Century. Portlant Press Ltd., London

Radford, A.E. 1986. Fundamentals of Plant Systematics.Harper & Row Publications, USA

Solbrig, O.T. 1970 Principles and Methods of Plant Biosystematics. The MacMillan Co.-Collier-MacMillan Ltd., London.

Solbrig, O.T. and Solbrig, D.J.-1079. Population Biology and Evolution. Addison-Wesley Publication Co. Inc., USA

Stebbins, G.L. 1974. Flowering Plant-EvolutionAbove species Level. Edward Arnold Ltd., London.

Stace, C.A. 1989 Plant Taxonomy and Biosystematics (2nd edition) Edward Ltd., London.

Takhtajan, A.L. 1997. Diversity and classification of Flowering Plants. Columbia University Press, New York.

Woodland, D.W. 1991, Contemporary Plant Systematics. Prentice Hall, New Jersey .

PAPER VIII: PLANT BIOCHEMISTRY AND GROWTH PHYSIOLOGY

Unit I

Energy flow: Principles of thermodynamics, free energy and chemicalpotential, redox reactions, structure and functions of ATP.

Fundamentals of enzymology: General aspects, allosteric mechanism, regulatory and active sites, isozymes, kinetics of enzymatic catalysis, Michaelis-Menten equation and its significance.

Unit II

Lipid metabolism : Structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids and storage lipids, and their catabolism.

Nitrogen fixation & Nitrogen metabolism : Overview, biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation,

Sulphur metabolism: sulfate uptake, transport and assimilation.

Unit III

Plant growth regulators and elicitors: Discovery, structure, bioassay, physiological effect on plants and mode of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid and salicylic acid. Physiological effects of various synthetic growth retardants. Role of various growth regulators in agriculture and horticulture.

The flowering process: Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development-genetic and molecular analysis role of vernalization.

Suggested Laboratory Exercises

1. Effect of time and enzyme concentration on the rate of reaction of enzyme (e.g. acid phosphatase, nitrate reductase).
2. Effect of substrate concentration on activity of any enzyme and determination of its Km value.
3. Demonstration of the substrate on activity of any enzyme nitrate reductase.
4. Extraction of seed proteins depending upon the solubility.
5. Preparation of the standard curve of protein (BSA) and estimation of the protein content in extracts of plant material by Lowry or bradford’s method.
6. SDS-PAGE for soluble proteins extracted from the given plant materials and comparison of their profile by staining with Coomassie brilliant Blue or silver nitrate.

7. Separation of isozymes of esterases, peroxidases by native poIyacrylarnide gel electrophoresis

8. Principles of colorimetry, spectrophotometry and fluorimetry

9. Bioassay for various plant growth regulators.

10. Preparation of standard curve of auxin.

Suggested Readings:

Dennis, D.T., Turpin, D.H. Lefebvre, D.D. and Layzell, D.B. (eds) 1997. Plant Metabolism (second edition). Longman, Essex England.

Salston, A.W. 1989. Life Processes in Plants. Scientific American Library,Springer-Verlag, New York, USA.

Hooykaas, P.J.J. Hall, M.A. and Libbenga, K.R. (eds) 1999. Biochemistry and Molecular Biology of Plant Hormones. Elsevier, Amsterdam, The Netherlands.

Hopkings, W.G 1995. Introduction to Plant Physiology, John Wiley & Sons,Inc., New York, USA.

Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J.2000. Molecular Cell Biology (fourth edition). W.H. Freeman and Company,New York, USA.

Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones (second edition). Springer-Verlag, New York, USA.

Nobel, P.S. 1999. Physiochemical and Environmental Plant Physiology (secondedition). Academic Press, San Diego, USA.

Westhoff, P. (1998) Molecular Plant Development. Oxford University press, Oxford, UK.