

Total 75

### II Practical (Paper-II and III)

Time 5 hours

Max. Marks 75

1. Gymnosperms	10
2. Pteridophytes	6
3. Bryophytes	6
4. Ecology (Field study-Quantitative and Analytical characters)	10
5. Ecological Anatomy-Adaptation	6
6. Phytogeography (India/world)	5
7. Economic Botany	48.
three-Paper-III	7. Spot (6) three-Paper-II 12
9. Viva-voce	8
10. Records	8
Total	75

### M.Sc. FINAL BOTANY—2021-22

#### Scheme

Total marks of M.sc Final = 450

Four papers of three hours duration (2 compulsory + 2 special).

Maximum marks of each paper = 75

Minimum Passing Marks of each paper = 19

Total Passing Marks of all four papers = 108

Maximum marks of Practical = 150

I Practical include Paper-V and VI of maximum 75 marks ( compulsory) Minimum Passing Marks = 27

II Practical include Paper-VII and VIII of maximum 75 marks(special) Minimum Passing Marks= 27

II Practical include 20 marks of PROJECT/DESSERTATION

Duration of each practical = 5 hours

#### Pattern of Theory Paper

Each paper is divided into 3 sections

Section A :- Consists of 10 compulsory Questions of 2 (two) mark each.

Word limit Max 50 words.

Selection of question of Examiner- Maximum 2 from each unit (10X2=20)

Section B :- Consists of 5 Questions of 5 (five) mark each with internal choice. Students are required to Attempt all five questions.

Word limit Max 200 words.

Selection of question of Examiner- Maximum 2 from each unit (5X5=25)

Section C :- Consists of 5 Essay type Questions of 10 (ten) marks each. Students are required to Attempt any 3 questions.

Word limit Max 500 words.

Selection of question of Examiner- Maximum one from each unit (3X10=30)

1.

#### COMPULSORY PAPERS

**Paper V : Angiosperms: Taxonomy, Morphology, Anatomy and Embryology Paper VI :  
Molecular Biology, Biotechnology, Genetics, Plant Breeding and Biometrics**

### **SPECIAL PAPERS**

- Paper VII : (a) Advanced Plant Pathology I**
- Paper VIII : (a) Advanced Plant Pathology II**
- Paper VII : (b) Advanced Plant Ecology I**
- Paper VIII : (b) Advanced Plant Ecology II**
- Paper VII : (c) Advanced Plant Physiology I**
- Paper VIII : (c) Advanced Plant Physiology II**
- Paper VII : (d) Advanced Plant Biotechnology I**
- Paper VIII : (d) Advanced Plant Biotechnology II**

### **PAPER V : ANGIOSPERM TAXONOMY, MORPHOLOGY, ANATOMY AND**

### **EMBRYOLOGY**

**3 Hrs.**

**75 Marks**

### **UNIT – I**

**Taxonomy:** Botanical exploration: B.S.I., its organization and role, modern tools of plant taxonomy, e10/Syllabus/Botony.

Systems of plants classification: Bentham and Hooker, Cronquist, Takhtajan and Thorne. Phylogeny of angiosperm. Origin, evolution and inter-relationships in dicots and monocots.

### **UNIT- II**

Phylogeny of Ranales, Amentiferae, Centrospermae, Tubiflorae, and Helobiales. Families of heterotrophic nature ( parasitic, saprophytic and insectivorous.) Botanical nomenclature: ICBN rules, articles, recommendations and amendments of code. Botanical literature: Monographs, Icones, floras and important periodicals with emphasis on Indian floristics.

### UNIT – III

**Morphology** : General concept of plant morphology: Origin and evolution of flower. Stamen- Origin and evolution from foliar to reduced condition , extension of connective beyond anthers, mono di polyadelphous, nectaries and nectar. Carpel evolution : Conduplicate, involute, appendicular and receptacular concepts, specialized carpels, poly and syncarpy, semi-inferior and inferior ovary. Evolution and types of placentation. Role of floral anatomy in interpreting the origin and evolution of flower and floral parts.

**Anatomy**: Ultrastructure and functions of primary and secondary xylem. Ultra structure and function of phloem. Structural variability in leaves and trichomes. Anatomy of dicotyledonous and monocotyledonous seeds.

### UNIT- IV

**Embryology**: Microsporangium, structure and function of wall layers, ultra functional changes in tapetum and meiocytes, role of callose, role of tapetum in pollen development, development of male gametophyte. Anther culture and haploid plants. Megasporangium (ovule) – types and evolution, megasporogenesis, embryo sac types, structure of egg, synergids, antipodal cells.

Pollination: structure and histochemical details of style and stigma. Self and interspecific incompatibility. Barriers to fertilization, methods of overcoming incompatibilities. In-vitro pollination and its uses.

### UNIT- V

Fertilization: discharge and movement of sperms, syngamy and triple fusion, post fertilization changes in embryo sac. Endosperm: Development types, haustoria, cytology and function of endosperm. Embryo : embryogenic types and embryo culture. Polyembryony: types, natural, induced, importance.

Apomixis : Type and importance. Role of embryology in plant breeding.

#### Reference Books-

- 1 Diversity and classification of Flowering Plants- Takhtajan, Columbia Univ. Press, New York.
- 2 An introduction to Embryology of Angiosperm - P. Maheshwari, New Delhi.
- 3 Recent Advances in the Embryology of Angiosperms-P. Maheshwari, New Delhi.
- 4 The embryology of Angiosperms - Bhajwani and Bhatnagar, Vikas Pub. House, New Delhi.

- 5 Taxonomy of Angiosperms - V.N. Nair, TMH Publishing Comp. Ltd., New Delhi.
- 6 Taxonomy of Angiosperms - Kshetrapal and Tyagi, RBD Pub., Jaipur.
- 7 Introduction to Principles of Plant Taxonomy-Sivarajan, Oxford & IBH Publishing Co., New Delhi.
- 8 Plant Systematics - Gurcharan Singh, Oxford & IBH Publishing Co. New Delhi.
- 9 Morphology of Vascular Plants - A.J. Eames, Tata McGraw Hill Publ. Co. Ltd., New Delhi.
- 10 An introduction to Taxonomy of Angiosperms - Shukla and Mishra, Vikas Publ. House Pvt. Ltd., New Delhi.
- 11 Modern Plant Taxonomy- N.S. Subranmanyam, Vikas Publ. House Pvt. Ltd., New Delhi.
- 12 Morphology of Angiosperms -A J Eames, McGraw Hill Book Comp.Ltd., New York.
- 13 The Morphology of Angiosperms - Sporne, K.P. Churamani for B.I. Publications, New Delhi.
- 14 Morphology of Vascular Plants-D.W. Bierhorst Macmillan Comp., New York.
- 15 Morphology of Angiosperms - A.J. Eames, Mc Graw Hill Book Comp., New York.

#### **PAPER VI :**

#### **MOLECULAR BIOLOGY, GENETICS, BIOTECHNOLOGY, PLANT BREEDING AND BIOMETRY**

**3 Hrs.**

**75Marks**

#### **UNIT-I**

**Molecular Biology:** The discovery of DNA, evidences indicating DNA as the genetic material, DNA and its types ( A, B and Z DNA), closed super coiled DNA, denaturing and renaturing of DNA, hybridization. DNA Replication: mechanism, enzymes, evidences in favour of semi conservative replication.

**RNA:** Structures, types, transcription, control at initiation , control at termination, attenuation, heterogeneous RNA processing, capping and tailing. Techniques employed in recombinant DNA technology, isolation and purification of DNA gel electrophoresis (Gel, Agarose), DNA sequencing, Southern and Northern blotting, PCR and its application.

#### **UNIT- II**

Gene structure and function , lac operon, tryptophan operon. Genetics: Mendelism versus meiosis: Mendel's inheritance, Genes and their interaction, Polygenic- inheritance. Cytoplasmic inheritance, Sex determination-XXX. Linkage , crossing over chromosomal mapping, Polyploidy and its role in evolution. Mutation -types, chemical and physical mutagens.

### UNIT- III

**Biotechnology** : concept and scope of biotechnology, Plant tissue-culture, anther and pollen culture, callus-culture and protoplast culture: Isolation, purification, culture and fusion: Cybrids and hybrids, Biotransformation; Production of useful compounds through cell-culture vectors; plasmids and cosmids, cloning strategies. Basic concepts about C-DNA , gene and genomic-library. Application of recombinant DNA technology . Genetic engineering and its principles, gene -transfer. Transgenic plants and methods, production , application and use, importance of genetic engineering.

### UNIT- IV

**Plant breeding**: Introduction, Breeding methods in self and cross pollinated and vegetatively propagated crops. Polyploids and mutations and their uses in breeding. Characterization of polyploids and mutants, uses in plant breeding . Heterosis and inbreeding depression and causes of hybrid vigour. Production and application of hybrid vigour in plant breeding.

### UNIT- V

**Biometry**: Mean, Mode & Median, standard deviation and SD experimental errors, hypothesis testing, reliability and validity of results and inferences from experiments. Variance, Standard deviation , co-efficient of variation, skewness and kurtosis. Probability distribution binomial, positive negative binomial. Chi square test hypothesis. Correlation : simple partial and multiple correlation, concept and uses.

#### Reference Books-

- 1 Molecular Biology of the Cell-Albert, Lewis, Raff, Robert and Watson, Garland Publishing Inc., New York.
2. Gene VII - Lewis, Oxford Univ. Press, New York, USA.
3. Genetics - Russel, The Benjamin Publ. Comp. Ltd., USA.
4. Cell and Molecular Biology - P.K. Gupta, Rastogi Publications, Meerut.
5. Molecular Biology of the Gene - J.D. Watson,
6. Cell Biology and Genetics K.C. Agarwal, Nidhi Publisher, Bikaner.
7. Molecular Biology and Biotechnology, Nidhi Publisher, Bikaner
8. Principles of Cell and Molecular Biology- Klein Smith Harper Collins College Publ., New York, USA.
9. Molecular Cell Biology- Lodish, Berk, Zipursky, Matsudaira, Baltimore and Darnell, Freeman and Co., New York, USA.
10. Methods in Plant Molecular Biology and Biotechnology, CRC Press, Boca Raton, Florida.

11. Plant Cell Biology : Structure and Function – Gunning and Steer, Jones and Barlett Publ. Boston, Massachusetts.
12. Plants tissue Culture-Bhojwani and Rajdan. Theory and practice. Elsevier Science Publ., New York, USA.
13. Plant Tissue Culture : Applications and limitations-Elsevier Sci. Publi., New York, USA.
14. Plant Cell and Tissue Culture-Vasil and Thorpe, Kluwer Academic Publishers, Netherland.
15. Genetics- A.M. Winchester, Oxford and IBH Publishing Co. New Delhi.
16. Cell and Molecular Biology- De Robertis (Indian Edition) Verghese Comp., Bombay.
17. Elements of Biotechnology – P.K. Gupta, Rastogi Publication, Meerut.
18. Plant Breeding -V.L Chopra,Oxford& BH Pub. Co. Pvt. Ltd.
19. Elementary principles of Plant Breeding - H .K. Chaudhary , Oxford & IBH Pub. Co. Pvt. Ltd.

#### **PAPER VII a :**

#### **ADVANCED PLANT PATHOLOGY - I**

**3 Hrs.**

**75 Marks**

#### **UNIT- I**

**Principles:** History of plants pathology, The nature, origin and evolution of parasitism. Interaction of pathogen, soil, other soil micro organism and the host. Biotrophic parasites in culture. Role of plant tissue culture in studies on host parasite relationship. Phenomeon of plant infection, penetration, infection, post infection development, factors affecting infection, defence mechanism.

#### **UNIT- II**

**Host pathogen interaction:** The response of the host, pathogenicity and virulence, host specific toxins in relation to pathogenesis and disease resistance, hypersensitivity reactions. Nucleic acids in host parasitic interaction, phytoalexins, Inoculum potential, epiphytotics and disease forecasting.

**Methods:** Techniques of isolation, purification, culture and inoculation of pathogens. Techniques of tissue culture and its application in plant pathology. Raising virus free plants in culture.

### UNIT- III

**Histopathology:** Calibration of microscopes and measurements. Use of electron microscope in histopathological investigations. Plant disease control: Physical control, chemical control, plant quarantines. Plant disease resistance and breeding of resistance varieties. Seed transmission diseases, factors affecting transmission of seed borne pathogens, control of seed borne diseases and types of seed treatments ( physical , chemical and biological). Testing of efficacy of fungicides.

### UNIT- IV

**Fungi Diseases:** Symptomatology and disease identification.

Some important disease of cereals: Smuts, rusts, leaf blights, spots mildew, Karnal bunt and flag smut of wheat, covered smut and stripe disease of barley; Brown spot and blast of paddy, Brown spot, downy mildew and Drechslera (Heiminthosporium). Blights of Maize: ergot and smut of Bajra, leaf spots and smuts of jowar, green ear disease of Bajra.

### UNIT- V

Other diseases: Red root and smut of sugarcane, fusarium wilt of cotton flax and pigeon pea; flax rust, Asochyta blight of gram; early blight of tomato and potato; late blight of potato; Tikka disease of groundnut and downy and powdery mildew of grapes.

### PAPER VIII a :

### ADVANCED PLANT PATHOLOGY- II

**3Hrs. Duration**

**75 Marks**

### UNIT- I

Classification and nomenclature of bacterial pathogens. Symptomatology, Methods of identification of bacterial pathogens. (i) Morphology (ii) Physiology (iii) Serology (iv) Pathogenicity. Physiological and cytological aspects of bacterial infection process and disease development. Mechanism of infection of bacterial pathogens.

### UNIT- II

**Bacterial disease :** Brown rot, ring rot of potato, Fire blight of stone fruits. Tundu disease of wheat, Stalk rots of maize. Bacterial blight of rice. Soft rot of vegetables. Red strip of sugarcane, Crown gall disease. Angular leaf spot of cotton, Citrus canker.

### UNIT- III

**Virology-** Symptomatology, isolation, purification and culturing of viruses. Viral infection, nutrition, synthesis and utilization. Transmission of viral disease. Mycoplasma, Acquired immunity, Interference and Synergism. Viral Diseases: Potato virus X and Y, Potato yellow dwarf

. Tomato mosaic and Tomato ring mosaic, Tobacco necrosis, Cucumber-mosaic, Bunchy top of Banana, Bhindi yellow mosaic.



## UNIT- IV

**Nematolog:** Classification and identification of plant pathogenic nematodes. Morphology and anatomy of nematodes. Methods and use in nematology.

Nematode disease: Ear cockle of wheat, Root knot of vegetables, Molya disease of wheat.

## UNIT- V

**Non parasitic diseases:** Disease due to deficiency of Nitrogen. Zinc, Boron and Oxygen, Ozone, PAN (peroxy acetyl nitrate), SO<sub>2</sub>, Sulphur and Hydrogen fluoride.

**Cecidology:** Classification and anatomy of galls. Some insect induced plant galls of Rajasthan (Pongamia leaf gall, Cordial leaf gall, Ziziphus stem gall, Prosopis stem gall) mechanism and physiology of insect galls.

### Reference Books –

1. Diseases of India – Rangaswami and Mahadevan, Prentice Hall of India Pvt. Ltd., New Delhi.
2. Plant Diseases - R.S. Singh, Oxford and IBH Publishing.
3. Plant Pathology – Mehrotra, Tata McGraw Hill. UK.
4. Microbiology and Pathology – P.D. Sharma, Rastogi Publication, Meerut
5. Principles of seed pathology – V.K. Agarwal and J.B. Sissclair Vol. 1 & II. CBS Publishers and distributors.
6. Plant pathology – G. N. Agrios. Academic Press, London and New York.
7. Seed pathology – P. Neergaarde Vol. 1 & 2 .The Macmillan Press Ltd., London.
8. Vistas in seed biology –T. Singh and P.C. Trivedi Vol.1 & 2 Prinwell, Jaipur and Hyderabad.
9. Seed pathology – D. Suranarayana , Vikas Publishing House Pvt. Ltd.
10. Plant pathology – Tar ,Mac Millan ,London.
11. Ad. Tritics in Plant Pathology ,Vol. I,II,III –Horsfall and Dimond, Academic Press ,London.
12. Plant diseases –David S. Ingram and Noel Robertson ,Callins.
13. Plant Pathology concept and laboratory exercises –Robert N. Trigiana, CRC Press.
14. Host pathogen interaction in plant diseases –J.E. Vander Plank, Academic Press, New York.

**PAPER VII b :**  
**ADVANCED PLANT ECOLOGY – I**

**3 Hrs.**

**75 Marks**

**Unit- I**

Fundamentals of Ecology, Definition, history and scope.

**Environment :** Holistic environment, factors (Climatic, Edaphic, Topographic and Biotic) and their interactions with plants. Population and community ecology. Succession in plant communities. Plant interaction with other organisms within community.

**Unit- II**

**Ecosystem :** concept, structure and function, flow of energy, Biogeochemical cycles, evolution of ecosystem, system analysis and its applications. Concept of ecosystem resistance and resilience; natural and anthropogenic ecological perturbations and their impact on plants and ecosystems. Ecosystem restoration. Ecology of plant invasion. Ecological management; concept of sustainable development, sustainability indicators.

**Unit- III**

**Types of Ecosystem :** Forest, grassland, desert, fresh water, marine water, wetland, natural and man made ecosystems, urban and rural ecosystem .

Production ecology : Organic production in different types of ecosystems, process and magnitude of production, primary and secondary productivity and methods of estimations of productivity.

**Unit- IV**

**Natural Resources :** Types, exploitation and conservation (forest, soil, water, air and energy). Biodiversity of India, Hot spots, threats to biodiversity (endangered flora and fauna), biodiversity indices ,biodiversity gradient, factors affecting species diversity , edge effect ,biodiversity – ecosystem stability relationship, conservation of biodiversity-ex-situ and in-situ, Introduction to world Biomes. Wild life protection act 1972, Forest Conservation Act 1980, Earth summit 1992.

**Unit- V**

**Pollution :** Air, Water, Soil, Noise, Thermal, Global warming and climatic change, effect of green house gases ;CO<sub>2</sub>,CH<sub>4</sub> ,N<sub>2</sub>O ,CFCs ,ozone layer and hole ,CBD (Convention on Biological Diversity) Role of international organizations (IUCN, UNEP, UNESCO). Red Data Book, Water Prevention and Control of Pollution Act 1974, Environmental Protection Act, 1986, Prevent and Control of Pollution Act 1981, Environmental Impact Assessment, Environment Education, Awareness and Ethics.

**PAPER VIII b :**  
**ADVANCED PLANT ECOLOGY-II**

**3 Hrs. Duration**

**75 Marks**

**Unit - I**

Desert, their formation, topography and distribution characteristics of desert with special reference to water economy. The hot and cold deserts and other similar habitats vegetations.

**Unit - II**

Introduction to World Desert Biome : Origin ,characters and geomorphology of thar desert .  
Vegetation and floral composition of Rajasthan desert : Adaptations of plant matching the desert environment Effect of abiotic and biotic factors on desert vegetation and distribution.Thar desert resources : forest energy , minerals, live stock and rangeland conditions, Ecology of grazing land and impact of overgrazing, Threatened plants of Rajasthan desert and conservation srtatgies .Arid regions of India with particular reference to Rajasthan.

**Unit - III**

Ecology of grazing land and impact of overgrazing, Threatened plants of Rajasthan desert and conservation srtatgies .Arid regions of India with particular reference to Rajasthan.

The seline tracts and their vegetation (Halophytes) with their reference to Rajasthan, Mangrove vegetation.

**Unit - IV**

Rajasthan - Geology, Physiography, Climate, Soil and Water problem in Rajasthan particularly underground water resources and its change. Desert as an ecosystem, biological productivity, cycles and balances in desert ecosystem.

**Unit - V**

Vegetation of Rajasthan desert and plant communities.

Soil erosion and reclamation of soil, stabilization of sand dunes. Adaptation of plants and animals to arid conditions.

Habit studies and Phenology of the desert. Plants, root investigation, reproduction capacity seed output, Germination, Dormancy and Viability **Reference books –**

1. Terrestrial plant ecology –M.G.Barbour,J.H. Burk and W.D.Pitts, Benjamin/Cumming Publication Compony, California.
2. Ecology – M. Begon,J.L.Harper and C.R.Townsend ,Blackwell science, Cambridge.
3. Population, environment and development – R.K. Pachausri and L.F. Qureshy,Tyeri, New delhi.
4. Population biology of plants – J.L. Harper,.Academic press, London and New York.
5. Introduction to plant ecology – Maurice Ashby, Mac Millan Uni. Of Wisconsin
6. Readings in conservation ecology –G.W. Cox, Appleton Century Crofts , Michigan.
7. Plant ecology– .E. Weaver , Ecological Society of America.
8. Forest ecology of India –G.B.Singh, Rawat Publications.
9. Ecology of natural resources –Francois Ramade,John Wiley & Sons Ltd.
10. Plants and environment –Daubenmire,
11. Environmental bioloy–K.C.Agarwal,Agrobotanical Pub..
12. Environmental pollution–Timmy Katyal, Anmol Pub..
13. Environment and pollution—Ambasht , CBS Publications.
14. Environmental pollution and health hazard in India –R. Kumar ,Anish publication home.
15. Indian forest ecology –G.S.Puri, Oxford IBH.

#### **PAPER VII c :**

#### **ADVANCED PLANT PHYSIOLOGY - I**

**3 Hrs. Duration**

**75 Marks**

#### **UNIT- I**

Carbohydrates: Classification and synthesis:Respiration: Anaerobic, aerobic, pentose phosphate cycle (HMP) Photo respiration, fermentation, Photosynthesis: Pigments (Chlorophylls, carotenoids) structure, synthesis functions, polyamines, Photophosphorylation, Calvin cycle, C4 dicarboxylic acid cycle.

#### **UNIT- II**

Protein: Chemistry, Classification and synthesis. Enzymes: Classification, structure, mechanism of action inhibition, promotion, activation.

Water soluble pigments (anthocyanins) synthesis and function (Genetic role) . Nitrogen fixation, nitrogen and sulphur metabolism : Overview biological nitrogen fixation, nodule formation and nod factor mechanism of nitrate uptake and reduction. Ammonium assimilation, sulphate uptake, transport and assimilation ,amino acid synthesis.

Lipid metabolism:Classification of fats and oils, saturated and unsaturated fatty acids, fatty acid oxidation.

### **UNIT- III**

Coumarins & lignins: Structure and synthesis, chemistry, distribution and function. Vitamins: Structure and function. Metabolism of secondary metabolites : Tannins : Distribution, synthesis and functions. Hallucinogens: distribution , chemistry and functions, Alkaloids : pyrrole and pyrrolidine, pyridine, polyacetyl, isoquinoline , tropane and indole alkaloids, their distribution synthesis and function.

### **UNIT- IV**

Saponins and saponogenins, sterols, steroids, steroid alkaloids, their distribution, synthesis and function .

Cardiac glycosides: structure and functions, Structure, synthesis & functions of flavonoids.

### **UNIT- V**

Tools and techniques :Principle and application of spectrophotometry, chromatography ,partition chromatography , thin layer chromatography, ion exchange chromatography, gas liquid chromatography,

high performance liquid chromatography, gel filtration ,electrophoresis, ultra-Centrifugation, isoelectric focusing , immobilized pH gradient , ELISA and RIA

## **PAPER VIII c :**

### **ADVANCED PLANT PHYSIOLOGY–II**

**3 Hrs. Duration**

**75 Marks**

### **UNIT- I**

Plant growth regulators: Auxins, discovery, structure, biosynthesis, mode of action and function.

Gibberellins- discovery, physiological effects, and response of plants, biosynthesis and mode of action.

Cytokinins- discovery, structure, biosynthesis, physiological effect on seed plants and mode of action.

## **UNIT- II**

Synthetic growth retardants, their physiological effect and biochemistry.

Growth inhibitors- Abscissic acid and related compounds: discovery, natural occurrence, physiological effects, biosynthesis, mode of actions. Ethylene- History, biological effects, biosynthesis, mode of actions.

## **UNIT-III**

Role of Growth regulators on modern agriculture and horticulture. Brief account of brassinosteroids, polyamines, Jasmonic acid , salicylic acid and nitric oxide signaling in plant defence. Hormone mutants.

Phytochromes— History and discovery, occurrence and distribution of phytochromes, cryptochromes and phototropins, their photochemical and biochemical properties.

## **UNIT- IV**

Photophysiology of light induced responses, cellular localization. Brief account of molecular mechanism of action of photomorphogenic receptors.

Photoperiodism, vernalization, chemical: control of flowering. Circadian rhythms in plants.

Seed germination and dormancy. Juvenility and senescence.

## **UNIT- V**

Stress physiology :Plant responses to biotic and abiotic stress , plant defence mechanisms against water stress ,salinity stress ,metal toxicity ,freezing and heat stress and oxidative stress. Photoinhibition and other physiological activities affected by stress. Role of plant hormones in plant response to stress (ABA and Polyamines).Photoinhibition and physiological activities affected by stress.

**Reference book –**

1. Introduction to plant physiology –W.G. Hopkins ,John Wiley & Sons,Inc.New York USA.
2. Biochemistry and physiology of plant hormones –T.C.Moore, Springer and Verlag, Naw York, USA.
3. Plant physiology–L.Taiz and E.Zeiger, 2<sup>nd</sup> edition, Sinauer Associates. In. Publisher, Massachusetts, USA.
4. Plant physiology–F.B. Salisbury and C.W.Ross, 4<sup>th</sup> edition, Wadsworth publishing Co. , California.
5. Photoperodism in plants –B.Thomas and D.Vince pure, 2<sup>nd</sup> edition Academic press, Sandiego, USA.
6. Plant Physiology—S. Mukharji and A.K.Gosh
7. Plant Physiology –D.Hess, Springer Berlin.
8. Plant Physiology –F.C.Steward, Academic Press ,New York.
9. Introduction to Plant Physiology - Hopkins, John Wiley and Sons, New York, USA.
10. Plant Physiology. Salisbury and Ross, Wadsworth Publ. Co., California, USA.
11. Plant metabolism Dennis, Turpin, Lefebure and Layzell, Longman Essex, England.
12. Plant Physiology Taiz and Zeiger, Sinauer Associates, Inc Pub. Massachusetts, USA.
- 13 Plant Physiology, Devlin. Yan Nostrand Reinhold Comp. New York. Affiliated East West Press Pvt.Ltd., New Delhi.
15. Plant Physiology C.P. Malik, Kalyani Publishers, New Delhi.
16. A Text book of Plant Physiology and Biochemistry S.K. Verma, S.Chand & Comp., New Delhi.
17. Physiology of Plant Growth and Development Edited M.B. Wilkins McGraw Hill, London.

**PAPER VII d :**

**ADVANCED PLANT BIOTECHNOLOGY- I**

**3 Hrs.**

**75 Marks**

**UNIT- I**

Concept and scope of plant Biotechnology Plant tissue culture: A historical perspective. The phenomenon of morphogenesis, morphogenetic factors for in vitro regeneration. Organogenesis and somatic embryogenesis.

## **UNIT- II**

Micro propagation technology, meristem culture, haploids, anther- pollen culture and their uses.

Management of micro propagated plants in laboratory and net houses. Commercial feasibility and advantages of micro propagation.

## **UNIT- III**

Somatic embryogenesis- concepts, prospects and uses. Hybrid embryo rescue technique, production of rare hybrids, invitro pollination. Use of somatic embryogenesis in crop improvement.

## **UNIT- IV**

Somatic hybridization and cybridization techniques and uses. Concepts about male sterility and their uses in crop improvement. Selection and characterization of mutant cell lines, auxotrophic mutants.

## **UNIT- V**

Tissue culture as a source of genetic variability. Somaclonal variations, basic concepts and its applications. Protoplast production- concepts and applications. Role of plant biotechnology in crop improvement, horticulture, forestry and conservation of biodiversity.

### **PAPER VIII d : ADVANCED PLANT BIOTECHNOLOGY- II**

**3 Hrs. Duration**

**75 Marks**

#### **UNIT- I**

Basic concept about recombinant DNA technology. Commonly used gene cloning vectors: plasmid, cosmids, phages. A brief account of YAC, BAC, HAC. Restriction: endo nucleases and other enzymes needed in genetic engineering.

#### **UNIT- II**

Gene transfer in plants, agro bacterium mediated gene transfer. Crown gall disease, the tumour inducing principle and Ti plasmid, incorporation of T-DNA into plant cells. Direct gene transfer methods for producing transgenic plants, DNA mediated transformation of protoplasts, electroporation, ballistic methods used for gene transfer. herbicide, insect resistance plants.



### UNIT- III

Southern, Northern and Western blotting technique. PCR: its principles and uses. Gene concepts and molecular biology of gene. Transcription and translation in prokaryotes and eukaryotes. Nitrogen fixing and genes and their genetic manipulation.

### UNIT- IV

Ant sense –RNA, principles and applications. Male sterility: types and uses. Molecular farming.

Secondary metabolites and strategies to increase their production in tissue culture.

### UNIT-V

Biotechnology and society, socio-economic aspects. Uses of cloned genes in agriculture, medicine and industry. Transgenic plants: Production and applications. Plant biotechnology and Intellectual Property rights( IPR).

#### Reference Books –

1. Introduction to Biotechnology –W.J.Thieman and M. A. Palladino, Publisher Benjain Cummings.
2. Plant Biotechnology –Randheer Singh, ISBN.
3. Plant Biotechnology Methods in tissue culture and gene transfer – R.Keshav Chand & K.V.Peter,ISBN
4. Plant conservation Biotechnology –Ranjeet Kaur Bhalla, ISBN.
5. Plant Biotechnology and Biodiversity Conservation –U.Kumar & A. K.Kumar, Agrobios Jodhpur.
6. Advances in Applied Biotechnology –P.Parihar & L.Parihar, Agrobios, Jodhpur.
7. Text Book of Biotechnology –Preeti Gupta ,ISBN.
8. Introduction to Plant Biotechnology –H.S.Chawla, Amazon.
9. Recent Advances in Plant Biotechnology –A.Kirakosyan & P.B.Kaufman.
10. Biotechnology fundamentals and applications –S.S.Purohit, Agrobios Jodhpur.
11. Biotechnology –S.R. Barnum, Brooks Cole.
12. PlantBiotechnology-P.K.Gupta,Rastogi Publication Meerut.
13. Laboratory Mannual of Biotechnology –P.K.Gupta, Rastogi Publication Meerut.

## Practical marking scheme

### I Practical (Paper-V and VI)

<b>Time 5 hours</b>	<b>Max. Marks 75</b>
1.Taxonomy	10
2. Anatomy	5
3. Morphology	4
4.Embryology	5
5.Genetics	10
6.Molecular Biology	4
7.Biotechnology	3
8.Plant Breeding	2
9.Biometry	4
10.Spot (6) three-Paper-V three-Paper-VI	12
11. Viva-voce	8
12.Records	5
13.Excursion Report	3
Total	75

### II Practical (Paper-VIIa and VIIIa)

<b>Time 5 hours</b>	<b>Max. Marks 75</b>
1.Major Exercise	20
2.Minor Exercise	7
3.Spot(5)	15
4. Viva-voce	8
5.Records	5
6.Project Report /Dessertation	20
Total	75

## II Practical (Paper-VIIb and VIIIb)

**Time 5 hours**

**Max. Marks 75**

1.Plant Community Study	10
2.Soil/Water Analysis(Physical/Chemical Characters) 5	
3.Phytogeographycal Regions(World/India/Rajasthan)	6
4.Morphological and Anatomical Adaptation	6
5.Spot(5)	15
6. Viva-voce	8
7.Records	5
8.Project Report /Dessertation	20
Total	75

## II Practical (Paper-VIIc and VIIIc)

**Time 5 hours**

**Max. Marks 75**

1.Major Exercise	20
2.Minor Exercise	7
3.Spot(5)	15
4. Viva-voce	8
5.Records	5
6.Project Report /Dessertation	20
Total	75