GOVERNMENT DEGREE COLLEGE FOR WOMEN(A) BEGUMPET

(AUTONOMOUS) CBCS

DEPARTMENT OF BOTANY

First Year, I -Semester

Paper-I

Microbial Diversity and Lower Plants

DSC - 1A (4 hrs./week) Credits- 4

Theory Syllabus (60 hours)

UNIT – I (15 hours)

1) Bacteria: Structure, nutrition, reproduction and economic importance. Brief account of Archaebacteria, Actinomycetes and Mycoplasma with reference to little leaf of Brinjal and Papaya leaf curl

2) Viruses: Structure, replication and transmission; plant diseases caused by viruses and their control with reference to Tobacco Mosaic and Rice Tungro.

3) An outline of plant diseases of important crop plants caused by bacteria and their control with reference toAngular leaf spot of cotton and Bacterial blight of Rice.

UNIT-II (15 hours)

1) General characters, structure, reproduction and classification of algae (Fritsch)

2) Cyanobacteria: General characters, cell structure their significance as biofertilizers with special reference to *Oscillatoria*, *Nostoc* and *Anabaena*.

3) Structure and reproduction of the following:Chlorophyceae- *Volvox*, *Oedogonium* and *Chara;*Phaeophyceae- *Ectocarpus*; Rhodophyceae- *Polysiphonia*.

UNIT-III (15 hours)

1) General characters and classification of fungi (Ainsworth).

2) Structure and reproduction of the following: (a) Mastigimycotina- *Albugo*

(b) Zygomycotina- *Mucor* (c) Ascomycotina- *Saccharomyces* and *Penicillium*.

(d) Basidiomycotina- *Puccinia* (e) Deuteromycotina- *Cercospora*.

3) Economic importance of lichens

UNIT-IV (15 hours)

1) Bryophytes: **General characters of Bryophytes**, Structure, reproduction, life cycle and systematic position of *Marchantia*, *Anthoceros* and *Polytrichum*, Evolution of Sporophyte in Bryophytes.

2) Pteridophytes: **General chararcters of Pteridophytes**, Structure, reproduction, life cycle and systematic position of *Rhynia*, *Lycopodium*, *Equisetum* and *Marsilea*.

3) Stelar evolution, heterospory and seed habit in Pteridophytes.

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GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET –HYDERABAD.

(AUTONOMOUS) CBCS

DEPARTMENT OF BOTANY

First Year, II -Semester

Paper-II

Gymnosperms, Taxonomy of Angiosperms and Ecology

DSC-1B Credits-4

Theory Syllabus (60 hours)

UNIT-I (15 hours)

1) Gymnosperms: **General charactersof Gymnosperms,** structure, reproduction and classification (Sporne's). Distribution and economic importance of Gymnosperms.

2) Morphology of vegetative and reproductive parts, systematic position and life cycle of *Pinus* and *Gnetum*.

3) Geological time scale Introduction to Palaeobotany, Types of fossils and fossilization, Importance of fossils.

UNIT-II (15 hours)

1) Introduction: Principles of plant systematics, Types of classification: Artificial, Natural and Phylogenetic; Systems of classification: Salient features and comparative account of Bentham & Hooker and Engler&Prantl classification systems. An introduction to Angiosperm Phylogeny Group (APG).

2) Current concepts in Angiosperm Taxonomy: Embryology in relation to taxonomy Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy.

3) Nomenclature and Taxonomic resources: An introduction to ICN, Shenzhen code – a brief account. Herbarium: Concept, techniques and applications.

UNIT-III (15 hours)

1) Systematic study and economic importance of plants belonging to the following families:

Polypetalae: Annonaceae, Capparidaceae, Rutaceae, Fabaceae (Faboideae/Papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae

2) Gamopetalae: Apiaceae, Asteraceae, Asclepiadaceae, Lamiaceae, Monochalmydeae: Amaranthaceae, Euphorbiaceae

3) Monocotyledons: Orchidaceae, Poaceae and Zingeberaceae.

UNIT-IV (15 hours)

1. Component of Eco system, energy flow, food chain and food webs.
2. Plants and environment, ecological adaptations of plants, Hydrophytes, Xerophytes and Mesophytes
3. Plant Succession serial stages, modification of environment, climax formation with reference to Hydrosere and Xerosere.

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GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET –HYDERABAD.
(AUTONOMOUS) CBCS
DEPARTMENT OF BOTANY B.Sc. BOTANY
II Year: Semester-III

Paper – III: Plant Anatomy and Embryology

DSC- 1C **Credits: 4**

Theory Syllabus **(60 hours)**

UNIT–I **(18h)**

1. Meristems: Types, histological organization of shoot and root apices and theories.
2. Tissues and Tissue Systems: Simple, complex and special tissues.
3. Leaf: Ontogeny, diversity of internal structure; stomata and epidermal out growths.
4. General account of adaptations in xerophytes and hydrophytes.

UNIT-II **(16h)**

5. Stem and root anatomy: Vascular cambium - Formation and function.
6. Anomalous secondary growth of Stem - *Achyranthes*, *Boerhaavia*, *Bignonia*, *Dracaena*; Root– *Beta vulgaris*
7. Wood structure: General account. Study of local timbers – Teak (*Tectona grandis*), Rosewood (*Dalbergia latifolia*), Red sanders (*Pterocarpu ssantalinus*), Nallamaddi (*Terminalia tomentosa*) and Neem (*Azadirachta indica*).

UNIT–III **(10h)**

8. History and importance of Embryology.
9. Anther structure, Microsporogenesis and development of male gametophyte.
10. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.

UNIT-IV **(16h)**

11. Pollen morphology, pollination and fertilization, Pollination Types, Pollen – pistil interaction, Double fertilization.
12. Seed – structure appendages and dispersal mechanisms
13. Endosperm – Development and types. Embryo development and types; Polyembryony and Apomixis – anoutline.
14. **Palynology: Pollen morphology, NPC system, Applications of Palynology.**

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IN BOTANY

Dr. K. Usha Rani

B. Rukmini Devi

GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET –HYDERABAD.

(AUTONOMOUS) CBCS

DEPARTMENT OF BOTANY

II YEAR: Semester-IV

Paper IV: Cell Biology, Genetics and Plant Physiology

DSC-1D Credits-4

Theory Syllabus (60 hours)

UNITI: (15h)

1. Plant cell envelops: Ultra structure of cell wall, Models of membrane structure, structure and functions of Semi permeable Plasma membrane.
2. Cell Organelles: Structure and semiautonomous nature of Mitochondria and Chloroplast.
3. Nucleus: Ultra structure, types and functions of DNA &RNA. Mitochondrial DNA & Plastid DNA and Plasmids.
4. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. Special types of chromosomes: Lampbrush and Polytene chromosomes.
5. Cell division: Cell and its regulation; mitosis, meiosis and their significance

UNIT–II (15h)

6. Mendalism: History, Principles of inheritance, Chromosome theory of inheritance, Autosomes and sex chromosomes, Incomplete dominance and Co-dominance. Multiple alleles, Lethal alleles, Epistasis, Recessive and Dominant traits, Polygenic inheritance.
7. Linkage and crossing over, Recombination frequency, two factor and three factor crosses; Interference and coincidence. Numericals based on gene mapping; Sex Linkage.
8. Variation in chromosome number and structure: Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy
9. Gene mutations: Types of mutations; Molecular basis of Mutations; Mutagens-physical and chemical (Base analogs, deaminating, alkylating and inter chelating agents);

Unit-III (15h)

10. Plant -water Relations: Water potential, osmosis, osmotic and pressure potential, absorption and transport of water.
11. Mineral Nutrition: Essential micro & macro nutrients and symptoms of mineral deficiency.
12. Transpiration: Stomatal structure and movement.
13. Mechanism of phloem transport.
14. Enzymes: Nomenclature, properties, Classification, **Mechanism of enzyme action.** Factors regulating enzyme activity.

UNIT- IV (15h)

15. Photosynthesis: Photosynthetic pigments, Cyclic and Non-cyclic Photo phosphorylation. Carbon assimilation pathways: C3, C4 and CAM.
16. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle and oxidative phosphorylation.
17. Nitrogen Metabolism: Biological nitrogen fixation. **Protein Synthesis, Mechanism of Protein Synthesis.**
18. Physiological role of Phytohormones: Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids Photoperiodism

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Dr. K. Uma Rao

B. Ruksana Begum

GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET –HYDERABAD.

(AUTONOMOUS) CBCS

DEPARTMENT OF BOTANY

B.Sc. BOTANY Syllabus-Total Hrs of Teaching 45 @ 3HRS/WEEK

III YEAR-SEMESTER-V-PAPER-V(DSC)

(CELL BIOLOGY AND GENETICS)

CELL BIOLOGY

UNIT-I **(10HRS)**

1.PLANT CELLENVELOPS:- Ultra structure of cell wall, molecular organization of cell membranes.

2. NUCLEUS:- Ultra structure, Nucleic acids- structure and replication of DNA; types and functions of RNA.

UNIT-II **(13HRS)**

3.CHROMOSOMES:- Morphology ,Organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. Special types of chromosomes (Lamp brush, polytene and B-chromosomes).

4. Cell Division: Mitosis, Meiosis, cell cycle and its regulation, **Hypertrophy and Hyperplasia**.

GENETICS

UNIT-III **(12HRS)**

5.MENDELISM:- Genetic interactions/Modified Mendelian Ratios (Epistasis, complimentary supplementary and Inhibitory genes).

6.LINKAGE AND CROSSING OVER:- A brief account , construction of genetic maps,2-point and 3-point Test cross data.

7.MUTATIONS :-Chromosomal aberrations-structural and numerical changes; Gene mutations

UNIT-IV **(10HRS)**

8.GENE EXPRESSION AND EXTRA NUCLEAR GENOME: - organization of gene, transcription, translation, mechanism and regulation of gene expression in prokaryotes(Lac and Trp operon).

9.Mitochondrial (mt DNA),(cp DNA) and Plasmids.

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B. Ramani Devi

GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET –HYDERABAD.
(AUTONOMOUS) CBCS
Syllabus-Total Hrs of Teaching 45
B.sc. III YEAR -SEMESTER-V -PAPER-VI DSE-1
(ECOLOGY AND BIODIVERSITY)

ECOLOGY

UNIT-I(16Hrs)

1.CONCEPTS and COMPONENETS OF ECOSYSTEM:- Energy flow , food chains, food webs, ecological pyramids, Biogeochemical cycles –Carbon cycle (4h)
2.Definition of Environment; Atmosphere, Hydro sphere, lithosphere and Biosphere(3h)
3.PLANTS AND ENVIRONMENT:-Ecological factors-Climatic (light and temperature), and biotic, Ecological adaptations of plants. (5h)
4.Edaphic factors; Soil-formation, weathering, mode of formation; transported; Colluvial, Alluvial, Glacial and Eolian. Soil Erosion and Conservation (4h)

UNIT-II

5. POPULATION ECOLOGY:-Natality, mortality, growth curves, ecotypes and ecads (4h)
6. COMMUNITY ECOLOGY:- Frequency, density, cover, life forms, biological spectrum, ecological succession (Hydrosere, xerosere). (4h)
7. Community Dynamics: Succession-Serial stages, Modification of physical environment, climax formation with reference to Hydrosere and xerosere. (4h)
8. Production Ecology: Concepts of productivity- Primary and secondary productivity.(4h)

BIODIVERSITY

UNIT-III (6hrs)

9. BIODIVERSITY; Concepts, convention on biodiversity-Earth Summit.(Copenhagen)
10. Biodiversity: Levels, threats and Value
11. **Flora of Telangana: Vegetation and Endemics.**

UNIT-IV
(7hrs)
12. Hot Spots of India- North Eastern Himalayas, Western Ghats, Endemism IUCN Categories Red Data Book
13. PRINCIPLES OF CONSERVATION:- IUCN threat- categories, RED data book- threatened & endangered Plants of India. Role of organizations in the conservation of biodiversity-WWF& NBPGR

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GOVERNMENT DEGREE COLLEGE FOR WOMEN BEGUMPET –HYDERABAD.

(AUTONOMOUS) CBCS

DEPARTMENT OF BOTANY

Syllabus-Total Hrs of Teaching 45hrs@ 3hrs/week

B.sc. III YEAR -SEMESTER-VI -PAPER-VII-DSC

(PLANT PHYSIOLOGY)

UNIT-I (16 Hrs.)

1. WATER RELATIONS:- Importance of water to plant life, physical properties of water, diffusion, imbibition, Osmosis& osmotic pressure ,water potentials; absorption& transport of water, Ascent of sap; transpiration, Stomata structure and movements.

2.MINERAL NUTRITION; Criteria of Essentiality of Elements, Essential macro and micro mineral nutrients and their role; symptoms of mineral Deficiency; absorption of mineral ions; passive and active absorption.

UNIT-II- (16Hrs)

3.ENZYMES:- Nomenclature, IUB classification, mechanism and regulation of enzyme action. Enzyme kinetics factors regulating enzyme action.

4. PHOTOSYNTHESIS:- Photosynthetic pigments, absorption and action spectra; red drop and Emerson Enhancement effect; concept of two photo systems; mechanism of photosynthetic electron transport and evolution of oxygen; photo phosphorylation; carbon assimilation pathways:C3,C4 and CAM Photorespiration.

UNIT-III (12Hrs)

5.TRANSLOCATION OF ORGANIC SUBSTANCES:-Mechanism of phloem transport; source –Sink Relationships

6.RESPRIATION:- Aerobic and Anaerobic; Glycol sis, Krebs' cycle; Electron transport system Mechanism of Oxidative phosphorylation, Pentose phosphate pathway.

UNIT-IV- (16Hrs)

7.NITROGEN METABOLISM:-Biological Nitrogen fixation, Nitrate reduction, Ammonia assimilation. Protein Synthesis, mechanism of protein synthesis.

8.Growth Definition, phases and kinetics of growth Physiological effects of Phyto hormones- Auxins, Gibberellins, Cytokinin, ABA, Ethylene and Brassinosteroids.

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DEPARTMENT OF BOTANY

Syllabus-Total Hrs of Teaching 45@3hrs/week

B.sc. III YEAR -SEMESTER-VI -PAPER-VIII DSE-III

(TISSUE CULTURE & BIOTECHNOLOGY)

TISSUE CULTURE:

UNIT- I

1. Introduction, sterilization procedures, explants culture media-composition and preparation Micropropagation.

(4h).

2. Callus culture; cell and protoplast culture, somatic hybrids and cybrids (8h)

Unit-II

3. Application of tissue culture: production of pathogen free plants and soma clonal variants, production of Stress resistance plants, secondary metabolites and synthetic seeds. (6h)

4. Induction of hairy root and its application in production of secondary metabolites.(2h)

BIOTECHNOLOGY:

Unit- III

1. Introduction, history and scope and applications (3h)

2. DNA Recombinant Technology: Basic aspects of gene cloning. Enzymes used in gene cloning. Restriction enzymes Ligases, polymerases. (8h)

3. Applications of biotechnology in agriculture. (2h)

Unit-IV

1. Gene cloning: Vectors-cloning vehicles, (Cosmids, plasmids, Bacteriophages and Phasmids) applications of r-DNA technology. (8h)

2. Gene Libraries: Genomic Libraries, cDNAlibraries.PCR and its applications. (4h)

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UNION PUBLIC SERVICE COMMISSION

EXAMINATION NOTICE NO. 04/2021-CSP DATE: 04/03/2021

(LAST DATE FOR RECEIPT OF APPLICATIONS: 24/03/2021) of CIVIL SERVICES EXAMINATION, 2021

(The Commission's Website: www.upsc.gov.in)

IMPORTANT

1. **CANDIDATES TO ENSURE THEIR ELIGIBILITY FOR THE EXAMINATION:** All candidates (male/female/transgender) are requested to carefully read the Rules of Civil Services Examination notified by the Government (Department of Personnel and Training) and this Notice of Examination derived from these Rules. The Candidates applying for the examination should ensure that they fulfill all eligibility conditions for admission to examination. Their admission to all the stages of the examination will be purely **provisional** subject to satisfying the prescribed eligibility conditions. Mere issue of e-Admit Card to the candidate will not imply that his/her candidature has been finally cleared by the Commission. The Commission takes up verification of eligibility conditions with reference to original documents only after the candidate has qualified for Interview/Personality Test.

2. **HOW TO APPLY:**

Candidates are required to apply Online by using the website **https://upsconline.nic.in** Detailed instructions for filling up online applications are available on the above mentioned website. Brief Instructions for filling up the "Online Application Form" given in Appendix-IIA.

2.1 Candidate should have details of one Photo ID Card viz. Aadhaar Card/Voter Card/PAN Card/Passport/Driving Licence/Any other Photo ID Card issued by the State/Central Government. The details of this Photo ID Card will have to be provided by the candidate while filling up the online application form. The candidates will have to upload a scanned copy of the Photo ID whose details have been provided in the online application by him/her. This Photo ID Card will be used for all future referencing and the candidate is advised to carry this Photo ID Card while appearing for Examination/Personality Test.

2.2 The facility of withdrawal of Application is available for those candidates who do not want to appear for Civil Services (Preliminary) Examination. In this regard, Instructions are mentioned in Appendix IIB of this Examination Notice

3. **LAST DATE FOR RECEIPT OF APPLICATIONS :**

The online Applications can be filled up to 24th March, 2021 till 6:00 PM. The eligible candidates shall be issued an e-Admit Card three weeks before the commencement of the examination. The e-Admit Card will be made available in the UPSC website [https://upsconline.nic.in] for downloading by candidates. No Admit Card will be sent by post.

4. **PENALTY FOR WRONG ANSWERS:**

Candidates should note that there will be penalty (negative marking) for wrong answers marked by a candidate in the Objective Type Question Papers.

5. **FACILITATION COUNTER FOR GUIDANCE OF CANDIDATES:**

Government strives to have a workforce which reflects gender balance and women candidates are encouraged to apply.

In case of any guidance/information/clarification regarding their applications, candidature etc. candidates can contact UPSC's Facilitation Counter near gate 'C' of its campus in person or over Telephone No. 011-23385271/011-23381125/011-23098543 on working days between 10.00 hrs and 17.00 hrs.

6. **MOBILE PHONES BANNED:**

(a) The use of any mobile phone (even in switched off mode), pager or any electronic equipment or programmable device or storage media like pen drive, smart watches etc. or camera or blue tooth devices or any other equipment or related accessories either in working or switched off mode capable of being used as a communication device during the examination is strictly prohibited. Any infringement of these instructions shall entail disciplinary action including ban from future examinations.

(b) Candidates are advised in their own interest not to bring any of the banned items including mobile phones/pagers to the venue of the examination, as arrangement for safe-keeping cannot be assured.

7. Candidates are advised not to bring any valuable/costly items to the venue of the examination, as safe-keeping of the same cannot be assured. Commission will not be responsible for any loss in this regard.

F. No. 1/13/2020-E.I(B) : Preliminary Examination of the Civil Services Examination for recruitment to the Services and Posts mentioned below will be held by the Union Public Service Commission on 27th June, 2021 in accordance with the Rules published by the Department of Personnel & Training in the Gazette of India Extraordinary dated 4th March, 2021. All candidates must carefully read the Civil Services Examination-2021 Rules together with all the Appendices along with the Annexures thereof and this Examination Notice derived from the CSE Rules, 2021 in entirety for gaining awareness of the current Rules and Regulations as changes may have been incorporated since the previous Examination Rules.

(i) Indian Administrative Service
(ii) Indian Foreign Service
(iii) Indian Police Service
(iv) Indian Audit and Accounts Service, Group 'A'
(v) Indian Civil Accounts Service, Group 'A'
(vi) Indian Corporate Law Service, Group 'A'
(vii) Indian Defence Accounts Service, Group 'A'
(viii) Indian Defence Estates Service, Group 'A'
(ix) Indian Information Service, Junior Grade Group 'A'
(x) Indian Postal Service, Group 'A'
(xi) Indian P&T Accounts and Finance Service, Group 'A'
(xii) Indian Railway Protection Force Service, Group 'A'
(xiii) Indian Revenue Service (Customs & Indirect Taxes) Group 'A'
(xiv) Indian Revenue Service (Income Tax) Group 'A'
(xv) Indian Trade Service, Group 'A' (Grade III)
(xvi) Armed Forces Headquarters Civil Service, Group 'B' (Section Officer's Grade)
(xvii) Delhi, Andaman and Nicobar Islands, Lakshadweep, Daman & Diu and Dadra & Nagar Haveli Civil Service (DANICS), Group 'B'
(xviii) Delhi, Andaman and Nicobar Islands, Lakshadweep, Daman & Diu and Dadra & Nagar

UPSC mains

9.3 Contributions of anthropology to the understanding of regionalism, communalism and ethnic and political movements.

BOTANY

PAPER-I

1. **Microbiology and Plant Pathology :**

Structure and reproduction/multiplication of viruses,viroids, bacteria, fungi and mycoplasma; Applications of microbiology in agriculture, industry, medicine and in control of soil and water pollution; Prion and Prion hypothesis.

Important crop diseases caused by viruses, bacteria, mycoplasma, fungi and nematodes; Modes of infection and dissemination; Molecular basis of infection and disease resistance/defence; Physiology of parasitism and control measures. Fungal toxins. Modelling and disease forecasting; Plant quarantine.

2. **Cryptogams :**

Algae, fungi, lichens, bryophytes, pteridophytes-structure and reproduction from evolutionary viewpoint; Distribution of Cryptogams in India and their ecological and economic importance.

3. **Phanerogams :**

Gymnosperms : Concept of Progymnosperms. Classification and distribution of gymnosperms. Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales, their structure and reproduction. General account of Cycadofilicales, Bennettitales and Cordiaitailes; Geological time scale; Type of fossils and their study techniques.

Angiosperms : Systematics, anatomy, embryology, palynology and phylogency.

Taxonomic hierarchy; International Code of Botanical Nomenclature; Numerical taxomomy and chemotaxomomy; Evidence from anatomy, embryology and palynology.

Origin and evolution of angiosperms; Comparative account of various systems of classification of angiosperms; Study of angiospermic families— Mangnoliaceae, Ranunculaceae, Brassicaceae, Rosaceae, Fabaceae, Euphorbiaceae, Malvaceae, Dipterocarpaceae, Apiaceae, Asclepiadaceae, Verbenaceae, Solanaceae, Rubiaceae, Cucurbitaceae, Asteraceae, Poaceae, Arecaceae, Liliaceae, Musaceae and Orchidaceae.

Stomata and their types; Glandular and non-glandular trichomes; Unusual secondary growth; Anatomy of C_3 and C_4 plants; Xylem and phloem differentiation; Wood anatomy.

Development of male and female gametophytes, pollination, fertilization; Endosperm—its development and function. Patterns of embryo development; Polyembroyony, apomixes; Applications of palynology; Experimental embryology including pollen storage and test-tube fertilization.

4. **Plant Resource Development :**

Domestication and introduction of plants; Origin of cultivated plants, Vavilov's centres of origin. Plants as sources for food, fodder, fibres, spices, beverages, edible oils, drugs,

narcotics, insecticides, timber, gums, resins and dyes; latex, cellulose, starch and its products; Perfumery; Importance of Ethnobotany in Indian context; Energy plantations; Botanical Gardens and Herbaria.

5. **Morphogenesis :**

Totipotency, polarity, symmetry and differentiation; Cell, tissue, organ and protoplast culture. Somatic hybrids and Cybrids; Micropropagation; Somaclonal variation and its applications; Pollen haploids, embryo rescue methods and their applications.

PAPER-II

1. **Cell Biology :**

Techniques of cell biology. Prokaryotic and eukaryotic cells—structural and ultrastructural details; Structure and function of extracellular matrix (cell wall) and membranes-cell adhesion, membrane transport and vesicular transport; Structure and function of cell organelles (chloroplasts, mitochondria, ER, dictyosomes ribosomes, endosomes,lysosomes, peroxisomes; Cytoskelaton and microtubules; Nucleus, nucleolus, nuclear pore complex; Chromatin and nucleosome; Cell signalling and cell receptors; Signal transduction Mitosis and meiosis; molecular basis of cell cycle. Numerical and structural variations in chromosomes and their significance; Chromatin organization and packaging of genome; Polytene chromosomes; B-chromosomes—structure, behaviour and significance.

2. **Genetics, Molecular Biology and Evolution :**

Development of genetics, and gene versus allele concepts (Pseudoalleles); Quantitative genetics and multiple factors; Incomplete dominance, polygenic inheritance, multiple alleles; Linkage and crossing over of gene mapping including molecular maps (idea of mapping, function); Sex chromosomes and sex-linked inheritance; sex determination and molecular basis of sex differentiation; Mutations (biochemical and molecular basis); Cytoplasmic inheritance and cytoplasmic genes (including genetics of male sterility).

Structure and synthesis of nucleic acids and proteins; Genetic code and regulation of gene expression; Gene silencing; Multigene families; Organic evolution-evidences, mechanism and theories.

Role of RNA in origin and evolution.

3. **Plant Breeding, Biotechnology and Biostatistics :**

Methods of plant breeding—introduction, selection and hybridization (pedigree, backcross, mass selection, bulk method); Mutation, polyploidy, male sterility and heterosis breeding. Use of apomixes in plant breeding; DNA sequencing; Genetic engineering—methods of transfer of genes; Transgenic crops and biosafety aspects; Development and use of molecular markers in plant breeding; Tools and techniques—probe, southern blotting, DNA fingerprinting, PCR and FISH. Standard deviation and coefficient of variation (CV). Tests of significance (Z-test, t-test and chi-square tests). Probability and distributions (normal, binomial and Poisson). Correlation and regression.

4. **Physiology and Biochemistry :**

Water relations, mineral nutrition and ion transport, mineral deficiencies.

Photosynthesis—photochemical reactions, photophosphorylation and carbon fixation pathways; C_3, C_4 and CAM pathways; Mechanism of pholem transport, Respiration (anerobic and aerobic, including fermentation)—electron transport chain and oxidative phosphorylation; Photorespiration; Chemiosmotic theory and ATP synthesis; Lipid metabolism; Nitrogen fixation and nitrogen metabolism. Enzymes, coenzymes; Energy transfer and energy conservation. Importance of secondary metabolites. Pigments as photoreceptors (plastidial pigments and phytochrome). Plant movements; Photoperiodism and flowering, vernalization, senescence; Growth substances—their chemical nature, role and applications in agri-horticulture; growth indices, growth movements. Stress physiology (heat, water, salinity, metal); Fruit and seed physiology. Dormancy, storage and germination of seed. Fruit ripening—its molecular basis and manipulation.

5. **Ecology and Plant Geography :**

Concept of ecosystem; Ecological factors. Concepts and dynamics of community; Plant succession. Concepts of biosphere; Ecosystems; Conservation; Pollution and its control (including phytoreme-diation); Plant indicators; Environment (Protection) Act.

Forest types of India—'Ecological and ecomomic importance of forests, afforestation, deforestation and social forestry; Endangered plants, endemism IUCN categories, Red Data Books; Biodiversity and its conservation; Protected Area Network; Convention of Biological Diversity, Farmers' Rights; and Intellectual Property Rights; Concept of Sustainable Development; Biogeochemical cycles. Global warming and climatic change; Invasive species; Environmetal Impact Assessment; Phytogeographical regions of India.

CHEMISTRY

PAPER-I

1. **Atomic Structure :**

Heisenberg's uncertainty principle Schrodinger wave equation (time independent); Interpretation of wave function, particle in one- dimensional box, quantum numbers, hydrogen atom wave functions; Shapes of s, p and d orbitals.

2. **Chemical bonding :**

Ionic bond, characteristics of ionic compounds, lattice energy, Born-Haber cycle; covalent bond and its general characteristics, polarities of bonds in molecules and their dipole moments; Valence bond theory, concept of resonance and resonance energy; Molecular orbital theory (LCAO method); bonding H_2 +, H2 He_2 + to Ne_2, NO, CO, HF, CN^-, Comparison of valence bond and molecular orbital theories, bond order, bond strength and bond length.

3. **Solid State :**

Crystal systems; Designation of crystal faces, lattice structures and unit cell; Bragg's law; X-ray diffraction by crystals; Close packing, radius ratio rules, calculation of some limiting radius ratio values; Structures of NaCl, ZnS, CsCl, CaF_2; Stoichiometric and