

	<p>8.5 Socio-economic changes in tribal milieu – Impact of urbanization, industrialization, forest policy, development projects on tribal people. Changes in tribal society in colonial and post-Independent periods. Impact of modern democratic institutions on traditional political system.</p> <p>8.6 Tribal movement (Nature and distribution), Emergence of Ethnicity, Issues of Identity, Tribe and Nation-State, Indian National Movement and Indian tribes, Regionalism, Jharkhand movement, Santal movement.</p> <p><b>9. Anthropology of development:</b></p> <p>9.1 Critique, approaches, issues of women development, cultural factors of development, displacement and rehabilitation, sustainable development, alternative to development.</p> <p>9.2 Role of NGO in development.</p> <p>9.3 Role of anthropology in development.</p> <p><b>10. Emerging issues in Indian Anthropology:</b></p> <p>10.1 Human Rights and advocacy of anthropology in the contexts of women, children, health and education.</p> <p>10.2 Social-cultural dimensions of health: Bio-medical, medical anthropology and ethno medicine.</p> <p>10.3 Issues in context: Sect, Cult, Religions pluralism in India, Visual image and Indian society, Public Culture in India, Refugee, Civil Society, Violence, Traditional Knowledge.</p>
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## BOTANY :

Paper – I :	<p><b><u>Microbiology:</u></b></p> <p>Plant virus- types - TMV- Physicochemical characteristics and Multiplication, One step growth curve, Lytic cycle (<math>T_4</math> phage) and Lysogenic cycle (Lambda phage), Significance of lysogeny, Viroids and Prions. Bacteria - Distinguishing features of Archaea and Bacteria, Flagella (ultrastructure) and Pili, wall – chemical structure and differences between Gram +ve &amp; Gram -ve bacteria, Bacterial genome and plasmid, Endospore – formation, structure and function. Genetic Recombination (Transformation, Transduction &amp; Conjugation) Application in Medicine and Industry.</p> <p><b><u>Plant Pathology:</u></b></p> <p>Terms and Definitions: Disease concept, Symptoms, Etiology and causal complex, Endemic, Epidemic, Pandemic and Sporadic diseases, Disease triangle, Disease cycle (monocyclic, polycyclic and polyetic) with special reference to Late Blight of Potato, Brown Spot of Rice and Citrus Canker. Host – Parasite Interaction. Pathotoxin (Definition, criteria and example), Phytoalexin, Resistance. Plant Disease Management- Symptoms, Causal organism, Disease cycle and Control measures.</p> <p><b><u>Cryptogams:</u></b></p> <p><b>ALGAE:</b></p> <p>General account. Ultrastructure of cell. Diatom: Cell structure, Cell division, Auxospore formation in Centrales and Pennales. Economic Importance: Food, Phycocolloid (Agar-agar, Algin, Carrageenan), Diatomite, Algal Biotechnology – potential of microalgae for SCP, <math>\beta</math>-carotene, Biofertilizer, Biodiesel; Principles of mass cultivation of microalgae; Algal toxins.</p> <p><b>FUNGI &amp; LICHEN:</b> General Account: Hyphal forms, Fungal spore forms and mode of liberation, Sexual reproduction and degeneration of sex, Homothallism and heterothallism, Life cycle patterns, Anamorphic fungi and parasexuality, Mycotoxins with emphasis on aflatoxin. Mycorrhiza: Role in Agriculture &amp; Forestry.</p> <p>Fungal Biotechnology: Mushroom, Cheese and Ethanol- Industrial production (brief outline), Fungal sources and uses of Mycoprotein, Enzyme (Cellulase), Amino acid (Tryptophan), Vitamin (Riboflavin), Antibiotic( Griseofulvin), Pharmaceuticals (Cyclosporin-A).</p> <p>Lichen : Types, Reproduction , Economic and ecological importance.</p> <p><b>BRYOPHYTES :</b></p> <p>General Account and Origin of Alternation of Generations (Homologous and Antithetic theory), Evolution of Sporophytes (Progressive and Regressive concept).</p> <p>Importance: Role of bryophytes in Plant succession and Pollution Monitoring.</p> <p><b>PTERIDOPHYTES:</b></p> <p>General Account: Colonisation and rise of early land plants.</p> <p>Fossil Pteridophytes: Structural features, Geological distribution and Evolutionary significance.</p> <p>Telome concept and its significance in the origin of different groups of Pteridophytes.</p> <p>Heterospory and Origin of Seed habit.</p> <p>Economic importance as food, medicine and Agriculture.</p>
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	<p><b><u>Palaeobotany &amp; Palynology:</u></b>  Plant Fossil: Types, Different modes of preservation, Nomenclature and Reconstruction, Importance of fossil study.  Geological time scale with dominant plant groups through ages.  Palynology: Pollen aperture types, NPC classification (Erdtman). Pollen wall- Sporopollenin, Stratification and Ornamentation (sculpturing), Applied Palynology:- Palaeopalynology, Aeropalynology, Forensic palynology, Melissopalynology.</p> <p><b><u>Phanerogams:</u></b>  <b>GYMNOSPERMS :</b>  Progymnosperms: Phylogenetic importance.  Fossil gymnosperms: Structural features of <i>Cycas</i>, <i>Pinus</i>, <i>Lyginopteris</i>, <i>Williamsonia oldhamia</i> and Geological distribution of reconstructed genera.  Economic Importance of fossils with reference to Wood, Resins, Essential oils, and Drugs.</p> <p><b>MORPHOLOGY OF ANGIOSPERMS:</b>  Inflorescence types with examples. Flower: Corolla- forms, aestivation; Stamen- types; Placentation- types; Ovule - structure and forms. Fruit - types with examples.</p> <p><b>TAXONOMY OF ANGIOSPERMS:</b>  Components of Systematics: Nomenclature, Identification, Classification; Taxonomy and its phases - Pioneer, Consolidation, Biosystematic and Encyclopaedic; alpha- and omega- taxonomy.  Nomenclature: Herbaria and Botanical Gardens – their role; important Indian Herbaria and Botanical Gardens; Dichotomous keys – indented and bracketed, Phenetics. Brief idea on Phenetics, Numerical taxonomy; Cladistics; Monophyletic, polyphyletic and paraphyletic groups; Plesiomorphy and apomorphy.  Data sources in Taxonomy: Supportive evidences from: Phytochemistry, Cytology and Anatomy.  Diagnostic features, Systematic position of Economically important plants (parts and uses) with special reference to the families Poaceae, Orchidaceae, Brassicaceae, Fabaceae, Solanaceae and Malvaceae.</p> <p><b><u>Embryology:</u></b>  Pre-fertilisation changes: Microsporogenesis and Microgametogenesis, Megasporogenesis. Post-fertilization changes. Embryogenesis and Development of Endosperm, Apomixis, Apospory and Apogamy, Polyembryony.</p> <p><b><u>Anatomy:</u></b>  Ultrastructure and chemical composition of cell wall. Stomata: Types, Ontogeny of Trachea and Sieve-tube. Stele: Stellar types &amp; evolution/ Secondary growth with special reference to the abnormal growth in <i>Dracaena</i>, <i>Boerhaavia</i> and <i>Bignonia</i>. Mechanical tissues and the Principles governing their distribution in plants.  Organisation of shoot apex (Tunica–Corpus) and Root apex (Korper-Kappe), Adaptive anatomical features of Hydrophytes and Xerophytes.</p> <p><b><u>Ecology:</u></b>  Habitat and Niche, Ecotone and edge-effect, Carrying capacity.  Community ecology: Community- Characteristics and diversity, Ecological succession –Primary and secondary, Seral stages (with reference to Hydrosere), autogenic and allogenic succession.  Plant indicators (metalophytes); Phytoremediation. Conservation of Biodiversity (<i>In-situ</i> &amp; <i>Ex-situ</i>).</p> <p><b><u>Plant Geography:</u></b>  Phytogeographical regions; Endemism; Endemic types and Factors; Age &amp; Area hypothesis and Epibiotic theory; Endemism in Indian flora with special emphasis on Sunderban and Eastern Himalayas.</p>
Paper – II :	<p><b><u>Cell &amp; Molecular Biology</u></b>  <b>CELL BIOLOGY:</b> Cell and its types (prokaryotic and eukaryotic), structure and functions of the major cell organelles (nucleus, mitochondria, chloroplast, ribosome, endoplasmic reticulum, Golgi bodies, microbodies), cell division (mitosis and meiosis), significance of cell division, Cell cycle, structure of a typical chromosome, nucleosome model of chromosome, chromosomal aberrations (deletion, duplication, translocation and inversion), Concept of RNA world.</p> <p><b>MOLECULAR BIOLOGY:</b> Chemical structure and nature of the nucleic acids, concept of gene, replication of DNA, concept of genomic DNA and cDNA, split genes, overlapping genes, oncogenes, genetic code, protein synthesis in prokaryotes and eukaryotes, central dogma, basic of recombinant DNA technology (restriction enzymes, vectors, molecular cloning, application of R DNA technology and its social ethics).</p> <p><b><u>Genetics, Plant Breeding, Biometry &amp; Evolution Biology:</u></b>  <b>GENETICS:</b> Mendelian principles (Mendel's monohybrid and dihybrid experiments and laws), concept of linkage and crossing over, polyploidy, multiple alleles, point mutation, sex-linked inheritance, cytoplasmic inheritance and basic population genetics.</p>

	<p><b>PLANT BREEDING:</b> Objective of plant breeding, methods of propagation in relation to breeding methods, methods of plant breeding (selection, hybridization, concept and causes of heterosis). Maintenance of germplasm, Heterosis and hybrid seed production, Molecular Breeding (use of DNA markers in plant breeding). Maintenance of germplasm, Mass selection and pure line selection, Heterosis and hybrid seed production, Molecular Breeding (use of DNA markers in plant breeding).</p> <p><b>BIOMETRY:</b> Random sampling, Frequency distribution, Central tendency– Arithmetic Mean, Mode and Median, Measurement of dispersion – Standard Deviation, Standard error of Mean, Test of significance: 't'- test; chi square test for goodness of fit. Probability, Measurement of gene frequency (Hardy-Weinberg equilibrium). Overview of Bioinformatics, nature of biological data, literature databases (searching and downloading), introduction and overview of biological databases, nucleic acid sequence databases, GenBank, Protein sequence databases, introduction to BLAST series.</p> <p><b>EVOLUTION BIOLOGY:</b> Concept of biological evolution, evidence of organic evolution (taxonomic, geological, morphological and anatomical); Lamarckism, Darwinism and mutation theories of de Vries.</p> <p><b><u>Physiology and Biochemistry:</u></b>  Plant-water relations, Stomatal physiology-mechanism of opening and closing, Organic Translocation Photosynthesis, Photochemical reaction centres, Cyclic and noncyclic electron transport, Water splitting mechanism, photophosphorylation, Z-scheme, Calvin cycle – Biochemical reactions and stoichiometry, Photosynthetic efficiency of C<sub>3</sub> and C<sub>4</sub> plants and crop productivity, Photorespiration, Crassulacean acid metabolism. Respiration- EMP pathway, TCA cycle, ETS and oxidative phosphorylation, Oxidative pentose phosphate pathway and its significance, <math>\beta</math>-oxidation of fatty acids and significance. Nitrogen Metabolism (symbiotic and non-symbiotic), structure and function of di-nitrogenase complex, ETS of di-nitrogenase, basic concept of <i>nif</i> and <i>nod</i> genes. Plant Growth Regulators (Auxin, Gibberellin, Cytokinin, Ethylene and Absciscic Acid). Photoperiodism and plant types, Phytochrome, Vernalisation, Concept of biological clock and biorhythm. Seed dormancy, Physiology of Senescence and Ageing. Stress Physiology.</p> <p>Biochemistry as the molecular logic of living organisms, axioms of living organisms, the major compounds of living beings; pH, buffers and basic bioenergetics, chemical structure and properties of water molecule, ionization of water, Henderson-Hasselbalch equation, titration curve and the concept of preparation of any buffer solution; biomolecules: general structure, properties, classification and metabolic importance of carbohydrates, proteins, lipids and nucleic acids; enzymes, basic structure (holoenzyme, apoenzyme, cofactor, coenzyme and prosthetic group), nomenclature and classification of enzymes according to IUBMB, mechanism of enzyme action (concept of active site of an enzyme, activation of free energy, principles of enzyme action, Fisher's and Koshland's models), enzyme kinetics (Michaelis-Menten equation and Lineweaver-Burk plot), reversible and irreversible enzyme inhibition, allosteric enzyme regulation and covalently modulated enzyme regulation, basic concept of ribozymes, abzymes and isozymes.</p> <p><b><u>Pharmacognosy :</u></b>  Pharmacognosy and its importance in modern medicine , Crude drugs, Drug evaluation Secondary metabolites, Interrelationship of basic metabolic pathways with secondary metabolite biosynthesis with special reference to <i>Cinchona</i>, <i>Ipecac</i>, <i>Adhatoda</i> and <i>Curcuma longa</i>.</p> <p><b><u>Plant Biotechnology &amp; Instrumentation:</u></b>  Plant tissue culture and Micropropagation. Plant Genetic Engineering: Brief concept of different gene transfer methods. Transgenic plants.  Principles and applications of simple, compound, confocal and electron microscopy, colorimetry, visible and UV-visible spectrophotometry, differential centrifugation, PCR, RT-PCR, Gel Electrophoresis, Blotting (Southern, Northern and Western) and ELISA.</p>
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## CHEMISTRY :

<p>Paper – I :</p>	<p style="text-align: center;"><b><u>Group A</u></b></p> <p><b>1. Atomic Structure:</b>  Bohr theory of hydrogen atom, Mosley's experiment. Heisenberg's uncertainty principle; Schrodinger wave equation; Interpretation of wave function, particle in a one-dimensional box; quantum numbers; hydrogen atom wave functions; shapes of s, p and d-orbitals.</p> <p><b>2. Chemical Bonding:</b>  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; shapes of molecule, VSEPR theory.  Valence bond theory, concept of resonance and resonance energy; molecular orbital theory (LCAO method); bonding in H<sub>2</sub><sup>+</sup>, H<sub>2</sub>, He<sub>2</sub><sup>+</sup> to Ne<sub>2</sub>, NO, CO, HF, and CN<sup>-</sup>, comparison of valence bond and molecular orbital theories, bond order, bond strength and bond length.</p>
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