M.Sc Semester III Botany Paper IX P C 11-3061

PLANT PHYSIOLOGY & METABOLISM

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Water relation of plants: Unique physiochemical properties of water Chemical potential, Water potential, Apparent free space, Bulk movement of water. Soil plant atmosphere continuum(SPAC), Stomatal regulation of transpiration.

Membrane transport: Passive nonmediated transport. Nernst equation. Passive mediated transport. ATP driven active transport. Uniport, Symport, Antiport, Ion channels.

Preliminary account of stress physiology, secondary metabolites and Circadian rhythms in Plants

Photobiology: Photoreceptors, Phytochrome-History, discovery, physiological properties. Interaction between hormones and phytochrome, role of different phytochromes in plant development and flowering.

Photosynthesis: Photosynthetic pigments, absorption and transformation of radiant energy, photo-oxidation, : photosystem I & II, non cyclic and cyclic transportation of electrons (photophosphorylation), Calvin cycle and its control, Regulation of RUBP carboxylase activity. C4 pathway, CAM pathway. Differences b\w c3 and c4 plants. Glycolate pathway and photorespiration, chlororespiration.

Respiration: Anaerobic and aerobic respiration. Amphibolic nature of TCA cycle, Pentose phosphate pathway, Glyoxylate pathway, Oxidative phosphorylation, Gluconeogenesis, High energy compounds: their synthesis and utilization.

Fat metabolism: Synthesis of long chain fatty acids, lipid biosynthesis, α- and β–oxidation.

Plant growth regulators: Auxins - chemical nature, bioassay, physiological effects and mode of action.

Gibberellins - chemical nature, bioassay, physiological effects and mode of action.

Cytokinins - chemical nature, bioassay, physiological effects and mode of action.

Abscisic acid - chemical nature, bioassay, physiological effects and mode of action.

Ethylene - chemical nature, bioassay, physiological effects and mode of action.

Physiology of flowering: Photoperiodism and Vernalization.

M.Sc Semester III Botany Paper X P C 11-3062

PLANT MORPHOLOGY & DEVELOPMENTAL ANATOMY

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 marks each and with internal choice. The limit of answer will be five pages per question.

Introduction: Unique features of plant development, differences between animal and plant development.

Seed germination and seedling growth: Metabolism of nucleic acids, proteins and mobilization of food reserves, tropisms during seed germination and seedling growth, hormonal control of seedling growth, gene expression, use of mutants in understanding seedling development.

Shoot development: Organization of the shoot apical meristem (SAM), cytological and molecular analysis of SAM, control of cell division and cell to cell communication, Primary and Secondary tissue differentiation, control of tissue differentiation, especially xylem and phloem, secretory ducts and laticifers, wood development in relation to environmental factors.

Leaf growth and differentiation: Determination, phyllotaxy, control of leaf form, differentiation of epidemis (with special reference to stomata and trichomes) and mesophyll, Leaf traces and leaf gaps, Petiolar anatomy.

Root development: Organization of root apical meristem (RAM), cell fates and lineages, vascular tissue differentiation, lateral roots, root hairs, root-microbe interactions.

Seed coat development: Ontogeny of seed coat, mature structure, Spermoderm pattern.

M.Sc Sem III Botany Paper XI P C 11-3063

PLANT ECOLOGY

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 marks each and with internal choice. The limit of answer will be five pages per question.

Introduction to ecology, evolutionary ecology, ecological models; Characteristics of population, population size and exponential growth, limits of population growth, population dynamics, life history pattern, fertility rate and age structure, population growth. Competition and coexistence, intra-specific interactions, interspecific interactions, scramble and contest competition model, mutualism and commensalism, prey-predator interactions.

Vegetation organization: Concepts of community and continuum, community coefficients, interspecific associations, ordination, Species Diversity and Pattern Diversity in Community, Concept of Habitat and Ecological Niche.

Vegetation development: Temporal changes (cyclic and non-cyclic), mechanism of ecological succession (relay floristic and initial floristic composition, facilitation, tolerance and inhibition models).Changes in Ecosystem Properties during Succession, Concept of Climax Nature of ecosystem, production, food webs, energy flow through ecosystem.

Biogeochemical Cycles (global) of C, N, P and S, resilience of ecosystem, ecosystem management. The biosphere, biomes and impact of climate on biomes.Biodiversity – assessment, conservation and management, biodiversity act of India and related international conventions. Sustainable development, natural resource management in changing environment. Molecular ecology, genetic analysis of single and multiple population, molecular approach to behavioural ecology, conservation genetics.

M.Sc Sem III Botany Paper XII(a) P C 11-3064

ADVANCED PLANT PATHOLOGY-I

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Plant Pathology : History & Scope. Nature, Origin. & Evolution of parasitism. Biotic and abiotic pathogens, Pathogen factors in disease development. Penetration, infection and pathogenesis. Physiological specialisation in phytopathogenic microbes.

Host factors in disease development. Inoculum Potential, Phenomena of resistance and susceptibility. Protective and defence mechanisms in plants, Phytoalexins. Breeding for disease resistance plants. **Environmental factors in disease development**. Epiphytotics and plant disease forecasting. Principles of plant protection. Physical, chemical and biological control of plant diseases, IPM, Application of biotechnology and information technology in pest management.

Molecular Plant Pathology : Molecular diagnosis, identification of genes and specific molecules in disease development molecular manipulation of resistance. Non-parasitic diseases and control measures.

Classification and anatomy of galls: Some insect induced plant galls of Rajasthan, mechanism and physiology of insect galls.

M.Sc Sem III Botany Paper XII(b) P C 11-3065

ENVIRONMENTAL BIOLOGY & ARID ZONE ECOLOGY-I

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

ECOSYSTEM: Structure and ecological processes in the Grassland, Forest, Freshwater and Marine ecosystems, Urban and Rural ecosystems. Air, water, soil & noise pollution: Kinds, sources, quality parameters, effects on plants and ecosystems; Remediation of soil, water (municipal) and air pollution, Green belt. Solid wastes and their management, 3Rs (Reduction, Recycle & Reuse) Principle; Social Forestry.

Climate Issues: Greenhouse gases (CO_2, CH_4, N_2O, CFCs: sources, trends and role) and consequence of greenhouse effects (CO_2 fertilization, global warming, sea level rise, Biodiversity erosion), ozone layer depletion and its consequences, Applications of GIS and Remote Sensing technology in environmental studies, the future of planet earth.

Policies, Regulations & related issues: Water (Prevention and Control of Pollution) Act 1974; Air (Prevention and Control of Pollution) Act 1981; Environment (Protection) Act 1986, Wild Life protection)Act 1972; Forest (Conservation) Act 1980; Environment auditing, Environment Impact Assessment, Bioindicator and biomarkers of environmental health; Environment economics, Ecopolitics and green policies; Ecolevel.

M.Sc Sem IV Botany Paper XIII P C 11-4061

PLANT REPRODUCTIVE BIOLOGY

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Reproduction : Vegetative options and sexual reproduction, flower development, genetics of floral organ differentiation, homeotic mutants in ***Arabidopsis*** and ***Antirhinum***, sex determination.

Male gametophyte : Structure of anthers, microsporogenesis, role of tapetum, pollen development and gene expression, male sterility, sperm dimorphism and hybrid seed Production, pollen germination, pollen tube growth and guidance, pollen storage, pollen allergy, pollen embryos.

Female gametophyte : Ovule development, megasporogenesis, organization of the embryo sac, structure of. the embryo sac cells.

Pollination, pollen-pistil interaction and fertilization : Floral characteristics, pollination mechanisms and vectors, breeding systems, commercial considerations, structure of the pistil, pollen-stigma interactions, sporophytic and gametophytic self-incompatibility (cytological, bio'chemical and molecular aspects), double fertilization, in vitro fertilization.

Seed development and fruit growth : Endosperm development during early maturation and desiccation stages, embryogenesis, ultrastructure and nuclear cytology, cell lineages during late embryo development, storage

proteins of endosperm and embryo, polyembryony, apomixis, embryo culture, dynamics of fruit growth, biochemistry and molecular biology of fruit maturation.

Latent life - dormancy: Importance and types of dormancy, seed dormancy, overcoming seed dormancy, bud dormancy.

Senescence and programmed cell death (PCD): Basic concepts, types of cell death, PCD in the life cycle of plants. Metabolic changes associated with senescence and its regulation, influence of hormones and environmental factors on senescence.

M.Sc Sem IV Botany Paper XIV P C 11-4062

PLANT RESOURCE UTILIZATION & ETHANOBOTANY

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Plant Biodiversity : Concept, status in India, utilization and concerns Sustainable development : Basic Concepts. Origins of agriculture.

World centres of primary diversity of domesticated plants : The Indo-Barmese centre, plant introductions and secondary centres.

Origin, evolution, botany, cultivation and uses of (i) Food, forage and fodder crops, (ii) fibre crops, (iii) medicinal and aromatic plants and (iv) vegetable oil-yielding crops.

Important fire-wood and timber-yielding plants and non-wood forest products

(NWFPs) such as bamboos, rattans. raw materials for paper making, gums, tannins, dyes, resins and fruits.

Green revolution : Benefits and adverse consequences. Innovations for meeting world food demands. Plants used as avenue trees for shade, pollution control and aesthetics.

Plants used as avenue trees for shade ,pollution control and aesthetics.

Principles of conservation, extinctions, environmental status of plants based on International Union for Conservation of Nature.

Strategies for conservation - *in situ* conservation : International efforts and Indian initiatives, protected areas in India -sanctuaries, national parks, biosphere reserves, wetlands, mangroves and coral reefs conservation of wild biodiversity.

Strategies for conservation - *ex situ* conservation : Principles and practices, botanical gardens. field gene banks, Seed banks, in vitro repositories, cryobanks, general account of the activities of Botanical Survey of India (BSI), National Bureau of plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR), and the Department of Biotechnology (DBT) for conservation, non formal conservation efforts.

M.Sc Sem IV Botany Paper XV P C 11-4063

PLANT BIOTECHNOLOGY & GENETIC ENGINEERING

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Plant Tissue culture: Principles, Concept, History, General methodology, culture media ingredients, preparation, methods of sterilization and disinfestations, aseptic techniques and preparation of explants, histological and photographic techniques for plant tissue culture.

Micropropagation in plants, Shoot morphogenesis and organogenesis, callus and suspension cultures, microspore culture and its importance.

Somatic embryogenesis: Principles, concepts and applications.

Protoplast technology: Isolation methods, purification, viability tests, culture, plating efficiency, Somatic cell hybridization, selection of protoplast fusion hybrids, Applications. Somaclonal Variation.

Plant tissue culture and Secondary metabolite production. Overview of Plant Tissue Culture Applications.

Recombinant DNA Technology: tools and techniques, construction of genomic/cDNA libraries, polymerase chain reaction, DNA fingerprinting

Vectors for plant transformation: Basic features of vectors (Promoters and terminators, selectable markers, reporter genes, origin of replication, Co-integrative and binary vectors), Optimization, clean gene technology.

Techniques for plant transformation: *Agrobacterium* mediated gene

transfer, process of T-DNA transfer and integration, practical applications of *Agrobacterium*-mediated gene transfer, Direct gene transfer methods. The genetic manipulation of Herbicide tolerance, pest tolerance, plant disease resistance. Reducing the effects of viral disease, Strategies for engineering stress tolerance, Improvement of crop yield and quality, Molecular farming of carbohydrate &lipids(Starch, polyfructans, bioplastics), proteins(custom made antibodies, edible vaccines, oleosin system).

Metabolic Engineering and industrial Products: control mechanisms and manipulation of phenylpropanoid pathway, alkaloids, industrial enzymes, biodegradable plastics, polyhydroxybutyrate, therapeutic proteins, Antibiotics, ethanol, Polyketides, Vitamins, Biopolymers , Biological Pigments , Amino acids, solvents.

Science and society: Public acceptance of genetically modified crops(Public concerns, current status of transgenic crops, concerns about GM crops, regulation of GM crops and products),Introduction to Intellectual property, Biosafety guidelines ,Environmental release of GMO's,Risk analysis, Risk Assessment, Risk management.

M.Sc Sem IV Botany Paper XVI(a) P C 11-4064

ADVANCED PLANT PATHOLOGY-II

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Fungal diseases : Symptomatology, disease identification and control of flag smut wheat, covered smut of barley, blast of paddy, smut Jowar, Red rot of sugarcane, flax rust, early blight of potato.

Bacteria : Classification and nomenclature of bacterial plant pathogens. Methods of identification of bacterial pathogens (morphology, physiology, serology and pathogenicity).

Bacterial diseases : Brown rot of potato, blight of rice, soft rot of vegetables, Crown gall disease, angular leaf spot of cotton.

Virus, viroid and phytoplasma disease : Symptomatology and transmission of viral diseases; Potato virus X & Y, Tomato ring mosaic, bunchy top of banana; viroids and important viroid diseases. Phytoplasma General account; Sesame phyllody, Spike disease of sandal.

Nematology : Brief history, classification and identification of plant pathogenic nematodes.

Morphology and anatomy of nematodes. Methods used in Nematology. Control of plant parasitic nematodes. Nematode Disease : Molya disease of wheat & barley/ear cockle of wheat, root-knot disease.

M.Sc Sem IV Botany Paper XVI(b) P C 11-4065

ENVIRONMENTAL BIOLOGY & ARID ZONE ECOLOGY-II

Scheme of examination: *MM: 70*

(1) The Semester End Examination (SEE) for theory will be of 70 marks and of 3 hours duration, having 5 questions, in all.

(2) Question No. 1 shall consist of 7 Short Answer Questions of 2 marks each, based on knowledge, understanding and applications of the topics/texts covered in the syllabus.

(3) Question No. 2 to 5 will be of 14 mark each and with internal choice. The limit of answer will be five pages per question.

Desert, their formation, topography, distribution and characteristics of world deserts, Hot and cold deserts with reference to India; Desert as an ecosystem, biological production with particular reference to conservation of flora and fauna.

Sand dunes classification, stabilization and management of sand dunes; wind breaks and shelter belts, afforestation and desert control measures.

Vegetation of Rajasthan desert and plant communities; The saline tracts and their vegetation (Halophytes) with special reference, to Rajasthan; Economic and social considerations in the management of salt affected soils, afforestation in salt affected soils

Water problems in Rajasthan particularly underground water resources and its change, Rain water harvesting, Dry land farming, Arid lands and Horticultural crops, Indira Gandhi Canal and its ecological implication, Waterlogging & salinity problems- The management alternatives.