

BSc. Botany Syllabus (as Prescribed by Manipur University)

BSc BOTANY SEMESTER – I

BOT-101/BOTANY PAPER 1 (Virus, Bacteria and Cryptogam) 75 marks

Unit 1: Virus - General structure, Viral component, Classification, Nomenclature, Viral replication .

Bacteria General characters, Prokaryotic cell organization, brief account of genetic recombination in bacteria, type of nutrition, autotropism and heterotropism. 15 marks

Unit 2: Fungi - General characters and Classification (Ainsworth), asexual and sexual Reproduction, economic importance of fungi

Life cycles of Saprolegnia (Mastigomycota), Mucor (Zygomycota), Neurospora(Ascomycota), Puccinia(Basidiomycota), and Penicillium (Deuteromycota),

Lichens – Thallus characters, Reproduction and economic importance

Plant Pathology-Concepts and Classification of plant disease, Causes of plant disease and principles of plant disease management 15 marks

Unit 3: Algae- General characters and Classification (Fritsch), ranges of vegetative and reproductive structure of different classes,

Life cycles of Oscillatoria (Cynophyceae), Oedogonium (Chlorophyceae), Vaucheria (Xanthophyceae), Cyclotella (Bacillariophyceae), Ectocarpus (Phaeophyceae)and Polysiphonia (Rhodophyceae), economic importance of algae 15 marks

Unit 4: Bryophyte- General characters, classification alteration of generation, range of structural organizationof gametophytes and sporophytes, methods of reproduction, 15 marks

Life cycles of Riccia, Marchantia, Anthoceros, Pellia, Porella, Sphagnum and Funaria

Unit 5: Pteridophytes- General characters, classification, anatomy of sporophytes, reproductive methods,

Life cycles of Lycopodium, Selaginella, Equisetum, Isoetes, Marsilea and Dryopteris 15 marks

BOT – 101(P)/BOTANY PRACTICAL – I

Marks 25

1. Gram Staining of Bacteria.
2. Microscopic study of vegetative and reproductive structures of algae genera included in theory syllabus.
3. Microscopic study of vegetative and reproductive structures of fungal genera included in theory syllabus.
4. Study of lichens thalli – crustose, foliose and fruticose.
5. Study of locally important plants disease.
6. Morphology and Microscopic study of vegetative and reproductive structures of bryophytes genera included in theory syllabus.
7. Morphology and Microscopic study of vegetative and reproductive structures of pteridophytes genera included in theory syllabus.

BSc BOTANY SEMESTER – II

BOT-202/BOTANY PAPER 202: (Gymnosperms, Angiosperm, Applied Botany and Embryology) **75 marks**

Unit1: Gymnosperms and Palaeobotany: General account of Gymnosperms and classification; Morphology, Reproduction
Life cycle of Cycas, Pinus and Gnetum. Economic importance of Gymnosperms.

Palaeobotany: Fossil Formation and types. Geological time scale and dominant fossil flora of different ages. **15marks**

Unit 2: Angiosperm Taxonomy: Introduction of Plant Taxonomy CO5: Importance of field work, observation, herbarium preparation. Concept of Species, genus and family. Key of Identification., Rules of nomenclature (validity, effectivity and priority). Classification systems of Linnaeus, Bentham and Hooker, Engler and Prantle and Hutchinson

Taxonomic studies of the following Families: Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Rosaceae, Apiaceae, Asteraceae, Solanaceae, Lamiaceae. **15marks**

Unit 3: Applied Botany and Ethnobotany: Origin of cultivated plants Vavilov's centre of origin. Origin, cultivation and improvement of Rice and Potato. History, cultivation and processing of Tea
Characteristics and uses of Timber yielding plants: Teak and Pinus
Medicinal plants: Cinchona, Rauwolfia and Adhatoda
Ethnobotany: Concept, Classification and interdisciplinary approaches.

15marks

Unit 4: Plant Anatomy: Cell structures, cell wall and cell inclusion.
Organisation of apical meristem, Structure and distribution of simple and complex tissues. Primary and secondary growth in plant.
Anomalous growth in *Amaranthus*, *Mirabilis* and *Dracaena* stem. **15 marks**

Unit 5: Embryology and Palynology,: Plant embryology, Micro and mega sporogenesis
Development of male and female gametophytes, fertilization, embryo and endosperm development.
Palynology: Pollen and spore morphology, Aerobiology and pollen allergy **15 marks**

BOT-202(P)/BOTANY PRACTICAL – II

Gymnosperms and Palaeobotany:

1. Temporary stained preparation of the reproductive structures of Gymnosperms included in the theory.
2. Examination of the available specimens/slides of the fossil plants
3. Description and classification of a representative species from each of the angiosperm families mentioned in the theory.

Ranunculaceae: *Ranunculus*Apiaceae: *Coriandrum*Asteraceae: *Ageratum*, *Gynura* & *Spilanthes*Solanaceae: *Solanum*Lamiaceae: *Leucas/Ocimum*Euphorbiaceae: *Castor*Liliaceae: *Onion/Asparagus*Poaceae: *Dactyloctenium/Cynodon*Malvaceae: *Sida/Urena*

Identification of collected plants from the field

4. Collection and identification of three plants each from cereals, pulses, fiber yielding plants, medicinal plants available in Manipur.
5. To prepare a chart containing the starch contains from five important crop plants and protein contains from five pulses by using internet.
6. Preparation of temporary slides for the study of anomalous secondary growth in plants included in the theory paper.
7. Preparation of stained squashed of pollen motile cells, pollen grains and dissection of endosperm and embryo.
8. Field observation of local vegetation and submission of report is compulsory.



Recommended books

1. Economic Botany : A. F. Hill
Tata McGraw-Hill Publishing Co., New Delhi
2. The Embryology of Angiosperms : S.S. Bhojwani & S.P. Bhatnagar
Vikas Publishing House Pvt. Ltd., New Delhi
3. Palynology : M.R. Saxena
Oxford & IBH Publ. Co. Ltd., New Delhi
4. Morphology of Gymnosperms : J.M. Coulter & C.J. Chamberlain
Central Book Depot, Allahabad
5. Taxonomy of Vascular Plants : G.H.M. Lawrence
Oxford & IBH Publ., New Delhi
6. A Handbook of Field and Herbarium Methods : S.K. Jain & R.R. Rao
Today & Tomorrows Print. & Publ., New Delhi
7. A Manual of Ethnobotany : S.K. Jain
Scientific Publications, Jodhpur.
8. Plant Anatomy : K. Esau
John Wiley & Sons Inc., New York.
9. An Introduction to Palaeobotany : C.A. Arnold
Tata McGraw-Hill Co., New Delhi

BSc BOTANY SEMESTER – III BOT 303/ BOTANY PAPER 3: (Plant Geography, Ecology, Physiology, Biochemistry and Molecular Biology) 75 marks

Unit 1: Plant Geography-scope and importance, Phytogeographical regions of India, Factors affecting distribution, Plant dispersal, Migration methods, Endemism and Barriers of distribution 15 marks

Unit 2: Principles of Ecology : Ecosystem concept, structure and function, Ecological pyramids, Energy flow and Mineral cycling (CNP), Food chain, food web and trophic levels, Structure of plant community, ecological factors (biotic and abiotic factors) Ecological adaptation of xerophytes, hydrophytes, Ecological succession- hydrosere and xerosere 15 marks

Unit 3: Plant Physiology: Plant water relation, its component; Absorption and Translocation of water, solutes, ascent of sap theories, Mineral nutrition, Transpiration- significance, factors; Mechanism of stomatal opening Growth and Development Concept of photoperiodism and Vernalization; Photoperiodism, Photosynthetic pigments, Cyclic and Non- cyclic Photophosphorylation, C₃ , C₄ and CAM Pathways; Factors affecting Photosynthesis, Respiration- aerobic, anaerobic, Factors affecting Respiration; Biological Nitrogen fixation- symbiotic and non symbiotic. 15 marks

Unit 4: Biochemistry: Chemical bond pH, buffer, structure , Classification and structure of biomolecules (Carbohydrates, Lipids, Amino acids, proteins, Nucleic acids and vitamins) Enzymes action, Respiration- Glycolysis, Krebs cycle, electron transport systems. 15 marks

Unit 5: Molecular Biology: Gene organisation of prokaryotes and Eukaryotes, Structure and physical properties of DNA and RNA , Biosynthesis of nucleic acids; DNA replication, RNA translation Mechanisms of protein synthesis 15 marks

BOT 303/ Botany Practical- 3

25marks

BOT-303(P)/ BOTANY PRACTICAL- III **Marks: 25**

1. Preparation of map of phytogeographical regions of India
2. Determination of the minimum size of the quadrat by species area curve method
3. Determination of frequency of vegetation in a community by quadrat method.
4. Determination of osmotic potential of vacuolar sap by plasmolytic method using *Rhoeo/Tradescantia* leaf and onion peel.
5. Determination of rate of transpiration by Gange's potometer
6. Extraction of chlorophyll pigments from leafy plants by paper chromatographic Technique.
7. Study of rate of photosynthesis under different light intensities.
8. Determination of RQ of plant materials having fats, protein.
9. Simple tests for carbohydrate, protein, fats and nucleic acids
10. Preparation of buffer-Phosphate and Tris acetate buffer
11. Isolation of DNA from plant seedlings
12. Field observation of local vegetation and submission of report is compulsory

BSc BOTANY SEMESTER – IV BOT 404 / BOTANY PAPER 4:
(Cytology, Genetics, Plant Breeding, Biotechnology and Biometry)

75 marks

Unit 1: Cytology: accounts of organization and function of cell and its components :
Cell wall; Plasmalemma; endoplasmic reticulum; Golgi apparatus;
Ribosomes; Mitochondria, Plasmids and Nucleus; Structure and Function of
chromosomes. Mitosis and Meiosis- Its significance 15 marks

Unit 2 : Mendelism: Law of segregation and independent assortment; Back cross
and test cross; Gene interaction; Gene expression; Structure of Gene; Transfer of
genetic information; transcription; translation; protein synthesis; t-RNA; Linkage ;
Crossing over; Mutation and Mutagens; Chromosome alterations- deletion,
duplication, translocation, inversions; Variation in chromosome number- aneuploidy,
polyploidy; Extra nuclear inheritance; Sex Chromosome ; Sex determination in plants
15 marks

Unit 3: Plant Breeding: Principles of Plant Breeding; Plant Breeding behavior;
Sexual, Asexual, Apomixis, Polyembryony; Methods of Breeding in self and cross
pollinated crops; Heterosis 15 marks

Unit 4: Biotechnology: Basic aspects of plant tissue culture; Cellular totipotency;
Differentiation and Morphogenesis;
Genetic engineering in plant improvement; Application of plant biotechnology in
medicine, agriculture and human welfare 15 marks

Unit 5: Biometry: Scope and Application; Collection of data. Sample and Sampling-
theory and methods; Mean, Median, Mode and Standard deviation; probability; chi-
square test and analysis 15 marks

BOT-404(P)/BOTANY PRACTICAL –IV

Marks: 25

1. To study cell structure from Onion leaf peel, demonstration of staining and mounting methods
2. Comparative study of Cell structures in Onion cells, *Spirogyra*; Study of Cyclosis in *Tradescantia* staminal Cells.
3. Study of plastids to examine pigment distribution in plants (e.g. *Cassia* and *capsicum*)
4. Examination of electron micrographs of eukaryotic cells with special reference to organelle.
5. Examination of various stages of mitosis and meiosis using appropriate land material (e.g. Onion root tips, Onion flower buds, *Rhoeo*, *Tradescantia*).
6. Working out the law of inheritance using seed mixtures.
7. Callus induction, organogenesis and plant regeneration (rice mature embryo)
8. Protoplast isolation e.g. tobacco, proteins.
9. Preparation of tissue culture media, sterilization and inoculation of plant material.
10. Analysis of data for mean, mode, median and standard deviation.

Recommended Book

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| 1. Molecular Biology of Cell | : | Albors, GB., Bray, D., Lewis, J., Raf, M., Roberts, K. & Naten, L.D.
Garland Publ. Co., New York |
| 2. Molecular Cell Biology | : | Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. & Darnel, J.
W.H. Freeman & Co., New York |
| 3. Principles of Genetics | : | Gardner E.J., Snustad, D.P. & Simmons S, M.J.
John Wiley & Sons, USA |
| 4. Molecular Cell Biology | : | Nolfe, S.H.
Wadsworth Publ. Co., California |
| 5. Plant Tissue Culture: Applications & Limitations | : | Bhojwani S. S.
Elsevier Science Publ., New York |
| 6. Breeding Field Crops | : | Pachlmann, J.M. & Sleeper, D.R.
Longman, London & New York |
| 7. Principles & Practice of Plant Breeding | : | Sharma, J.R.
Tata McGraw-Hill Publ. Co., New Delhi |
| 8. Ecology Work Book | : | Misra, R.
Oxford University Press, Calkutta |
| 9. Plant Microtechnique | : | Johansen, D.A.
McGranier Hill Book Co., New York |
| 10. Chromosome Technique (Theory & Practice) | : | Sharma, A. & Sharma, A.
Butterworths, London. |

BSc. BOTANY HONOURS SEMESTER –V BOT 505/ BOTANY HONOURS

PAPER 5 (Microbial Diversity, Plant Pathology and Embryophyta) 100 marks

Unit1: Microbial Diversity-History of microbiology, Five kingdom system of classification, Carl Woese's three Domains of living organism (Archaeobacteria, Bacteria and Eukaryotes), Microbial forms Viruses (including prions and viroids), Archaeobacteria, Bacteria algae, Fungi and Protozoa- their characteristic features, Microbiology of soil, air and water 20 marks

Unit 2: Microbes and Human welfare- Role of microbes in industry (alcohol, antibiotics, biofertilizers and biopesticides). Food microbiology(Spoilage, and food preservation), Medical microbiology (Microbes as pathogenic organisms). 20 marks

Unit 3: Plant Pathology- History of Plant Pathology, Koch's postulates of Host pathogen interrelation, Classification of plant diseases on the basis of causal organisms and symptoms, Studies on symptoms, diseases cycles and control measures of the following diseases- Damping off of seedlings, Late blight of potato, White rust of crucifers, Powdery mildew of pea, Blast of rice, Stem rust of wheat, Leaf blight of paddy, Citrus cancer and TMV 20 marks

Unit 4: Plant diseases management- Plant Quarantine, Seed certification, Cultural practices Fungicide (Classification on the basis of chemical nature and mode of action), Biological control, Breeding of resistant varieties, Genetically modified plants (merits and demerits), Concept of integrated pest diseases management 20 marks

Unit 5: Bryology and Pteridology : Bryophytes as the first land plants, evolutionary trend, Ecological and Economic importance of Bryophyte Brief account on the development of Bryology in India. Origin and evolution in Pteridophytes , Relationship of Pteridophytes with Bryophytes and Gymnosperms , Ecological and Economic importance of Pteridophytes 20 marks

**BSc. BOTANY HONOURS SEMESTER –V BOT 506/ BOTANY HONOURS
PAPER-6 (Advanced Plant Taxonomy, Anatomy, Embryology and Palynology)
100 marks**

Unit 1: Primitive Seed plants and Palaeobotany: Concept of Progymnosperms, Diversity among Gymnosperms and their distribution in Indian sub- continent. Origin and Evolution of Gymnosperms, Salient features and life cycle of *Ginkgo*, *Taxus*, *Ephedra*. Fossil Algae and Fungi, Primitive land plants: Rhynia, Lepidodendron, Calamites and Sphenophyllum, Fossil Gymnosperms orders Cycadofilicales, Bennettiales and Cordaitales. Fossil Angiosperm : Palmoxylon, Enigmocarpon, Sahnianthus. Palaeobotany in the exploration of Fossil fuels. 20 marks

Unit 2: Advance plant Taxonomy: Objective, Principles and Practices of Plant Taxonomy . Methods and techniques of herbarium preparation .Development of Chemotaxonomy, Cytotaxonomy and Numerical .Biosystematics, Taxonomy on the web; Molecular Taxonomy : Application of DNA hybridization technique in Plant Taxonomy Importance of biological markers in Taxonomic studies. Role of Botanical survey of India and Taxonomic Literatures. Classical system of Classification : Bentham and Hooker Taxonomic studies affinities CO4: Economic importance of the following Families:*Magnoliaceae, Asteraceae, Rutaceae, Anacardiaceae, Myrtaceae, Cucurbitaceae, Dipterocarpaceae, Polygonaceae, Moraceae, Rubiaceae, Apocynaceae, Asclepeadaceae, Acanthaceae, Verbinaceae, Aracaceae, Scitaminae (Musaceae, Zingiberaceae, Cannaceae and Marantaceae)Orchidaceae and Cyperaceae* 20 marks

Unit 3: Plant Resources- Management and Utilization

Classification of economic plants based on the uses. Cynobacteria: *Spirulina* Origin, cultivation and improvement of Maize, Mustard, Pea and Banana. History, cultivation and processing of Rubber. Characteristics and uses of Timber yielding plants: Dipterocarpus, Phobe and Melanorrhoea. Medicinal plants: *Ephedra, Carthamus, Aloe vera* and *Vinca*. Pharmacognosy: Aim and objects, Collection and preoaration of Drugs. Importance of Ethnobotany in genepool and germplasm conservation. 20 marks

Unit 4: Anatomy of Angiosperm: Apical meristem and histological theories of shoot and root apices. Vascularization: Primary shoots of Monocotyledons and Dicotyledons Formation of internodes, branching pattern, monopodial and sympodial. Root- Stem transition. Cambium and its function; Formation of secondary xylem, Characteristic of growth ring, Sapwood and heartwood. Secondary Phloem, Stomata and its types. Anomalous growth in *Bauhinia, Bougainvillea* and *Nyctanathus* 20 marks

Unit 5: Plant Embryology and Palynology:

Plant embryology. Microsporogium and types of Pollen tetrad. Megasporogium and types of megasporogenesis. Pollen- Pistil interaction, compatibility and incompatibility. Syngamy and triple fusion. Development , structure and function of endosperm .types of haustoria, Embryology and types. Development of monocot and dicot embryos. Suspensor, synergid, Polyembryony, apomixes and its role.

Pollen production and dispersion in space and time. . Role of Pollen in taxonomy Paleopalynology. melissopalynology and forensic paleopalynology 20 marks

BOT-507(P)/BOTANY - VII PRACTICAL (Based on theory paper BOT-505 and BOT-506)

Marks: 100

1. Preparation of culture media for bacteria and fungi (nutrient agar and PDA).
2. Isolation of microorganisms (bacteria and fungi) from soil/water/air.
3. Pure culture maintenance of bacteria and fungi.
4. Staining of bacteria and fungi.
5. Microscopic study of *Bacillus*, *Coccus*, *Staphylococcus*, *Spirillum*, *Escherichia*, *Nostoc*, *Anabaena*, *Saccharomyces*, *Candida*, *Aspergillus*, *Trichoderma*.
6. Morphological and anatomical studies of different types of root nodules (pea, broad bean, *Mimosa*, *Sesbania*).
7. Demonstration of Koch's postulates.
8. Symptoms, causal organisms and microscopic studies of diseased plant specimens included in theory syllabus.
9. Demonstration of commercial fungicides and equipments for field application.
10. Comparative studies of thallus and reproductive structures of *Riccia*, *Anthoceros* and *Polygonum*.
11. Comparative studies of morphological and anatomical structures of *Lycopodium*, *Selaginella* and *Marsilea* in relation to stellar evolution and heterospory.
12. Gymnosperm and palaeobotany:
Ginkgo and *Taxus* – Temporary mounts of transverse sections of young and mature stems, radial section and maturation secondary wood; transverse and vertical sections of needle; whole mounts of mature microspores, young and mature embryo.
Ephedra – T.S. of node and internode of stem, whole mount of epidermal peel, L.S. of leaf, microspores and embryos; permanent preparation of anther and ovule.
13. Examination and classification of specimen/slides of the fossil plants as per syllabus.
14. Advance plant Taxonomy: Description and classification up to genus of a representative species from each of the angiosperm families mentioned in the theory.

REDMI NOTE 9

AIQUAD CAMERA

Rutaceae: *Michelia*
Prunella, *Cardamine*
 Rutaceae: *Citrus*
 Fabaceae: *Crotalaria/Vigna/Cassia/Caesalpinia/Mimosa/Acacia*

Myrtaceae: *Callistemon/Eucalyptus*,
 Anacardiaceae: *Mangifera*
 Cucurbitaceae: *Luffa*
 Rubiaceae: *Mussaenda*
 Apocynaceae: *Vinca*
 Asclepiadaceae: *Calotropis/Asclepias*
 Acanthaceae: *Justicia/Adhatoda*
 Verbinaceae: *Duranta/Lantana*
 Polygonaceae: *Polygonum*
 Orchidaceae: *Vanda/Dendrobium*
 Scitamineae: *Musa/Canna/Maranta/Zingiber*
 Arecaceae: *Phoenix*
 Cyperaceae: *Cyperus*

15. Utilization of plants and Ethnobotany: Collection and identification of five plants each used as a source of carbohydrate, Protein, wood, oil-seed, spice and condiment and drug. Preparation of charts containing the percentage of carbohydrate contain, protein contain, oil contain, from five different species each from internet data.
16. Anatomy: Preparation of permanent/semipermanent slides for the study of anomalous secondary growth in plants included in the theory paper (Double Staining).
17. Embryology and Palynology: Examination of cleared and dissected whole mount permanent preparation of various structures mentioned in theory paper. Preparation of stained slides of endosperm and embryo. To study the germination percentage of pollen grains. Preparation of pollen slides by acetolysis method. Description and illustration of six selected pollen/spore types.
18. Identification and preparation of field notes of 50 plant species in the field.
19. An external field study tour to nationally important botanical gardens/herbaria/sanctuaries/research laboratories, etc. and submission of the study report is compulsory.

BSc BOTANY HONOURS SEMESTER –VI

BOT 608 /BOTANY HONOURS PAPER 8 (Ecology, Plant Physiology and Molecular Biology) **100 marks**

Unit 1: Vegetation and Natural Resources: Detailed study of the vegetation and floristic region of India- Evergreen, deciduous, mangrove forest; Natural Resources- forest resources, conservation, afforestation, social forestry, agro forestry- timber extraction, dams and their effects; Mineral resources; water resources- floods, drought, Energy resources- renewable and non- renewable resources **20 marks**

Unit 2 : Ecosystem and Pollution: Physical environment; biotic environment, biotic and abiotic interaction, concept of habitat and niche. Ecosystem- basic component of Ecosystem, Energy flow in Ecosystem, trophic levels
Environmental pollution- Major pollutants- air , water and soil, pollution control measure; Climate change and Global warming- environmental revolution. Biodiversity- Concept of Biodiversity **20 marks**

Unit 3: Plant Physiology : Absorption of water, Absorption of Mineral element,-roots as absorbing surfaces- active and passive Absorption. Physiological role of micro and macro elements- their deficiency symptoms. Phase of Growth-growth curve. Plant hormones (Auxins, Gibberellins, Ethylene, Abscisic acid)- Physiological functions, senescences,, Photoperiodism, Physiology of flowering, Photomorphogenesis, Phytochromes, Physiological role. Physiology- Significance- light reactions, Calvin cycle, Photorespiration, laws of limiting factors, Chemosynthesis- a brief account; Pentose Phosphate Pathway. Biological Nitrogen fixation mechanisms, Elementary knowledge of Nif, Nod, Hup genes and leghaemoglobin ; stress physiology (Principles and application) **20 marks**

Unit 4: Biochemistry water as universal solvent. Weak interaction in aqueous system. Principles of physical chemistry (pH, buffer reaction, kinetics, thermodynamics, colligative properties), Bioenergetics, Enzymes and enzymes kinetics, Enzymes regulation, Isozymes, Respiration- Glycolysis, Krebs cycle, Fermentation, oxidative phosphorylation, ATP synthesis, Biosynthesis of nucleic acids and Protein synthesis **20 marks**

Unit 5: Molecular Biology: : Gene structure, expression and regulation, Gene organisation in prokaryotes and Eukaryotes, Operon concept, Gene regulation organisation in prokaryotes and Eukaryotes , positive and negative Gene regulation, interrupted organisation in Eukaryotes, RNA Slicing, mRNA stability, Recombinant DNA Technology; Restriction endonuclease, prokaryotic and Eukaryotic clone vectors, genomic and DNA libraries; various techniques of gene mapping and concept of DNA, fingerprinting, Polymerase chain reaction, DNA Sequencing. Nucleic acids: Composition of nucleic acids; DNA structure; A, B, and Z form of DNA; Denaturation and Renaturation of DNA; Chromatin structure; DNA replication and recombinations; DNA Polymerase ; different forms of RNA. **20 marks**

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BSc SEMESTER –VI BOT 609/ BOTANY HONOURS PAPER 9: (Cell Biology, Genetics, Plant Breeding ,Biotechnology ,Computer application and Bioinformatics) 100 marks

Unit1: Cell Biology : The Cell: Historical background; Cell theory; Kingdom wise Cell size and Cell structure; comparative account of prokaryotic and Eukaryotic cell; Characteristics of Archaeobacteria and Mycoplasma, Nucleus and Ribosomes: Ultrastructure; Nuclear envelope nuclear pore complex, nuclear matrix and nucleoplasm; DNA and Histones; nucleoplasm and higher level organization; centromere and telomere. Ribosomes Structure, prokaryotic and Eukaryotic organelles; Ribosome and their functional significance

Mitochondria and Chloroplast: origin , structure and biosynthesis ; Organelles membrane and organization of macromolecular complexes, variation in size, shape and number; Types of plastids; Organelles nuclear interactions; Organelles gene interactions; Structure and function of Golgi complex; endoplasmic reticulum; Golgi apparatus; Lysosomes; Microbodies, Peroxisome and glyoxysomes; Cytoskeleton Cell membrane: origin , ultrastructure , chemical constituents and model of membrane organization; Roles of various membrane proteins, lipids and carbohydrates; role of ion channels and pumps in cellular transport and signaling.

20 marks

Unit 2: Genetics: Mendel's experiments and Principle of inheritance; Back cross and test cross; Gene interactions Modified dihybrid ratios- Complementary, Supplementary, epistatic and duplicate factors, Multiple allelism: Multiple alleles in *Drosophila* (eye colour), Man (blood groups), Plants (self - incompatibility) Quantitative genetic: Quantitative traits and quantitative genetic; the multiple factor hypothesis.

20 marks

Unit 3: Plant Breeding: Types of plant reproduction: Vegetative, Sexual and Apomixis : its effect on generating and fixing genotypic variation, Methods of plant improvement ; Pureline and mass selection ; Hybridization in self and cross pollinated crops, Introduction and acclimatization in Hybrid vigour. Mutation and Polyploidy methods of plant improvement.

20 marks

Unit 4: Biotechnology: History, definition and scope; Cellular differentiation and totipotency ; Organogenesis and embryogenesis; Protoplast isolation and culture; Somatic hybridization; Clonal propagation; Genetic engineering of plants; Vectors of Gene delivery; Selectable markers and reporter genes; Methods of gene delivery; Agrobacterium- the natural genetic engineer; Salient achievements in crop biotechnology (with suitable examples) and prospects.

20 marks

Unit 5: Computer application and Bioinformatics: Computer organisation programming principles, Programming language; internet and its application; communication tools- word processing, spread sheet and presentation of software; Concept of database, Application of Computer in Biological sciences ; Introduction to biostatistical analysis of data; Application of software for Botany, Bioinformatics- introduction and asses of bioinformatics tools.

20 marks

BSc BOTANY HONOURS SEMESTER –VI BOT (P) 610/ BOTANY (P) PAPER-10

BOT-610(P)/BOTANY - X PRACTICAL (Based on theory papers BOT-608 and BOT-609)

Marks: 100

1. Field observation of local vegetation
2. Study of structure of a plant community by random & belt transect methods
3. Determination of density and abundance of vegetation in a community by using minimum size of quadrat
4. Determination of physical characteristics of soil like pH, Temperature and moisture content
5. Water analysis (determination of chlorine, dissolved CO₂ and O₂ in water and measurement of pH)
6. Determination of dissolved oxygen and biochemical oxygen demand (BOD) in unpolluted and polluted water.
7. Determination of stomatal frequency using leaf epidermal peeling/impression
8. Separation of plant pigment by paper chromatography technique and chemical method
9. Isolation of chloroplast and demonstration of Hill's activity.
10. Estimation of starch in photosynthesizing leaves
11. Estimation of protein by Bradford method
12. Paper chromatography separation of amino acids
13. Measurement of pH of beet, carrot, potato, tuber, *Amaranthus* leaves and sap of water hyacinth.
14. Study of Cell structure from onion leaf peels; demonstration of staining and mounting methods
15. Comparative study of cell structure in Onion cells, *Hydrilla* and *Spirogyra*. Study of cyclosis in *Tradescantia* stamens/cells hairs.
16. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, *Lycopersicon*, *Capsicum*)
17. Examination of electron micrographs of eukaryotic cells with special reference to organelles
18. Study of various stage of mitosis and meiosis using appropriate plant material (e.g. root tips, flower buds of onion/pea/broad bean).
19. Determination of chromosome counts from dividing pollen mother cells, root tips and pollen grains.

20. Preparation of karyotypes from dividing root tip cells and pollen grains
21. Detection of aneuploidies in chromosome pairing and disjunction caused by mutant genes and structural alterations of Chromosome.
22. Preparation of chromosome maps from 3-point test cross data.
23. Correlation of floral structure with pollination system (e.g. *Salvia*, *Sesamum*, *Pea*, *Lathyrus*, *Triticum*, *Oriza*, *Ricinus*).
24. Field exploration for detection of male sterile plants and estimation of their pollen fertility in locally grown crop plants e.g. tomato, *lencum* etc.
25. Estimation of pollen ovule ratios and its bearing on pollination system.
26. Emasculation and bagging of flowers of Brassicaceae, Poaceae, Papilionaceae, Malvaceae etc. pollinating them manually and estimating fruits and seed set.
27. Preparation of tissue culture media, sterilization and inoculation of plant materials
28. Demonstration of techniques of *in vitro* culture of various explants.
29. Isolation of plant protoplasts (e.g. tobacco, petunia) using enzymes available commercially and estimation of their yield
30. Isolation, purification of DNA from plant materials
31. Separation of DNA fragments through gel electrophoresis
32. Isolation of plasmids for *Bacillus/Pseudomonas*
33. Hybridization experiments – F₁ and available F₂ material analysis for specific character.
34. Determination of mean, standard deviation, using MS Excel/SPSS
35. Preparation of presentation of cell organelles, using MS powerpoint or similar packages
36. Retrieving the botanical articles from internet