

CELL BIOLOGY

UNIT-I

Structural organization and function of cell organelles: Cell wall, Nucleus, mitochondria, golgi bodies, lysosomes, endoplasmic reticulum, Peroxisomes, plastids and chloroplast, vacuoles. Structure and function of cytoskeleton and its role in motility.

UNIT-II

Plasma membrane and plasmodesmata: Structure of cell membrane, models and functions, site for ATPase, ion carriers, diffusion, osmosis, channels and pumps, receptors, Role of plasmodesmata in movement of micro molecules and macromolecules.

Mitochondrial and Chloroplast Genomes: Diversity and evolution of organelle genomes, chloroplast protein targeting to different compartments.

Intracellular components and transport: mechanism of protein sorting in peroxisome, nucleus, chloroplast, mitochondria, ER regulation of intracellular transport. Transfer of genes between organelles and nucleus, mitochondrial DNA and male sterility.

UNIT-III

Chromatin Organization: Chromosome structure and packaging of DNA. Nucleosome Organization (Assembly and disassembly), molecular organization of centromere and telomere, euchromatin and heterochromatin, nucleolus and ribosomal RNA genes, Karyotype analysis, banding patterns, karyotype evolution, specialized types of chromosomes (polytene, lampbrush, B-chromosome and sex chromosome), molecular basis of chromosome pairing.

Cell division, Cell Cycle and Apoptosis: Mitosis and Meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle. Mechanism of programmed cell death. Apoptosis inducing factors, Cancer and oncogenes.

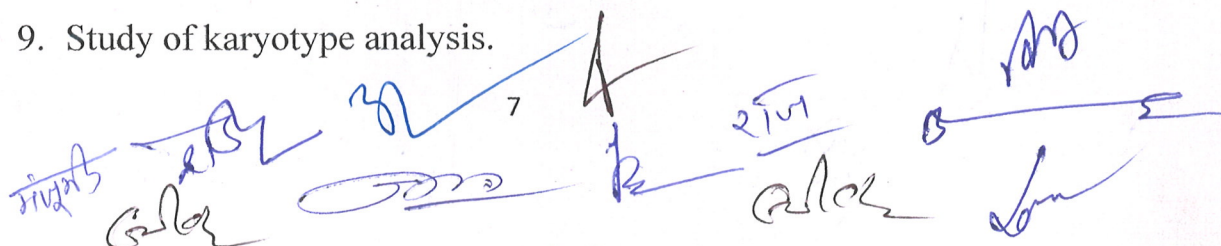
UNIT-IV

Cell signaling: Hormones and their receptors, cell surface receptors, signaling through G protein coupled receptors, signal transduction pathways (Cyclic AMP, phospholipase C, Ca^{2+} calmodulin & receptor tyrosine kinase pathways), mechanism and cellular response to environmental signaling.

Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and role of different adhesion molecules, gap junctions, extracellular matrix, integrins.

Suggested practical exercises:

1. Isolation of mitochondria and the activity of its marker enzyme, succinate dehydrogenase (SDH).
2. Isolation of chloroplast and SDS-PAGE profile of proteins to demarcate the two subunits of Rubisco.
3. Fluorescence staining with FDA for cell viability and cell wall staining with calcofluor.
4. Demonstration of centrifuge, spectrophotometer, colorimeter, SEM and TEM.
5. Study of different stages of mitosis in onion root tip cells.
6. Study of different stages of meiosis in flower buds of onion.
7. Lignin staining with Phloroglucinol stain.
8. Study of polytene and lampbrush chromosomes.
9. Study of karyotype analysis.

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10. Study of cell structure in onion peel and in Rheo leaf.

11. Study of *Spirogyra* cells.

Suggested readings:

1. Krishnamurthy, K.V. 2000. Methods in cell wall cytochemistry. CRC press, Boca Raton, Florida.
2. De, D. N., 2000. Plant cell vacuoles: An introduction. CISCO publication, Collingwood, Australia.
3. Klein smith, L.J. and Kish, V. M., 1995. Principles of cell and molecular biology. Harper Collins college publishers, New York, USA.
4. Hall, J.L. and Moore, A.L., 1983. Isolation of membranes and organelles from plant cells. Academic Press, London, UK.
5. Harris, N. and Oparka, K.J., 1994. Plant cell biology: A practical approach. IRL Press, Oxford university press, oxford, UK.
6. Gunnings, B.E.S. and Steer, M.W. 1996. Plant cell biology: structure and function. Jones and Barlett publishers. Boston, Massachusetts.
7. Karp, G., 1999. Cell and Molecular Biology: concept and experiments. John wiley & sons, Inc., USA.
8. Lewin, B. 2000. Gene VII. Oxford University Press, New York, USA.
9. Wolfe, S. L., 1993. Molecular and cellular biology. Wadsworth Publishing Co. California, USA.

ALGAE, FUNGI AND BRYOPHYTA

UNIT-I

Algae: General characters ; diversified habitats (terrestrial, freshwater and marine); range of thallus organization; cell ultrastructure ; reproduction (vegetative , asexual and sexual) and classification.

Salient features of Cyanophyta, Chlorophyta, Bacillariophyta Xanthophyta, Pyrrophyta, Phaeophyta and Rhodophyta with special reference to *Spirulina*, *Scytonema* , *Dunaliella* , *Acetabularia*, *Pinnularia*, *Botrydium*, *Gonyaulax*, *Laminaria*, and *Batrachospermum*.

UNIT-II

Fungi: General characters ; substrate relationship ; nutrition (saprobic, biotrophic and symbiotic) cell ultrastructure ; cell wall composition ; thallus organisation ; reproduction (asexual and sexual) and classification

General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina , and Deuteromycotina with special reference to *Physarum*, *Peronospora* , *Mucor*, *Neurospora*, *Polyporus*, and *Colletotrichum*.

UNIT-III

Bryophyta : General characters, Distribution, morphology; reproduction .and classification.

General account of Marchantiales, Jungermaniales, Anthocerotales, Sphagnales , Funariales and Polytrichales with special reference to *Plagiochasma*, *Porella*, *Notothylas*, *Sphagnum*, *Funaria* and *Polytrichum*.

UNIT-IV

Economic importance of algae: especially in industries, food, fodder, biofertilizers and algal blooms, biofuels. Isolation and culture of algae.

Economic importance of Fungi : Fungi in industries , in medicines , as food and as biocontrol agents, Poisonous fungi. Fungal diseases in plants and animals including humans, Mushroom cultivation.

Heterothallism, heterokaryosis, parasexuality, sex hormones and phylogeny of fungi.

Economic and ecological importance of bryophytes (Role of bryophytes in succession).

Suggested practical exercises:

Morphological study of representative members of algae, fungi and bryophytes present in your locality in their natural habitat with special reference to:

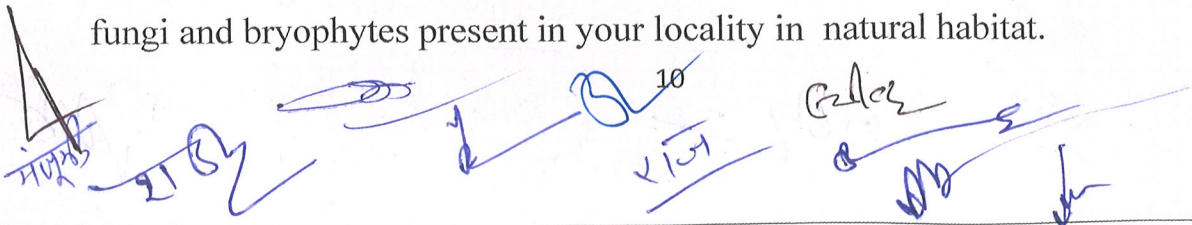
Algae: *Microcystis*, *scytonema*, *Spirulina*, *Dunaliella*, *Spirogyra*, *Pediastrum*, *Hydrodictyon*, *Ulva*, *Pithophora*, *Stigeoclonium*, *Drapanaldiopsis*, *Closteridium*, *Botrydium*, *Cosmarium*, *Nitella*, *Pinnularia*, *Laminaria*, *Gelidium* and *Batrachopermum*.

Isolation and culture of algae.

Fungi: *Peronospora*, *Albugo*, *Mucor*, *Pernospora*, , *Peziza*, *Morchella*, *Agaricus* , *Polyporus*, *Drechslera*, *Penicillium*, *Aspergillus*, , *Fusarium* and *Alternaria*.

Bryophytes: *Riccia*, *Marchantia*, *Plagiochasma*, *Pellia*, *Porella*, *Anthoceros*, *Notothyllus*, *Funaria*, *Sphagnum*, *Andreaea* and *Polytrichum*.

Field visit for morphological study of representative members of algae, fungi and bryophytes present in your locality in natural habitat.



Suggested Readings:

1. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology, John Wiley & Sons Ind.
2. Anderson RA (2005) Algal Culturing Techniques. Physiological Society of America. Elsevier Academic Press, USA.
3. Cole KM and Sheath RG (1990). Biology of the Red Algae. Cambridge Univ. Press, Cambridge.
4. Fritsch FE (1935, 1945). The Structure and Reproduction of Algae Vols. I and II. Cambridge University Press, Cambridge, UK.
5. Fritsch FE (1945). The Structure and Reproduction of Algae. Vol. I. Cambridge Univ. Press, Cambridge, UK.
6. Geissler and Greene SW (1982) Bryophyte Taxonomy, methods, practices and floristic exploration. Cramer, Germany.
7. Isabella A. Abbott, George | and Hollenberg (1993). Marine Algae of California. Stanford University Press. USA.
8. Kumar, H.D. 1988. Introductory Phycology. Affiliated East-West Press Ltd., New Delhi.
9. Lee RE (1989). Phycology. Vol. II. Cambridge Univ. Press. Cambridge, USA.
10. Mehrotra, S. and Aneja, R.S. 1998. An Introduction to Mycology, New Age Intermediate Press.
11. Morris, I. 1986. An Introduction to the Algae. Cambridge University Press, U.K.

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12. Parihar, NS (1993) An Introduction to Embryophyta: Vol I - Bryophyta, Vol II. Pteridophyta, Central Book Depot. Allahabad.
13. Parihar, N.S, 1991. Bryophyta. Central Book Depot, Allahabad.
14. Puri, P. 1980. Bryophytes. Atma Ram & Sons, Delhi.
15. Rangaswami, G. and Mahadevan, A. 1999. Diseases of Crop Plants in India (4th edition). Prentice Hall of India Pvt. Ltd., New Delhi.
16. Richardson DHS (1981) The Biology of mosses. John Wiley & Sons, Inc New York.
17. Round, F.E. 1986. The Biology of Algae. Cambridge University Press, Cambridge.
18. Sahoo D & Qasim SZ (Eds), (2002). "Sustainable Aquaculture". APH Publishing Corporation, New Delhi, India.
19. Shaw Al and B Goffinet (2000) Bryophyte Biology. Cambridge University Press, Cambridge
20. South GR and Whittick A. (1987). Introduction to Phycology. Blackwell Scientific Publications. London.
21. Webster, J. 1985. Introduction to Fungi. Cambridge University Press.

PRACTICAL EXAM SKELETON PAPER

M.Sc. (Botany) Semester-I

Group-I

Paper-I Cell Biology P-22-1037

Paper-II Algae, fungi and bryophytes

Time: 4 Hours.

MM: 100

1. Make suitable stained preparation of given material 'A'. Report at least two stages. Draw labelled diagrams and identify the stages giving reasons. 20
2. Stain the salivary gland chromosomes of *Drosophila* and draw its labelled diagram.

OR

- Prepare the karyotype of the given genome. 10
3. Identify and classify, giving reasons, any two algae from the given mixture 'B'. Draw labelled diagrams. Comment upon the significant features. 10
 4. Make a suitable stained preparation of given material 'C'. Draw labeled sketches. Write their systematic position and identify giving reasons. 10
 5. Make a suitable stained preparation of given material 'D'. Draw its labeled diagram. Identify and assign it to its systematic position with reasons. 10
 6. Identify and critically comment upon the spots 1-5. 5X4= 20
 7. Practical Record 10
 8. Viva-Voce 10

Transposable elements in prokaryotes and eukaryotes, mutation induced by transposons.

Site directed mutagenesis , Origin, meiosis and breeding behavior of Duplication, Deficiency, Inversion and Translocation Heterozygotes.

Structural and numerical alterations in chromosomes (Polyploidy) : Origin, occurrence, production and meiosis of Haploid, Aneuploids, Euploids, Autopolyploids, Allopolyploids, Induction and characterization of Trisomic and Monosomic. Evolution of major crop plants.

UNIT -IV

Molecular cytogenetics ; Nuclear DNA content, C-value paradox, cot curve and its significance, Restriction mapping : concepts and techniques, DNA sequencing . *In situ* hybridization- Concept and Techniques.

Computer assisted chromosome analysis, chromosome microdissection and micro cloning.

Plant breeding: Introduction and objectives of plant breeding, General methods of plant breeding (Introduction, Acclimatization, Selection and Hybridization) for self-pollinated, cross pollinated and clonally propagated crop plants. Gene pyramiding for multiple-trait incorporation. Famous Indian and international plant breeders and their contribution in plant breeding. Hybrid vigor and Inbreeding depression.

Suggested practical exercises:

1. Linear differentiation of chromosome through bending techniques such as G banding ,C banding and Q banding.
2. Study of Karyotypes.
3. Emasculation selfing and crossing over techniques.
4. Test cross and back cross In plant breeding.
5. Germ plasm conservation methods In-situ and ex-situ.
6. linkage and mapping.
7. Seminar and PPT.

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8. Induction of polyploidy using Colchicines different methods of application of colchicines.
9. Analysis of morphological and molecular diversity in different cultivar or varieties of a crop plant.
10. Fraction and estimation of repetitive and unique DNA sequence in nuclear DNA.
11. Isolation of chlorophyll mutants following irradiation and treatment with chemical Mutagens.
12. Mutation of complex translocation heterozygotes.
13. Effect of induced and spontaneous polyploidy on Plant phenotype, meiosis, Polyploidy and Seed fertility and fruits set.
14. Working out the effect of Mono and trisomy me one plant phenotype, fertility and meiotic behaviour.
15. Characteristics and behaviour of the B chromosomes using Maize or any other appropriate material.
16. Orcein and Feulgen staining of the salivary gland chromosome of drosophila.

Suggested readings:

1. Genes V by Benjamin Lewin, Oxford University Press, New York.
2. Gene IX, Benjamin Lewin Oxford University Press, New York.
3. Principles of Genetics, Snustad and Simmons, Fourth Edition, John Wiley and Sons, Inc.
4. Molecular Cell Biology, Lodish et.al., W. H. Freeman and Company.
5. Genomes by T.A. Brown, John Wiley and sons (Asia)PTE LTD, New York.
6. Principles of Gene Manipulation and Genomics by S.B. Primrose and R. M. Twyman, Seventh edition, Blackwell Publishing, U.K.
7. Cell and Molecular Biology concepts and experiments By Gerald Karp, Third edition, John Wiley and sons, Inc., U.S.A.
8. Chromatin and Gene regulation (2001) Turner Wiley-Blackwell
9. An Introduction to Genetic Analysis, Grifiths et al., W. H. Freema

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PTERIDOPHYTA, GYMNOSPERMS AND PALAEOBOTANY

UNIT-I

Pteridophytes: General characters, morphology , Anatomy, Reproduction and life history.

Distribution, Classification and economic importance .

General characters of Psilopsida, Lycopsidea, Sphenopsida and Pteropsida.

Morphology, Anatomy, reproduction and life history of *Tmsiepteris*, *Lycopodium*, *Equisetum*, *Isoetes*, *Dryopteris* and *Azolla*.

UNIT-II

Gymnosperm: General characters, morphology , Anatomy, Reproduction . life history.

Distribution, classification and economic importance of gymnosperms.

General account of orders and families of following gymnosperms.

Cycadales (*Zamia*), Coniferales (*Pinus*, *Biota* and *Taxes*)

Ephedrales (*Ephedra*), Welwitschiales (*Welwitschia*)

Gnetales (*Gnetum*) and Ginkgoales (*Gingko*).

UNIT-III

Origin and evolution of stele, heterospory and seed habit.

Evolution of Pteridophytes and Gymnosperms.

Paleobotany: Formation and types of fossils, Techniques of study of Fossils, Geological time scale, Applied Aspects of Paleobotany, use in Coal and Petroleum exploration.

UNIT-IV

Brief account of fossils of Pteridophytes: *Rhynia*, *Lepidodendron* and *Calamites*.

Brief account of divisions and genera of following fossils of Gymnosperm:

Divisions: Progymnospermophyta, Pteridospermophyta, Cycadeiodophyta

Genera : *Lygenopteris*, *Medullosa*, *Caytonia*, *Glossopteris*, *Cycadeodia* and *Cordaitea*.

Suggested practical exercises:

1. Morphological and anatomical study of representative members of Pteridophytes and Gymnosperm in their natural habitat found in your locality with special reference to *Psilotum*, *Lycopodium*, *Selegiella*, *Isoetes*, *Equisetum*, *Azolla*, *Pteris*, *Dryopteris*, *Adiantum*, *Ophioglossum* and *Marsilea* in pteridophytes and
Zamia, *Cycas*, *Thuja*, *Ginkgo*, *Pinus*, *Taxus*, *Araucaria*, *Biota*, *Ephedra* and *Gnetum* in Gymnosperm.
2. Collection and field study.

Suggested readings:

1. Parihar. N. S. 1996. Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
2. Sporne, K. K. 1991. The Morphology of Pteridophytes. B. I. Publishing Pvt. Ltd. Bombay
3. Stewart W. N. and Rathwell, G. W. 1993. paleobotany and the Evolution of Plants. Cambridge University Press.
4. Bhatnagar, S. P. and Mitra, A. 1996. Gymnosperms. New Age International Pvt, Ltd., New Delhi.
5. Singh. H. 1978. Embryology of Gymnosperms, Encyclopaedia of Plant Anatomy X. Gebruder Bortraeger. Berlin, Germany.
6. Smith, G.M. 1955. Cryptogamic Botany Vol. II Tata Mc Graw Hill Bool Co, Ny.
7. Pandey, B.P. 1993. College Botany. Vol.II. S. Chand And Company Ltd., New Delhi.
8. Arnold, Chester, A. 2000. An Introduction to Paleobotany. Agrobios, (India).
9. Rashid. A. 2001. An Introduction to Pteridophyte (II Edition). Vikas Publishing House, Pvt. Ltd., New Delhi.
10. Sunder Ranjan, S (2007), Introduction to Pteridophyte, New Age International Publishers, New Delhi.

PRACTICAL EXAM SKELETON PAPER

M.Sc. (Botany) Semester –I

(Group II)

P-22-1038

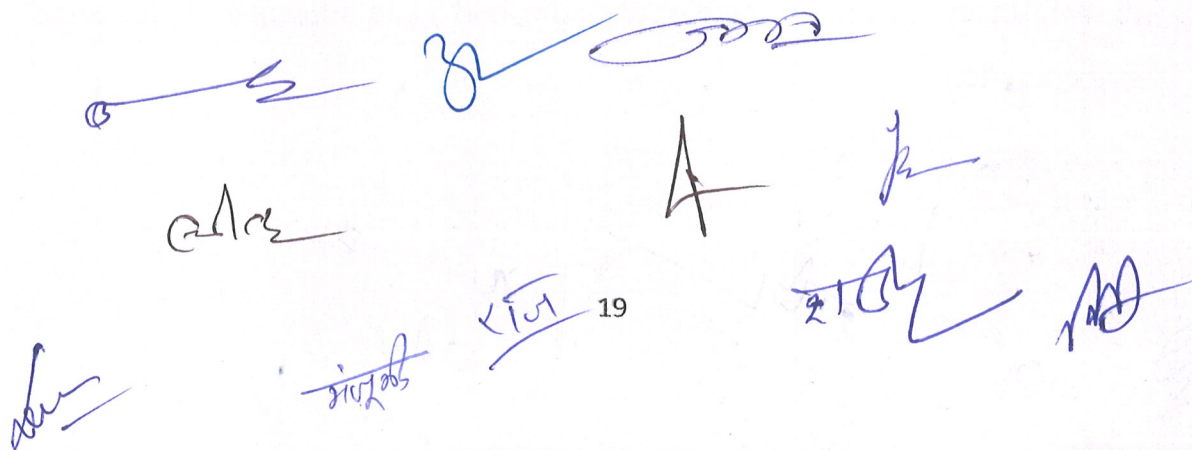
Paper-III Genetics and

Paper-IV Pteridophytes and gymnosperms

Time : 4 hours.

MM: 100

1. Study the given plant breeding exercise. Write down the procedure & Precaution to be taken. 10
2. (A) Solve the given problems of genetics. 10
(B) Biostatistics problems. 10
3. Cut an appropriate section of given vegetative/reproductive part of material and make a suitable stained preparation. Draw labelled diagram of the section prepared. Identify giving reasons. Assign its systematic position. 15
4. Cut a T.S./L.S./T.L.S./R.L.S of given vegetative/reproductive part of material 'B' and Make a suitable double stained preparation. Draw labelled diagram of the section prepared. Identify giving reasons. Assign its systematic position. 15
5. Identify and critically comment upon the spots 1-4. 4X5 = 20
6. Practical Record 10
7. Viva-voce 10

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MOLECULAR BIOLOGY AND EVOLUTION

UNIT-I

Genes and DNA: Genome, gene, evidences of DNA and RNA as genetic material, Double helical structure of DNA.

DNA Replication: Prokaryotic and eukaryotic DNA replication-unit of replicon, enzymes involved, mechanism of DNA replication origin and replication fork, fidelity of replication, accessory proteins involved in DNA replication, extra chromosomal replicon.

DNA damage and repair: Causes of DNA damage and molecular mechanism of repair, excision repair system in bacteria and eukaryotes, base excision, recombination repair systems and SOS repair. Inherited diseases and defects in DNA repair.

UNIT-II

RNA structure and function: Different types of RNAs-mRNA, t-RNA, r-RNA, snRNA, Small nucleolar proteins, Ribosomes-subunits and its molecular structure and functions, Genetic code.

Transcription: Prokaryotic and eukaryotic transcription, transcriptional factors and machinery, RNA polymerases, regulatory elements and mechanism of transcription regulation-formation of initiation complex. Transcription activators and repressors, inhibitors and silencers. Role of chromatin in regulating gene expression and gene silencing. Epigenome and epigenetics.

UNIT-III

RNA splicing and processing: Capping, polyadenylation, splicing, spliceosome, group I introns and transesterification, ribozymes and RNA editing.

RNA transport: Nuclear transport of m RNA, mRNA stability.

Translation: Prokaryotic and eukaryotic translation-translational machinery, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, aminoacylation of tRNA, aminoacyl tRNA synthetase, termination of translation, regulation of translation, translational proof reading, translational inhibitors, co and post translational modifications of proteins.

Gene Regulation and gene expression: Regulation in phages, viruses, prokaryotic and eukaryotic gene expression. Regulation of chromatin structure, Regulation of Transcription Initiation.

UNIT-IV

Emergence of evolutionary thoughts: Lamarck, Darwin-concept of variation, adaptation, struggle, fitness and natural selection.

Population genetics: Populations, gene pool, gene frequency, Hardy-weinberg law, concepts and rate in gene frequency through natural selection, migration and random genetic drift.

Origin of cells and unicellular evolution: Origin of the basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane, Experiment of Miller (1953). The First cell; Evolution of prokaryotes cells; Origin of eukaryotic cells, Origin of unicellular and multi-cellular organisms, major groups of plants and animals.

Suggested practical exercises:

1. Isolation of nuclei and identification of histones by SDS-PAGE.
2. Isolation of plant DNA and its quantification by a spectrophotometric method.
3. Isolation of DNA and preparation of 'cot' curve.
4. Restriction digestion of plant DNA, its separation by agarose gel electrophoresis and visualization by ethidium bromide staining.
5. Isolation of RNA and quantification by a spectrophotometric method.
6. Separation of plant RNA by agarose gel electrophoresis and visualization by ethidium bromide staining.
7. Southern blot analysis using a gene specific probe.
8. Northern blot analysis using a gene specific probe.
9. Immunological technique: Ouchterlony method, ELISA and western blotting.
10. Study of Polymerase chain reaction (PCR).
11. Building of a model of B-DNA.
12. Hardy-weinberg numericals

Suggested readings:

1. Lewis, B., 2000. Genes IX. Oxford University Press, New York.
2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J. D., 1999. Molecular Biology of the cell. Garland Publishing, Inc., New York.
3. Rost, T. *et al.* 1998. Plant biology. Wadsworth publishing Co. California, USA.
4. Buchanan, B. B., Gruissem, W. and Jones, R. L. 2000. Biochemistry and Molecular Biology of plants, American Society of Plant Physiologists, Maryland, USA.
5. Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D. and Darnell, J., 2000. Molecular Cell Biology. W.H. Freeman and co., New York, USA.
6. Glick, B. R. and Thompson, J. E., 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
7. Glover, D. M. and Hames, B. D. (Eds.), 1995. DNA Cloning 1: A Practical Approach, Core Techniques, PAS, IRL press at Oxford university press, Oxford.

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PRINCIPLES OF PLANT PATHOLOGY

UNIT-I

Plant diseases: Introduction; history and scope of plant pathology; biotic and abiotic factors in disease development, host specific and non host specific toxins.

Defense mechanism: Structural and biochemical defenses.

Plant disease management: Physical, chemical and biological control; IPM systems.

Development of transgenics, biopesticides, plant disease clinics.

Information technology in plant pathology: Preliminary account of application of information technology in plant pathology.

UNIT-II

General symptoms of plant diseases.

Symptomatology, etiology and control of following:

Fungal diseases:

Wheat : Flag smut , Rust and Karnal bunt .

Bajra : Green ear, Ergot and Smut diseases.

Groundnut & Cotton: Tikka disease of groundnut and Wilt of cotton.

UNIT-III

Symptomatology ,etiology and control measures of following:

Fungal diseases of grapes: Downy mildew and powdery mildew.

Bacterial diseases: Yellow ear rot of wheat (Tundu disease), Citrus canker, Black rot of crucifers, Crown gall of stone fruits.

Viral diseases: Tobacco Mosaic Disease , Yellow vein mosaic of bhindi.

Viroids and its diseases. Cadang -Cadang disease of coconut.

UNIT-IV

Phytoplasma diseases: General account of phytoplasma; Little leaf of brinjal.

Nematode diseases: General account of plant parasitic nematodes; Root knot of vegetables, Ear Cockle.

Nonparasitic diseases: General account of nonparasitic diseases, Black heart of potato.

Suggested practical exercises:

1. Fungal diseases: Wheat rust, Loose smut of wheat, Covered smut of wheat, Green ear of bajra, Ergot of bajra, Bunt of wheat, White rust of crucifers, Paddy blast, Downy Mildew and powdery mildew of grapes, Angular leaf spot of cotton.
2. Bacterial diseases: Citrus canker, Crown gall
3. Phytoplasma diseases: Little leaf of brinjal, Sesame phyllody,
4. Nematode diseases: Root knot of vegetables, Ear cockle of wheat,
5. Non parasitic diseases: Black heart of potato, Spindle tuber of potato.
6. Isolation and identification of seed- borne mycoflora by standard blotter method.
7. Preparation of culture media (PDA and NA)
8. Plating seeds on PDA / NA for identification of seed borne fungi and bacteria.
9. Micrometry and camera lucida
10. Field visits to show diseases in crop plants.
11. Institute visits: Agriculture research station, Quarantine station(eg. NBPGR), Seed testing labs, NSC, FCI etc.
12. Seminar and PPT
13. Any other practical based on theory syllabus.

Suggested readings:

1. Alexopoulos, C., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology. John Wiley & Sons Inc.
2. Agrios, G.N. 1997. Plant Pathology. Academic Press, London.
3. Albajes, R., Gullino, M.L., Van Lenteren, J.C. and Elad, Y. 2000. Integrated Pest and Disease management in Greenhouse Crops. Kluwer Academic Publishers.
4. Bridge, P., Moore, D.R. & Scott, P.R. 1998. Information Technology Plant Pathology and Biodiversity. CAB International, U.K.
5. Mehrotra, R.S. Plant Pathology, Tata McGraw Hill.
6. Rangaswamy, G. & Mahadevan, A. 1999. Diseases of crop plants in India (4th edition) Prentice Hall of India, Pvt. LTD. New Delhi.
7. Horsfall, J.G. & A.E. Dimond. Plant Pathology Vol. 1, 2 & 3. Academic Press, New York, London.

PRACTICAL EXAM SKELETON PAPER

M.Sc. (Botany) Semester – II

Group-I

P-22-2037

Paper-V Molecular Biology and evolution

Paper-VI Principles of plant pathology

Time: 4 Hours

M.M.: 100

1. (A) Extract the material from the given plant material do the quantitative estimation, and write the principle and procedure. 20
(B) Evolution exercise 10
2. Study the given material carefully by preparing its suitable stained preparation and draw labelled diagram and describe the pathogen and abnormalities in host. 15
3. Cut the section of given plant material and make a double stained preparation and describe its histopathology with the help of suitable diagrams. 15
4. Identify and critically comment upon the spots.(1-4) 4x5 = 20
5. Practical Record 10
6. Viva-Voce 10

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MICROBIOLOGY AND TOOLS & TECHNIQUES IN PLANT SCIENCES

UNIT-I

General account of microbiology: Scope, History and Development in the field of microbiology.

Whittaker's five kingdom concept, modern trends in classification (Ribotyping, nucleic acid, hybridization, RNA fingerprinting, molecular chronometer).

Bergey's manual of systematic Bacteriology.

Cultivation of Bacteria. Anaerobic, aerobic culture media, growth curve, kinetics, batch, continuous culture, growth measurement. Pure culture techniques, preservation methods.

Morphology and General characters of Bacteria, Mode of nutrition and Reproduction in Bacteria, Cytoplasmic inclusions, Plasmids, Endospores.

General accounts of: Spirochaetes, Rickettsia, Archaeobacteria: Methanotrophs Halophiles and Sulphur dependent archaeobacteria.

UNIT-II

Virus: Virus Nomenclature, Classification (Baltimore).

Properties and Structure of viruses: RNA viruses: (Corona Virus and HIV viruses), DNA viruses: (Cauliflower and Turnip yellow mosaic virus). A brief account of Viroids and Prions, Phytoplasma and Spiroplasma.

Immunology: General account of immunity, properties of antigen and antibodies, Antibody structure and function, Affinity and Antibody Specificity, Monoclonal antibodies and their uses. Antibody engineering,

Serology, Vaccine, Vaccination and Interferon. Antigen Antibody interaction, MHC molecule, Antigen processing presentation, activation and differentiation of B and C cell receptors, cell mediated immune responses.

UNIT-III

Applications of microbiology: In Agriculture, food and waste management including Siderophores and other PGRs, food microbiology: application of microbial enzymes in food industry, microbiology of fermented milk products. Contamination and spoilage of food products, food preservation methods.

Industrial microbiology: Production of alcohol, citric acid, solvent, amino acids, enzyme, antibiotics. Microbial degradation of petroleum and hydrocarbons. Bioremediation.

Preliminary account of Biofilms, Biochips, Biosensors and Biosurfactants.

UNIT-IV

Tools And Techniques : Advances in Light and Electron microscopy, Flow cytometry and Confocal microscopy in karyotype analysis, Cytochemistry microprobe analysis, X-ray diffraction, Cell fraction and Visualization.

FISH, GISH and Banding patterns of chromosomes, Genomics and Proteomics,

Blotting Techniques: Southern blotting, Northern blotting and Western blotting, Electro forces and Autoradiography. Gel Electrophoresis and SDS PAGE.

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Suggested practical exercises:

1. Preparation of culture media : liquid and solid.
2. Study of growth curve.
3. Sterilization methods.
4. Gram staining methods.
5. Telephone test of milk.
6. Methods of quantitative estimation of microorganisms
7. Total count- hemocytometer and viable count -plate count.
8. Seminar and PPT.
9. Isolation of culture by pour plate, serial dilutions and streak plate method
10. Effect of pH temperature osmolarity and oxygen desiccation on growth of bacteria.
11. Sample staining.
12. Negative staining.
13. Fermentation the production of the ethyl alcohol by yeast.
14. WBC count.
15. RBC count.
16. Blood grouping RH factor.
17. Hemoglobin estimation.
18. To study spontaneous mutations by replica plating.
19. To study induced mutation in bacteria.
20. Isolation of antibiotic mutants by gradient plate technique.
21. Isolation of antibiotics resistant Mutants by antibiotic disk method.
22. Isolation of microorganisms from air ,water, soil and rhizosphere microflora.
23. Isolation and identification of pathogens.

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Suggested readings:

1. Lansing M Prescott, John P. Harley, Donald A Klein, Microbiology. Sixth edition, Mc Graw Hill Higher education.
2. General Microbiology; R.Y. Ingraham, J.L. Wheels, M.L. Painter. Thesis Macmillan Press Ltd.
3. Brock Biology of Microorganism; M.T, Martinko, J.M. Parker, Prentice-Hall.
4. Microbiology; M.J. Pelczar, E.C.S Chan and N.R. Kreig, Tata McGraw Hill.
5. Microbial Genetics, S.R. Molloy, J.E. Jr. Cronan and Frreifelder D Jones, Bartiett Publishers.
6. Breed and Buchanan. Bergey's Manual of Systematic Bacteriology. 2nd Edition, (Volumes. 1 – 5) (2001 – 2003).
7. General Microbiology, R. Y. Stanier, E. A. Adelberg, J. L. Ingraham, 4th edition, Mac Millan Press, London.
8. Microbiology An introduction by Tortora Funke case.
9. A Biologist Guide to Principles and Techniques of Practical Biochemistry, Wilson and Goulding
10. Physical Biochemistry: Applications to Biochemistry and Molecular Biology, David Frefelder,
11. Microbiology; Lansing M Prescott, John P. Harley, Donald A Klein, Sixth edition, Mc Graw Hill Higher education.
12. Principles of Instrumental Analysis, Skoog and West.
13. Biological Spectroscopy, Campbell and Dwek.
14. Principles and Techniques of Biochemistry and Molecular Biology, Wilson Keith and Walker John (2005) 6th Edition. Cambridge University Press, New York.

PLANT ECOLOGY

UNIT-1

Introduction to ecology, evolutionary ecology, ecological models .

Population : Characteristics of population, population size and population growth curve, limits of population growth, population dynamics, concept of metapopulation, life history pattern, fertility rate and age structure, population growth. Genetic analysis of single and multiple population.

Species interactions: Competition and coexistence, intra-specific interactions, interspecific interactions, scramble and contest competition model, mutualism allelopathy, commensalism, and prey- predator interactions.

UNIT-II

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, Ecotone and Ecological equivalents.

Vegetation development: Temporal changes (cyclic and non- cyclic), mechanism of ecological succession (relay floristic and initial floristic composition) Succession Models (facilitation, tolerance and inhibition models). Changes in Ecosystem, Properties during Succession, Concept of Climax.

UNIT -III

Ecosystem : Ecosystem structure and function, forest ,grassland and freshwater ecosystems, food webs, energy flow models, Productivity of

various ecosystem, Ecology of plant invasion and Biogeochemical Cycles of Carbon, Nitrogen, Phosphorus and Sulphur.

Ecosystem management: Homeostasis and cybernetics of ecosystem, resilience of ecosystem, ecosystem services, restoration of degraded ecosystems.

UNIT-IV

Biomes and biodiversity: Biosphere and major biomes of world, biomes of India, Impact of climate on biomes, Biogeographical zones of India, Biodiversity: concept and status in India , utilization and concerns. Sustainable Development: Basic concepts.

Biodiversity act of India and related International conventions.

Molecular ecology, genetic analysis of single and multiple population, molecular approach to behavioral ecology, conservation genetics

Suggested practical exercises:

1. To determine minimum size and number of quadrats required for reliable estimation of biomass in grassland.
2. To compare protected and unprotected grassland stands using community coefficients (similarity indices).
3. To estimate IVI of the species in a grassland/woodland using quadrat method.
4. To determine gross and net phytoplankton productivity by light and dark bottle method.
5. To determine soil moisture content, porosity and bulk density of soils collected from varying depths at different locations.
6. To determine the Water holding capacity of soils collected from different locations.

7. To determine percent organic carbon and organic matter in the soils of cropland, grassland and forest.
8. To estimate and dissolved oxygen content in eutrophic and oligotrophic water samples by azide modification of Winkler's method.
9. To estimate chlorophyll content in SO₂ fumigated and unfumigated plants leaves.
10. To estimate rate of carbon dioxide evolution from different soils using soda lime or alkali absorption method.

Suggested readings :

1. Smith, R.L. 1996. Ecology and Field Biology, Harper Collins, New York.
2. Muller-Dombois, D. and Ellensburg, H. 1974. Aims and Methods of Vegetation Ecology, Wiley, New York.
3. Begon, M. Harper, J.L. and Towsend, C.R. 1996. Ecology, Blackwell Science, Cambridge, U.S.A.
4. Ludwig, J. and Reynolds, J.F. 1988. Statistical Ecology. John Wiley and Sons.
5. Odum, E.P. 1971. Fundamentals of Ecology, Saunders, Philadelphia.
6. Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
7. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology, Benjamin/Cummings Publications Company, California.
8. Kormondy, E.J. 1996. Concepts of ecology. Prentice-Hall of India Pvt. Ltd., New Delhi.
9. Chapman, J.L. and Reiss, M.J. 1988. Ecology, Principles and Applications, Cambridge University Press, Cambridge, U.K.

10. Molan, B. and Billharz, S. 1997. Sustainability Indicators, John Wiley Sons, New York.
11. Heywood, V.H. and Watson, R.T. 1985. Global Biodiversity Assessment. Cambridge University Press.
12. N.S. Subrahmanyam and A.V. S.S. Sambamurty. 2000. Ecology. Narosa Publishing House, Jaipur.
13. S.K. Maiti. 2004. Handbook of Methods in Environmental Studies Vol. 1 & 2 ABD Publisher, Jaipur.
14. J.L. Chapman and M.J. Reiss. 1995. Ecology principles and applications. Cambridge University Press.
15. C. Faurie, C. Ferra, P. Medori and J. Devaux. 2001. Ecology Science and Practice. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
16. G.T. Miller Jr. 2005. Essentials of Ecology. III Editi

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PRACTICAL EXAM SKELETON PAPER

M.Sc. (Botany) Semester – II

Group II

P-22-2038

Paper-VII Microbiology and tools & techniques in plant sciences

Paper-VIII Plant ecology

Time : 4 hours

MM :100

1. Perform the given microbiological exercise describe the principle, methodology, conclusion and question based on observation of the experiment. 20
2. Prepare a suitable stained preparation of the bacteria using gram's strain.

OR

- | | |
|--|----|
| Numerical exercise | 10 |
| 3. Calculate the frequency/Density/Abundance of different species by quadrat method. | 20 |
| 4. Exercise of CO_3 / NO_3 / Cl^- / SO_4^{2-} / pH | 10 |
| 5. Identify and critically comment upon the spots.1-5 | 20 |
| 6. Practical Record | 10 |
| 7. Viva-Voce | 10 |