

UNIVERSITY OF KOTA, KOTA
MBS Marg, Near Kabir Circle, KOTA (Rajasthan)-324 005

SCHEME OF EXAMINATIONS AND
TENTATIVE SYLLABUS
First & Second Semester Examinations
(Effective from the Academic Session 2016-2017)

Master of Science (M. Sc.)
BOTANY

Faculty of Science

This syllabus is only for M. Sc. (BOTANY) course running at
University Department of Life Science

I Year : I Semester

Paper-B-01 BIOLOGY & DIVERSITY OF LOWER PLANTS: CRYPTOGRAMS

Paper-B-02 BIOCHEMISTRY

Paper-B-03 CELLBIOLOGY

Paper-B-04 PLANT PATHOLOGY AND BIostatISTICS

Paper-B-05 BOTANY Practical: Duration 10 Hrs.; MM 200, Min 100.

Day 1; 5 Hrs. (B-01 & B-02) and Day 2; 5 Hrs. (B-03 & B-04).

For each **theory paper**:-

Teaching hrs	Credit Points	Continuous assessment		Semester assessment		Max. marks	Min. Pass marks	Paper Duration
		MM	Pass	MM	Pass			
04	04	30	12	70	28	100	40	3 Hrs.

For **Practical**: Teaching Hrs 18, Credit pt: 9; Max. Marks 100, Min. pass marks 50 for each day.
Total (I Semester):- 27 Teaching Hrs 34, Credit pt 25, Continuous assessment (MM 120, Min 48)
Semester Assessment (MM 380, Min 162) Total marks 500 Min Pass marks 250.

I Year : II Semester

Paper-B-06 IMMUNOLOGY AND MICROBIOLOGY

Paper-B-07 TAXONOMY & DIVERSITY OF SEED PLANTS

Paper-B-08 GENETICS and CYTOGENETICS

Paper-B-09 PLANT PHYSIOLOGY AND METABOLISM

Paper-B-10 BOTANY Practical: Duration 10 Hrs; MM 200, Min 100.

Day 1; 5 Hrs (B-06 & B-07) and Day 2; 5 Hrs (B-08 & B-09).

For each **theory paper**:-

Teaching hrs	Credit Points	Continuous assessment		Semester assessment		Max mar	Min.Pass mar	Paper Durati
		MM	Pass	MM	Pass			
04	04	30	12	70	28	100	40	3 Hrs.

For **Practical**: Teaching Hrs 18, Credit pt: 9; Max. Marks 100, Min. pass marks 50 for each day.
 Total (II Semester):- 27 Teaching Hrs 34, Credit pt 25, Continuous assessment (MM 120, Min 48)
 Semester Assess. (MM 380, Min 162) Total marks 500 Min Pass marks 250.

Continuous Assessment or Internal or Mid Term Assessment:

- (a) The continuous or internal or mid-term assessment (30% weightage of the maximum marks) for each theory paper shall be taken by the faculty members in the Department during each semester. There will be two internal assessment tests (i.e. First Internal Assessment Test or First Mid Term Test and Second Internal Assessment Test or Second Mid Term Test) each of 15% weightage for each theory paper. Each internal assessment test shall be of one hour duration for theory paper and shall be taken according to academic calendar which will be notified by the Department / University.
- (b) For practical papers, there will be only one external or semester or end term assessment (100% weightage of maximum marks) and there will be no continuous or internal or midterm assessment.
- (c) A student who remains absent (defaulter) or fails or wants to improve the marks in the internal assessment may be permitted to appear in the desired paper(s) (only one time) in the same semester with the permission of the concerned Head of the Department. A defaulter / improvement fee of Rupees 250/- per paper shall be taken from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after production of satisfactory evidence about the reason of his/her absence in the test(s) and deposition of the defaulter / improvement fee. A record of such candidates shall be kept in the Department.
- (d) Regular attendance of the student shall be considered in the internal assessment. If the attendance / regularity factor is similar for all the students, then it may be merged with the weightage of second internal assessment test (class test / home assignment / quiz, seminar, etc.).
- (e) Paper wise consolidated marks for each theory paper and dissertation / seminar (i.e. total marks obtained during various modes of internal assessment) obtained by the students (out of the 30% weightage of the maximum marks of the paper) shall be forwarded by the Head of the Department (in two copies) to the Controller of Examination of the University within a week from the date of last internal assessment test for incorporation in the tabulation register.
- (f) The consolidated marks obtained by the students be also made known to them before being communicated by the Head of the Department concerned to the University for final incorporation in the tabulation register. If any discrepancies are discovered or pointed out by the students, the same shall be looked into by the concerned faculty member and corrections made wherever necessary. The decision of the Head of the Department before the communication of marks to the University shall be final. No corrections shall be made in the internal assessment marks after the declaration of the result by the University.
- (g) Consolidated marks communicated to the University shall be in whole number and not in fraction. Marks awarded for the various internal assessments in each paper shall be added up and then round off to the next whole to avoid any fraction.

SCHEME OF EXAMINATION
(Semester Assessment)

Duration : 3 hours

Max. Marks – 70

Note : The question paper will contain three sections as under –

Section-A : One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks: 10

Section-B : 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 30

Section-C : 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks: 30

UNIT WISE DETAILED SYLLABUS

Paper-B-01 : BIOLOGY AND DIVERSITY OF LOWER PLANTS: CRYPTOGAMS

Unit –I

Phycology : Algae in diversified habitats (terrestrial, freshwater, marine) thallus organization, cell ultrastructure, reproduction (vegetative, asexual, sexual) criteria for classification of algae; pigments, reserve food, flagella, modern classification. Salient features of Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta. Phaeophyta and Rhodophyta, with special reference to Microcystis, Hydrodictyon, Draperndiopsis, Cosmarium, algal blooms, algal biofertilizers: algae as food, feed and use in industry.

Unit-II

Mycology : General character of fungi, substrate relationship in fungi, cell ultrastructure, unicellular and multicellular organization, cell wall composition, nutrition (saprotrophic, biotrophic, symbiotic), heterothallism, heterokaryosis, parasexuality, recent trends in classification, phylogeny of fungi.

Unit-III

General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina, with special reference to Pilobolus, Chaetomium, Morchella, Melampsora, Polyporus, Drechslera & Phoma, fungi in industry medicine and as food, Mycorrhizae, fungi as biocontrol agents.

Unit-IV

Bryophyta : Morphology, structure, reproduction and life history, distribution, classification, general account of Sphaerocarpaceae. Economic and ecological importance.

Unit-V

Pteridophyta : Morphology, anatomy and reproduction, classification; evolution of stele; heterospory and origin of seed habit; general account of fossil pteridophyta; introduction to Psilopsida, Lycopsidea, Sphenopsida and Pteropsida; with special reference to Lycopodium, Gleichenia, Pteris, Isoetes & Ophioglossum.

Paper-B-02 : BIOCHEMISTRY

UNIT I

1. **Introduction:** Basic chemical concepts: a study of the chemical bonds and functional groups.
2. **Biocatalysts :** Classification and nomenclature of the enzymes; nature of enzymes, enzyme specificity; factors affecting enzyme activity; enzymatic and non-enzymatic catalysts; coenzymes and their functions. Enzymes and prosthetic groups.
3. **Energy considerations:** Biological oxidation & reduction. Fundamental reactions of biological oxidation; redox potential and electron transport system.

UNIT II

1. **Carbohydrate** – Classification, structure, general properties and functions of polysaccharides and complex carbohydrates; amino sugars, proteoglycans and glycoproteins.
2. **Lipids** – Classification, structure, properties and functions of fatty acids, essential fatty acids, fats, phospholipids, sphingolipids, cerebrosides, steroids, bile acids, prostaglandins, lipoamino acids, lipoproteins, proteolipids, phosphatidopeptides, lipopolysaccharides.
3. **Nucleic acids** – Classification, structure, properties and functions of nucleic acids. Primary, secondary and tertiary structure of nucleic acids, DNA forms and conformations, Denaturation of DNA.

UNIT III

1. **Proteins** – Peptide synthesis: chemical and Merrifield synthesis. Primary (peptide conformation, N- and C- terminal, peptide cleavage), Secondary (α -helix, sheet, random coil, Ramachandran plot), Tertiary and Quaternary structures of proteins.
2. **Vitamins** – Classification, structure, properties and functions of vitamins.
3. **Hormones** – Classification, structure, properties and functions of Hormones.

UNIT IV

1. **Metabolic pathways** of protein (General reactions of amino acid metabolism - Transamination, decarboxylation, oxidative & non-oxidative deamination of amino acids.)
2. **Metabolic pathways** of carbohydrates (Glycolysis, various forms of fermentations in micro-organisms, citric acid cycle, its function in energy generation and biosynthesis of energy rich bond, pentose phosphate pathway and its regulation. Gluconeogenesis, glycogenesis and glycogenolysis, glyoxylate and Gamma aminobutyrate shunt pathways, Cori cycle, Entner-Doudoroff pathway, glucuronate pathway. Metabolism of disaccharides.)
3. **Metabolic pathways** of lipids (hydrolysis of tri-acylglycerols, α -, β -, ω - oxidation of fatty acids. Oxidation of odd numbered fatty acids – fate of propionate, role of carnitine, degradation

of complex lipids. Fatty acid biosynthesis & Lipid biosynthesis) and nucleic acids (Biosynthesis and degradation of purine and pyrimidine nucleotides and its regulation).

UNIT V

1. **Bioanalytical Techniques:** Spectroscopy – Concepts of spectroscopy, Visible and UV spectroscopy, Laws of photometry. Beer-Lambert's law, Principles and applications of colorimetry.
2. **Bioanalytical Techniques:** Chromatography – Principles of partition chromatography, paper, thin layer, ion exchange and affinity chromatography, gel permeation chromatography, HPLC and FPLC. Electrophoretic techniques – Principles of electrophoretic separation: Continuous, zonal and capillary electrophoresis, different types of electrophoresis including paper, cellulose and gel. Electroporation, SDS-PAGE gel electrophoresis.
3. **Bioanalytical Techniques:** Centrifugation – Principles of centrifugation, concepts of RCF, different types of instruments and rotors, preparative, differential and density gradient centrifugation, analytical ultra-centrifugation, sub-cellular fractionation.

Paper- B-03 CELL BIOLOGY

UNIT I

1. A general idea of properties of light, lenses and magnification power. An elementary knowledge about principles and functioning of microscopes: - light (dissecting and compound), interference, polarizing, fluorescence, phase contrast, UV and electron (SEM and TEM).
2. Cytological techniques: Centrifugation and ultracentrifugation, intravital and supravital staining, preparation of cell cultures, isolation and fractionation of cell.
3. The evolution of the Cell: - From molecules of the First Cell; From Prokaryotes to Eukaryotes; From Single Cell to multi-cellular Organisms

UNIT II

1. Plasma membrane and intracellular compartments: Structure and functions of membrane, endocytosis and exocytosis; principles of membrane transport, carrier proteins, ion channels.
2. Structure and functions of endoplasmic reticulum. Signal recognition particles, ER signal peptides; signal transduction.
3. Vesicular traffic organelles: Structure and functions of Golgi complex and lysosomes, transport from Golgi bodies to lysosomes.

UNIT III

1. Structure and functions of microbodies, glyoxysomes, peroxysomes, and spherosomes; Structure and functions of ribosomes.
2. Energy transducer organelles: Structure, functions and evolution of Mitochondria and Plastids; their role as energy transducers.
3. Structure of cilia, flagella, vacuoles and cytoskeleton – Microtubules, Actins filaments.

UNIT IV

1. Nucleus: Structure of interphase nucleus, pore complex, nucleoplasm and nucleolus.
2. Chromosomes: Chromatin organization in dividing and non-dividing cells, structure of chromosomes, solenoid model, importance of C-value paradox, centromere and telomere,
3. Karyotype, banding techniques, FISH, GISH, Mc FISH, cytometry ; giant and mini chromosomes.

UNIT V

1. Cell cycle and mitosis: Stages of cell cycle (G1, S, G2 and M stage), centriole cycle,
2. Mechanism of mitosis, anaphasic movements. Mechanism of meiosis, nondisjunction.
3. Regulation of cell division and abnormalities: Genetic regulation of cell cycle, check points, cyclins, MPF, chalones, mitotic poisons; molecular origin of cancer; apoptosis.

Paper-B-04 PLANT PATHOLOGY AND BIOSTATISTICS

UNIT I

1. History and scope of plant pathology: General account of diseases caused by plant pathogens.
2. Pathogen attack and defense mechanisms Physical, physiological, biochemical and molecular aspects.
3. Plant disease management: Chemical, biological, IPM systems, development of transgenics, biopesticides, plant disease clinics.

Unit-II

1. Symptomology, identification and management of following plant diseases.
2. Fungal diseases: Wheat (Rust, Smut, Bunt), Bajra (Greenear, ergot and smut), crucifer (Rust). Paddy (Paddy blast), Cotton (Wilt), Grapes (Downy mildew and powdery mildew).

Unit-III

1. Preliminary account of application of Biotechnology in plant pathology.
2. Bacterial diseases: Wheat (Tundu), Soft rot of vegetables.
3. Viral diseases: Tobacco mosaic, Bhindi yellow mosaic.
4. Phytoplasma diseases: Little leaf of brinjal.
5. Nematode diseases: Root-knot of vegetables.

UNIT IV

1. Biostatistics Objective & significance: important terms & symbols, graphs (bar diagrams, histograms, frequency polygons, line diagrams)
2. Frequency distributions & centering constants (Mean Median and Mode).
3. Measures of variation (standard deviation, variance, standard error of the Mean). Sampling variation of proportions, Significance of difference in proportions .

UNIT V

1. Chi-square test. Rates and ratios
2. Correlation and regression. Analysis of Variance (ANOVA)
3. Probability distributions: Binomial, Poissons and normal.

Practical Work Based on Paper B-01 to B-04

Total No. of laboratory hrs. 240

I. Morphological study of representative members of algae, fungi, bacteria, bryophytes and peridophytes :

Microcystis, Aulosira, Oocysts, Pediastrum, Hydrodictyon, Ulva, Pithophora, Stigeoclonium, Draparnaldiopsis. Closterium, Cosmarium, Chara, Stemonitis, Peronospora, Albugo, Mucor, Pilobolus, Yeast, Emericella, Chaetomium, Pleospora, Morchella, Melampsora, Phallus, Polyporus, Drechslera, Phoma, Penicillium, Aspergillus, Colletotrichum, Plagiochasma, Asterella, Notothylas Polytrichum, Psilotum, Lycopodium, Selaginella, Equisetum, Gleichenia, Pteris, Ophioglossum, Isoetes. Symptomology of some diseased specimens: White rust, downy mildew, powdery mildew, rusts, smuts, ergot, groundnut leaf spot, red rot of sugarcane, wilts, paddy blast, citrus canker, bacterial blight of paddy, angular leaf spot of cotton, tobacco mosaic, little leaf brinjal, sesame phyllody, mango malformation. Study of morphology, anatomy and reproductive structures of bryophytes and pteridophytes. Identification of fungal cultures: Rhizopus, Mucor, Aspergillus, Penicillium, Emericella, Chaetomium, Drechslera, Curvularia, Fusarium, Phoma, Colletotrichum, Graphium.

II. Biochemistry: 1. Identification of protein, carbohydrates and Lipid in various tissues. 2. Identification of different kinds of mono-, di- and poly-saccharides in biological and chemical materials. 3. Quantitative estimation of the following by spectrophotometric / semiautoanalyser method in various tissues. (a) Carbohydrates: Glycogen and glucose. (b) Proteins: Total proteins. (c) Lipid: Phospholipids and cholesterol. (d) Nucleic acids: DNA and RNA. (e) Enzymes: Acid and alkaline phosphatase. 4. Paper chromatography and Thin Layer Chromatography: Unidimensional chromatography using amino acids from purified samples and biological materials. 5. Study of digestive enzymes in different parts of alimentary canal.

III. Cell biology: 1. Squash & smear preparations of anthers of *Trediscantia* flower buds: Acetocarmine & Feulgen staining of these preparations. 2. Study of mitosis in onion root tip. 3. Study of giant chromosomes. 4. Vital and supra-vital staining (with neutral red and Janus Green B) of cells to study the mitochondria. 5. Chromosome counts in cells, micrometry and image analysis. 6. Study of prepared microscopic slides of various cell types, mitosis, meiosis and giant Chromosomes.

IV. Biostatistics: 1. Preparation of frequency tables and graphs (Computer based exercise). 2. Calculation of standard deviation, variance and standard error of the mean. 3. Correlation and rank of correlation. 4. Calculation of probability & significance between mean using t-test. 5. Calculation of significance using Chi-square test. 6. Plotting the slope of a line on a graph: calculations of the slope of a line, coefficient and regression. 7. Preparation of histogram, bar diagram and line graph.

V. Pathology: Preparation of Winogradsky column using pond bottom mud. Gram staining of bacteria, Observations on temporal sequence of appearance of microbes (visual appearance, microscopic, observations), Observation on virus infected plants (symptoms).

VI. Field Trip: 1. Study of plants in their natural habitats.

M.Sc. BOTANY I Semester

Scheme of Practical Examination & Distribution of Mark

Max. Marks	100	First Day	Duration - 5 hrs.
(a) Identify the various stages of cell division / measure the pollen size through micrometry.	08		
(b) Identify the material present in the mixture A, draw a labeled diagram and comment upon their significant characteristics and systematics.	08		
(c) Make a suitable preparation of material B (show reproductive part of the given plant).	08		
(d) Make a suitable preparation of vegetative and reproductive part of material C, draw labeled sketches, write features of special interest and identify with reasons.	15		
(e) Make a suitable preparation of vegetative and reproductive part of material D, draw labeled sketches, write features of special interest and identify with reasons.	08		
(c) Exercise in statistical methods			
(i) Diagrammatic presentation	10		
(ii) Numerical based on statistical methods	10		
(d) Identification & comments on spots (6)	18		
(e) Viva-voce	10		
(f) Class record	10		
(g) Regularity, Participation in Departmental activities, Laboratory skills, Cleaning of Work place, etc.	10		
Total	100 Marks		

M.Sc. BOTANY I Semester

Scheme of Practical Examination & Distribution of Mark

Max. Marks	100	Second Day	Duration - 5 hrs.
(a) Prepare an artificial key of given plant materials (B,C)	05 Marks		
(b) Make a suitable preparation of material E (reproductive parts only), draw labeled diagram and identify with reasons.	05 Marks		
(c) Perform the microbiological exercise F. Draw suitable diagram; describe methodology and record observations (Gram staining).	10 Marks		
(d) Prepare a suitable slide of given material G. For histological study – draw labeled diagram and identify the pathogen giving reasons.	10 Marks		
(e) Exercise in Biochemistry	10 Marks		
(f) Report of Field Trip	10 Marks		
(g) Viva-voce	20 Marks		
(h) Class record	10 Marks		
(i) Seminar	20 Marks		
Total	100 Marks		
GRAND TOTAL (100+100)	200 Marks		