M.Sc. Syllabi of Bioscience: 2019-2021

| 1 | Pt. Ravishankar Shukla Univ | ersity, R | aipur | |
|-------|---|------------|--------------------------|--------|
| | M. Sc. Bioscience | | | |
| | Scheme and Syllabi of Examination for | SESSION 20 | 19-21 | |
| | July 2019 – December 201 | | | - |
| | First Semester | Ma | rks | Credit |
| Paper | Title of Paper | (External) | (Internal [*]) | |
| 1 | Cell Biology | 80 | 20 | 4 |
| - 11 | Biomolecules | 80 | 20 | 4 |
| 111 | Microbiology | 80 | 20 | 4 |
| IV | Biology of Immune System | 80 | 20 | 4 |
| LC-I | Lab Course I (Based on Theory papers I & II) | 80 | 20 | . 2 |
| LC-II | Lab Course II (Based on Theory papers III & IV) | 80 | 20 | 2 |
| | Tota | I | 600 | 20 |
| | January 2020– June 2020 | 0 | | |
| | Second Semester | | arks | Credit |
| Paper | Title of Paper | (External) | (Internal) | |
| 1 | Genetics and Molecular Biology | 80 | 20 | 4 |
| 11 | Bioenergetics & Metabolism | 80 | 20 | 4 |
| 111 | Instrumentation and Techniques | 80 | 20 | 4 |
| IV | Biometry, Computer and Scientometry | 80 | 20 | 4 |
| LC-I | Lab Course I (Based on Theory papers I & II) | 80 | 20 | 2 |
| LC-II | Lab Course II (Based on Theory papers III & IV) | 80 | 20 | 2 |
| | Tota | 1 | 600 | 20 |
| | July 2020 – December 2020 | | | |
| | Third Semester Marks | | arks | Credit |
| Paper | Title of Paper | (External) | (Internal) | |
| . 1 | Molecular Plant Physiology | 80 | 20 | 4 |
| - 11 | Ecology and Environmental Biology | 80 | 20 | 4 |
| 111 | Animal Physiology | 80 | 20 | 4 |
| IV | Developmental Biology and Evolution | 80 | 20 | 4 |
| LC-I | Lab Course I (Based on Theory papers I & II) | 80 | 20 | 2 |
| LC-II | Lab Course I (Based on Theory papers III & IV) | 80 | 20 | 2 |
| | Tota | al | 600 | 20 |
| | January 2021 – June 2021 | | | |
| | Fourth Semester Marks | | arks | Credit |
| Paper | Title of Paper | (External) | (Internal) | |
| ı | Molecular Endocrinology | 80 | 20 | 4 |
| П | Plant Biotechnology | 80 | 20 | 4 |
| 111 | | 80 | 20 | 4 |
| | Special Paper B: Basic Chronobiology/ | | | - |
| | Special Paper C: Ethnobotany | | | |
| IV | Special Paper A: Immunology/ | 80 | 20 | 4 |
| | Special Paper B: Applied Chronobiology / | | | |
| i | | | | |

Academic Section, PRSU, Raipur

Page **1** of **27**

04 page 15/19

Special Paper C: Secondary Metabolites

à 1919

Production 06/5/19

Me.5.19
(Meus 106) 16

M.Sc. Syllabi of Bioscience: 2019-2021

| - | LC-II | Total | 00 | 600 | 20 |
|---|-------|---|----|-----|----|
| | LCII | Lab Course II (Based on Theory papers III & IV) | 80 | 20 | 2 |
| | LC-I | Lab Course I (Based on Theory papers I & II) | 80 | 20 | 2 |

Important Note:

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words.

Continuous evaluation of Performance*

Each student will be evaluated continuously throughout the semester. There will be a class test based on each theory paper. The full marks will be 10 for each paper. There will be a poster/oral presentation based on each theory paper. The full marks will be 10 for each presentation. Each student will be required to submit a brief write-up (not more than 15-20 pages) on his/her poster/oral presentation.

Project Work**

A student of IV semester will have the choice to opt for project work in lieu of four theory papers and two lab courses provided he/she secure at least 75% or more marks in aggregate in semester I and II. The project has to be carried out in recognized national laboratories or UGC-recognized universities. No student will be allowed to carry out project work in private laboratories/ college/ institutions, excluding the colleges recognized as research centers by the RDC of Pt. Ravishankar Shukla University, Raipur. The valuation of all the projects will be carried out by an external examiner and HoD of UTD or its nominee at the UTD Centre.

| Scheme for External/Int | Lab Course (for each Semester) ernal | Maximum Marks | 100 |
|-------------------------|---|---------------|-----|
| 1- | Major exercise based on paper I | | 20 |
| 2- | Minor exercise based on paper I | | 10 |
| 3- | Major exercise based on paper II | | 20 |
| 4- | Minor exercise based on paper II | | 10 |
| 5- | Spotting/Interpretation* | | 10 |
| 6- | Viva-voce | | 10 |
| Internal | | | |
| 1- | Sessional | | 20 |
| Total | | | 100 |

A student will be required to interpret on the displayed item/material

Academic Section, PRSU, Raipur

Page 2 of 27

12 5.19 Aug/5/19

W.C.

Dender 00

Moero/119

FIRST SEMESTER (July 2019 - December 2019)

PAPER - I: CELL BIOLOGY

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

- UNIT-I Molecular organization of membranes Asymmetrical organization of lipids, proteins and carbohydrates. Membrane transport: Passive transport, Osmosis, ion channels, membrane pumps and, Active transport: ATP-powered pumps-types, properties and mechanisms, electrical properties of membranes.
- UNIT-II Protein trafficking: Transport of proteins into mitochondria, chloroplast, endoplasmic reticulum and nucleus [in and out]. Transport by vesicle formation: exocytosis, endocytosis and its molecular mechanism.
- **UNIT-III** Cell signaling: Signaling via G-protein linked and enzyme linked cell surface receptors, MAP kinase pathways.

Eukaryotic cell division cycle: different phases and molecular events, regulation and control of cell cycle. Oncogenes: retinoblastoma, E2F and p53 proteins.

Apoptosis: regulation by CASPases and formation of apoptosome. Pro- and anti-apoptotic factors.

UNIT-IV States of chromosomes during cell cycle. Mitotic chromosome. Organization of genes in chromosomes. Banding pattern of chromosomes. Lampbrush and Polytene chromosomes. DNA packaging: Chromatin, nucleosomes, heterochromatin and euchromatin.

Lab Course:

- 1. Study of chromosome behaviour during Mitosis and meiosis (Onion / Garlic root tips, Onion buds, human lymphocytes, rat or bird testis /grass hopper testis or any other materials).
- 2. Calculation of mitotic index in growing Onion / Garlic root tips
- 3. Squash preparation: Polytene chromosome (in chironomus / Drosophila or other insect salivary gland) and Barr body (in buccal epithelial cells).
- 4. Demonstration of secretory granules in the salivary gland cells of insect.
- 5. Demonstration of mitochondria by vital staining.
- 6. Study of permanent slides.
- 7. Estimation of DNA
- 8. Estimation of RNA
- 9. Sub-cellular fractionation and marker enzymes
- 10. Identification of biomolecules in different tissues by histochemical techniques
- 11. Preparation of mitotic plate by carmine squashing method and phase identification.
- 12. Demonstration of the nuclear matrix networks in onion cells.
- 13. Study of the effect of chemical agents on chromosomes plant cells.
- 14. Isolation of protoplast, measurement of cell density plating efficiency.
- 15. Preparation of Karyotype of metaphase plate.
- 16. Preparation of Meiotic plate and determination of phases.
- 17. Computation of Chaisma frequency and Terminalization of phases.
- 18. Micrometry and Camera Lucida drawings.

Academic Section, PRSU, Raipur

Page 3 of 27

P13, CA

Aug 5/19 M. C.19

36005/201

Serne a 06/5/19

Mess 119

H. Lodish, A. Berk, S L Zipursky, P. Matsudaira

D. Baltimore, and James Darnell.

B. Alberts, D. Bray, K. Hopkin, A. Johnson

H. Lodish, A. Berk, C. A. Kaiser & M. Krieger B. Alberts, A. Johnson, J. Lewis and M. Raff Gerald Karp Molecular Cell Biology

Essential of Cell Biology

Molecular cell Biology Molecular Biology of the Cell Cell and Molecular Biology Concepts and experiments

M. Sc. Bioscience

FIRST SEMESTER (July 2019 - December 2019)

PAPER – II: Biomolecules [Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

UNIT-I Classification, structure and function of Carbohydrates, Lipid:

Carbohydrate: Monosaccharides, homo and hetero-polysaccharides, Peptidoglycan glycoproteins and liposaccharide.

Lipids: Simple; cholestrol and complex; phospholipids and TAG

UNIT-II Classification, structure and functions of amino acids, Synthesis of peptides, Proteins- properties, secondary, tertiary and quaternary structure of proteins, Ramchandran plot.
Nucleic Acid: Structure and functions of Purine and pyrimidine, DNA-types, linking number, RNA-types.

UNIT-III Enzyme: apoenzymes, cofactors, coenzymes, active site, factors contributing to the catalytic efficiency of enzyme; enzyme kinetics- Michaelis-Menten equation, determination of Km, enzyme inhibition, allosteric enzymes, isoenzymes, multienzyme complexes

UNIT-IV Structure and biological role of:

Porphyrins in biology, structure of hemoglobin and chlorophyll Animal hormones: protein, peptide and steroid hormones. Vitamins: fat and water soluble.

Lab Course:

- 1. Specific tests for sugars, amino acids and lipids
- 2. Formal titration of amino acids
- 3. Estimation of proteins using ninhydrin and biuret method
- 4. Estimation of sugar by anthrone and Folin-Wu method.
- 5. Saponification value and iodine number of fat.
- 6. Estimation of ascorbic acid.
- 7. Achromic point determination using salivary amylase
- 8. Effect of ions on salivary amylase activity.
- 9. Enzyme assay and kinetics (ex. Amylase, Protease)

Academic Section, PRSU, Raipur

Page 4 of 27

19 86/05/20

Pundua 0615/19

6.5.19 6.5.19

Nelson, Cox and Lehninger

G. Zubay Stryer

Garrett and Grosham

West, Tood, Mason & Bbruglen

White, Handler & Smith

D. Voet and J C Voet

Principles of Biochemistry

Biochemistry

Biochemistry

Biochemistry

Text book of biochemistry

Biochemistry-clinical application

Biochemistry

M. Sc. Bioscience

FIRST SEMESTER (July 2019 – December 2019)

PAPER – III: Microbiology

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

- UNIT-I General characteristics of fungi, classification of fungi, life cycle of selected fungal genus (Aspergillus, Pencillium, Fusarium and Mucor). Economic importance of fungi. Microbial association, parasitism, mutualism and symbiosis with plants and animals. Mycorrhiza, VAM. Algae: Distribution, classification, reproduction, ecology and importance.
- UNIT-II Morphology and ultra-structure of bacteria: Morphological types, cell wall of archaebacteria, gram negative, gram positive eubacteria. Bacterial cell membranes structure, composition and properties. Structure and function of flagella, cilia, pili, gas vesicles. Cyanobacteria, protozoa, mycoplasma and Rickettsia. Gene transfer mechanisms: transformation, transduction, conjugation and transfection. Plasmids and cosmid vector for gene cloning
- UNIT-III Nutritional types (autotrophs, heterotrophs, phototrophs, chemotrophs), growth curves, measurement of growth, factors affecting growth, generation time, growth kinetics. Batch and continuous culture, Basis of microbial classification, classification and salient feature of bacteria according to Bergey's manual of determinative bacteriology.
- UNIT-IV Viruses: Structure and classification; General concepts: Viral genome, capsids, envelopes, viroids and prions). Virus reproductions: Lysogeny and Lytic phase, Bacteriophages and their types. Introduction to Plant and animal viruses (TMV, HIV, Hepatitis virus, H1N1 virus, Small Pox virus and Ebola virus), Route of transmission of viruses, Laboratory diagnosis and treatment, Antiviral therapy

Lab Course:

- 1. Glassware preparation and sterilization techniques- wet heat- dry heat- filter types- laminar flow chamber types- CDC- safety levels.
- 2. Preparation of liquid & solid media, plating, pouring, inoculation and incubation for growth of microorganism
- 3. Methods of obtaining pure culture of microorganisms (a) streak plate (b) Pour plate, and (c) spread plate methods
- 4. Identification and Microscopic examination of the microorganisms.
- 5. Motility of bacteria by hanging drop technique.
- 6. Bacterial DNA isolation from E-coli culture.

Academic Section, PRSU, Raipur

Page 5 of 27

101.25

Aug (219

Dunina 0615/19

- 7. Grams' staining for Gram positive and Gram's negative Bacteria.
- 8. Study of bacterial growth by turbiditimetry/ spectrophotometry
- 9. Isolation and enumeration of microorganisms from soil by serial dilution agar plating method.
- 10. Enumeration of viruses by plaque assay technique.

Microbiology
General Microbiology
Principles of Microbiology
Microbiology
General Virology
Introduction to Mycology
Principles of Virology: Molecular
Biology, Pathogenesis, and
Control of Animal Viruses

L.M. Prescott, J.P. Harley and D.A. Klein RY Stanier, J L Ingrahamana, ML Wheelis & P. R. Painter R.M. Atlas Peleczar, Chan & Krieg. Luria, Darnell, Baltimore and Campell. CJ Alexopoulos and CW Mims S. J. Flint, V. R. Racaniello, L. W. Enquist,

V. R. Rancaniello, A. M. Skalka

M. Sc. Bioscience

FIRST SEMESTER (July 2019 - December 2019)

PAPER - IV: Biology of Immune System

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

UNIT-I Innate immune mechanism and characteristics of adaptive immune response. Cells of immune system: Hematopoisis and differentiation, mononuclear cells and granulocytes, antigen presenting cells

Primary and Secondary lymphoid organs and tissues.

Ontogeny and phylogeny of lymphocytes. Lymphocyte traffic.

- **UNIT-II** Antigen receptor molecules: B-cell receptor complex, Immunoglobulin- structure, types and function. T-cell receptor complex. Major Histocompatibility Complex- types, structural organization, function and distribution. Transplantation and Rejection. Complement system.
- UNIT-III Antigens: nature of antigens, factor affecting immunogenicity, Haptens and super antigens. Antigenic determinants. Recognition of antigens by T and B cell.
 Antigen processing. Role of MHC molecules in antigen presentation and co-stimulatory signals. Antigen and antibody interaction.
- UNIT-IV Cell mediated immune response. Cytokines and interleukins- structure and function. Immunity to infections. Hypersensitive reactions and their types.

 Immunodeficiency disorders. Autoimmunity and autoimmune disorder. Immunological tolerance.

Lab Course:

1. Identification of cells of immune system

Academic Section, PRSU, Raipur

Page 6 of 27

abrupt 6/5/19

50 mad 2019

Proph a 06/5/1

100 06105119

- 2. Separation of mononuclear cells by Ficoll-Hypaque
- 3. Identification of Lymphocytes and their subsets
- 4. Lymphoid organs and their microscopic organization
- 5. Isolation and purification of Antigens
- 6. Purification of IgG from serum
- 7. Estimation of Levels of gamma globulins and A/G ratio in blood
- 8. Antigen antibody interaction

Kuby's Immunology

Immunology- A short Course

Immunology

Fundamentals of Immunology

Immunology

Immunology

R.A. Goldsby, T. J Kindt and B. A. Osborne

E. Benjamini, R. Coico and G. Sunshine

Roitt, Brostoff and Male William Paul

Tizard

Abbas et al

M. Sc. Bioscience

SECOND SEMESTER (January 2020 – June 2020)

PAPER – I: Genetics and Molecular Biology

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

- UNIT- I Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants, complementation analysis. Mutation: Types, mutagens and detection.
 - Mutant types lethal, conditional, biochemical, loss of function, gain-of-function, germinal verses somatic mutants, insertional mutagenesis.
- UNIT-II DNA replication in eukaryotes and prokaryotes : enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons.

DNA damage and repair mechanisms: Repair of Base-excision, Nucleotide excisions, Mismatch and Double Strand. p_{53} and p_{21} .

- UNIT-III RNA synthesis and processing: enzymes involved, formation of initiation complex, transcription activator and repressor, elongation, and termination, RNA processing, capping, RNA editing, splicing, and polyadenylation, RNA transport.
- UNIT-IV Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors, elongation and elongation factors and their regulation, termination.

Aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors.

Post Translational modification of proteins.

Lab Course:

1. Isolation, purification and estimation of RNA

Academic Section, PRSU, Raipur

- 2. Isolation, purification and estimation of DNA
- 3. Determination of Tm of nucleic acid
- 4. Fraction of poly (A) RNA
- 5. Restriction Mapping
- 6. Restriction Digestion
- 7. Ligation
- 8. DNA molecular size determination

Molecular Cell Biology

H. Lodish, A. Berk, SL Zipursky, P. Matsudaira, D. Baltimore, and

James Darnell.

Essential Cell Biology

Molecular Biology of the Cell

Cell and Molecular Biology

: Concepts and experiments

Molecular Biology of the Gene

Molecular Biology of the Cell

The Problems

Molecular Biology of the Cell

Genes VIII

B. Alberts, D. Bray, K. Hopkin and A. Johnson B. Alberts, A. Johnson, J. Lewis and M. Raff

Gerald Karp

JD Watson et al.

John Wilson, Tim Hunt

Bruce Albert's, Alexander Johnson, Julian Lewis,

Martin Raff, Keith Roberts, Peter Walter

Benjamin Lewin

M. Sc. Bioscience

SECOND SEMESTER (January 2020 – June 2020)

PAPER - II: Bioenergetics & Metabolism

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

- First and second laws of thermodynamics. Gibbs free energy G, free energy change ΔG, endergonic & UNIT-I exergonic reactions. Standard state free energy changes- ΔG , ΔG^0 and $\Delta G^{'0}$, Relationship between equilibrium constant and $\Delta G^{'o}$, Feasibility of reactions. ATP-Structure, properties and energy currency of the cell, Importance of Coupled reactions, other high energy compounds.
- Carbohydrate metabolism: Glycolysis, Kreb's cycle, glycogenolysis, glycogenesis, pentose phosphate pathway, gluconeogenesis, and glyoxylate pathway. Regulation of carbohydrate metabolism.
- UNIT-III Electron transport and oxidation phosphorylation: electron carriers, complexes I to IV, substrate level phosphorylation, mechanism of oxidative phosphorylation. Shuttle system for entry of electron. Biosynthesis and degradation of Lipids. Regulation of lipid metabolism
- UNIT-IV Nitrogen Assimilation: Overview of Nitrogen in biosphere and uptake by organism. Biosynthesis and degradation of amino acids. Regulation of amino acid metabolism Biosynthesis and degradation of purine and pyrimidine nucleotides.

Lab Course:

cademic Section, PRSU, Raipur

Page 8 of 27

- Protein estimation by Lowry, Bradford and Spectrophotometric method 1.
- 2. Estimation blood cholesterol
- Estimation of sugar by Nelson-Somagy and Benedict's reagent 3.
- Isolation and estimation of lipid from seeds and egg. 4.
- Estimation of inorganic and total phosphorus by Fiske-Subba Rao method 5.
- Assay of phosphatases in blood and seeds 6.
- 7. Urease estimation in plant tissues

Principles of Biochemistry

Nelson, Cox and Lehninger

Biochemistry **Biochemistry** G. Zubay

Biochemistry

Strver

Text book of biochemistry

Garrett and Grosham

Biochemistry

West, Tood, Mason & Bbruglen

Biochemistry with clinical application

White, Handler & Smith

D. Voet and J C Voet

Enzymes

Dixon and Webb

Fundamentals of Enzymology

Price and Steven

Practical biochemistry Enzyme biotechnology Plummer

Enzyme Reaction Mechanism

G. Tripathi Walsh

Enzyme catalysis and regulation

Hammes

M. Sc. Bioscience

SECOND SEMESTER (January 2020 – June 2020)

PAPER- III: Instrumentation and Techniques

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

Centrifugation: Principle, techniques. Preparative, analytical and ultracentrifuges, sedimentation UNIT-I coefficient and factors affecting sedimentation coefficient. Application of centrifugation.

Photometry: Basic principles of colorimetry, UV- visible spectrophotometry & IR- spectrophotometry.

Spectroflurometry

Atomic absorption spectroscopy: Principle, Instrumentation and applications

- Microscopic techniques: light microscopy, phase-contrast microscopy, scanning and transmission UNIT-II electron microscopy, different fixation and staining techniques for EM, freeze-etch and freezefracture methods for EM, image processing methods in microscopy.
- UNIT-III Chromatography: Paper and Thin Layer Chromatography. Gel filtration, Ion exchange and Affinity chromatography. GLC and HPLC.

Histochemical and immunohistotechniques: Detection of molecules using immunoprecipitation, EIA, RIA and FIA.

Academic Section, PRSU, Raipur

Page 9 of 27

UNIT-IV Electrophoresis: Agarose, PAGE, 2D-E.

Radioactivity: GM counter, liquid Scintillation counter, solid Scintillation counter, gamma counters.

Lyophilization: Principle, instrumentation and applications.

Microtomy: types, principle and applications

Lab Course:

- Verification of Beers Law
- Determination of absorption maxima
- Quantitative determination, Enzyme kinetics
- Amino acid and carbohydrate separation by paper and TLC
- Ion exchange and gel filtration chromatography
- SDS Polyacralamide Gel Electrophoresis
- Isoenzymes
- Separation of sub-cellular organelles by differential centrifugation.
- Isolation of DNA and Agarose gel Electrophoresis

Books Recommended:

Chandak

| K Wilson and John Walker | Practical Biochemistry: Principles & Techniques |
|--------------------------|---|
| | |

RF Boyer Biochemistry Laboratory: Modern Theory &

Techniques

S Carson, H Miller and D Scott Molecular Biology Techniques: A Classroom

Laboratory Manual

TC Ford and J. M. Graham An Introduction to Centrifugation

R Baserga and D Malamud Autoradiography: techniques and application
T Chard An Introduction to Radioimmunoassay and Related

Techniques, Volume 6

TA Jennings
Lyophilization: Introduction and Basic Principles
James M. Miller
Chromatography: Concepts and Contrasts

LR Synder, JJ Kirkland and JL Glajch Practical HPLC Method Development, 2nd Edition

Anna Pratima Nikalje & D. Bhosale A Handbook of Chromatography

Mark F. Vitha Chromatography: Principles and Instrumentation

AGE Pearse Histology and Histochemical methods PA Midgley The principles of microscopy

DB Murphy & MW Davidson Fundamentals of Light Microscopy and Electronic

Imaging, Second Edition

IW Watt The Principles and Practice of Electron Microscopy
RF Egerton Physical Principles of Electron Microscopy

Physical Principles of Electron Microscopy An Introduction to TEM, SEM, and AEM

P Haselet, G-W Oetjen Freeze-Drying, 3rd Edition

EC Clayden Practical Section Cutting and Staining

T Chandak, M Chaudhary & V Microtomy: Microtome and its applications

Simon Renshaw Immunohistochemistry and Immunocytochemistry:

Essential Methods, Second Edition

IB Buchwalow & W Bocker Immunohistochemistry: Basics and Methods

JB Birks The Theory and Practice of Scintillation Counting

Academic Section, PRSU, Raipur

Page **10** of **27**

Purce 5/9 (5/5 Mag 2019

Ma

07/05/pg (Desolia)

SECOND SEMESTER (January 2020 - June 2020)

PAPER- IV: BIOMETRY, COMPUTER AND SCIENTOMETRY

[Credit: 4 and Maximum Marks: 80]

(Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words).

Unit-I Introduction to biostatistics. Types of biological data: data on different scales.

Frequency distributions. Cumulative frequency distributions. Random sampling.

Parameters and statistics. Measures of central tendency and dispersion: Mean,

Median, Mode, Range, Variance and Standard deviation. Coefficient of variation.

The effects of coding data. Data transformations: Log-transformation, Square-root transformation and Arcsine transformation. Distribution: normal & binomial.

Probability: Basic laws of probability, addition law, multiplication law. Probability and frequency.

Unit-II Statistical errors in hypothesis testing. Testing goodness of fit: Chi-square goodness of fit. Heterogeneity Chi-square. The 2 x 2 contingency table. One sample hypothesis. Two-sample hypothesis. Testing for difference between two means (t-test). Testing for difference between two variances (F-test). The paired sample t-test. Multiple-sample hypothesis (ANOVA): Single factor and two factors ANOVA. Multiple comparisons: Duncan's multiple-range tests. Simple linear regression. Regression vs. Correlation. Regression equation. Interpretations of regression functions. Simple linear correlation. The correlation coefficient.

Unit-III Introduction to MS-Office software: Word processing; creating new document, editing documents, adding graphics to documents, Word tables. Management of Workbook & Worksheets; Applications, Features, Using formulas and functions, Features for Statistical data analysis, Excel ToolPak for data analysis, Generating charts/ graph. Presentation software; Working in PowerPoint, Creating new presentation, working with slides.

Unit-IV Introduction to Internet and Applications. Basics of internet, e-mailing, Search engine – Google and Yahoo; Pub med, Scopus, Web of Science, Google Scholar, Indian Citation Index, Science Citation Index (SCI), h-index, i-10-index. Journal Impact Factor (JIF). Introduction to Plagiarism and Cyber laws.

Lab Course:

- 1. Exercises for data distribution
- 2. Exercises for computation of measures of central tendency
- 3. Exercises for computation of measures of variability
- 4. Computation of correlation coefficient, r, and regression constants
- 5. Data analysis by ANOVA and multiple-range tests
- 6. Hypothesis testing by t-test, F-test, and Chi-square test
- 7. Graphical presentation of data using a suitable package
- 8. Statistical analysis of a data using a suitable package
- 9. Preparation of document using a suitable package
- 10. Preparation of slides using a suitable package
- 11. Hands-on-practice for finding indices [SCI, h-index, i-10 index] of articles using relevant database

Academic Section, PRSU, Raipur

Page 11 of 27

9

S South Ost 200°

0615/19

16.5.19 (Mail of 105)19

Campbell RC

Zar JH

Statistics for biologists

Biostatistical Analysis

Wardlaw AC Snedecor GW & Cochran WG Practical Statistics for Experimental Biologists Statistical Methods

Sokal RR & Rohlf FJ

Introduction to Biostatistics

Sumner M

Computers: Concepts & Uses

White R Cassel P et al. **How Computers Work** Inside Microsoft Office Professional

Coleman P and Dyson P

Mastering Internets

Gralla P

Shelly GB, Vermaat ME,

How the Internet Works

Cashman TJ

Microsoft 2007: Introductory Concepts & Techniques

Habraken J

Microsoft Office 2003 All in One

Gilmore B

Microsoft Office 2010 In Depth

Buranen L & Roy AM

Plagiarism: Why it happens, How to prevent it? Perspectives on Plagiarism & Intellectual Property

in a Post-Modern World

Kumar Anupa P

Cyber Law

Sood V

Cyber Law Simplified

M.Sc. Bioscience

Third Semester (July 2020 - December 2020)

Paper I: Molecular Plant Physiology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The

| question ha | s to be answered in about 150 words |
|-------------|---|
| Unit-I | Membrane transport : Pumps; F-type H ⁺ -ATPase mitochondria, P-type PM H ⁺ -ATPase, V |
| | Туре |
| | H ⁺ -ATPase, and ABC type. Ion Channels; Voltage gated channels of K and Ca. Water |
| | transport through Aquaporins. |
| | Physiology of Mineral Nutrition: Molecular mechanism and regulation of K, Fe and Zn |
| | transport. Phosphorous nutrition and transport. Phytoremediation. Mineral toxicity |
| Unit-II | Photosynthesis: Light absorption and energy conversion, photosystems I and II, ATP |
| | synthesis, Assimilation of carbon in C ₃ , C ₄ and CAM pathways, Photorespiration |
| Unit-III | Phytohormones: Structure, biosynthesis, molecular mechanisms of Auxin, Gibberellins, |
| | Cytokinin, Abscisic acid and Ethylene, Brassinosteroids |
| Unit-IV | Senescence and Programmed cell death: Senescence; Metabolism and regulation of |
| | pigment and nucleic acid, PGR regulation, SAG. PCD; Formation of TE and mobilization of |
| | cereal endosperm, Formation of aerenchyma. Signal transduction and PCD |

Academic Section, PRSU, Raipur

Page 12 of 27

M.Sc. Syllabi of Bioscience: 2019-2021

| Lab Cour | 'se: | | |
|------------------------------------|--|--|--|
| 1. | Spectrophotometric determ mature and senescent leave | nination of chlorophyll-a, chlorophyll-b and total chlorophyll in young, es | |
| 2. | Kinetin estimation by cucun | nber cotyledons expansion bioassay | |
| 3. | Auxin bioassay using wheat | coleoptiles | |
| 4. | GA bioassay by inducing de- | -novo synthesis of Amylase in de-embryonated seeds of wheat | |
| 5. | Estimation of mono, di and | total phenols in the young and aged leaves | |
| 6. | Estimation of Guaiacol pero | xidase activity in fresh and aged seeds | |
| 7. | Determination of Superoxid | le dismutase levels in the healthy and deteriorated seeds | |
| 8. | Estimation of metal toxicity | induced changes in the AOS levels in leaf tissues | |
| 9. | Determination of Nitrate re | ductase activity in leaf tissues | |
| 10. | Separation of isozymes of SOD and GPX | | |
| Recomm | nended Books: | | |
| Fosket DF | | Plant Growth & Development | |
| Foyer CH | | Photosynthesis | |
| Bacon Ke | | Photosynthesis: Photobiochemistry&Photobiophysics | |
| Leopold A | C &Kriedemann PE | Plant Growth & Development | |
| Moore TC | | Biochemistry & Physiology of Hormones | |
| L Taiz & E Zeiger | | Plant Physiology | |
| BB Buchanan, W Gruissem & RL Jones | | Biochemistry & Molecular Biology of Plants | |
| MB Wilkins | | Advanced Plant Physiology | |
| JA Hopkins | | Introduction to Plant Physiology | |
| FB Salisburry& CW Ross | | Plant Physiology | |
| Hans-Walter Heldt | | Plant biochemistry & Molecular Biology | |

| | M.Sc. Bioscience | | |
|---|---|--|--|
| | Third Semester (July 2020 – December 2020) | | |
| | Paper II: Ecology and Environmental Biology | | |
| | [Credit: 4 and Maximum Marks: 80] | | |
| covering wh answered in answered in | Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words | | |
| Unit-I | Ecosystem: Concept, Components and types. Productivity, Ecological energetics, Energy flow in ecosystem, Energy flow models, Ecological pyramids, Food chain, Food web. Ecological succession, Ecological niche. | | |
| Unit-II | Aquatic ecosystem: Biotic and abiotic components, lentic and lotic ecosystems, wetlands. Terrestrial ecosystems: Forest types of India with special reference to Chhattisgarh. Natural and plantation (artificial) forests, Agroforestry, Social forestry, National parks and Sanctuaries in Chhattisgarh. | | |
| Unit-III | Environmental pollution: Definition, types (air, water, soil, noise, thermal & radioactive), causes, effects and control. | | |

Academic Section, PRSU, Raipur

Page **13** of **27**

W. S. W.

Stig (5) 800 00 2001

60/05/19

Dew Wood

| | Solid waste m wastes. | anagement: Causes, effects and control measures of urban and industrial | |
|-----------------|--|---|--|
| | Disaster mana | gement: Floods, earthquake, cyclone and landslides. | |
| Unit-IV | Biodiversity, ex-situ and in- situ conservation. Intellectual property right (IPR) with special reference to India. Natural resources: Water, Forest and Medicinal plants. | | |
| Lab Cou | rse: | | |
| 1. | To determine the | ne minimum size of the quadrate by 'Specis –Area-Curve' method | |
| 2. | To study the community by quadrate method by determining frequency, density and abundance different species present in the community | | |
| 3. | | ic separation of chlorophyll pigments in leaf | |
| 4. | Measurement of pH and Total alkalinity in water | | |
| 5. | | of Free carbon dioxide and dissolved oxygen in given water | |
| 6. | Identification and drawing of at least 15 medicinal plants | | |
| Recomm | nended Books: | | |
| A Beattie a | and PR Ehrlich | Biodiversity, 2001 | |
| EP Odum | | Fundamentals of Ecology, 2nd ed., 494-496 | |
| EP Odum | | Basic Ecology (Philadelphia: Saunders, 1983), 518. | |
| PD Sharma | | Ecology and Environment, 2009, Rastogi Publications | |
| M Calver | | Environmental Biology, Murdoch University, Western Australia | |
| Aggarwal | | Concept of Ecology | |
| NS Subrahmanyam | | Ecology, Narosa Publications | |

Third Semester (July 2020 - December 2020)

Paper III: Animal Physiology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

| Unit-I | Blood and Circulation: Composition of blood, Cell types, Hemopoiesis, Structure and |
|----------|--|
| | function of hemoglobin - Oxygen and carbon dioxide transport, Blood Coagulation. Blood |
| | volume and its regulation. Blood group. |
| | Respiration: Mechanism and regulation of breathing, Factors influencing oxygen uptake, |
| | Diving and high altitude adaptations. Measurement of metabolic rate and Q_{10} |
| Unit-II | Nervous system: Mechanisms of conduction along axon and across synapses, Nernst |
| | equation and measurement of action potential, Neurotransmitters, Types and physiology |
| | of reflexes. |
| | Myology: Types of muscles, Ultrastructure, mechanism and regulation of contraction of |
| | skeletal muscle. |
| Unit-III | Cardiovascular System: Anatomy of heart structure, ECG-its principle and significance, |

Academic Section, PRSU, Raipur

Page 14 of 26

Par Chille a

16. (.19 De 310 119

| | cardiac cycle, blood pro | ssure and its neural and shamisal | | |
|---------------------------------|--|--|--|--|
| | cardiac cycle, blood pressure and its neural and chemical regulation. | | | |
| | Excretory system - Physiology of excretion, kidney, urine formation, urine concentra | | | |
| | waste elimination, regulation of water balance, electrolyte balance, acid-balance | | | |
| balance. | | | | |
| Unit-IV | Digestive system - Dig | estion, absorption, energy balance, BMR. | | |
| | Thermoregulation - C | omfort zone, body temperature – physical, chemical, neura | | |
| | regulation, acclimatiza | ation. | | |
| Lab Cour | se: | | | |
| 1. | Examination of RBC in Pisc | ine/Avian/Human blood | | |
| 2. | Examination of WBC in Pis | | | |
| 3. | Differential leukocyte cour | | | |
| 4. | | Absolute values in Piscine/Avian/Human blood. | | |
| 5. | To determine prevalence classification). | of different types of polymorphs in human blood (Based on Arneth's | | |
| 6. | Demonstration of hemin c | rystal. | | |
| 7. | | sinophil count in Human blood | | |
| 8. | To determine blood pressu | re in different body position [standing, supine, seating position] | | |
| 9. | To determine the effect of exercise on blood pressure | | | |
| 10. | | | | |
| 11. | To evaluate peak expirator | ry flow rate [lung efficiency] as function of age and gender | | |
| 12. | To study different stages o | f melanophores in scales of the live fish | | |
| 13. | | perature on melanophores in scales of live fish | | |
| 14. | To observe the effect of ac | renalin [neurotransmitter] on melanophores in scales of live fish | | |
| Books Re | commended: | | | |
| PJ Bentley | | Comparative vertebrate endocrinology | | |
| WF Ganong | S | Review of medical physiology | | |
| A Gorbman& HA Bern | | A textbook of endocrinology | | |
| AC Guyton | | Textbook of medical physiology | | |
| WS Hoar & DJ Randall | | Fish physiology [Series] | | |
| CR Martin | | Endocrine physiology | | |
| CL Prosser & FA Brown | | Comparative animal physiology | | |
| K Schmidt-I | | Animal physiology: Adaptation & environment | | |
| | & JT Bagnara | General endocrinology | | |
| JD Wilson & DW Foster | | Textbook of endocrinology | | |
| D Randall, W Burggren& K French | | Animal Physiology: Mechanisms and adaptations | | |

Third Semester (July 2020 - December 2020)

Paper IV: Developmental Biology and Evolution [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

Unit-I

Gametogenesis in animals. Molecular events during fertilization. Activation of egg metabolism. Cleavage patterns and fat maps. Regulation of Cleavage cycle. Cleavage and

Academic Section, PRSU, Raipur

Page **15** of **2**

10 6, 6, W

Symad Toda

a K

| | nuclear | activity. | | |
|-------------------|------------------------------|--|--|--|
| Unit-II | Caenori Totipot | oncepts of determination, competence, induction and differentiation. Determination in aenorhabditis elegans. Germ cell determination, migration and differentiation. otipotency and nuclear transfer experiments. Embryonic induction. Formation of vulvance. elegans. Mechanism of differentiation in Dictyostelium. | | |
| Unit-III | embryo | ogenetic determinants in egg cytoplasm. Role of maternal contributions in early onic development. Genetic regulation of early embryonic development in phila. Homeotic genes. Genetic interaction during differentiation. Hox genes and | | |
| Unit-IV | Genetic Molecu outline | ots and theories of organic evolution. The processes of Evolutionary change- c drift, Natural selection and the Hardy-Weinberg equilibrium. Speciation. Ilar evolution and origin of life. Evolution of Prokaryotes and Eukaryotes. A brief of the evolutionary history of Metazoans including-Evolution of tissue grade, ic body plans and Chordates. Evolution of Mankind. | | |
| Lab Cour | se: | | | |
| 1. | Study of | developmental stages in Snail/Amphibian/Chick | | |
| 2. | | n Drosophila development | | |
| 3. | Role of h | normones in metamorphosis and development | | |
| 4. | Effect of | Vitamin A on tail regeneration in frog | | |
| 5. | Biochem | nical estimations in developing embryos | | |
| 6. | Structur | e of hen's egg and its vital staining | | |
| 7. | Demons | tration of cell death by vital staining | | |
| 8. | Study of | permanent slides of chick embryos | | |
| 9. | Histolog | ical studies of Gametogenesis | | |
| 10. | Induced | breeding in fishes | | |
| Recomm | ended Bo | ooks | | |
| Alberts et a | al. | Molecular Biology of the Cell | | |
| SF Gilbert | | Developmental Biology | | |
| Lewin Benj | amin | Gene VIII | | |
| | | Developmental Genetics | | |
| PO Moody | | Introduction to Evolution, 1970, Harper and Row | | |
| Dobzhansky et al. | | Evolution, W. H. Freeman. New York | | |
| SW Fox an | d K Dose | Molecular Evolution and the Origin of Life, 1972, W.H. Freeman & Co Ltd. | | |
| FJ Ayala an | nd JW | Evolving: The theory and processes of Organic evolution, 1979, Benjamin/Cummings | | |
| Valentine | | Pub. Co. | | |
| EO Dodson | | Evolution: Process and Product | | |
| MW Strickberger | | Evolution, 1979, James and Barlett International | | |

Fourth Semester (January 2021 – June 2021)

Paper I: Molecular Endocrinology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

Unit-I

Definition and scope of molecular endocrinology. Chemical nature and general classes of hormones: Peptide, Amino acid derived, Steroid, Neurotransmitters, Neuropeptides,

Academic Section, PRSU, Raipur

Page 16 of 27

Symad 2019

Repolition 06/5/19

Woodloelle

| | Chalones, Eicosanoids and Pheromones. Hypothalamic octapeptide hormones: Oxytocin and Vasopressin. Purification and characterization of hormones. Hypothalamohypophyseal axis. | |
|----------|---|--|
| Unit-II | Genetic control of hormone synthesis: Structure and expression of protein hormone encoding gene. Molecular aspects of peptide hormone biosynthesis and secretion. Molecular aspects of synthesis and delivery of thyroid hormones, biogenic amines and steroid hormones. Production of protein hormones by recombinant DNA technology | |
| Unit-III | Molecular mechanism of hormone action: Membrane, cytoplasmic and nuclear hormone receptors, Non-genomic mechanism of hormone action, Receptor-ligand interactions. Hormonal signal transduction: G-proteins and second messengers. Genomic mechanism of hormone action: Steroid and thyroid hormones. | |
| Unit-IV | Molecular aspects of Reproductive endocrinology: Genetics of sex. Testicular and ovarian determining genes. Mullerian inhibiting substance genes. Stem cell renewal in testis. Molecular basis of male and female contraception. Endocrine disruptors. Neuroendocrine control of reproduction and feedback mechanism. | |
| Lab Cour | 'se: | |
| 1. | Purification of any protein hormone. | |
| 2. | Assay of steroid dehydrogenase | |
| 3. | Isolation and characterization of steroid/prostaglandin. | |
| 4. | In vivo bio- assay for estrogen/testosterone/LH | |
| 5. | Perfusion technique for the fixation of endocrine tissue | |
| 6. | Identification of hypothalamic nuclei following histological / histochemical methods | |
| 7. | Histological / Cytological / Histochemical study of endocrine glands. | |
| 8. | Study of estrus cycle by vaginal smear technique. | |
| 9. | Extraction and estimation of Gondotrophin / Pregnanediole from urine. | |
| 10. | Sperm count and motility. | |
| 11. | Study of neurosecretory cells/ materials/granules in the given materials. | |

Recommended Books

Franklyn F. Bolander Freedman and Birkhauser

An Introduction to Neuroendocrinology Endocrinology Endocrinology (Vol. I-III) Vertebrate Endocrinology

Essential Endocrinology

Williams Textbook of Endocrinology

Basic Medical Endocrinology Introduction to Endocrinology Reproductive Endocrinology Reproductive Endocrinology **Experimental Endocrinology**

Essential techniques in reproductive physiology and Endocrinology

Cell and Molecular Biology of Testis Biochemical actions of hormones

Nuclear Receptors: Current Concepts and Future Challenges

Molecular Endocrinology:.

Molecular Biology of Steroid and Nuclear Hormone

receptors:

Brown R. Mac E. Hadley

D Groot. L. J. (ed.), W. B. Saunder

Norris, D. O.

Brook, C.G.D. and Marshall, N.J.

Shlomo Melmed et al, Goodman. H.M.

Negi.

Yen et al (ed)

Adashi et al,

Zarrow et al.

Chinoy et al.

Claude D and Larry L. E (ed)

Litwack, G.

CM Bunce, MJ Campbell

Academic Section, PRSU, Raipur

Page 17 of 27

Fourth Semester (January 2021 – June 2021)

Paper II: Plant Biotechnology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

| Unit-I | Introduction to cell and tissue culture: Tissue culture media (composition and preparation), explant preparation, Callus and suspension culture, cytodifferentiation and organogenic differentiation, somatic embryogenesis, micropropagation. Shoot tip culture: Rapid clonal propagation and production of virus free plant. |
|----------|---|
| Unit-II | Embryo culture and embryo rescue. Anther, pollen and ovary culture for production of haploid plants & homozygous lines. Protoplast isolation, culture and fusion; selection of hybrid cells and regeneration of hybrid plants; symmetric and asymmetric hybrids, cybrids. Germplasm conservation: Cryopreservation & slow growth cultures. Chloroplast Transformation: Advantages, vectors, success; tobacco & potato |
| Unit-III | Plant transformation technology: Plant transformation technology: basis of tumor formation, hairy root, features of Ti and Ri plasmids, mechanism of DNA transfer, role of virulence genes, use Ti and Ri as vectors, binary vectors, use of 35S and other promoters, use of reporter genes, particle bombardment, electroporation, microinjection. |
| Unit-IV | Applications of plant transformation for productivity and performance: herbicide resistance, insect resistance, long shelf-life of fruits. Bt genes, Non–Bt like protease inhibitors & amylase inhibitors, virus resistance, nucleocapsid gene, disease resistance, PR (Pathogenesis Related) proteins, nematode resistance, abiotic stress, male sterile lines. |

Lab Course:

| 1. | Preparation of culture media | |
|-----|--|--|
| 2. | To performe meristem/ bud culture, shoot multiplication & rooting phenomenon | |
| 3. | To study organogenesis | |
| 4. | To perform somatic embryogenesis | |
| 5. | To study the process of plantlet acclimatization | |
| 6. | To perform embryo culture | |
| 7. | To study the process of anther culture development | |
| 8. | Study of molecular markers | |
| 9. | Extraction of DNA from plant cultures | |
| 10. | Estimation and separation of DNA using agarose gel electrophoresis and spectrophotometer | |

Recommended Books:

Academic Section, PRSU, Raipur

Page 18 of 27

Hos Kla

1000 MO

18,19

Ama 5/19

M.Sc. Syllabi of Bioscience: 2019-2021

| MK Razdan | Introduction to Plant Tissue Culture, 2 nd Edition, |
|-----------------------------------|--|
| IK Vasil | Plant Cell and Tissue Culture; |
| SS Bhojwani and MK Razdan | Plant Tissue Culture; |
| TJ Fu, G Singh and WR Curtis | Plant Cell and Tissue Culture for the production of Food Ingredients. |
| J Hammond, P McGarvey & V Yusibov | Plant Biotechnology, |
| HS Chawla | Biotechnology in Crop Improvement, |
| HS Chawla | Introduction to plant biotechnology. |
| BD Singh | Biotechnology- Expending Horizons. |
| Roberta H Smith | Plant Tissue Culture: Techniques and Experiments, 2 nd Edition: |
| Kyte L and Kleyn J | Plants from Test Tubes: An Introduction to Micropropagation, 3 rd |
| M Smith | Plant Propagator's Bible, 1 st Edition, |
| MR Ahuja | Micropropagation of Woody Plants, |
| YPS Bajaj | Trees III, Springer, |
| YPS Bajaj | Trees IV, Springer, |

M.Sc. Bioscience

Fourth Semester (January 2021 - June 2021)

Paper III (Special Paper-A) Parasitology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

| Unit-I | Parasites and parasitism. The Infection process: Modes of Parasite transmission, invasion, migration within host, maintaining station, obtaining nutrients and resisting host attack. Concept of Disease: Inflammation and Repair, Degeneration, Necrosis. | |
|----------------|--|--|
| | Mechanism of Disease transmission with particular reference to vectors. Vector control measures. | |
| Unit-II | General organization and life cycle patterns of Protozoa; Epidemiology, pathogenesis, | |
| | diagnosis and control of major human diseases, such as- Malaria, Leishmaniasis and | |
| | Trypanosomiasis. | |
| Unit-III | General organization and life cycle patterns of Trematodes and Cestodes; Epidemiology, | |
| | pathogenesis, diagnosis and control of major human diseases, such as- Schistosomiasis | |
| | and Hydatidosis. Arthopod- related ectoparasitic diseases: Ticks, mites and flies. | |
| Unit-IV | General Organization and life cycle patterns of Acanthocephala and Nematoda; | |
| | Epidemiology, pathogenesis, diagnosis and control of major nematode diseases, such as- | |
| | Ascariasis, Ancylostomiasis and Filariasis. Biology of plant parasitic nematodes. | |
| Lab Cours | se: | |
| 1. | Identification and comments on permanent mounts of parasitic organisms | |
| 2. | Host examination for parasites; preparation of permanent slides and identification | |
| 3. | Histology/Histopathology/Histochemistry by routine and differential staining | |
| 4. | Biochemistry of parasites and pathophysiology of the hosts | |
| 5. | Root knot nematodes: Extraction and isolation (Cobb's sieving and decantation method and | |
| | Baerman's Funnel technique), preparation of perennial pattern mounts | |
| 6. | Detection of blood parasites: Malarial parasite | |

Academic Section, PRSU, Raipur

Page **19** of **2**

@15/19 (

Wad 2019

Puning 0613/19

16:5.19 2000 100

M.Sc. Syllabi of Bioscience: 2019-2021

| 7. M | Macroscopic and microscopic examination of stool samples, concentration methods | |
|--------------------------|---|---|
| Recommende | ed Books | : |
| KD Chatterjee | | Parasitology (Protozoology and Helminthology) in Relation to Clinical Med 9 th Ed. |
| TC Cheng | | General Parasitology. Second Ed., |
| CKJ Panicker | | Textbook of Medical Parasitology. Jaypee Brothers, |
| TV Rajan | | Textbook of Medical Parasitology. |
| D Rollinson, and SI Hay, | | Advances in Parasitology; Volumes 1 to 78, |
| JD Smyth and DW Halton | | The Physiology of Trematodes. |
| DJWyler,Ed. | | Modern Parasite Biology: Cellular, Immunological and MolecularAspects. |

M.Sc. Bioscience Fourth Semester (January 2021 – June 2021) Paper III (Special Paper-B) Basic Chronobiology [Credit: 4 and Maximum Marks: 80] Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words Unit-I Historical developments in chronobiology. Different types of geophysical and biological cycles with examples of circadian rhythms. Quantification of biological rhythms -Average, amplitude, phase, and period. Brief introduction to time series analysis. Methods of time series analyses: COSINOR, AUTOCORRELATION, CHI-SQUARE PERIODOGRAM. Unit-II Characteristics of circadian rhythm: Free-run, Temperature and nutrition compensation, and Entrainment. Zeitgeber Time (ZT) and Circadian Time (CT). Aftereffects and Aschoff's rule. Aging and circadian clocks. Photoperiodism. Plant Rhythms Unit-III Synchronization (=Entrainment) and masking. Entrainment by single light pulse, complete and skeleton photoperiods. Zeitgebers for circadian clocks. Key properties of a Zeitgeber. Photic and non-photic zeitgebers. Mechanisms of entrainment. Phase response curves (PRC), phase transition curves, strong and weak PRC. **Unit-IV** Circadian pacemakers in insects with special reference to *Drosophila*. Suprachaismatic nucleus as mammalian circadian clock. Multi-oscillatory organization: master and slave oscillators, morning and evening oscillators, pacemaker and peripheral oscillators. Adaptive significance of circadian rhythms. Social consequence of circadian rhythms. Lab Course: 1. Terminology in Chronobiology Study of locomotor activity rhythm in suitable animal models 2. Actogram construction of locomotor activity of suitable animal models 3. 4. Study of phase shift in circadian rhythmin a suitable variable, such as locomotor activity 5. Construction of Cosinor Curves using Mesor (M), amplitude (A) and acrophase/peak (\varnothing) of circadian, and other low and high frequency rhythms 6. Computation of period (τ), phase angle (Ψ)

Academic Section, PRSU, Raipur

Page 20 of 27

My, 199

Sk wood 2019

| 7. | Circadian changes in volume o | f nuclei in onion peel (Allium cepa) cells (microscopic observation) | |
|-----------------------------------|--|--|--|
| 8. | Observation of leaf movement of a plant on circadian and longitudinal time scales | | |
| 9. | Periodogram, amount of activity and spectral analysis of rhythm datausing TSA-Cosinor software | | |
| Reco | ommended Books: | | |
| MJ Berridge | | Biochemical oscillations and cellular rhythms. The molecular bases of periodic and chaotic behaviour | |
| E Bun | ning | The physiological clock | |
| | lumbus | Trends in chronobiology | |
| G Cor | nelissen & F Halberg | Introduction to chronobiology | |
| JC Dunlap, JJ Loros& PJ DeCoursey | | Chronobiology: Biological timekeeping | |
| JC Hall | | Genetics and molecular biology of rhythms in <i>Drosophila</i> and other insects | |
| PJ Lumsden& AJ Millar | | Biological rhythms and photoperiodism in plants | |
| JD Palmer | | The living clock | |
| AK Pati | | Chronobiology: The dimension of time in biology and medicine; PINSA (Biological Sciences), December 2001 | |
| AK Pati (Ed.) | | Chronobiology | |
| DS Saunders | | An introduction to biological rhythms | |
| B Thomas & D Vince-Prue | | Photoperiodism in plants | |
| V Kumar (Ed.) | | Biological rhythms | |
| MK Chandrashekaran | | Time in the Living World | |
| AT Winfree | | The Geometry of Biological Time | |
| MCM | oore, FM Sulzman, & CA Fuller | The clocks that time us, Harvard University Press,1982 | |
| | | , | |

M.Sc. Bioscience Fourth Semester (January 2021 - June 2021)

Insect clocks, Pergamon, 2002

DS Saunders

Paper III (Special Paper-C): Ethnobotany [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

| Unit-I | Ethnobotany | | |
|---------|---|--|--|
| | Introduction, Concept, Scope and objectives; Ethnobotany as an interdisciplinary science. | | |
| | The relevance of Ethnobotany in the present context; major and minor ethnic groups or tribals of India and their life styles. | | |
| | Plants used by the tribals as: (a) Food plants (b) Intoxicants and Beverages (c) Resins, oils and miscellaneous uses. | | |
| Unit-II | Methodology of Ethnobotanical studies | | |
| | Field work: collection and confirmation of tribal information; its documentation; assessment of its valuation | | |
| | Herbarium: its role in confirmation of ethnic data; assessment of similarities of data across different habitats | | |

Academic Section, PRSU, Raipur

Page 21 of 26

| | | Ancient literature; Archaeo-ethnological findings; Sacred Grooves- their role in | | | |
|---|--|--|--|--|--|
| | confirmation of ethnic data | | | | |
| Unit-III | | Role of Ethnobotany in modern medicine | | | |
| | | Medico- Ethnobotanical sources in India | | | |
| | | Significance of the following plants in ethno botanical practices (alongwith their habitat | | | |
| | | | | | |
| | | and morphology) (a) Saussurea costus (b) Arnebia benthami (c) Fritillaria roylei (d) | | | |
| Rheum webbianum (e) Tribulus terrestris (f) Aconitum heterophyllu purpurea (h) Indigofera heterantha. | | | | | |
| | | Role of Ethnobotany in modern medicine with special examples a) <i>Digitalis purpurea</i> b) <i>Atropa acuminata</i> c) <i>Artemisia</i> sp. d) <i>Withania</i> sp. Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory | | | |
| | | | | | |
| | | | | | |
| | | forest management). | | | |
| Unit- | IV | Ethnobotany and legal aspects | | | |
| | | Ethnobotany as a tool to protect interests of ethnic groups. | | | |
| | | Sharing of wealth concept with few examples from India. | | | |
| | | Biopiracy, Intellectual property rights and traditional knowledge. | | | |
| Lab (| Course: | · · | | | |
| 1 | Invest | nvestigation of Food plants used by tribes. | | | |
| 2 | Invest | nvestigation of plants used as Beverages by tribes. | | | |
| 3 | Prepa | Preparation of herbarium of ethnomedicinal plants. | | | |
| 4 | Ethnomedicinal investigation on plants . | | | | |
| 5 | Gardening rare plant Species. | | | | |

Recommended Books:

S.K. Jain

S.K. Jain (ed.)

S.K. Jain, (ed.)

S.K. Jain

Colton C.M.

Rajiv K. Sinha

Rama R. N. and A.N. Henry

Manual of ethnobotany

Glimpses of Indian Ethnobotany

Methods and approaches in ethnobotany

Contributions of Indian ethnobotany.

Ethnobotany- Priciples and applications.

The ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India

Ethnobotany- the renaissance of traditional Herbal Medicine

M.Sc. Bioscience

Fourth Semester (January 2021 – June 2021)

Paper IV (Special Paper-A): Immunology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

Unit-I

Generation of diversity in BCR. Light and heavy chain gene recombination. Recombination Signal sequences. Class switching. Membrane and secreted immunoglobulins. Organization, arrangement of T-cell receptor genes and recombination.

Academic Section, PRSU, Raipur

Page 22 of 26

2 Dunu G

| | Regulation of immune rescytokines. | ponse by antigen, antibody, immune complex, MHC and | |
|---------------------------------------|---|--|--|
| Unit-II | Immunoprophylaxis: Principles of Vaccination. Immunization practices. Vaccines against important bacterial and parasitic diseases. DNA vaccines; passive prophylactic measures. Viral vaccines and antiviral agents. Vaccination schedules and safety. Production of vaccines. | | |
| Unit-III | Diagnosis of microbial diseases - Collection, transport and preliminary processing Clinical pathogens. Clinical, microbiological, immunological and molecular diagnosis diseases. Principles of immunodiagnostics. Antigen-antibody based diagnosis and the techniques involved – Enzyme, Radio and Fluorescence Immuno assays, Immunoblotting, Flow cytometry. Effector cell assays, Cytotoxic assays. Isolation of pure antibody. Monoclonal & Designer antibody and their application in immunodiagnostics. | | |
| Unit-IV | Nanomaterials, Nanopart nanomaterials. Biosensors: Biosensor-d | obial diagnosis. Use of nanotechnology in diagnosis. Synthesis of icle based drug delivery, Toxicity and environmental risks of evelopment, types and characteristics, DNA biosensors, in clinical diagnostics: detection of infectious diseases, food at all monitoring. | |
| Lab Cours | se: | | |
| 1. | Preparation of Parasite Antig | gen and analysis by PAGE | |
| 2. | Immunizations and production | on of antibody | |
| 3. | Antigen antibody reaction by | Double Diffusion, Counter current and IEP, RID and EIA | |
| 4. | Western Blot Analysis | | |
| 5. | Immunodiagnosis using com | | |
| 6. | | ials using physical and chemical properties. | |
| 7. | Green and chemical route fo | | |
| 8. | | ons using UV-Vis and FT-IR spectroscopy. | |
| 9. | Assessment of antibacterial | | |
| | ended Books: | alyte/ biomolecules for biosensing system. | |
| | | W.L. Z. L. S. L. S | |
| | y, TJ Kindt and BA Osborne ni, R Coico and G Sunshine | Kuby's Immunology | |
| | | Immunology-A short Course Immunology | |
| Roitt, Brostoff and Male William Paul | | Fundamentals of Immunology | |
| Stewart Snell | | Immunology, Immunopathology and Immunity | |
| Elgert | | Understanding Immune System | |
| M. Wilson, K. Kannangara, G Smith, | | Nanotechnology: Basic science and Emerging technologies | |
| | ns, B. Raguse | and Emerging Continuogics | |
| G. Cao | | Nanostructures and Nanomaterials: Synthesis, properties and | |
| | | applications | |
| Challa S.S.I | | Nanomaterials for medical diagnosis and therapy | |
| | Poole Jr. and Franks. J. Qwens | Introduction to Nanotechnology | |
| C. M. Niem | neyer, C. A. Mirkin (Editor) | Nanobiotechnology: Concepts, Applications and Perspectives | |
| | | | |

Page 23 of 26

Academic Section, PRSU, Raipur

Fourth Semester (January 2021 - June 2021)

Paper IV (Special Paper-B): Applied Chronobiology [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

| Unit-I | Molecular mechanisms underlying clock functions in organisms: Autoregulatory transcriptional feedback loops; Circadian clock mutant types in <i>Drosophila</i> (<i>per</i> , <i>tim</i> , <i>dbt</i> , <i>dclock</i> , <i>cycle</i> , <i>vrille</i> , <i>pdf</i> , <i>lark</i> , <i>takeout</i>), <i>Neurospora</i> , cyanobacteria, mouse, and humans. Temporal expression pattern of clock genes, Regulation of expression of clock genes, Expression patterns under constant light and darkness; Autonomous functions of clock genes in peripheral tissues. | | |
|--------------|--|--|--|
| Unit-II | Human circadian organization: Methods to study human circadian rhythm; Free-running rhythms in humans, Constant routine protocol, and Forced desynchronization protocol. Chronotypes and its assessment methods. Marker rhythms in humans: Core body temperature (CBT), melatonin, and cortisol. Sleep-wake alertness and performance rhythms in humans. | | |
| Unit-III | Circadian rhythms and human health: Chronopharmacology; Basics of chronopharmacology – clinical chronopharmacology – circadian dependence of drug pharmacokinetics. Chronotherapy; Application of chronotherapy in treatment of cancer, cardiovascular diseases, allergies, asthma, and circadian rhythm sleep disorders (for example, DSPS and ASPS) & mood disorders (SAD). | | |
| Unit-IV | Circadian rhythms in occupational and travel stresses: Shift work; Types of shift system, direction and frequency of shift rotation, Effect on rhythm parameters, Desynchronization of circadian rhythm, Consequences on sleep, Psychosocial problems, Clinical and non-clinical problems. Shift work tolerance/ intolerance. Shift optimization: Nap, Bright light therapy, Melatonin therapy. Jet lag: Consequences of jet lag; direction asymmetry & variable asymmetry; Approaches to jet lag alleviation. | | |
| Lab Cours | | | |
| 1. | Study of circadian rhythms in objective variables in human subjects using autorhythmometry technique. | | |
| 2. | Study of circadian rhythms in subjective variables in human subjects using autorhythmometry technique. | | |
| 3. | Chronotyping in human population. | | |
| 4. | Study of circadian rhythm in the rest-activity of humans by using wrist actigraphy. | | |
| 5. | Study of circadian rhythm in blood pressure of humans by using Ambulatory Blood Pressure Monitor. | | |
| 6. | Circadian variations in RBC and WBC in suitable animal models. | | |
| 7. | Circadian rhythm in cortisol and melatonin by ELISA. | | |
| 8. | Computation of mid-sleep and social jetlag | | |
| 9. | Observation of functional status of in-built alarm clock in humans. | | |
| Recomm | ended Books: | | |
| JC Dunlap, J | | | |
| -/) | emonosiology, biological cintercepting | | |

Academic Section, PRSU, Raipur

Page 24 of 26

| DeCoursey | |
|-------------------------|--|
| JC Hall | Genetics and molecular biology of rhythms in <i>Drosophila</i> and other insects |
| WJM Hrushesky | Circadian cancer therapy |
| BG Katzung | Basic and clinical pharmacology |
| G Klein and P Becker | Farewell to the internal clock: a contribution in the field of Chronobiology |
| AK Pati | Chronobiology: The dimension of time in biology and medicine; PINSA (Biological Sciences), December 2001 |
| AK Pati, Ed. | Chronobiology |
| TT Postolache | Sports Chronobiology: An issue of clinics in sports medicine |
| D Purves <i>et al</i> . | Molecular mechanisms of biological clocks |
| PH Redfern and B Lemmer | Physiology and pharmacology of biological rhythms |
| R Refinetti | Circadian Physiology |
| A Reinberg | Clinical chronopharmacology: Concepts, kinetics, applications |
| A Sehgal | Molecular biology of circadian rhythms |
| LE Scheving | Chronobiotechnology and chronobiological engineering |
| Y Touitou <i>et al.</i> | Handbook of medical chronobiology |

Fourth Semester (January 2021 - June 2021)

Paper IV (Special Paper-C): Secondary Metabolites [Credit: 4 and Maximum Marks: 80]

Each theory paper will have questions divided into four sections, A, B, C & D. Section A will have 20 MCQ of 1 mark each covering whole syllabus. Section B will have 8 very short answer questions, two from each unit, of 2 marks each to be answered in two to three lines. Section C will have 8 questions, two from each unit, of 3 marks each. The question has to be answered in about 75 words. Section D will have 4 questions, one from each unit with internal choice, of 5 marks each. The question has to be answered in about 150 words

| Unit-I | Introduction to secondary metabolites: Definition and systematic of secondary metabolites. Major classes of secondary metabolites i.e. alkaloids, terpenoids/ or |
|----------|--|
| | isoprenoids, flavonoids and phenolics. Significance of secondary metabolites in plant's life. Roles in chemical defense system, taxonomical and ecological functions. |
| | Pharmacological and biological properties of secondary metabolites. Industrial and commercial significance of secondary metabolites |
| Unit-II | Biosynthesis and regulation of secondary metabolites: Biosynthesis of alkaloids derived from Shikimic acid pathway. Biosynthesis of isoprenoids via 3C-methyl-D-erythritol-4-phosphate (MEP) pathway. Biochemical pathways of flavonoids and polyphenol (lignin) biosynthesis. Integration of secondary metabolism with primary metabolic pathways. Regulation: Genetic, developmental, seasonal and geographical factors, roles of precursor feeding, metabolic channeling and compartmentalization. Cross-talk/exchange of intermediates between biochemical pathways. Use of specific enzyme inhibitors in regulation |
| Unit-III | Production of secondary metabolites: Methods of production of secondary metabolites: Tissue, organ and hairy root cultures. Roles of Endophytes in production of secondary metabolites. Production of secondary metabolites in bioreactors. Effects of precursors, co-factors and elicitors on production. Production of Taxol, Camptothecin, Berberine and rubber. |

Academic Section, PRSU, Raipur

S A mad S 2019

Page 25 of 26

o615/19

10610×119

| Unit- | Metabolic Engineering of secondary metabolic pathways: Cloning and characterization of enzymes of the Shikimate and MEP pathways. Functional genomics approaches for improvement of secondary metabolite production. Metabolic engineering of Escherichia coli and yeast for the production of flavonoids, terpenoids and alkaloids. |
|-------|--|
| Lab | Course: |
| 1 | Isolation of essential oil and determination of the oil yield. |
| 2 | Qualitative test for determination of |
| | a- terpenoids |
| | b- alkaloids |
| | c- flavonoids |
| | d- saponins |
| 3 | Quantitative test for determination of: |
| | a- terpenoids |
| | b- alkaloids |
| | d- saponins |
| | e- phenolics |
| 4 | Determination of antimicrobial activity of the plant extracts. |
| 5 | Demonstration of hairy root culture for production of secondary metabolites |
| 6 | RNA extraction and gene expression of key enzymes of Biosynthesis of alkaloid; Strictosidine |
| | Synthsae [STR1], Strictosidine glucosidase (SG), Acetylajmalan Esterase (AAE) etc. |

Recommended Books:

1. David S. Seigler

2. Alan Crozier

3- Y. M. Shukla

4- R. Verpoorte, A. W. Alfermann

5-Herbert, R.B.

6- Fett-Neto, Arthur Germano (Ed.)

7- Keller, Nancy P., Turner,

8- Bell, E.A., Charlwood, B.V. (Eds.)

9- Petroski, Richard J., McCormick, Susan P. (Eds.)

10- Makkar, Harinder P.S., Sidhuraju, P., Becker, Klaus Plant Secondary Metabolism,

Plant Secondary Metabolites: Occurrence, Structure and Role in the Human

Diet

Plant Secondary Metabolites

Metabolic Engineering of Plant Secondary Metabolism.

The Biosynthesis of Secondary Metabolites

Biotechnology of Plant Secondary Metabolism

Methods and Protocols

Fungal Secondary Metabolism

Secondary Plant Products

Secondary-Metabolite Biosynthesis and Metabolism

Plant Secondary Metabolites

adju

dfvte 16/5/19 5) mad 2019





6.6.19

Cross 06/5/19