

SYLLABUS FOR Ph.D. COURSE WORK BIOCHEMISTRY

(Under Revised Ordinance 16 notified vide letter no/Acad./2018/1944 dated 24/05/2018)
(Academic Session 2018 – 2019 & Onwards)

SCHEME OF EXAMINATION

Number & Title of the Paper	Credit	End Semester Exam		
		Maximum Marks	Minimum Marks	Total
PAPER I RESEARCH METHODOLOGY	4	100	50	100
PAPER II REVIEW OF PUBLISHED RESEARCH IN RELEVANT FIELD (IN THE FORM OF THESIS)	3	100	50	100
PAPER III COMPUTER APPLICATIONS	3	100	50	100
PAPER IV APPLIED BIOCHEMISTRY	3	100	50	100
PAPER V COMPREHENSIVE VIVA VOCE (VIRTUAL CREDITS)	3	100	50	100

Note : Aggregate passing marks 55 %

***SCHEME OF EXAMINATION AS APPROVED BY EXECUTIVE COMMITTEE OF THE UNIVERSITY**

PAPER – I RESEARCH METHODOLOGY

Unit – I

Sampling technique, sterilization technique, various methods for isolation of pure culture, methods for measurement of microbial growth, manipulation of environment, nutritional and genetic parameters, maintenance and preservation of microbes (pure culture). Introduction to cell & tissue culture. Design & lab setup of tissue culture laboratory, Tissue culture media (Composition preparation), Types of culture.

Unit - II

Chromatographic techniques – Gel filtration, ion exchange chromatography, hydrophobic interaction and reverse phase chromatography, affinity chromatography, gas chromatography, high performance liquid chromatography, fast protein liquid chromatography; Application in separation of proteins.

Unit - III

Molecular Biology and spectroscopic techniques – Comet Assay; Real time PCR; RAPD, RFLP, ARDRA and Fluorescence *in situ* hybridization techniques. Atomic absorption spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectroscopy, mass spectrometry including ESI MS and MALDI-TOF MS and Applications.

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Unit - IV

Electrophoretic and centrifugation techniques - SDS and Native PAGE, Agarose gel electrophoresis, isoelectric focusing and two-dimensional electrophoresis, proteome analysis; Differential and density gradient centrifugation, analytical ultracentrifugation, separation of DNA/RNA using ultracentrifugation technique, determination of molecular weight and Sedimentation coefficient.

Unit - V

Quantitative methods; Principles and Designs of Experiments; Tools Parametric and Non~parametric statistics. Confidence interval, Errors. Levels of significance, Regression and Correlation coefficient. Analysis of variance - one way and two way classifications; Multiple Comparisons – Least Significant Difference Test, Duncan’s New Multiple Range Test; Factorial Analysis; Analysis of Covariance.

PAPER-II
REVIEW OF PUBLISHED RESEARCH IN RELEVANT FIELD
(IN THE FORM OF THESIS)

PAPER - III
COMPUTER APPLICATION

Unit - I

Features and applications related to presentation of text in suitable format and saving the MS WORD data for future applications. Practical knowledge of MS Word to type the script, insert tables, figures and graphs to prepare thesis and research papers in presentable format.

Unit – II

Construction of spreadsheets from the experimental data. MS EXCEL design and application of formula for calculations and their applications to the experimental data. Use of statistical tools, preparation of graphs, histograms and charts.

Unit – III

Preparation of powerpoint presentations based on the topic of research. Insertion of MS power point figures, graphs, charts in presentation. Preparation of scientific posters for presentations. Use of various presentation techniques.

Unit – IV

Method of preparing data sheets and entering the data according to its characteristics. Use of SPSS & various statistical tools on SPSS. Internet Overview of networking, Internet and its

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applications. Applications exploring various websites and search engines for collecting quality literature and secondary data related to research work.

Unit – V

Data processing, Data mining; Bioinformatics – concept and applications; Biological databases – Primary and Secondary; Sequence Databases (EMBL, GenBank, DDBJ, SWISS-PROT, PIR, TrEMBL); Protein Family/Domain Databases (PROSITE, Pfam, PRINTS & SMART); Structure Database (PDB); Tools like BLAST, FASTA and EMBOS.

PAPER-IV APPLIED BIOCHEMISTRY

Unit –I

Structure and Function of Proteins and Enzymes: Amino acid and their structural organization, Ramachandran plot, Conformation, Domains, Super secondary structure, Collagen structure, Myoglobin and Haemoglobin quaternary structure.

Biosignaling: General features of signal transduction, G-Protein and Cyclic AMP, Receptor Tyrosine kinases, Gated Ion channel signaling in microorganisms and plants.

Unit –II

Photosynthesis: Photosynthetic membrane and light reactions, General features of Electron transport and photophosphorylation, Photosynthetic carbohydrate synthesis, C₄ and CAM pathways; Plant celluloses and Bacterial peptidoglycans.

Unit –III

Protein Biochemistry: Protein folding, Biophysical and cellular aspects, Molecular chaperons, Chaperonins, Denaturation, Protein-Protein interactions, Physical and chemical methods for their study, Functional proteins: Structure and Drug targets.

Determination of Protein structure: Structural analysis of Proteins by UV- Visible, IR, NMR spectroscopy, Fluorescence spectroscopy, Electron-cryomicroscopy, X-Ray crystallography.

Unit –IV

Purification of Proteins and Enzymes: Extraction methods, Ammonium sulphate fractionation; Purification strategies: Gel filtration chromatography, Ion-Exchange

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chromatography, Affinity chromatography, Dye-ligand; Electrophoresis: SDS and Native, Western Blotting; Proteomics: 2DE and Mass Spectrometry.

Regulatory Enzyme: Covalent modification, Regulation of muscle glycogen phosphorylase, Zymogens, Multienzyme complex, Pyruvate dehydrogenase complex.

Unit –V

Enzymes and Isoenzymes in clinical diagnosis: Polymorphism in Isoenzymes; Enzymes of diagnostic significance: Amylase, Transaminases, Creatine- phosphokinase, Cholinesterase, Lactate dehydrogenase, 5'- nucleotidase, Alkaline phosphatase, Acid phosphatase, Glucose-6-phosphate dehydrogenase.

**PAPER-V
COMPREHENSIVE VIVA VOCE**

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