

**DEPARTMENT OF BIOCHEMISTRY
MAHARSHI DAYANAND UNIVERSITY, ROHTAK**

Scheme of Examination of PhD (Course Work) in Biochemistry (session 2014-15 onwards)

Paper No	Nomenclature	Max Marks	Internal assessment	Theory	Time
BC-CW-I	Research Methodology	100	20	80	3 Hrs
BC-CW-II	Biostatistics & Computers	100	20	80	3 Hrs
BC-CW-III	Advanced Techniques in Biochemistry	100	20	80	3 Hrs
BC-CW-IV	Review Writing	100	-	-	-

BC-CW-1: Research Methodology

Note: Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

Unit-I:

Research Methodology:- Meaning, types and objective of research, Selection of Research, Research methodology- philosophical, descriptive, experimental and genetical methods. Motivation in Research, Developing the hypothesis.

Types of information and sources: primary and secondary sources, overview of research process-phases and steps. Research process planning and conducting.

Unit-II:

Review of Literature: Meaning. Procedure and steps for preparing review;

Data collection:- Types of data, Sources, Methods of data collection, Constructing questionnaire, Establishing reliability and validity, Data processing:- Coding, Editing, displaying of data by tables and graphs.

Thesis layout:- Preliminaries, Text of the thesis-Format and conventions, charts and diagrams, Norms for using Index and Bibliography.

Unit-III:

Scientific Writing: Scientific Document; Organization and writing of research paper, Types of Scientific Communications- short communications, monographs, technical and survey reports, Importance of publishing research paper. Writing review articles (*notes*), Patent drafting and submission, Preparing documents for Technology Transfers, MoUs,

Unit-IV:

Presenting and Publishing paper: Format, choosing Journal, Title, Running Title, Writing Abstract, Keywords, Introduction section, Materials and Methods selection, Result section, Figures, tables, graphs, Discussion Section, References, Preparing posters for scientific presentation, Preparing and delivering of oral presentation, Research Grant Funding Agencies,

References:

1. Research Methodology: Methods And Techniques By Dr C R Kothari.
2. Research Methodology: An Introduction By Wayne Goddard and Stuart Melville
3. Research methodology: techniques and trends By Y.K. Singh
4. Experimental Design and Data Analysis for Biologists By Gerry P. Quinn and Michael J. Keough. Publisher: Cambridge University Press.
5. Fundamentals of Research Methodology for Health-care Professionals By Hilla Brink, Christa Van der Walt
6. Planning, designing and reporting research By G. B. Stead

BC-CW-2: Biostatistics and Computers

Note: Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions.

Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

Unit-I:

Tests of significance – concepts of null and alternative hypothesis, level of significance, type-I and type-II errors – power of the test. Measures of central tendency and dispersion

Non-parametric tests: Wilcoxon signed rank test, Wilcoxon rank sum test (Mann-Whitney U test), Sign test, Runs test, Kruskal-Wallis H Test, Spearman's rank correlation and Tukey-Duckworth test

Unit-II:

Parametric Tests of large samples by Z test. Small sample tests- t-test, F, chi-square test. Coefficient of correlation & regression. ANOVA- one way and two way techniques.

Unit-III:

Basics of Computers- classification, computer system components (CPU, Input/output devices, internal memory i.e. RAM, ROM & Cache and external memory i.e. secondary storage devices). Computers networks and communications. Operating Systems and Utility programs.

Unit-IV:

Computer Security- Internet & Network Attacks; Number systems, Flow charts in computing language, DOS internal and external commands, Batch files, generations of programming languages, system and application software, Introduction of programming in BASIC and C.

References:

1. Biostatistics By PN Arora and PK Malhan, Himalaya Publishing House.
2. Biostatistics: a guide to design, analysis and discovery By Ronald Forthofer, Eun Sul Lee and Michael Hernandez.

3. Experimental Design and Data Analysis for Biologists By Gerry P. Quinn and Michael J. Keough. Publisher: Cambridge University Press.
4. Fundamentals of Research Methodology for Health-care Professionals By Hilla Brink, Christa Van der Walt
5. Computer Fundamentals: Concepts, Systems and Applications By PK Sinha. BPB Publications.
6. Computer Fundamentals and Programming in C By JB Dixit. University Science Press.
7. Computer fundamentals and programming in C By Amiya Kumar Rath, Alok Kumar Jagadev and Santosh Kumar Swain. Scitech Publications.
8. Computer Fundamentals (Paperback) by Ashok Arora, Shefali Bansai and Shefali Bansal. Publisher: Excel Books.
9. Discovering Computers: Fundamentals (Paperback) by Gary B. Shelly. Publisher: Course Technology.
10. Discovering Computers: Fundamentals, Fourth Edition (Shelly Cashman) (Paperback) by Gary B. Shelly Thomas J. Cashman and Misty E. Vermaat. Publishers: Course Technology
11. Computer Fundamentals: Architecture and Organization (Paperback) by B. Ram. Publisher: New Age Publications (Academic)

BC-CW-3: Advanced Techniques in Biochemistry

Note: Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

Unit-I: Molecular biology & Bioinformatics

Gene Cloning, Screening and selection of recombinants clones, RFLP, RAPD, tRFLP analysis, Polymerase chain reactions, Site directed mutagenesis, De Novo Genome sequencing of Prokaryotes and Sequence analysis, protein-protein interactions, yeast two hybrid systems, pull down assay, reporter assays, searching in BLAST & FASTA, Multiple sequence alignment, phylogeny analysis, Structure database- Secondary structure prediction, Predicting 3D structure of proteins

Unit-II: Enzyme Technology

Immobilization of enzymes/proteins on organic and inorganic supports including artificial and natural membranes, Study of kinetic properties of immobilized enzymes, Co-immobilization of enzymes and their analytic applications, Construction of enzyme electrodes, Optimization and applications of enzymes electrodes.

Unit-III: Toxicology

Analytical and preparative methodology, Drug susceptibility testing: Minimum inhibitory conc., Disc diffusion, Spot assay, Time kill kinetics, Combinatorial drug testing, Hodge test, Drug-drug interactions, CYP interaction, inhibition and induction.

Toxicokinetics and toxicodynamics, Transport and accumulation of xenobiotics, bioactivation of xenobiotics, xenobiotic-induced oxidative stress. Introduction to GLP/GMP and CRO.

Unit –IV: Biochemical Techniques

Centrifugation and its applications, purification of proteins using ion-exchange, gel-filtration and affinity chromatography, SDS-PAGE, western blotting, 2-D PAGE, isoelectric focusing, Mass spectrometry, HPLC. Preparation and processing of sample for electron microscopy, Fluorescence microscopy and immuno-histochemistry

References:

1. Bioinformatics: Methods & Protocols **By** Stephen Misener and Stephen Krawetz
2. Essential Bioinformatics **By** Jin Xiong
3. Gene cloning **By** TA Brown
4. Principles of Gene Manipulation and Genomics, **By** S.B. Primrose & Richard M. Twyman, Blackwell Publishing.
5. Molecular Biology of the Gene VI **By** Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.
6. Handbook of Enzyme Biotechnology **By** Alan Wiseman
7. Nature of enzymology **By** RL Foster
8. Disinfection, sterilization, and preservation **By** Seymour Stanton Block
9. Pharmacodynamics and drug development: perspectives in clinical pharmacology **By** Neal R. Cutler, John J. Sramek, Prem K. Narang
10. Mechanistic toxicology: the molecular basis of how chemicals disrupt biological targets **By** Urs A. Boelsterli
11. Modern Experimental Biochemistry **By** Rodney Boyer
12. Principles & Techniques of Biochemistry and Molecular Biology **By** Keith Wilson and John Walker.
13. Immunohistochemistry: Basics and Methods **By** Igor B. Buchwalow, Werner Böcker