M. Phil. Course Work
SYLLABUS
of

Biochemistry

CHOICE BASED CREDIT SYSTEM (CBCS)

Revised as per Ministry of Human Resource Development, UGC New Delhi, Notification 5th May, 2016, (Minimum Standards and Procedure for award of M.Phil. / Ph.D. Degrees) Regulation – 2016

Accredited **Grade 'A'** by NAAC

Department of Biochemistry
Saurashtra University
Rajkot

M.Phil in Biochemistry

General Rules

Revised as per Ministry of Human Resource Development, UGC New Delhi, Notification 5th May, 2016, (Minimum Standards and Procedure for award of M.Phil. / Ph.D. Degrees) Regulation – 2016

O.MPhil 1:

A candidate for the admission in M.Phil Biochemistry must possess the M.Sc. degree or its equivalent degree in science from corresponding statutory regulatory body (postgraduates in Biochemistry, Biotechnology, Bioinformatics, Botany, Microbiology, Zoology and any life sciences) with at least 55% marks in aggregate or its equivalent grade 'B' in UGC 7 point scale.

O.MPhil 2:

A relaxation of 5% of marks, from 55% to 50% or an equivalent relaxation of grade may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-Abled and other catagories of candidates as per the decision of the Commission from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991 (Clause 1.2).

Entrance test will be conducted and the admission will be offered on the basis of merit list prepared from the entrance test.

O.MPhil 3:

M.Phil in Biochemistry Programme shall be for a minimum duration of two (2) consecutive semesters / one year and a maximum of four (4) consecutive semesters / two years (Clause 3.1).

The M.Phil. Coursework will be of one semesters (clause 3.1) having two theory courses 100 marks each. The coursework shall be treated as prerequisite for M. Phil. preparation (clause 6.2). The M. Phil. research work for Dissertation / Thesis will be spread over all the semesters as prescribed in the Circular. Though the Dissertation will commence in the beginning, it will be evaluated and grade points, if any, will be given at the end of the programme.

O.MPhil 4:

All candidates admitted to the M.Phil. Programme shall be required to complete the Coursework prescribed by the Department during the initial semesters (clause 6.5).

A M.Phil. candidate has to obtain a minimum of 55 % of marks or its equivalent grade in the UGC 7 point scale (or an equivalent grade / CGPA in a point scale wherever the grading system is followed) in the Course work in order to be eligible to continue in the programme and submit the Dissertation / Thesis (clause 6.8).

O.MPhil 5:

Upon satisfactory completion of course work and obtaining the required marks/grade, the M. Phil. Scholar shall be required to undertake research work and produce a draft dissertation/thesis within the stipulated time for M.Phil (Clause 8.2).

O.MPhil 6:

M.Phil. Scholars shall present at least one (1) research paper in a conference / seminar before the submission of the dissertation/thesis for adjudication, and produce evidence for the same in the form of presentation certificate/reprints (Clause 8.4).

Minimum 75 % of attendance is mandatory.

O.MPhil 7:

The M.Phil. Dissertation submitted by a scholar shall be evaluated by his/her Research Supervisor and at least one external examiner who are not in the employment of the same University/College. The panel of the examiners shall consist of four Experts suggested by the research supervisor of which one shall be nominated by the Vice-Chancellor to evaluate dissertation. The Viva-voce examination, based among other things, on the critiques given in the evaluation report, shall be conducted by both of them together, and shall be open to be attended by members of the RAC, all faculty members of the Department, other research scholars and other interested experts/researchers (clause 8.7).

Structure and evaluation system of M. Phil. in Biochemistry

Programme : Master of Philosophy (M.Phil) Biochemistry
Duration : Minimum of 2 Semesters and maximum 4 Semesters

Components of the Progrmme : (a) M. Phil. Course Work and (b) M. Phil. Dissertation

(a) M. Phil. Course work: Coursework completion certificate will be issued by the University mentioning Marks secured in each course, Total Marks secured, % of marks, Grade and Credit obtained, month and year, and other details.
(b) M. Phil. Dissertation: Notification and Certificate will be issued by the University after successful Viva-Voce.

Details of M. Phil. Course work:

Courses : 2 (one Core and one Elective) in First Semester.

Credit : Each Course will be of 5 credits in 5 h/week/Semester. 10 Credits
Dissertation: 20 hours/week/Sem. For 2 Semester . 20 Credits

Total 30 Credits

Marks : Each course 100 marks Total 200 Marks (Two Course)

Evaluation and Examination Scheme:

1. The Evaluation (through RAC of the Department) and Degree award notification will be done by the University as it is done in the case of Ph.D. Award.
2. The Semester-end evaluation of each course will be based on the evaluation on assignments and/or seminar/presentations made by the M.Phil. Scholar before the RAC of the Department and theory examination conducted by Department. The RAC of the Department will finalize the Grades of the candidate by a combined assessment as mentioned above and the final grades shall be communicated to the University by the RAC of the Department (clause 6.7).
3. **A completion certificate** of the **M. Phil. Course Work** will be issued by the University at the end of the first semester (200 marks, 10 Credits). The passing mark is 55% (clause 6.8) without which the Dissertation cannot be submitted.
4. M. Phil. Dissertation will commence in the beginning of the year but will be evaluated by External and Internal examiners in a Viva-Voce (clause 8.7) and grade points (20 for Dissertation and total 30 for the entire M. Phil Programme) will be given in the M.Phil. Award Notification.
5. No Marksheet will be issued for Dissertation as the viva-voce examination contains no marks, But regular **M. Phil. Award Notification** (as issued for Ph.D. Award Notification) will be issued by the University after successful completion of Viva-Voce examination (Like Ph.D. Notification) of the M.Phil. Dissertation.
6. The **M. Phil Degree Award Notification** will contain (a) M.Phil. Coursework marks and grade with month and year of passing, (b) Year of M. Phil. Awarded, Total M.Phil. Credit earned, Title of the Dissertation, Month, date and year of M.Phil. Degree Awarded.

M. Phil. Biochemistry Syllabus

Choice Based Credit System (CBCS)
(Total 30 credits)

Course code and title	**Credits**	**Hours / Week**	**Mode of Semester-end Evaluation**	**Total Marks**	**16 digit Number**
Semester 1					
Course 1 (Core)					
CBC 1: Research Methodology	05	05	Evaluation by the RAC of the Department based on assignments and/or seminar/presentations and theory examination conducted by Department	100	1603120103010100
Course 2 (Elective, Any one)					
EBC 1: Concepts in Biochemistry	05	05	Evaluation by the RAC of the Department based on assignments and/or seminar/presentations and theory examination conducted by Department	100	1603120203020100
EBC 2: Human Physiology & Clinical Biochemistry	05	05			1603120203020200
Dissertation*	20	20			1603120303020100
Semester 2					
Dissertation*	20	20	Evaluation by External and Internal examiners in a Viva-Voce. M.Phil. completion Notification and Certificate will be issued by Uni.	-	1603120303020100

*Dissertation will commence in the beginning of the first Semester but will be evaluated and grade points will be given in the Final Semester.

M. Phil. Biochemistry Course Work Syllabus

SEMESTER I

CBC 1: RESEARCH METHODOLOGY

UNIT 1: Types of Research & Literature Survey

Types, Research process and steps in it, Hypothesis, Research proposals and aspects. Literature survey and review, Research design process, Errors in research. Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals.

UNIT 2: Design of Experiments

Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Heuristic and Simulation modeling. Research Design: Need, Problem Definition, variables, research design concepts, Objectives, strategies, Factorial experimental design, Designing engineering, experiments, basic principles: replication, randomization, blocking, Guidelines for design of experiments.

UNIT 3: Statistical Methods

Single Factor Experiment: Hypothesis testing, Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval; ANOVA for random effects model, Estimation of variance components, Model adequacy checking.

UNIT 4: Computer Applications

Spreadsheet Tool: Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features. Tools used may be Microsoft Excel, Open office or similar tool. Presentation Tool: Introduction to presentation tool, features and functions, Creating presentation, Customizing presentation, Showing presentation. Tools used may be Microsoft Power Point, Open Office or similar tool. Web Search: Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo etc, Using advanced search techniques.

CBC 1: RESEARCH METHODOLOGY

Objectives:

- The main objective of this paper is to provide students with a broad introduction to the methodological foundations and tools used in research.
- To learn how to identify problems, develop hypotheses and research questions.
- To check for the validity and reliability of studies and design research projects.
- To expose the students to the broad range of designs used in research from laboratory, field experiments, surveys and content analysis.
- To study the statistical tools and computer applications used in research.

Outcome:

By studying this paper students will able to define research, explain and apply research terms, describe the research process and the principle activities, skills and ethics associated with the research process; students can explain the relationship between theory and research, describe and compare the major quantitative and qualitative research methods; construct an effective research proposal that will serve as the launching point for the research project, understand the importance of research ethics and integrate research ethics into the research process. Students will easily use the statistical tool and computer software for organization and analysis of data.

EBC 1: CONCEPTS IN BIOCHEMISTRY

Unit 1: Metabolism & Enzymology

Carbohydrate Metabolism, Lipid metabolism, Metabolism of Proteins & Amino Acids, Nucleotide metabolism, Electron Transport Chain, Oxidative Phosphorylation, Structures of Protein, Introduction of Enzymes, Enzyme Kinetics, Enzyme Inhibition, Enzyme Catalysis, Allostery Enzymes

Unit 2: Cell Biology

Structure and function of cells and cell organelles, Membrane biochemistry, Tissue organization and cytoskeleton, Cell Cycle

Unit 3: Immunology

Introduction to the immune system and Effect or Mechanism, Recognition of Antigens and Maturation, Activation, Regulation of Lymphocytes, Antigen and Antibody reactions, Hybridoma technology, Vaccination, Immunological disorders

Unit 4: Molecular Biology

Gene Structure & Organization, Cloning of genes, Protein engineering, Recombinant DNA technology

EBC 1: CONCEPTS IN BIOCHEMISTRY

Objectives:

This paper aims to provide:

- An advanced understanding of the core principles and topics of metabolic process and their biochemical reactions.
- Detailed study on mechanical and kinetics properties of enzyme including various models of kinetics and various types of inhibition
- To equip students with a basic knowledge of the structural and functional properties of cells.
- In-depth knowledge and understanding of major cellular and molecular mechanisms underlying immunological processes in health and diseases
- Detailed understanding of gene structure & organization, cloning of genes, protein engineering, recombinant DNA technology

Outcome:

Students will acquire knowledge of metabolism, enzymology, molecular biology, cell biology and immunology at basic level as well as its biochemical importance.

EBC 2: **HUMAN PHYSIOLOGY & CLINICAL BIOCHEMISTRY**

Unit 1: Physiology
Respiration, Renal Physiology & Fluid Balance, Gastrointestinal Physiology, Muscular System & Nervous System

UNIT 2: Endocrinology and Reproduction
Pituitary Hormones and Their Control by the Hypothalamus, Thyroid Hormones, Adrenocortical Hormones, Insulin, Glucagon, Parathyroid Hormone, Calcitonin, Reproductive Hormones of the Male and Female

Unit 3: Drug action
Drug Metabolism and Mechanism of Action, side effects, GMP, GLP, Preclinical and Clinical trials

Unit 4: Diseases
Blood, Diseases of GIT, Inflammatory and Infectious Diseases, Liver diseases, Diseases of Kidney, Diabetes mellitus, Diseases of cardiovascular system and Respiratory System, Malaria, AIDS.

EBC 2: HUMAN PHYSIOLOGY & CLINICAL BIOCHEMISTRY

Objectives:

- The course is designed to assist the students to learn and understand fundamental concepts and principles of respiratory, renal, digestive, cardiovascular, muscle and neuro physiology.
- To develop a vocabulary of appropriate terminology to effectively communicate information related to anatomy and physiology.
- To study the interrelationships within and between anatomical and physiological systems of the human body.
- To understand the basic mechanisms of homeostasis by integrating the functions of cells, tissues, organs, and organ systems.
- To study the roll and mechanism of endocrine system in metabolism, regulation of normal homeostatic condition of body and other physiological functions.

Outcome:

This course will provide a sound basis in human physiology and clinical biochemistry to support in-depth understanding of physiological processes of all body systems in detail and on an appropriate level. Students will able to explain how the activities of organs are integrated for maximum efficiency. Students will be prepared to identify how changes in normal physiology lead to disease and it will support further study in health and medical sciences or related fields. This paper will also provide understanding of hormonal action in human body to regulate normal physiological activity of different organ system as well as metabolic process.

DISSERTATION PROJECT WORK

Dissertation research work is offered to students of Semester I and II to carry out research according to the provision of objectives and teacher guide. Students are eligible to apply in other national and international level research institutes, Universities and industries of high repute to pursue six month dissertation research project for the partial fulfillment of M.Phil. Biochemistry degree.

Reference Books

1. Amino Acid Biosynthesis-Pathways Regulation and Metabolic Engineering by Wendisch, V. F.
2. Analytical Biochemistry 3rd Ed. by Holme, D. J. & Peck, H.
3. Basic Concepts in Biochemistry A Student's Survival Guide by Gilbert, H. F.
4. Biochemistry (3rd ed. 1994) by Rawn J. D.
5. Biochemistry and Molecular Biology of Antimicrobial Drug Action by Franklin, T. J. & Snow, J. A.
6. Biochemistry by Champe
7. Biochemistry by Todd, W. B., Mason, M., Bruggen, R. V. & Macmillan.
8. Biochemistry by Voet & Voet
9. Biochemistry by Mathews 3rd Ed.
10. Biochemistry The Chemical Reactions of Living Cells 2d Ed Vols 1&2 by Metzler, D. E.
11. Biochemistry with Clinical Correlation by Devlin, T. M.
12. Biochemistry: (3rd ed. Vol.1, 2, 3, 1993) by Zubay, J.
13. Biochemistry2ed by Stryer
14. Cell Biology Protocols by Harris, R., Graham, J. & Rickwood, D.
15. Color Atlas of Biochemistry by Koolman, J. & Roehm, K. H.
16. Current Protocols in Protein Science (All Vol) John Wiley & Sons
17. Dynamics of Proteins and Nucleic Acids by Mccammon, J. A. & Harvey, S. C.
18. Enzyme kinetics - a modern approach by Marangoni, A. G.
19. Enzyme Kinetics Principles and Methods by Bisswanger, H.
20. Fundamentals of Biostatistics by Bernard Rosner 5th Ed.
21. Fundamentals of Protein Structure and Function by Buxbaum, E.
22. Harper's Illustrated Biochemistry by Murray, R. K., Granner, D. K., Mayes, P. A. & Rodwell, V. W.
23. Human Nutrition and Dietetics by Davidson & Passmore
24. Human Physiology by Devis
25. Instant Notes in Biochemistry by Hames, B. D. & Hooper, N. M.
26. Introduction to molecular biology by Paolella, P.
27. Introduction to Protein Architecture: The structural biology of proteins by Lesk, A. M.
28. Introductory Biostatistics by Chap T. Le
29. Lehninger Principles of Biochemistry by Nelson, D. L. & Cox, M. M.
30. Modern Experimental Biochemistry by Boyer, R.
31. Molecular Biology of The Cell - Bruce Alberts
32. Nucleic Acids by Bloomfield, V. A., Crothers, D. M. & Tinoco, I.
33. Practical Protein Chromatography by Hutchens, T. W.
34. Principles of Biochemistry by Zubay, J.
35. Protein Biochemistry and Proteomics: Experimental series by Rehm, H
36. Protein purification: principles and practice by Scopes, R. K.
37. Protein structure: a practical approach by Creighton, T. E.
38. Proteins: structure and function by Whitford, D.
39. Textbook of Medical Physiology by Arthur C. Guyton 11th Ed.