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# FIRST-YEAR OF MASTER OF SCIENCE CHEMISTRY REVISED SYLLABUS ACCORDING TO CBCS NEP2020

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COURSE TITLE: BIOORGANIC CHEMISTRY-I  
SEMESTER-III  
W.E.F. 2024-2025

**RECOMMENDED BY THE BOARD OF STUDIES IN CHEMISTRY  
AND  
APPROVED BY THE ACADEMIC COUNCIL**

Devrukh Shikshan Prasarak Mandal's  
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and  
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.  
Tal. Sangameshwar, Dist. Ratnagiri-415804, Maharashtra,  
India

Academic Council Item No:

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangameshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Master of Science
Name of the Department	:	Chemistry
Name of the Class	:	Second Year
Semester	:	Third
No. of Credits	:	02
Title of the Course	:	Bioorganic Chemistry-I
Course Code	:	S606CHT
Name of the Vertical in adherence to NEP 2020	:	Elective
Eligibility for Admission	:	Chemistry Graduate learner seeking Admission to Post Graduate Programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	PG
Pattern of Marks Distribution for SEE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2024-2025
Ordinances /Regulations (if any)		

## Syllabus for Second Year of Master of Science in Chemistry

(With effect from the academic year 2024-2025)

**SEMESTER-III**

**Paper No.- V**

**Course Title: Bioorganic Chemistry-I**

**No. of Credits: 02**

**Type of Vertical: Elective**

**COURSE CODE: S606CHT**

### Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to...

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	draw synthesis of oligonucleotide and structure of protein, nucleosides, DNA and RNA.
CLO-02	Understand	explain mechanism of enzyme action and chymotrypsin catalysed hydrolysis of a peptide bond, chemistry of enzyme
CLO-03	Apply	write the Factors effects on enzyme kinetics.

## Syllabus for Second Year of Master of Science in Chemistry

(With effect from the academic year 2024-2025)

**SEMESTER-III**

**Paper No.- V**

**Course Title: Bioorganic Chemistry-I**

**No. of Credits: 02**

**Type of Vertical: Elective**

**COURSE CODE: S606CHT**

COURSE CONTENT			
Module No.	Content	Credits	No. of Hours
1	<p><b>UNIT-I: Biomolecules-I</b></p> <ul style="list-style-type: none"> <li>○ <b>Amino acids, peptides and proteins:</b> Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins, forces responsible for holding of secondary structures, <math>\alpha</math>-helix, <math>\beta</math>-sheets, super secondary structure. Tertiary structure of protein: folding and domain structure. Quaternary structure.</li> <li>○ <b>Nucleic acids:</b> Structure and function of physiologically important nucleotides (c-AMP, ADP, ATP) and nucleic acids (DNA and RNA), replication, genetic code, protein biosynthesis, mutation.</li> <li>○ <b>Structure:</b> Purine &amp; pyrimidine bases, ribose, deoxyribose, nucleosides and nucleotides (ATP, CTP, GTP, TTP, UTP) formation of polynucleotides strand with its shorthand representation.</li> <li>○ <b>RNAs</b> (various types in prokaryotes and eukaryotes) m- RNA and r- RNA – general account, t- RNA-clover leaf model, Ribozymes.</li> <li>○ <b>DNA:</b> Physical properties – Effect of heat on physical properties of DNA (Viscosity, buoyant density and UV absorption), Hypochromism, Hyperchromism and Denaturation of DNA. Reactions of nucleic acids (with DPA and Orcinol).</li> </ul>	01	15

	<ul style="list-style-type: none"> <li>○ <b>Chemical synthesis of oligonucleotides:</b> Phosphodiester, Phosphotriester, Phosphoramidite and H-phosphonate methods including solid phase approach.</li> </ul>		
2	<p><b>Unit-III: Biomolecules – II</b></p> <ul style="list-style-type: none"> <li>○ Chemistry of enzymes: Introduction, nomenclature, classes and general types of reactions catalyzed by enzymes. Properties of enzymes: a) enzyme efficiency/ catalytic power b) enzyme specificity; Fischer's 'lock and key' and Koshland 'induced fit' hypothesis. Concept and identification of active site.</li> <li>○ Factors affecting enzyme kinetics: Substrate concentration, enzyme concentration, temperature, pH, product concentration etc. Reversible and irreversible inhibition.</li> <li>○ Mechanism of enzyme action: transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Mechanism of chymotrypsin catalyzed hydrolysis of a peptide bond.</li> </ul>	01	15
	<b>Total</b>	<b>02</b>	<b>30</b>

### Access to the Course

The course is available for all the students admitted for Master of Science.

### Methods of Assessment

The assessment pattern would be 60:40, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

### References:

1. Nelson, D. L., and Cox, M. M., (2008) Lehninger principles of Biochemistry 5th Edition, W. H. Freeman and Company, NY., USA.
2. Stryer, Lubert; Biochemistry; W. H. Freeman publishers.
3. Voet, D. and J. G. Voet (2004) Biochemistry, 3rd Edition, John Wiley & sons, Inc. USA.
4. The organic chemistry of drug design and drug action, Richard B. Silverman, 2nd edition, Academic Press.

*Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce and Vid. Dadasaheb Pitre Science College, Devrukh (An Autonomous College Affiliated with University of Mumbai)*

5. Medicinal chemistry, D.Sriram and P. Yogeewari, 2nd edition, Pearson
  6. An introduction to drug design-S. S. Pandeya and J. R. Dimmock (New age international)
  7. Burger's medicinal chemistry and drug discovery. by Manfred E. Wolf
  8. Introduction to Medicinal chemistry. by Graham Patrick
  9. Medicinal chemistry-William O. Foye 18. T. B. of Organic medicinal and pharmaceutical chemistry-Wilson and Gisvold's (Ed. Robert F. Dorge)
  10. An introduction to medicinal chemistry-Graham L. Patrick, OUP Oxford, 2009.
  11. Principles of medicinal chemistry (Vol. I and II)-S. S. Kadam, K. R. Mahadik and K.G. Bothara , Nirali prakashan.
  12. Medicinal chemistry (Vol. I and II)-Burger.
  13. Strategies for organic drug synthesis and design - D. Lednicer Wiley
  14. Pharmacological basis of therapeutics-Goodman and Gilman's (McGraw Hill)
  15. Enzyme catalysis in organic synthesis, 3rd edition. Edited by Karlheinz Drauz, Harold Groger, and Oliver May, Wiley-VCH Verlag GmbH & Co KgaA, 2012.
  16. Biochemistry, Dr U Satyanarayan and Dr U Chakrapani, Books and Allied (P) Ltd.
  17. Bioorganic, Bioinorganic and Supramolecular chemistry, P.S. Kalsi and J.P. Kalsi. New Age International Publishers.
  18. The Organic Chemistry of Enzyme-Catalysed Reactions, Academic Press, By Richard B. Silverman.
  19. Enzymes: Practical Introduction to structure, mechanism and data analysis, By Robert A. Copeland, Wiley-VCH, Inc.
  20. The Organic Chemistry of Biological Pathways By John McMurry, Tadhg Begley by Robert and company publishers.
  21. Bioorganic Chemistry- A practical approach to Enzyme action, H. Dugas and C. Penny. Springer Verlag, 1931
  22. Biochemistry: The chemical reactions in living cells, by E. Metzler. Academic Press.
  23. Concepts in biotechnology by D. Balasubramanian & others.
  24. Principals of biochemistry by Horton & others.
  25. Bioorganic chemistry - A chemical approach to enzyme action by Herman Dugas and Christopher Penney.
  26. Medicinal Natural Products: A Biosynthetic Approach by Paul M. Dewick. 3rd Edition, Wiley.
  27. Organic synthesis in water. By Paul A. Grieco, Blackie.
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