

UNIVERSITY OF MADRAS
B.Sc. DEGREE PROGRAMME IN ADVANCED ZOOLOGY
AND BIOTECHNOLOGY
SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course	CHEMISTRY FOR BIOLOGICAL SCIENCES-I (Other than Physics and Mathematics)						
Paper No.	Generic Elective						
Category	Generic Elective	Year	I/II	Credits	2	Course Code	221E3A
		Semester	I/III				
Instructional hours per week	Lecture	Tutorial	Lab Practice	Total			
	2	-	-	2			
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at providing knowledge on basics of atomic orbitals, chemical bonds, hybridization and fundamentals of organic chemistry nuclear chemistry and industrial chemistry importance of speciality drugs and separation and purification techniques.						
Course Outline	<p>UNIT I - Chemical Bonding and Nuclear Chemistry Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences.</p> <p>Unit II - Industrial Chemistry Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.</p> <p>UNIT III - Fundamental Concepts in Organic Chemistry Hybridization: Orbital overlap hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Polar effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p>						

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Course Outline	UNIT IV - Drugs and Speciality Chemicals Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.	
	UNIT V - Analytical Chemistry Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.	
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.	
Recommended Text	<ol style="list-style-type: none"> 1. A. Rajendran, Text book of Allied chemistry Vol-I & II, Dhanam publications, Chennai, First edition, 2018. 2. V.Veeraian, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, firstedition,2009. 3. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications,Karur,2006. 4. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty thirdedition,2012. 5. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry; SultanChand & sons, New Delhi, twentyninthedition,2007. 	
Reference Books	<ol style="list-style-type: none"> 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company,NewDelhi,twentiethedition,2007. 2. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition,2014. 3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006. 	

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Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

- CO1:** state the theories of chemical bonding, nuclear reactions and its applications.
- CO 2:** evaluate the efficiencies and uses of various fuels and fertilizers.
- CO 3:** explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
- CO 4:** demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.
- CO 5:** analyse various methods to identify an appropriate method for the separation of chemical components.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0