SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

(*Affiliated to Bharathidasan University*)

(Accredited with "A" Grade by NAAC; An ISO 9001:2015 Certified Institution)

SUNDARAKKOTTAI, MANNARGUDI – 614016.

TAMILNADU, INDIA.

B.Sc., BIOCHEMISTRY
REVISED COURSE STRUCTURE WITH SYLLABUS
UNDER CBCS

(*For the candidates admitted in the academic year 2021–2022*)

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(For the candidates admitted in the academic year 2021–2022)

ELIGIBILITY: Those who have completed +2 examinations with Chemistry and Biology as two of the core Subjects

Sem.	Part	Nature of the Course	Course Code	Title of the Course	Inst. Hour/ Week	Credit	Exam Hours	Marks		
								CIA	ESE	Total
I	I	Language Course (LC)-I-Tamil*/Other Languages ** #	21LC101	Ikkala Ilakkiyam	6	3	3	25	75	100
	II	English Language Course (ELC) – I	21ELC101	Language through Literature I (Prose and Communication Skills)	6	3	3	25	75	100
	III	Core Course (CC)-I	21BC101	Fundamentals of Biochemistry	6	6	3	25	75	100
		Core Practical (CP) -I	21BC102P	Fundamentals of Biochemistry Practical	3	2	3	40	60	100
		Allied Course (AC)-I	21ACH101	Allied Chemistry I	4	3	3	25	75	100
		Allied Practical (AP)-I	21ACH102P	Allied Chemistry Practical-I	3	2	3	40	60	100
	IV	Value Education		Value Education	2	2	3	25	75	100
	TOTAL				**30**	**21**	**-**	**-**	**-**	**700**
II	I	Language Course (LC) –II-Tamil*/ Other Languages ** #	21LC201	Idaikkala Ilakkiyamum Pudhinamum	6	3	3	25	75	100
	II	English Language Course (ELC)-II	21ELC201	Language through Literature II (Poetry and Communication Skills)	6	3	3	25	75	100
	III	Core Course (CC)-II	21BC203	Analytical Techniques	6	6	3	25	75	100
		Core Practical (CP) -II	21BC204P	Analytical Techniques Practical	3	2	3	40	60	100
		Allied Course (AC)-II	21ACH203	Allied Chemistry- II	4	3	3	25	75	100
		Allied Practical (AP)-II	21ACH204P	Allied Chemistry Practical- II	3	2	3	40	60	100
	IV	Environmental Studies	-	Environmental Studies	2	2	3	25	75	100
	TOTAL				**30**	**21**	**-**	**-**	**-**	**700**
III	I	Language Course (LC) -III Tamil*/Other Languages ** #	-	-	6	3	3	25	75	100
	II	English Language Course (ELC)-III	-	-	6	3	3	25	75	100
	III	Core Course (CC) -III	-	-	6	6	3	25	75	100
		Core Practical (CP)-III	-	-	3	2	3	40	60	100
		Allied Course (AC)-III	-	-	4	3	3	25	75	100
		Allied Practical (AP)-III	-	-	3	2	3	40	60	100

Sem.	Part	Nature of the Course	Course Code	Title of the Course	Inst. Hour/ Week	Credit	Exam Hours	Marks		
								CIA	ESE	Total
	IV	Non Major Elective I- for those who studied Tamil underPart-I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 butopt for other languages in degree programme	-	-	2	2	3	25	75	100
		TOTAL			**30**	**21**	**-**	**-**	**-**	**700**
IV	I	Language Course (LC) -IV - Tamil* /Other Languages ** #	-	-	6	3	3	25	75	100
	II	English Language Course(ELC) -IV	-	-	6	3	3	25	75	100
	III	Core Course (CC) -IV	-	-	5	4	3	25	75	100
		Core Practical (CP)-IV	-	-	3	2	3	40	60	100
		Allied Course (AC)-IV	-	-	3	3	3	25	75	100
		Allied Practical (AP)-IV	-	-	3	2	3	40	60	100
	IV	Non Major Elective (NME)-II–for those who studied Tamilunder Part I a). Basic Tamil for other language students b). Special Tamil for those who studied Tamil upto +2 butopt for other languages in degree programme	-	-	2	2	3	25	75	100
		Skill Based Elective (SBE) - I	-	-	2	2	3	25	75	100
		TOTAL			**30**	**21**	-	-	-	**800**
V	III	Core Course (CC) -V	-	-	5	5	3	25	75	100
		Core Course (CC) -VI	-	-	5	5	3	25	75	100
		Core Course (CC)-VII	-	-	5	5	3	25	75	100
		Core Practical (CP)-V	-	-	4	3	3	40	60	100
		Major Based Elective (MBE)-I	-	-	5	4	3	25	75	100
	IV	Skill Based Elective (SBE)- II	-	-	2	2	3	25	75	100
		Skill Based Elective (SBE)- III	-	-	2	2	3	25	75	100
		Soft Skills Development		Soft Skills Development	2	2	3	25	75	100
		TOTAL			**30**	**28**	-	-	-	**800**
VI	III	Core Course (CC)-VIII		-	6	6	3	25	75	100
		Core Course (CC)-IX		-	6	6	3	25	75	100
		Core Practical (CP)-VI		-	6	4	3	40	60	100
		Major Based Elective (MBE)-II		-	5	4	3	25	75	100
		Core Course (CC)-X		-	6	6	3	25	75	100
	V	Extension Activities		**Extension Activities-Gender Studies	1	2	3	25	75	100
		Gender Studies		-						
		TOTAL			**30**	**28**	**-**	**-**	**-**	**600**
				G. TOTAL	**180**	**140**	**-**	**-**	**-**	**4300**

CURRICULUM DESIGN

LIST OF ALLIED COURSES

ALLIED COURSE I-CHEMISTRY **ALLIED COURSE II-BIOLOGY**

Subject	No. of Courses	Total Credits
Language Part – I	4	12
English Part –II	4	12
Core Course	9	49
Core Practical	6	15
Allied Course	4	12
Allied Practical	4	08
Non-Major Elective	2	04
Skill Based Elective	3	06
Major Based Elective	2	08
Project	1	06
Environmental Studies	1	02
Value Education	1	02
Soft Skill Development	1	02
Gender Studies	1	01
Extension Activities	-	01 (Credit only)
Total	**43**	**140**

* For those who studied Tamil upto 10^{th} +2 (Regular Stream);

\+ Syllabus for other Languages should be on par with Tamil at degree level;

those who studied Tamil upto 10^{th} +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV;

** Extension Activities shall be outside instruction hours.

Note:

	CIA	ESE
1. Theory	25	75
2. Practical	40	60
3. Project	25	75

Separate passing minimum is prescribed for CIA and ESE

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for ESE shall be 40% out of 75 marks [i.e.30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
The passing minimum for ESE shall be 40% out of 60 marks [i.e. 24 marks]

NON MAJOR ELECTIVE (NME) OFFERED BY THE DEPARTMENT

Semester	Part	Nature of the Course	Course Code	Title of the Course
III	-	NME -I	-	-
IV	-	NME -II	-	-

SKILL BASED ELECTIVE (SBE) OFFERED BY THE DEPARTMENT (PHYTOMEDICINE)

Semester	Part	Nature of the Course	Course Code	Title of the Course
IV	-	SBE-I	-	-
V	-	SBE-II	-	-
V		SBE-III	-	-

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TAMILNADU, INDIA.

DEPARTMENT OF BIOCHEMSITRY

B.Sc., BIOCHEMISTRY

(For the candidates admitted in the academic year 2021–2022)

Question Paper Pattern- (Theory)

Max time: 3 Hours **Max Marks: 75**

Section – A (10 x 2 = 20)

Answer all the questions

Answer in One or Two sentences each

1.
2. } **Unit I**

3.
4. } **Unit II**

5.
6. } **Unit III**

7.
8. } **Unit IV**

9.
10. } **Unit V**

Section – B (5 x 5 = 25)

Answer all the questions

Each answer should not exceed 500 words

11.a. or
b. } **Unit I**

12.a. or
b. } **Unit II**

13.a. or
b. } **Unit III**

14.a. or
b. } **Unit IV**

15.a. or
b. } **Unit V**

Section – C(3 x 10= 30)

Answer any <u>THREE questions</u> in 1200 words

16. Unit I
17. Unit II
18. Unit III
19. Unit IV
20. Unit V

SEMESTER I

Semester: I-CC-I: Fundamentals of Biochemistry
Ins. Hrs./Week: 6 **Course Credit**: 6 **Course Code**:

OBJECTIVES

- To expose the importance of biological macromolecules
- To study the influence and role of structure in reactivity of biomolecules
- To understand the role of biomolecules and their functions

UNIT- I: Carbohydrates (19 Hours)

Carbohydrates- Definition, classification, structure, properties and functions of biologically important carbohydrates viz. monosaccharide (glucose, fructose and galactose), Disaccharides – (sucrose, lactose and maltose) and homo and hetero polysaccharides- starch, glycogen, inulin, cellulose, chitin, hyaluronic acid, chondroitin sulfate and heparin. Interconversion of sugars.

UNIT –II: Proteins (20 Hours)

Definition, classification, structure, properties and functions of amino acids; Peptides and peptide bond. Proteins- Definition, classification, properties, Biological importance. Structure of proteins- primary structure, secondary, tertiary and quaternary structure; forces stabilizing the structure of proteins. Super secondary structure of proteins.

UNIT –III: Lipids (18 Hours)

Fatty acids - Definition, nomenclature, classification, properties and biological significance. Lipids- Definition, classifications properties and biological functions. Simple lipids: oils and waxes. Compound lipids- Definition, properties, structure and functions- Phospholipids, sphingolipids and glycolipids. Lipoproteins – classification and composition. Derived lipids- Definition, properties, structure and functions of steroids. Prostoglandin- Classification, properties, structure and functions.

UNIT- IV: Nucleicacid (17 Hours)

Definition, components of mono nucleotides- bases (pyrimidines, purines), nucleosides, nucleotides. nucleoside. Properties -Denaturation and Renaturation. Polynucleotides- DNA- Definition, properties, composition, structure and biological importance. RNA- Definition, classifications (mRNA, tRNA and rRNA), structure, properties and biological importance.

UNIT –V: Vitamins and Minerals (16 Hours)

Definition and classification, source, structure, properties, daily requirement, deficiency manifestation and biological role of the fat soluble vitamins (A, D, E and K) and water soluble vitamins (C, B1, B2, B3, B5, B6, B9 and B12). Mineral requirements-essential macro minerals- sodium, potassium, calcium, phosphorus and micro minerals- zinc, chromium, iron, selenium- sources and functions.

Total Lecture Hours- 90

COURSE OUTCOME

The students will be able to,

1. Understand the structure, classification, biological functions and properties of carbohydrates
2. Learn the structure of amino acids, and classification, properties and biological functions of proteins.
3. Acquire comprehensive knowledge on structure, classification, nomenclature and functions of lipids.
4. Learn the different types of nucleic acids, their structure and their biological significance.
5. Understand nutrients requirements and the importance of various kinds of vitamin, their sources important biological functions.

TEXT BOOK(S)

1. Deb AC. 2016. Fundamentals of Biochemistry. 7th edition, NCBA Publishers, New Delhi.
2. Jain JL, Sunjay Jain and Nitin Jain. 2018. Fundamentals of Biochemistry. Updated edition. 2020. S.Chand Publishers, New Delhi.
3. Poonam Agarwal. 2020. Review of Biochemistry. 5th edition. CBS Publishers, New Delhi.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 2003. Harper's Illustrated Biochemistry, 26th edition, McGraw-Hill Medical Publishers, New York.
5. Vasudevan DM. 2018. Biochemistry. 9th edition. Aypee Brothers Medical Publishers, New Delhi.

REFERENCE BOOK(S)

1. Anders Liljas. 2019. Textbook of Structural Biology, 2nd edition, World Scientific Publishers, Singapore.
2. Berg JM., Tymoczko JL and Stryer L. 2019. Biochemistry, 9th edition, WH. Freeman Publishers, New York.
3. David L. Nelson and Michael M. Cox. 2017. Lehninger Principles of Biochemistry, 7th edition, WH Freeman Publishers, New York.
4. Lehninger AL, Nelson DL and Cox MM. 2020. Principles of Biochemistry, 8th edition.WH Freeman Publishers, New York.
5. Satyanarayana U and U. Chakrapani. 2020. Biochemistry, 5th Updated edition, Elsevier Publishers, India.

E-RESOURCES

1. http://www1.biologie.uni-hamburg.de/b-online/library/biology107/bi107vc/fa99/terry/sugars.html
2. https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod10.pdf
3. https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod11.pdf
4. https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod12.pdf
5. https://www.pdfdrive.com/biochemistry-books.html

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Semester: I-CP-I: Fundamentals of Biochemistry Practical
Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**:

OBJECTIVES
- To acquire hands on training in quantitative and qualitative analytical techniques

Practicals
1. Safety measures in Laboratories
2. Use of analytical balance and weighting.
3. Preparation & Standardization of laboratory reagents.
4. Calibration of volumetric glass wares (Burette, pipette and measuring cylinder).
5. Handling of Microscope.

QUALITATIVE ANALYSIS
1. Qualitative analysis of carbohydrates (Glucose, Fructose, Galactose, Maltose, Sucrose, Lactose).
2. Qualitative analysis of amino acids (Tryptophan, Tyrosine, Arginine, Proline, Phenyl alanine, Methionine and Histidine)
3. Qualitative analysis of Lipids-Coconut oil, Gingelly oil

QUANTITATIVE ANALYSIS
1. Estimation of reducing sugar by Benedict's quantitative method.
2. Estimation of amino acid by formal titration
3. Estimation of ascorbic acid by titrimetric method using 2,6 - dichlorophenol indophenol.
4. Determination of acid number of edible oil.
5. Determination of saponification number of edible oil.

COURSE OUTCOME
Student are able to
- Familiar with analytical instruments
- Get trained in quantitative and qualitative analytical techniques

TEXT BOOK(S)
1. Anil Kumar, Sarika Garg and Neha Garg, 2012. Biochemical Tests – Principles and Protocols, 1st edition, Vinod Vasishtha Viva Publishers, New Delhi.
2. Jayaraman J. 2011. Manuals in Biochemistry, 1st edition, New Age International Publishers, New Delhi.
3. Pattabiraman TN. 1998. Labouratory Manual in Bio Chemistry – 3rd edition, All India Publishers, Chennai.
4. Sadasivam S and Manickam VA. 2006. Biochemical methods, 3rd edition, New Age international Publishers, New Delhi.
5. Varun Kumar Malhotra, 1996. Practical Biochemistry for students. 4th edition, Jaypee Brothers Medical Publishers, New Delhi.

REFERENCE BOOK(S)

1. Homie DJ and Peck H. 2003. Analytical Biochemistry, 1st edition, Longman group – Rastogic CBS Publishers, New Delhi.
2. Keith Wilson and John Walker, 2015. Principles and Techniques of Practical Biochemistry, 6th edition, Cambridge University press Publishers, USA.
3. Plummer T. 2001. Practical Biochemistry, 3rd edition, McGraw Hill Publishing Company, New York.
4. Sawhney SK, Randhir Singh, 2005. Introductory Practical Biochemistry, 2nd edition, Alpha Science International Limited, United Kingdom.
5. Sergio Caroli and Zyula, 2017. Analytical Techniques for Clinical Chemistry, 1st edition, John Wiley & Sons Inc Publishers, New York.

E-RESOURCES

1. https://www.pdfdrive.com/principals-and-techiniques-of-biochemistry-and-molecular-biology-7th-e18725198.html
2. https://www.pdfdrive.com/practical-textbook-of-biochemistry-for-medical-students-e187182647.html
3. https://www.pdfdrive.com/introduction-to-practical-biochemistry-e33418060.html
4. https://www.pdfdrive.com/practical-biochemistry-e187196416.html
5. https://www.pdfdrive.com/introduction-to-practical-biochemistry-e33418060.html

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***(For the Candidates admitted in the academic year** 2021 – 2022)*

DEPARTMENT OF CHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: I-AC-I: Allied Chemistry I

Ins. Hrs./Week: 4 **Course Credit**: 3 **Course Code**:

OBJECTIVES

- To understand the industrial chemistry and various Preparation of drugs.
- To study the various concepts of resonance and halogen compounds.
- To study the properties of aromatic compounds and organic reactions.

UNIT- I: Industrial Chemistry (11 Hours)

IndustrialChemistry:Fuelgases–Watergas-producergas-LPGgas-Gobargasand naturalgas. Fertilizers–NPK and mixed Fertilizers-soaps and detergents.Cumene process for phenol manufacturing ;Manufacturing of Paracetamol,Chlorophenicol-Preparation of Shampoo.

UNIT- II: Electron Displacement Effects and HalogenCompounds (13 Hours)

Polar effects: Inductive effect –Resonance – Condition for resonance. Consequences of resonance –resonance of energy. Basic property of aniline and acidic property of phenol. Hyperconjugation–Heat of hydrogenation - Bondlength and dipolemoment – Steric effect. Halogen containing compounds: Important chlorohydrocarbons used as solvents. Pesticides–Dichloromethane-chloroform-carbontetrachloride-DDT and BHC Types of solvents- Polar, Nonpolar.

UNIT - III : Aromatic Compounds and Organic Reactions (13 Hours)

Aromatic compounds: Structure, stability resonance and aromaticity of benzene. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, properties and uses. Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Haloform reactions. Chemotherapy: Explanation with two examples each for analgesics, antibacterial, anti-inflammatory, antibiotics, antiseptic and disinfectant, anesthetics local and general (Structure not necessary)

UNIT – IV: Solid State, Energetics and Phase Rule Reactions (12Hours)

Solid state: Typical crystal lattices- unitcell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices. Energetics: First law of thermodynamics–state and path function–need for the second law–carnots cycle and thermo-dynamic scale of temperature, spontaneous and Non–spontaneous processes–entropy–Gibbs free energy. Phaserule: Phase, component, degree of Freedom, phase rule definitions-one component system–water system.

UNIT –V: Chemical Equilibrium and Chemical Kinetics Reactions (11 Hours)

Chemical equilibrium: Criteria of homogeneous and heterogeneous equilibria,- decomposition of HI, N_2O_4, $CaCO_3$, PCl_5.

Chemical Kinetics: Order of reaction and their determinations- activationenergy, effects of temperature on reaction rate.

Total Lecture Hours- 60

COURSE OUTCOME

1. Study the preparation of some drugs, and industrial chemistry.
2. Learn the concepts of resonance and halogen compounds are known.
3. Learn Aromatic compounds and organic reactions.
4. Understand the concepts of solid state chemistry.
5. Understand the principle of kinetics.

TEXT BOOK(S)

1. Biswas AK. 1989. Frontiers in Applied Chemistry, Narosa publishing house.
2. James A. Andley. 2018. Industrial chemistry, 9 th edition, John Wiley Publishers ,New Jersey.
3. James A. Kent. 2017. Riegel's handbook of Industrial Chemistry, 9 th edition , S.Chand Publishers, Kochi, Kerala.
4. Nafis S. 2019. Organic Chemistry ,11 th edition , S.Chand Publishers, Kochi, Kerala.
5. Thangamma Jacob and Macmillian , 1990. Textbook of Applied Chemistry, India Ltd. Mumbai.

REFERENCE BOOK(S)

1. Geralad H. Hollack. 2013. Fourth phase of water, Pearson Publishers, India.
2. Gopalan R. 2012.Text Book of Inorganic Chemistry, 2nd edition, Hyderabad, Universities Press, (India).
3. Morrison RT and RN and SK. Boyd Bhattacharjee SK. 2011. Organic Chemistry, 7th edition, Pearson India.
4. Puri BR, LR. Sharma LR and MS. Pathania MS. 2013. Principles of Physical Chemistry, 35th edition, New Delhi: Shoban Lal Nagin Chand and Co
5. Soni PL and HM.Chanurel. HM. 2012. A text book of Organic Chemistry, S.Chand Publishers, Kochi, Kerala.

E- RESOURCES

1. https://www.springer.com/gp/book/9781461442592
2. https://mltcollege.org/wp content/uploads/2020/05/Electron displacement-effect.pdf
3. https://www.sciencedirect.com/book/9780080129488/aromatic-chemistry
4. https://www.freebookcentre.net/Electronics/Solid-State-Devices-Books.html
5. https://www.springer.com/gp/book/9783030171797

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Semester: I-AP-I: Allied Chemistry Practical-I

Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**:

OBJECTIVES

- To determine the concentration of solution
- To learn the technique of titrimetric analysis.
- To describe the estimation of several cations and anions.

I. Acidimetry and alkalimetry

(a) Strongacid VS Strongbase

(b) Weakacid VS Strongbase

(c) Determination of hardness of water.

II. Permanganometry

(a) Estimation of ferrous sulphate

(b) Estimation of oxalicacid

III. Iodometry

(a) Estimation of potassium dichromate

(b) Estimation of potassium permanganate

Scheme for Practical Evaluation.

Volumetric Estimation	**- 50 marks**
Record	-10 marks
Internal Assessment	– 40marks
Volumetric Analysis:	**- 50 marks**
Procedure	-15 marks
Results	
<2%	-50marks
2-3%	-40 marks
3-4%	-30marks
>4%	-20marks

COURSE OUTCOME

The students will be able to,

1. Evaluate the principle of redox chemistry in inter chealation reactions.
2. Learn the art of preparation of solutions of various molar concentrations.
3. Standardize various solutions.
4. Estimate the amount of substance present in a given solution.
5. Utilize the mathematical skills to use formulae and find solutions

TEXT BOOK(S)

1. Berry AJ. 2014. Volumetric Analysis (First edition), Cambridge University press, UK.
2. Gopalan R. 2000. Elements of analytical chemistry, S.Chand, New Delhi.
3. Lalitha Pottail and Subashini Sripathi. 2017. V Pubishing volumetric analysis and systematic analysis of organic compounds, First edition, Lap Lambert Academic Pubishing, USA.
4. Longman 1989. Vogel's Text Book of Quantitative Chemical Analysis, 5th edition, Engl.
5. Peter McPherson. 2014. Practical volumetric analysis, Royal Society of Chemistry.

REFERENCE BOOK(S)

1. Arthur I Vogel. 2010. Elementary practical organic chemistry (second edition), Pearson education.
2. Chirag R Fultariya DR, Jalap P Harsor DR, 2017, Volumetric analysis: concepts and experiments, First edition, Lulu.Com.
3. Frederick George Mann, Bernard Charles Saunders, Practical organic chemistry, Longman London and New York.
4. Gnanapragasam NS, Ramamurthy G. 1998. Organic Chemistry lab manual, S.Viswanathan and Co. Pvt. Ltd. Chennai.
5. Henry W Schimpf. 2009. A text book of volumetric analysis Bibliolife.
6. Venkateswaran V, Veerasamy R, Kulandaivelu AR. 2006. Basic principles of Physical Chemistry, Secondedition, Sultan Chand & Sons, New Delhi.

E-RESOURCES

1. https://byjus.com/chemistry/volumetric-analysis/
2. http://www.veerashaivacollege.org/images/pdf/study_material/volumetric_analysis.pdf
3. https://www.powershow.com/view0/86886c-zwmzn/volumetric_analysis_core_practical_chemistry_powerpoint_ppt_presentation
4. https://www.researchgate.net/publication/267029826_practical_volumetric_analysis
5. https://chemistry.tcd.ie/assets/pdf/preliminary%20course/titration%20demonstration.pdf

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SEMESTER II

Semester: II-CC-II: Analytical Techniques

Ins. Hrs./Week: 6 **Course Credit**: 6 **Course Code**:

OBJECTIVES

- To enable the students to have a deep knowledge on the techniques for measurement of biophysical factors in living organisms.
- To enable the students to get an insight on the usage of various techniques and their applications in industry and R&D.
- To develop competence in handling various chromatographic techniques and apply them in isolating and characterizing different biological molecules.

UNIT- I: Colorimetry (16 Hours)

Beer Lambert's Law, Light absorption and its transmittance, Absorption Spectroscopy - Principle, instrumentation and applications of colorimetry and UV-Vis spectrophotometer. Emission Spectroscopy – Spectrofluorimeter - Principle, instrumentation and applications. Flame photometry - principle and applications.

UNIT- II: Chromatographic Techniques (19 Hours)

Chromatography - Principle, method and applications of paper, thin layer, ion exchange, affinity chromatography, gel permeation chromatography and Gas liquid chromatography, Hydrophobic interaction chromatography, liquid chromatography, reverse phase chromatography, liquid chromatography, gel filtration chromatography, flash chromatography. Partition and adsorption chromatography.

UNIT- III: Centrifugation Techniques (19 Hours)

Cell disruption and homogenization-Media for homogenization, methods of cell disruption. Centrifugation - principle- sedimentation coefficient, RCF. Types of centrifuges and rotors. Preparative centrifugation differential, density gradient centrifugation, and Analytical ultracentrifugation – instrumentation and applications - Determination of molecular weight.

UNIT- IV: Electrophoretic techniques (19 Hours)

Electrophoresis - Principles and applications of electrophoresis, Factors affecting electrophoretic mobility. Types of electrophoretic techniques – zonal, capillary, paper and agarose gel. PAGE- Native - PAGE and SDS PAGE. Staining method used in electrophoretic technique, Isoelectric focusing. General scheme for purification of biocomponents.

UNIT- V: Radio isotopic techniques (17 Hours)

Types of radioactive decay, rate of radioactive decay, decay constant, Units of radio activity, measurement of radioactivity based on ionization- GM counter and excitation- Scintillation counter. Autoradiography. Applications of radioisotopes in biology. Hazards of radioactivity, CT scan, MRI scan, Doppler.

Total Lecture Hours- 90

COURSE OUTCOME

The students will be able to,

1. Acquire practical training to handle the instruments like colorimeter, spectrophotometer and to use them for biochemical determinations.
2. Acquire practical skill to separate proteins by gel filtration and PAGE, and are able to separate amino acids and sugar using the techniques of paper/thin layer chromatography, students.
3. Learn about the principle and applications of spectrophotometry, different chromatographic techniques like gel filtration, Ion exchange, thin layer, etc.
4. Students also learn about various electrophoretic techniques such as cellulose acetate, gel, PAGE, etc. and their applications in analyzing proteins and nucleic acids.
5. Learn the basic principles of centrifugation, various types of centrifuges, rotors and methods for subcellular fractionation

TEXT BOOK(S)

1. West, E.S. and Todd, W.R., MacMillan, Textbook of Biochemistry, 1985 Germany.
2. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, 2014 Biophysical Chemistry (Principles and Techniques) 4th Edition Himalaya Publishing House, India.
3. Keith Wilson & John Walker, 2005, Principles and Techniques of Practical Biochemistry Cambridge University Press, India.
4. Rajan Katoch. 2011. Analytical Techniques in Biochemistry and Molecular Biology, 1st edition, Springer New York Dordrecht Heidelberg London Publishers, United Kingdom.
5. Sabari and Srivastava A. K., 2009, Fundamentals of Bio Analytical Techniques and InstrumentationGhosal PHI Learning Pvt. Ltd. India.

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1. Abhilasha Shourie and Shilpa S Chapadgaonkar, 2015, Bioanalytical Techniques, The Energy and Resources Institute, TERI, India.
2. C.R. Kothari, 2004 Research Methodology, Methods and Techniques, 2nd ed, New Age International Publishers. India.
3. Braun, R.P, 1987, Introduction to Instrumental Analysis, Tata McGraw Hill, India.
4. Pavia et al, 2000, Introduction to Spectroscopy. 3rd Edition, Brooks/Cole Pub Co., New Delhi, India.
5. Machve, K. and Neha, K. 2010, Basic Instrumentation, Publishers & Distributors, India.

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3. https://nptel.ac.in/content/storage2/courses/102103047/PDF/mod3.pdf
4. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf
5. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf

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Semester: II-CP-II: Analytical Techniques Practical
Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**:

OBJECTIVES
- To make the students to learn separation techniques and handling of certain laboratory equipments

PRACTICALS
1. Preparation of Buffers and measurement of pH.
2. Titrable acidity of Aminoacids
3. Measurement of Blood pressure
4. Calculate Body Mass Index (BMI)
5. Handling of Colorimeter and Spectrophotometer
6. Estimation of RNA by Orcinol method.
7. Estimation of DNA by Diphenylamine method.

DEMONSTRATION
1. Paper Chromatography for separations and detections of simple Sugars and Aminoacids.
2. Separation of plant pigments by Column Chromatography.
3. Thin Layer Chromatography of Aminoacids.
4. ECG
5. EEG
6. Doppler
7. CT-SCAN
8. MRI-SCAN

COURSE OUTCOME
- Students acquire skill in handling some specified equipments and their application
- Able to separate amino acids and sugars using chromatographic techniques

TEXT BOOK(S)
1. David Plummer. 1988. A Textbook of Practical Biochemistry.Tata McGraw- Hill Education.
2. Peramachi Palanivelu. 2018. Analytical Biochemistry and Separation Techniques - A Laboratory Manual, 4 th edition, Twenty first century Publishers, Srilanka.
3. Rajan Katoch. 2011. Analytical Techniques in Biochemistry and Molecular Biology, 1st edition, Springer New York Dordrecht Heidelberg London Publishers, United Kingdom.
4. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath. 2014. Biophysical Chemistry (Principles and Techniques), 4th edition, Himalaya Publishers, Hyderabad.
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1. Methods in Enzymology Vol. I and II by S.P. Colowick and N.O. Kaplan eds. New York:

Academia Press, 1955.
2. Jayaraman, J. 1981. Laboratory Manual in Biochemistry. New Age International Publishers. 2nd Edition.1981.
3. Alan H Gowenlock, 1988. Varley's Practical Clinical Biochemistry, Sixth Edition, CBS Publishers and distributors, India.
4. Kothari, C.R. 2004. Research Methodology, Methods and Techniques, 2nd edition, New Age International Publishers, India.
5. Ghosal Sabari and Srivastava A, 2009. Fundamentals of Bio Analytical Techniques and Instrumentation, 2nd edition, PHI Learning Pvt. Ltd. India.

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4. https://www.healio.com/cardiology/learn-the-heart/ecg-review/ecg-interpretation-tutorial/introduction-to-the-ecg
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Semester: II-AC-II: Allied Chemistry- II

Ins. Hrs./Week: 4 **Course Credit**: 3 **Course Code**:

OBJECTIVES

- To learn the basics of nuclear chemistry**.**
- To understand the properties and applications of carbohydrates, aminoacids and proteins.
- To study the basic concepts of polymers, heterocyclic compounds.

UNIT- I: Nuclear Chemistry (12 Hours)

Nuclear Chemistry: Fundamental particles of nucleus- isotopes, isobars, isotones and isomers–differences between chemical reactions and nuclear reactions, nuclear fusion and fission-radioactive series. Nuclear chain reactions-Breeder reaction-Nuclear power plant

UNIT- II: Carbohydrates, Amino acids and proteins (12 Hours)

Carbohydrates: classification – glucose and fructose – preparation and properties–structure of glucose Fischer and Haworth cyclic structures.
Amino acids and proteins: Amino acids – Classification based on structure. Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment). Zwitterion. Isoelectric point.

UNIT- III: Hetero cyclic compounds, Vitamins and Drugs (12Hours)

Heterocyclic compounds: Furan, pyrrole and pyridine–preparation, properties and uses basic properties of pyridine and pyrrole. Vitamins: Biological activities and deficiency diseases of Vitamin A, B, C, D, E and K -Hormones- Functions of insulin and adrenaline. Drugs- Sulpha Drugs- Uses and Mode of action of Sulpha Drugs. Antibiotics- Uses of Penicillin, Chloramphenicaol, streptomycin.

UNIT- IV: Surface and Photo Chemistry (12Hours)

Surface Chemistry: Introduction to surface chemistry absorption, adsorption physisorption- chemisorption –Difference between phyisorption and chemisorption. Emulsions, gels – preparation, properties - Electrophoresis and applications. Photochemistry : Laws of photochemistry - Lambert and Beer's law, Grothus Drapper law and Stark Einstein law of photochemical equivalance its and applications.

UNIT –V: Chromatographic Techniques (12 Hours)

Introduction to Qualitative and Quantitative Analysis –Error Analysis- Mean, Median, Mode, Standard Deviation (Only Definition) Chromatographic

separations - Principles and application of column, paper, thin layer chromatography.

Total Lecture Hours- 60

COURSEOUTCOME

The students will be able to,

1. Know the applications of physical, inorganic and organic chemistry towards biological systems.
2. Recognize and predict the structure and reactivity of biologically important organic molecules
3. Understand the synthesis of biologically important organic molecules and their role in metabolic pathways
4. Understand the building blocks of both DNA and RNA, secondary structures, tertiary structures.
5. Understand hetero cyclic compounds and separation techniques

TEXT BOOK(S)

1. Brian Wardle. 2019. Principles and applications of photochemistry, 4th edition, John Publishers.
2. Jain JL. 2017. Elementary Bio-Chemistry, 2nd Revised edition, S. Chand & Company.
3. James M Miller. 2019. Chromatography contrast and concept, 5th edition, Wiley publishers.
4. Raj K Pansal. 2017. Heterocyclic compounds, 5th edition, New Age publishers.
5. Sathyanarayana U. 2019. Essentials of Bio-Chemistry, 3rd edition, Books & Allied Pvt. Ltd.

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1. Bahl BS, and Bahl A. 2010, Organic Chemistry, 12th edition, Sultan Chand & Co, New Delhi.
2. Puri B.R, Sharma LR, Kalia KC. 2004-2005. Principles of Inorganic Chemistry, 21st edition, Vallabh Publications.
3. Puri BR, Sharma LR, Pathania MS. 2013. Principles of Physical Chemistry, (35th edition), Shoban Lal Nagin Chand and Co, New Delhi.
4. Vaithyanathan S and Others. 2019. Textbook of Ancillary Chemistry,2nd Edition, Priya Publications, Karur.
5. VeeraiyanV.2016.Textbook of Ancillary chemistry, Highmount Publishing house,14th Edition, (Both in Tamil and English) Chennai.

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Semester: II-AP-II: Allied Chemistry Practical- II
Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**:

OBJECTIVES

- To introduce the fundamental methods and procedures used in the analysis of organic compounds at micro and semi-micro scale.
- To perform laboratory experiments to demonstrate the synthetic reactions
- To make them able to identify, classify, analyze organic molecules

Organic Qualitative Analysis

Analyze the following organic Compounds.

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

Scheme of Evaluation

Organic Qualitative Analysis	**50 marks**
Identification of Nitrogen	5marks
Saturated and unsaturated	5marks
Aliphatic or Aromatic	5 marks
Preliminary reactions with Procedure	**15marks**
Functional group identification Correctly	10marks
Confirmative test	10marks
Record	10 marks

COURSEOUTCOME

The students will be able to,

1. Learn practical knowledge in the synthesis of organic compounds on lab scale.
2. Understand the common organic reactions.
3. Analyze various organic compounds using documented procedures.
4. Classify organic compounds based on functional groups.
5. Distinguish the reactions of various functional groups.

TEXT BOOK(S)

1. Arthur I Vogel. 2010. Elementary practical organic chemistry second edition,

Pearson education.
2. Chirag R Fultariya, DR. Jalap P Harsor. 2017. Volumetric analysis: concepts and experiments First edition, Lulu.
3. Frederick George Mann, Bernard Charles Saunders. Practical organic chemistry, Longman London and New York.
4. Gnanapragasam NS and Ramamurthy G. 1998. Organic Chemistry lab manual, S.Viswanathan and Co. Pvt. Ltd. Chennai.
5. Henry W. Schimpf. 2009. A text book of volumetric analysis Bibliolife.
6. Venkateswaran V, Veerasamy R, Kulandaivelu AR. 2006. Basic principles of Physical Chemistry, Second edition, Sultan Chand & Sons, New Delhi.

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1. Ahluwalia, Sunita Dhingrs VK. 2000. Comprehensive practical organic chemistry University Press.
2. Gopalan R. 2000. Elements of analytical chemistry, S.Chand, New Delhi.
3. Satinder K Juneja, Aran Kumar. 2021. Practical Chemistry, S.Vinesh & Co
4. Vagish CB. 2018. Organic analysis, Kindle Edition.
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3. pubs.acs.org/doi/10.1021/ac071150w
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