

## STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

### **Institutional Learning Outcomes**

Stella Maris College, an autonomous Catholic institution of higher education, is committed to the highest standards of academic excellence based on sound values and principles, where students are strengthened with whole person education to lead purposeful lives in service to the community and the nation.

The Institutional Learning Outcomes (ILOs) of Stella Maris College (SMC) reflect the broader mission and purpose of the institution. They are the overarching set of learning outcomes that all students, regardless of discipline, must achieve at graduation. All programme and course learning outcomes are mapped to the institutional outcomes, thus reflecting an overall alignment of values, knowledge and skills expected at programme completion. ILOs are designed to help guide individual departments and disciplines in the development of their programme learning outcomes.

The ILOs of SMC are formed by two components:

1. **Core commitments:** Knowledge and scholarship, values and principles, responsible citizenship, service to community
2. **Institutional values:** Quest for truth, spirit of selfless service, empowerment

### **Upon graduation, students of Stella Maris College will**

- Display mastery of knowledge and skills in their core discipline (**Knowledge and Scholarship**)
- Exhibit in all actions and attitudes a commitment to truth and integrity in all contexts, both personal and professional (**Values and Principles**)
- Demonstrate knowledge about their role in society at local and global levels, and actively work for social and environmental justice (**Responsible Citizenship**)
- Engage in the process of self-discovery through a life-long process of learning (**Quest for truth**)
- Demonstrate readiness to serve those who are in need (**Spirit of selfless service**)
- Be able to function effectively and with confidence in personal and professional contexts (**Empowerment**)

## **STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**

### **Programme Learning Outcomes/Intended Programme Learning Outcomes**

Graduates of a Bachelor's Degree will have a broad and coherent body of knowledge in their disciplines, with a deep understanding of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning.

#### **At the end of an undergraduate programme students will be able to**

- Describe and define critical concepts in their discipline
- Explain and discuss concepts and ideas pertaining to their discipline
- Demonstrate a broad understanding of their discipline
- Demonstrate communication skills to present a clear, coherent and independent exposition of knowledge and ideas
- Demonstrate understanding of the interconnections of knowledge within and across disciplines
- Apply knowledge, theories, methods, and practices in their chosen field of study to address real-world challenges and opportunities
- Demonstrate proficiency in experimental techniques and methods of analysis appropriate for their area of specialisation
- Generate and analyse data using appropriate quantitative tools
- Construct and test hypotheses
- Demonstrate cognitive and technical skills to synthesise knowledge in interrelated disciplines
- Demonstrate critical thinking and judgement in identifying and solving problems with intellectual independence
- Demonstrate the skills needed to be able to function successfully in their field
- Show responsibility and understanding of local and global issues
- Demonstrate through their actions and speech that they are agents of social justice and change
- Practice the discipline's code of ethics in their academic, professional and personal lives
- Practice the values of democracy and principles of human rights
- Show self-awareness and emotional maturity
- Demonstrate career and leadership readiness
- Demonstrate intercultural, interracial, interclass, inter-caste, and ethical competency
- Exhibit the ability to work in teams
- Exhibit a strong sense of professionalism in a range of contexts
- Demonstrate sensitivity and readiness to share their knowledge, experience, and capabilities with the marginalised and oppressed in their communities

**STELLA MARIS COLLEGE (AUTONOMOUS), CEHNNAI – 600 086**

**DEPARTMENT OF CHEMISTRY**

**PROGRAMME DESCRIPTION**

The Bachelor of Science degree in Chemistry at Stella Maris College aims to provide quality education in Chemistry and prepares students for advanced postgraduate study in Chemistry. The programme offers practical skills to students through extensive hands-on experience with state-of-the-art scientific equipment thereby giving them the requisite skills for problem solving, data analysis and interpretation. With its emphasis on interdisciplinary research skill development, the undergraduate programme builds on a core of courses covering the principal areas of Chemistry such as Organic, Inorganic, Physical and Analytical Chemistry.

Distinguished professors specialised in specific areas of Chemistry are invited to conduct classes to prepare students for competitive exams. The students acquire critical thinking, independent and team learning and opportunities for undergraduate research. To keep abreast with current trends in Chemistry, eminent scientists are invited to deliver lectures on significant areas of research and interact informally with the faculty and students.

**PROGRAMME SPECIFIC LEARNING OUTCOMES**

At the end of a Bachelor of Science programme in Chemistry students will be able to

- Demonstrate knowledge and understanding of the fundamental concepts in all areas of chemistry
- Demonstrate critical thinking, analytical reasoning and judgement in identifying and solving scientific problems with intellectual independence
- Design and carry out scientific experiments as well as accurately record and analyse the results of the experiments
- Demonstrate communication skills to present a clear, coherent and independent exposition of knowledge and ideas
- Develop the ability to communicate scientific information and research results in written and oral formats
- Demonstrate understanding of the interconnections of knowledge within and across disciplines
- Apply knowledge, theories, methods and practices in their chosen field of study to address real-world challenges and opportunities

- Understand the interdisciplinary nature of Chemistry and to integrate knowledge of Mathematics, Physics and other disciplines to a wide variety of chemical problems
- Explore new areas of research in both Chemistry and allied fields of science and technology
- Generate and analyse data using appropriate quantitative tools
- Construct and test hypotheses
- Appreciate the vital role of Chemistry in our society and use this as a basis to show responsibility and understanding local and global issues, including an understanding of safe handling of chemicals
- Practice the discipline's code of ethics in their academic, professional and personal lives
- Practice the values of democracy and principles of human rights
- Show self-awareness and emotional maturity
- Demonstrate career and leadership readiness
- Exhibit the ability to work in teams
- Exhibit a strong sense of professionalism in a range of contexts
- Demonstrate sensitivity and readiness to share their knowledge, experience, and capabilities with the marginalised and oppressed in their communities



**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI 600 086**

**B.Sc. DEGREE : BRANCH IV - CHEMISTRY**

**COURSES OF STUDY**

**(Effective from the academic year 2019-2020)**

**CHOICE BASED CREDIT SYSTEM**

C-Credit, L-Lecture Hours, T-Tutorial Hours, P- Practical Hours, Ex-Exam Hours, CA- Continous Assessment Marks, ES-End Semester Marks, M-Maximum Marks									
Subject Code	Title of Course	C	L	T	P	Ex	CA	ES	M
<b>SEMESTER-V</b>									
19CH/MC/OC54	Organic Chemistry III	4	4	1	0	3	50	50	100
19CH/MC/PC54	Physical Chemistry II	4	4	1	0	3	50	50	100
19CH/MC/BC54	Biochemistry	4	4	1	0	3	50	50	100
19CH/MC/P551	Biochemistry Practical	1	0	0	2	3	50	50	100
19CH/MC/P652	Physical Chemistry Practical I	2	0	0	3	3	50	50	100
<b>Interdisciplinary Core Course (CH and BT) to students of Chemistry and Botany</b>									
19ID/IC/BA55	Bioanalytical Techniques	5	5	1	0	3	50	50	100
	General Elective III	2	2	0	0	-	50	-	100
	SAP / SL	2	2	0	0	-	50	-	100
<b>SEMESTER-VI</b>									
19CH/MC/IC64	Inorganic Chemistry II	4	4	1	0	3	50	50	100
19CH/MC/PC64	Physical Chemistry III	4	4	1	0	3	50	50	100
19CH/MC/SP64	Spectroscopy	4	4	1	0	3	50	50	100
19CH/MC/P761	Organic Chemistry Practical II	1	0	0	2	3	50	50	100
19CH/MC/P862	Physical Chemistry Practical II	2	0	0	3	3	50	50	100
19VE/SS/HL63	Life Skills:An Approach to a Holistic Way of Life	2	2	0	0	-	50	-	100
	General Elective IV	2	2	0	0	-	50	-	100
	Major Elective II								
<b>Major Elective Courses</b>									
19CH/ME/PH45	Pharmaceutical Chemistry	5	4	0	1	3	50	50	100
19CH/ME/PL45	Polymer Chemistry	5	4	0	1	3	50	50	100
19CH/ME/CC45	Computers in Chemistry	5	3	0	2	3	50	50	100
19CH/ME/FC45	Food Chemistry	5	4	0	1	3	50	50	100
19CH/ME/PR45	Project	5	0	0	5	-	50	50	100
<b>General Elective Courses</b>									
19CH/GE/CP22	Cosmetics and Personal Care	2	2	0	0	-	50	-	100
19CH/GE/NH22	Nutraceuticals and Health Care	2	2	0	0	-	50	-	100
19CH/GE/FA22	Food Quality and Detection of Food Adulteration	2	1	0	1	-	50	-	100
19CH/GE/BN22	Basic Nutritional Chemistry	2	2	0	0	-	50	-	100
19CH/GE/FC22	Forensic Chemistry	2	2	0	0	-	50	-	100
19CH/GE/CE22	Chemistry in Everyday Life	2	2	0	0	-	50	-	100
<b>Independent Elective Courses</b>									
19CH/UI/IC23	Industrial Chemistry	3	0	0	0	3	-	100	100
19CH/UI/DD23	Drugs and Diseases	3	0	0	0	3	-	100	100

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**GENERAL CHEMISTRY**

**CODE:19CH/MC/GC14**

**CREDITS: 4**

**L T P: 4 1 0**

**TOTAL TEACHING HOURS: 65**

**OBJECTIVES OF THE COURSE**

- Explain the nature of electromagnetic radiation by describing its wave properties: wavelength ( $\lambda$ ), frequency ( $\nu$ ) and speed ( $c$ )
- Describe the quantum mechanical model of the atom including the relationships among the following concepts: the wave properties of electrons, Heisenberg's uncertainty principle, orbitals, electron density, and probability
- Understand the causes and properties of radiation and radioactivity.
- To understand different types of electronic displacements in covalent bonds provide an overview of Organic Chemistry
- Recognize and distinguish between aromatic and anti-aromatic compounds by their structures.

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Evaluate the molecular geometry, hybridization and polarity of a covalent molecule
- Appreciate the significance of quantum numbers
- Demonstrate the type of molecular bonding (s or p) in a covalent molecule and identify the orbitals used for bonding
- Draw the resonance structures and predict the order of stability
- Explain the effect of electronic displacements in covalent bonds on molecular stability and chemical reactivity
- Classify organic compounds as aromatic/anti-aromatic/non-aromatic

**Unit 1**

**(15 Hours)**

**Atomic structure**

- 1.1 Rutherford's nuclear model of the atom. Planck's quantum theory of radiation. Photoelectric effect. Bohr's theory, its limitations and atomic spectrum of hydrogen atom.
- 1.2 Wave mechanics: de Broglie equation, Davisson - Germer experiment. Heisenberg's principle of uncertainty. Compton Effect.
- 1.3 Postulates of Quantum mechanics; operators- Hermitian operators, Laplacian and Hamiltonian operators, Eigen functions and Eigen values of operators. Conditions for a well behaved function, Schrodinger wave equation (no derivation). Significance of  $\psi$  and  $\psi^2$
- 1.4 Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Shapes of orbitals (s, p, d, f)

**Unit 2** (5 Hours)

**Introduction to Chemical bonding**

- 2.1 Types of Bonds - Ionic, Covalent, Metallic, Coordinate Bonds and their Properties.
- 2.2 Lattice Energy - Born-Landé Equation (No Derivation) - Factors affecting Lattice Energy
- 2.3 Born Haber Cycle and its Applications

**Unit 3** (10 Hours)

**Covalent Bond**

- 3.1 Covalent Bond – Lewis Structures of Simple Molecules and Ions, Valence Shell Electron Pair Repulsion Theory {[BF<sub>4</sub>]<sup>-</sup>, NH<sub>3</sub>, H<sub>2</sub>O, PCl<sub>5</sub>, SF<sub>4</sub>, ClF<sub>3</sub>, I<sub>3</sub><sup>-</sup>}. Covalent Character in Ionic Compounds - Polarisation and Fajan's Rules
- 3.2 Valence Bond Theory (VBT) – Hybridization of orbitals (BeF<sub>2</sub>, BF<sub>3</sub>, CH<sub>4</sub>)
- 3.3 Molecular Orbital Theory (MOT) – Bonding, Antibonding and Nonbonding Orbitals. Application of MOT to He<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, O<sub>2</sub><sup>-</sup>, O<sub>2</sub><sup>2-</sup>, CO, NO, HF, Comparison between VBT and MOT

**Unit 4** (15 Hours)

**Nuclear Chemistry**

- 4.1 Elementary Particles - Concept of Nuclides, Representation of Isobars, Isotones, Isotopes with Examples. Nucleus Structure – Liquid Drop and Shell Model. Nuclear Stability –  $n/p$  Ratio, Binding Energy, Mass Defect and Magic Numbers
- 4.2 Radioactive Elements, Modes of Decay – Neutron, Positron Theory of  $\alpha$ ,  $\beta$  and  $\gamma$  emission, Characteristics of  $\alpha$ ,  $\beta$  and  $\gamma$  particles, K-Electron Capture and Positron emission. Half-Life Period, Geiger – Nuttall Rule. Radioactive Displacement Laws – Soddy, Fajan and Russel. Radioactive Decay Series  $4n$ ,  $4n+1$ ,  $4n+2$  and  $4n+3$
- 4.3 Detection and Measurement of Radioactivity - Ionization Chamber, Geiger-Muller Counter and Scintillation Counter. Artificial Radioactivity - Artificial Transmutation of Elements, Nuclear Reactions – Nuclear Fusion and Fission

**Unit 5** (20 Hours)

**Introductory Organic Chemistry**

- 5.1 IUPAC Nomenclature of Organic Compounds
- 5.2 Types of Organic Reaction and Reagents: Nature of Bond Fission – Homolytic and Heterolytic. Types of Reagents – Electrophiles and Nucleophiles. Substitution, Addition, Elimination and Rearrangement Reactions (Definition with an example)
- 5.3 Reactive Intermediates with Examples – Carbocations, Carbanions and Free Radicals - Conditions Favouring their Formation, Stability and Structure, their Reactions with Examples. Electron Displacement Effects - Inductive, Electromeric, Mesomeric, Resonance, Hyper-Conjugation and Steric Effects – Tautomerism
- 5.4 Concept of Aromaticity – Definition, Huckel's Rule – Application to Benzenoid and Non-Benzenoid Compounds-Benzene, Naphthalene, Cyclopropenyl Cation, Cyclopentadienyl Anion and Tropylium Cation



## BOOKS FOR STUDY

J.D. Lee. *Concise Inorganic Chemistry*. New Delhi: Oxford University Press, 2018.  
Jain M.K, Sharma S.C., *Modern Organic Chemistry*, Vishal publishing & Co, 2017  
Morrison .R.T. Boyd R.N & Bhattacharjee.S.K. *Organic Chemistry*. Pearson, Dorling Kindersley 2016.  
Puri,B.R., L.R. Sharma., Madan S. Pathania. *Principles of Physical Chemistry*. New Delhi: Vishal, 2018.  
Puri B.R, Sharma L.R & Kalia K.C. *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2017.

## BOOKS FOR REFERENCE

Arinikar H.J. *Essentials of Nuclear Chemistry*. New Delhi: New Age International, 2011.  
Madan R.D. *Satyaprakash's Modern Inorganic Chemistry*. New Delhi: Sultan Chand, 2014.  
Solomons & Fryhle, *Organic Chemistry*, New Delhi, Wiley India, 2017.

## WEB RESOURCES

<http://www.chem1.com/acad/webtext/chembond/cb01.html>  
<http://education-portal.com/academy/topic/nuclear-chemistry.html>  
<https://www.class-central.com/mooc/437/coursera-introductory-organic-chemistry-part-1>

## PATTERN OF ASSESSMENT

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/MCQ  
Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**VOLUMETRIC ANALYSIS PRACTICAL**

**CODE:19CH/MC/P112**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

**Unit 1**

**Calibration**

Calibration of Burettes / Pipettes

**Unit 2**

**Theory of Volumetric Estimations**

Theory and Principle behind the Experiments, Equivalent Weight Calculations to be tested in every class

**Unit 3**

**Volumetric Estimation**

3.1 Estimation of  $\text{Na}_2\text{CO}_3$  / HCl

3.2 Estimation of Oxalic Acid (Permanganimetry)

3.3 Estimation of Dichromate (Iodometry)

3.4 Estimation of Iron (Dichrometry / Permanganimetry)

3.5 Estimation of Magnesium / Zinc (Complexometry)

3.6 Group Experiment - Estimation of Chloride (Argentometry), Estimation of Hardness of the given Water Sample

**Testing of Principles in the CA tests and also End Semester Examination for a maximum of five marks**

**BOOKS FOR STUDY**

Sathian Jesurietta. *Volumetric Estimations – Lab Manual*. 2010.

**BOOKS FOR REFERENCE**

Vogel, A.I., *Vogel's Textbook of Quantitative Chemical Analysis*. Prentice Hall, Science, 2000.

Mendhan,J., *Vogel's Textbook of Quantitative Chemical Analysis*, Pearson 2009.

## **PATTERN OF ASSESSMENT**

**Continuous Assessment:                      Total Marks: 50                      Duration: 3 hours**

Two – Three questions related to Theory of Volumetric Analysis                      5 marks

Equations and short Procedure (10 minutes)                      5 marks

Experiment                      upto 2% error - 40 marks

2.1 – 3.0% - 35marks

3.1 – 4.0    25 marks

4.1 -5%    20 marks

Above 5%    15Marks

**End-Semester Examination:                      Total Marks: 50                      Duration: 3 hours**

Two – Three questions related to theory of Volumetric Analysis                      5 marks

Equations and short Procedure (10 minutes)                      5 marks

Experiment                      upto 2% error - 40 marks

2.1 – 3.0% - 35marks

3.1 – 4.0    25 marks

4.1 -5%    20 marks

Above 5%    15Marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**

**Soft Skills Course Offered to students of  
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme**

**SYLLABUS**

(Effective from the academic year 2019 – 2020)

**LIFE SKILLS – HEALTH, ENERGY AND COMPUTER BASICS**

**CODE: 19CH/SS/HC13**

**CREDITS: 3**

**L T P: 3 0 0**

**TOTAL TEACHING HOURS: 39**

**OBJECTIVES OF THE COURSE**

- To sensitise students to the fact that good health lies in nature
- To create an awareness about energy obtained from different components of food and to plan for a balanced diet
- To enable students to understand the significance of energy conservation and strategies for conserving energy
- To provide a basic knowledge of computer fundamentals and Email configuration

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- identify the importance of a few plants and their health benefits
- recognise the causes and symptoms of common disorders
- calculate food energy values and follow the Recommended Dietary Allowances (RDA) and appreciate the need for them.
- conserve energy and use it responsibly
- understand computer configuration for purchase of personal computer and E mail setting

**Unit 1**

**(13 Hours)**

**Food and Health**

**1.1 Traditional food and their health benefits**

1.1.1 **Six tastes** – Natural guide map towards proper nutrition

1.1.2 Nutritional value and significance of Navadhanya (Sesame seed, Bengal gram, Horse gram, Green gram, Paddy seeds, White beans, Wheat, black gram and Chick pea) and Greens (Vallarai, Thuthuvalai, Manathakkali, Pulichakeerai, Agathi Keerai, Murungai Keerai, Karuveppilai, Puthina and Kothamalli)

**1.2 Causes, symptoms and home remedies for the following ailments**

Common cold, Anaemia, Hypothyroidism, Obesity, Diabetes, Mellitus, Polycystic Ovarian Syndrome, Ulcer, Wheezing and Hypertension

**Unit 2** **(13 Hours)**

**Food and energy balance**

- 2.1 Units of Energy, Components of Total Energy Requirement – Basal Metabolic Rate, energy requirements for (work) physical activity and Thermic effect of food
- 2.2 Factors affecting Basal Metabolic Rate and Thermic Effect of food
- 2.3 Recommended Dietary Allowances and Balanced Diet, Food Energy Values- Calculation

**Unit 3** **(13 Hours)**

**3.1 Energy conservation**

3.1.1 Needs for Energy Conservation – Power consumption of domestic appliances – Electrical Energy Audit – Strategies for Energy Conservation - Modern lighting systems– Light emitting diode (LED), Compact fluorescent lamps (CFL), Green indicators and Inverter, Green building - Home lighting using Solar cell - Solar water heaters- Water and waste management - Biogas plant

3.1.2 Safety Practices in using electronic gadgets and electricity at home – Precautions - Shock- Use of testers to identify leakage

**3.2 Computer fundamentals**

3.2.1 Essentials of Purchasing a Personal Computer - Fundamentals of Networks – Local Area Network, Internet, Networking in real-time scenario- Computer Hacking – Computer Forensics Fundamentals – Cyber Laws - Secure Browsing

**3.2.2 Configuring Email**

Configure Email Settings – Attachments – Compression – Organizing Emails – Manage Folders - Auto Reply - Electronic Business Card - Email Filters- Manage Junk Mail - Calendar - Plan Meetings, Appointments - Scheduling Emails

3.2.3 Emerging Trends in IT - 3D Printing, Cloud Storage, Augmented Reality, Artificial Intelligence, Internet of Things (IoT)

**BOOKS FOR REFERENCE**

Achaya K. T. *The Illustrated Foods of India*. Oxford Publications, 2009.

Guyton, A.C. *Text Book of Medical Physiology*. (12<sup>th</sup> ed.). Philadelphia: W.B. Saunders & Co., 2011.

Joe Benton, *Computer Hacking: A Beginner's Guide to Computer Hacking, How to Hack, Internet Skills, Hacking Techniques, and More!*, Createspace Independent Pub, 2015.

John Vacca, *Computer Forensics: Computer Crime Scene Investigation*, Laxmi Publications 2015.

Pradeep Sinha, Priti Sinha, *Computer Fundamentals 6th Edition*, BPB Publications, 2003.

Srilakshmi, B. *Nutrition Science* (4<sup>th</sup> Revised Edition), New Delhi: New Age International (P) Ltd., 2014.

Suzanne Le Quesne *Nutrition: A Practical Approach*, Cornwall: Thomson, 2003.

Therapeutic Index – Siddha, 1<sup>st</sup> edition, SKM Siddha and Ayurveda, 2010.

Trevor Linsley, *Basic electrical installation work*. Newnes rint of Elsevier 2011.

## **PATTERN OF ASSESSMENT**

### **Continuous Assessment:**

**Total Marks: 50**

Two to three Task based components

Task based classroom activities

Case studies

Group discussions

Group presentation

Role play

### **No End Semester Examination**

**No CA test**

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**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**ORGANIC CHEMISTRY I**

**CODE:19CH/MC/OC24**

**CREDITS: 4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To enable the students to recognize molecules as optically active or inactive, chiral or achiral, racemic or meso, to distinguish between pairs of stereoisomers as enantiomers or diastereomers, to label the chiral carbons as R/S and geometrical isomers as E/Z
- To enable a comprehensive understanding of aliphatic substitution as  $S_{N1}$ ,  $S_{N2}$ ,  $S_{Ni}$ , and  $S_{NcB}$ , aromatic substitution electrophilic and nucleophilic, addition and elimination reactions
- To apply learned concepts and mechanisms of carbonyl compounds to analyse and solve problems relating to nucleophilic addition and Oxidation Reduction Reactions of Carbonyl Compounds

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Classify, explain, and apply concepts associated with general reaction types to product prediction, synthesis design and reaction mechanism.
- Recognize and draw structural isomers and stereoisomers including enantiomers and diastereomers, racemic mixtures and meso compounds.
- Identify stereocenters in a molecule and assign absolute configuration
- Draw logical and detailed mechanisms for various fundamental reactions of carbonyl compounds
- Recall important name reactions associated with the oxidation and reduction reactions of carbonyl compounds.

**Unit 1**

**Stereochemistry**

**(15 Hours)**

- 1.1 Stereoisomerism-Definition and Types, Geometrical Isomerism - *E-Z* Notation. Optical Isomerism – Definition, Conditions for Optical Activity and its Measurement, Specific Rotation, Asymmetric Centre, and Chirality. Enantiomers, Diastereomers, racemic and meso Compounds (Definition and Examples)
- 1.2 Notations for Optical Isomers with one and two Asymmetric Carbon Atoms. Specification of Configuration - *D-L* and *R-S* Notations (Cahn-Ingold-Prelog Rules), Erythro and Threo representations
- 1.3 Conformational Isomerism-Interconversion of Newman Projection, Fischer, Flying Wedge and Sawhorse Projections. Conformational Analysis of Ethane, n-Butane and Cyclohexane
- 1.4 Stereospecific and Stereoselective Reactions - Addition of hydrogen and bromine to Alkenes-Syn and Anti Addition

## Unit 2

### **Electrophilic and Nucleophilic Substitution Reactions (15 Hours)**

- 2.1 Aliphatic nucleophilic substitution reaction -  $S_N1$ ,  $S_N2$ ,  $S_Ni$ , and  $S_NcB$ . Factors governing  $S_N1$ ,  $S_N2$  Reactions - Effects of Structure, Solvent, nature of entering and leaving group. Kinetics, stereochemistry of nucleophilic aliphatic substitution, duality of mechanism, Walden Inversion.  $S_N1$  vs  $S_N2$
- 2.2 Aromatic nucleophilic substitution reaction-  $S_NAr$  Mechanism-Benzyne intermediate formation and evidences. Aromatic electrophilic substitution reaction - sulphonation, nitration, halogenation, Friedel Crafts alkylation and acylation reaction, Effect of substituent already present in the ring, ortho / para ratio, orientation in di substituted compounds

## Unit 3

### **Addition and Elimination Reactions (15 Hours)**

- 3.1 Addition: Electrophilic Addition- orientation and reactivity, Markownikoff and Anti- Markownikoff rule. Examples of Addition Reaction- Addition of Hydrogen, Halogen, Hydrogen halide, Hypohalous acid, sulphuric acid, water, hydroxylation, epoxidation, hydroboration (with Propene and Propyne as Examples), ozonolysis, mechanism of the peroxide initiated addition of HBr. Electrophilic addition to conjugated dienes-1, 2 and 1, 4 addition
- 3.2 Elimination:  $E_1$ ,  $E_2$  and  $E_1cB$  Mechanisms, orientation and reactivity (Hoffmann and Saytzeff rule) and evidences. Stereochemistry of  $E_1$  and  $E_2$  reactions. Syn- and Anti- Elimination and Elimination vs Substitution

## Unit 4

### **Aliphatic, Aromatic and Unsaturated Carbonyl Compounds (12 Hours)**

- 4.1 Structure of Carbonyl Group, acidity of alpha hydrogen, Keto-Enol tautomerism – evidence for the two forms. Relative reactivity of Aldehydes and Ketones. A comparison of reactivity with aromatic carbonyls and its derivatives
- 4.2 Nucleophilic addition reactions: Aldol Condensation, Cannizzaro, Crossed Cannizzaro, Claisen- Schmidt, Houben- Hoesch (Synthesis of Phenolic Ketone), Benzoin Condensation, Haloform, Knoevenagel, Reformatsky and Perkin reactions
- 4.3 Acrolein, Crotonaldehyde, Cinnamaldehyde– Preparation and reactions

## Unit 5

### **Oxidation and Reduction Reactions of Carbonyl Compounds (8 Hours)**

- 5.1 Oxidation and Reduction of Carbonyl Compounds- Meerwein-Ponndorf-Verley, Clemmensen, Oppenauer, Baeyer- Villiger, Wolff- Kishner,  $LiAlH_4$  and  $NaBH_4$  reductions

## **BOOKS FOR STUDY**

Kalsi P S. *Stereochemistry: Conformation and Mechanism*, New Age International Publisher, 10<sup>th</sup> Edition, 2019

Morrison.R.T. Boyd R.N & Bhattacharjee.S.K. *Organic Chemistry*. Pearson, Dorling Kindersley 2016

Ahluwalia V K. *Organic Reaction Mechanisms*. New Delhi: Narosa,(2011)

Tewari, K.S. and Vishnoi, N. K. *A Text Book of Organic Chemistry*, 4<sup>th</sup> edition, Vikas Publishing 2017



## BOOKS FOR REFERENCE

- Francis A. Carey, Richard A. Sundberg. *Advanced Organic Chemistry*. Springer, 2007
- Michael B. Smith, Jerry March. *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure*. Wiley 2007
- Jonathan, Clayden., Nick Greeves, Stuart Warren. *Organic Chemistry*. Oxford University Press, 2012
- Paula Y. Bruice. *Organic Chemistry*. Prentice Hall, 2010
- Reinhard Brückner. *Organic Mechanisms - Reactions, Stereochemistry and Synthesis*. Springer, 2010

## WEB RESOURCES

- <http://www.organic-chemistry.org/>
- <http://www.chemguide.co.uk/orgmenu.html>
- <http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>

## PATTERN OF ASSESSMENT

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/ MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

**B.Sc. DEGREE: BRANCH IV - CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019- 2020)

**ANALYTICAL CHEMISTRY**

**CODE:19CH/MC/AC23**

**CREDITS:3**

**L T P:3 1 0**

**TOTAL TEACHING HOURS:52**

### **OBJECTIVES OF THE COURSE**

- To introduce the key concepts of Analytical Chemistry with a special reference to its applications
- To understand the importance of statistical measures
- To familiarize students with separation techniques and thermoanalytical methods
- To understand the common sampling strategies for inorganic and organic compounds

### **COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Account for measurement quality at chemical determinations and apply relevant statistical methods to chemical data
- Differentiate between types of errors and precision and solve problems in various statistical methods
- Separate simple organic mixtures using basic chromatographic techniques
- Apply the principles of titrimetry to perform volumetric analysis experiments
- Evaluate the importance of thermoanalytical techniques in the study of simple compounds

#### **Unit 1**

##### **Stoichiometry**

**(6 Hours)**

1.1 Important Units of Measurement – S.I Units, Distinction between Mass and Weight, Concentration of Solutions - Moles, Millimoles, Milliequivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Density and Specific Gravity of Liquids. Stoichiometry Calculations.

#### **Unit 2**

##### **Sampling and Errors**

**(12 Hours)**

2.1 Sampling Techniques-Sampling and Sample Handling of Liquids and Gases, Particulate Solids, Metals and Alloys. Preparation of a Laboratory Sample  
2.2 Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation, Coefficient of Variation, Confidence Limits, Q-test, F-test, T-test. The Least Square Method for Deriving Calibration Plots

### Unit 3

#### **Separation Techniques (14 Hours)**

- 3.1 Solvent Extraction – Liquid - Liquid Extraction - Factors affecting Solvent Extraction, Soxhlet and Rotavapor Extraction
- 3.2 Chromatography - Column, TLC, Paper, Gas, HPLC and Electrophoresis – Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution, Development of Chromatogram and  $R_f$  Value

### Unit 4

#### **Titrimetry (13 Hours)**

- 4.1 Calibration of Burette, Pipette, Standard Flask, Titrant, Titrand, Indicators, Equivalence Point, End Point. Primary and Secondary Standards- Criteria and Preparation. Limitations of volumetric analysis
- 4.2 Neutralisation Titrations- strong acid-strong base, weak acid-strong base titrations, indicators, range of indicator, choice of indicator, feasibility of acid base titrations, effect of pH on equivalence point.
- 4.3 Complexation Titrations- metallochrome indicators, masking and demasking agents, Factors affecting Equivalence Point
- 4.4 Precipitation Titrations- Mohr method and Fajans method of estimation of halides. Redox titrations -Theory of redox indicators (Ferroun and diphenyl amine)

### Unit 5

#### **Thermoanalytical Methods (7 Hours)**

- 5.1 TGA/DTG and DTA - Principle and Instrumentation, Thermal Analysis of Silver Nitrate, Calcium Oxalate, Methods of obtaining Thermograms, Factors affecting TGA/DTA
- 5.2 DSC - Principle and Applications

### **BOOKS FOR STUDY**

- Vogel, A.I. *Vogel's Textbook of Quantitative Chemical Analysis*. Prentice Hall, Science, 2009
- Gopalan, R, Subramanian, P.S and Rengarajan, K. *Elements of Analytical Chemistry*. New Delhi: Sultan Chand, 2004.
- Skoog, D.A, West, D.M. *Fundamentals of Analytical Chemistry*. Thomson Asia, 2014.
- Shoba Ramakrishnan and Banani Mukhopadhyay, *Essentials of Analytical Chemistry*. Noida: Pearson, 2018

### **BOOKS FOR REFERENCE**

- Day R.A.Jr. & A.L. Underwood. *Quantitative Analysis*. New Delhi: Prentice Hall of India, 1993.
- Skoog, Douglas A, James F. Holler & Timothy A. Nieman. *Principles of Instrumental Analysis*. Singapore: Haracourt Asia, 2001.
- Srivastava, T.N & P.C.Kamboj. *Systematic Analytical Chemistry*. New Delhi: Shobanlal Nagin Chand, 1999.
- Usharani, S. *Analytical Chemistry*. New Delhi: Macmillan, 2006.

### **WEB RESOURCES**

- <http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf>
- <http://eric.ed.gov/?id=EJ386287>

<http://www.sjsu.edu/faculty/watkins/diamag.htm>

<http://www.britannica.com/EBchecked/topic/108875/separation-and-purification>

<http://www.chemistry.co.nz/stoichiometry.htm>

### **PATTERN OF ASSESSMENT**

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the  
Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/  
MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the  
Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**SEMI-MICRO QUALITATIVE ANALYSIS PRACTICAL I**

**CODE:19CH/MC/P222**

**CREDIT:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

**Unit 1**

- 1.1 Reactions of the Following Acid Radicals: Carbonate, Sulphate, Sulphide, Nitrate, Chloride, Bromide, Fluoride, Oxalate, Phosphate, Arsenite, Arsenate, Chromate and Borate
- 1.2 Elimination of Interfering Radicals – Fluoride, Oxalate, Phosphate, Chromate and Borate
- 1.3 Reactions of the Following Basic Radicals and its Group Separations. Lead, Copper, Bismuth, Cadmium, Antimony, Iron, Chromium, Aluminum, Cobalt, Nickel, Manganese, Zinc, Barium, Strontium, Calcium, Ammonium and Magnesium

**Unit 2**

Analysis of a given Salt Containing one Cation and one Anion (which will be an interfering ion.)

**Unit 3**

**Preparation of Inorganic Complexes (to be tested internally)**

Tetraamminecopper(II)sulphate hydrate,  
Tris(thiourea)copper(II)sulphate dehydrate  
Potassium trioxalatoferrate (III)

**Theory and principles behind the experiments concerned to be tested periodically (equations involved) and along with the CA tests and end semester exam for a maximum of ten marks**

**BOOKS FOR STUDY**

Sathian Jesurietta, *Semi Micro Qualitative Analysis*. 2008.  
Svehla.G. *Vogel's Qualitative Inorganic Analysis*. Prentice Hall, 2008.  
Sundaram. S., P. Krishnan. and P.S. Raghavan, *Practical Chemistry*. Madras.  
S.Viswanathan (Printers & Publishers) Pvt. Ltd., 1993.  
Venkateswaran V. R., Veeraswamy, A.R. Kulandaivelu, *Basic Principles of Practical Chemistry*, New Delhi. Sultan Chand & Sons, 1993.

**PATTERN OF ASSESSMENT****Continuous Assessment Test:                      Total Marks: 50                      Duration: 3 Hours**

Two-Three questions involved in Semi-Micro Analysis	10 marks
General Procedure	5 marks
Acid Radical (1x15)	15 marks
Elimination Procedure	5 marks
Basic Radical (1x15)	15 marks

**End-Semester Examination:                      Total Marks: 50                      Duration: 3 hours**

Two-Three questions involved in Semi-Micro Analysis	10 marks
General Procedure	5 marks
Acid Radical (1x15)	15 marks
Elimination Procedure	5 marks
Basic Radical (1x15)	15 marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**General Core Course Offered to students of  
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**ENVIRONMENTAL STUDIES**

**CODE:19CH/GC/ES12**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To help students to gain the fundamental knowledge of the environment
- To create in students an awareness of current environmental issues
- To inculcate in students an eco-sensitive, eco-conscious and eco-friendly attitude

**COURSE LEARNING OUTCOMES**

On successful completion of this course, students will be able to

- Articulate the interdisciplinary context of environmental issues
- Adopt sustainable alternatives that integrate science, humanities and social perspectives
- Appreciate the importance of biodiversity and a balanced ecosystem
- Calculate one's carbon footprint

**Unit 1 (10 Hours)**

- 1.1 Introduction: The multidisciplinary nature of environmental studies;  
Environmental Ethics-Role of the Individual in protecting the environment
- 1.2 Natural Resources: renewable (forests and water)and non-renewable (minerals)-  
energy resources: renewable and non-renewable sources, impact of over-  
exploitation
- 1.3 Ecosystems: terrestrial (forest, grassland and desert) and aquatic (ponds, oceans  
and estuaries); structure and function
- 1.4 Biodiversity: India as a mega-diversity nation; threats to biodiversity; *in-situ* and  
*ex-situ* conservation of biodiversity
- 1.5 Solid Waste Management, Source Segregation and Rain Water Harvesting

**Unit 2 (10 Hours)**

- 2.1 Environmental Pollution: Air, Water, Noise and Plastic Pollution: causes, effects  
and control measures -Impact of over-population on pollution and health –  
carbon footprint
- 2.2 The Environmental Dimension of Sustainable Development: The United Nations  
Sustainable Development Goals of the 2030 Agenda

- 2.3 Climate Change and Environmental Disasters: Natural Disasters: floods, earthquakes, cyclones, tsunamis and landslides; man-made disasters: Bhopal Gas Tragedy and Chernobyl Nuclear Disaster
- 2.4 Environmental Movements: Chipko, Silent Valley and Narmada Bachao Andolan International Agreements: Montreal Protocol, Kyoto Protocol and Climate Change Conferences
- 2.5 An Overview of Environmental Laws in India: Environmental (Protection) Act 1986, Biological Act, 2002, National Green Tribunal Act, 2010, Coastal Regulation Zone Notification, 2011

**Unit 3 (6 Hours)**

- 3.1 A study of the eco-friendly initiatives on campus
- 3.2 A critical review of an environmental documentary film
- 3.3 Ecofeminism and the contributions of Indian Women Environmentalists
- 3.4 The highlights of Environmental Encyclical-*Laudato si*-On Care for our Common Home
- 3.5 Environmental Calendar

**BOOK FOR STUDY**

Bharucha, Erach. *Textbook of Environmental Studies for Undergraduate Courses*, (2<sup>nd</sup> ed.) Universities Press, 2013.

**BOOKS FOR REFERENCE**

Bhattacharya, K.S. Arunima Sharma, *Comprehensive Environmental Studies* Narosa Publishing House Pvt.. Ltd., New Delhi, 2015.

Saha, T.K., *Ecology and Environmental Biology* Books and Allied (P) Ltd., Kolkata 2016.

Sharma, J.P. *Environmental Studies (for undergraduate classes)* 3<sup>rd</sup> edition, University Science Press, 2016.

**JOURNALS**

Journal of Environmental Studies and Sciences

Journal of Environmental Studies

**WEB RESOURCES**

[www.emn.com](http://www.emn.com)

[www.nationalgeographic.com](http://www.nationalgeographic.com)

**PATTERN OF ASSESSMENT**

**Continuous Assessment Test: Total Marks: 25 Duration: 60 minutes**

Section A-10 x 1 = 10 Marks (All questions to be answered) Multiple Choice Questions

Section B - 3 x 5 = 15 Marks (3 out of 6 to be answered in 150 words each)

**Other Component: Total Marks: 25**

Any **one** of the following for 25 marks

Quiz/Scrap Book/Assignment / Poster Making/Case Study/Project/Survey/Model-Making

**No End Semester Examination**



**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**INORGANIC CHEMISTRY I**

**CODE:19CH/MC/IC34**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVE OF THE COURSE**

- To give an understanding of the general trends in the chemistry behind s and p-block elements.
- To impart an understanding of the biological significance of sodium, potassium, magnesium and calcium and the preparation and properties of industrially important compounds.
- To create interest in the chemistry of the compounds of boron, carbon, nitrogen, sulphur and halogens

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- State the list of elements in the periodic table so as to demonstrate trends in their physical and chemical properties.
- Classify alkali and alkaline earth metals according to their properties
- Compare the reactivity of groups 13 to 17 in the periodic table
- Appreciate the importance of noble gases and their compounds
- Understand the significance of Clathrate compounds

**Unit 1**

**Periodicity of Properties and the Hydrides (15 Hours)**

- 1.1 Periodic Table, Horizontal, Vertical and Diagonal Relationships in the Periodic Table – Li-Mg, Be-Al, B-Si
- 1.2 Periodicity of Properties of s, p and d – Block Elements with respect to Atomic Radii, Ionic Radii, Covalent Radii, Ionization Energy, Electronegativity, Electron Affinity
- 1.3 Inert Pair Effect, Effective Nuclear Charge – Screening Effect, Slater Rules
- 1.4 Hydrides – Classification as Saline, Metallic, Molecular and Polymeric Hydrides - One Method of Preparation and Important Properties, Hydrogen Bonding and its Consequences
- 1.5 Acids and Bases: Bronsted-Lowry, Lux-Flood, Solvent System and Lewis Concepts of Acids and Bases, Factors affecting strengths of Lewis Acids and Bases, HSAB Principle and its Applications

**Unit 2****Chemistry of s-Block Elements (10 Hours)**

- 2.1 Group 1 Alkali Metals: Position of Alkali Metals in the Periodic Table, Discussion of Alkali Metal Group with respect to their Oxides, Halides and Hydroxides. Extraction of Lithium from Spodumene. Importance of Cryptates and Crown Ethers
- 2.2 Group 2 Alkaline Earth Metals: Similarities and Gradations in Physical and Chemical Properties with respect to Oxides, Hydroxides, Halides and Sulphates. Extraction of Beryllium

**Unit 3****Chemistry of p-Block Elements – Groups 13 & 14 (12 Hours)**

- 3.1 Boron Family: Periodicity in the Properties of Boron Group with respect to their Oxides, Hydroxides and Halides. Preparation and Bonding of  $B_2H_6$ . Preparation, Properties, Structure and uses of Boron Nitride and Borazole
- 3.2 Carbon Family: Comparison of Carbon Group Elements - Hydrides, Oxides and Halides. Silicates: Classification and Structure. Silicones- Preparation, Properties and uses

**Unit 4****Chemistry of p-Block Elements–Groups 15, 16 & 17 (18 Hours)**

- 4.1 Nitrogen Family: Comparison of Nitrogen Group Elements with respect to Oxides, Hydrides and Halides. Preparation, Properties and Structure of Hydrazine, Hydroxylamine, Hydrazoic Acid. Oxyacids of Nitrogen and Phosphorus - Preparation, Properties and Structure. Structure and Applications of Phosphonitrilic Compounds
- 4.2 Oxygen Family: Comparison of Oxygen Group Elements with respect to Hydrides, Halides, Oxides. Preparation, Properties and Structure of Oxyacids and Peracids of Sulphur. Thionic Acids
- 4.3 Halogen Family: Comparison of Halogens with respect to the Elements, Hydrides and Oxides. Preparation and Structure of  $OF_2$ ,  $Cl_2O$ ,  $I_2O_5$  and  $Cl_2O_7$ ,  $HClO_4$ .
- 4.4 Interhalogen Compounds: Preparation and Structure of  $ICl$ ,  $BrF_3$ ,  $IF_3$ ,  $IF_5$  and  $IF_7$ . Basic Nature of Iodine. Pseudohalogens and Polyhalides

**Unit 5****Chemistry of Group 18 elements (10 Hours)**

- 5.1 Occurrence, Position of Noble Gases in the Periodic Table. Preparation, Properties and Structure of Compounds of Xenon -  $XeF_2$ ,  $XeF_6$ ,  $XeO_3$ ,  $XeOF_2$  as per VSEPR Theory
- 5.2 Clathrate Compounds and its Applications

**BOOKS FOR STUDY**

Puri. B.R., L.R Shama, & C.I. Kalia. *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2018.

Gopalan. R. *Inorganic Chemistry for Undergraduates*. Hyderabad: Universities Press, 2009.

## BOOKS FOR REFERENCE

- Cotton, F.A. and G. Wilkinson. *Advanced Inorganic Chemistry*. New Delhi: Wiley Eastern, 2008.
- Emeleus, H.J. & A.G. Sharpe. *Modern Aspects of Inorganic Chemistry*. London: ELBS, 1973,
- Shriver, O and Atkins, P.W. *Inorganic Chemistry*. San Francisco: W.H. Freeman, 2006.
- Lee J.D. *Concise Inorganic Chemistry*. New Delhi: Oxford University Press, 2008.

## WEBSITES

- <http://www.funscience.in/study-ne/Chemistry/ModernPeriodicTable/PeriodicityOfElements.php>
- [https://chem.libretexts.org/Bookshelves/Inorganic\\_Chemistry](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry)
- <https://www.thoughtco.com/noble-gases-forming-compounds-608601>
- <https://www.brightstorm.com/science/chemistry/the-periodic-table/s-block-elements>

## PATTERN OF ASSESSMENT

- Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**  
Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5  
Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)  
Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

- Other Components:** **Total Marks: 50**  
Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving/MCQ/Model Preparation/Short Answer Tests

- End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**  
Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5  
Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)  
Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**PHYSICAL CHEMISTRY I**

**CODE:19CH/MC/PC33**

**CREDITS:3**

**L T P:3 1 0**

**TOTAL TEACHING HOURS:52**

**OBJECTIVES OF THE COURSE**

- To provide an understanding of different crystal systems
- To explain the various cubic lattices
- To impart a comprehensive knowledge on closed packed structures
- To introduce the concept of electrical polarizability and magnetic susceptibility
- To enlighten on concepts of ionic equilibria

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Recognize the seven crystal systems, represent Miller planes and identify cubic powder X-ray diffractograms
- Explain the principle involved in closed packed structures
- Relate the electrical and magnetic properties of molecules and their structures
- Determine the pH of buffers, weak electrolytes and salts of weak electrolytes
- Understand the applications of solubility product

**Unit 1 (13 Hours)**

**Solid State**

- 1.1 Elements of Symmetry in a cube, Crystalline and Amorphous Solids, Isotropy and Anisotropy, Interfacial Angles, Symmetry in Crystal Systems
- 1.2 Unit Cell, Seven Crystal Systems, Space Lattice and Bravais Lattices
- 1.3 Law of Rational Indices, Weiss indices, Miller Indices, X-Ray Diffraction, Bragg's Law, Derivation of Bragg's Equation, Representation of Planes.
- 1.4 Bragg's Equation, Experimental Technique-Powder Method, X-Ray Diffraction Patterns of a Cubic System- Primitive, Body Centered and Face Centered Cubic Lattice

**Unit 2 (13 Hours)**

**Closed Packed Structures of Ionic Crystals**

- 2.1 Closed Packed Structures- CCP and HCP, Percentage Void, Packing Efficiency, Radius Ratio Rule
- 2.2 Simple Structures: Types - AX (NaCl, ZnS, NiAs), AX<sub>2</sub> (CaF<sub>2</sub>, TiO<sub>2</sub>, CdCl<sub>2</sub> and CdI<sub>2</sub>)
- 2.3 Point Defects – Schottky and Frenkel Defects, Non-Stoichiometric Defects
- 2.4 Liquid Crystals – Types, Structures, Textures and Applications

**Unit 3** (10 Hours)

**Electrical & Magnetic Properties of Atoms and Molecules**

- 3.1 Electrical properties: Polarisation, Clausius-Mossotti equation, Debye equation, polarisability & frequency
- 3.2 Dipole moment and molecular polarisabilities and their measurements.
- 3.3 Magnetic properties: Magnetic permeability, magnetic susceptibility, Diamagnetism, Paramagnetism, Ferro and Anti-ferromagnetism

**Unit 4** (10 Hours)

**Ionic Equilibria**

- 4.1 Proton Transfer Equilibria-Bronsted Lowry Theory, Protonation and Deprotonation ( $pK_a$ ,  $pK_b$ , pH, pOH,  $K_w$  and  $pK_w$ ), Polyprotic Acids, Amphiprotic Systems ( $H_2O$ )
- 4.2 Buffers: Acid, Basic and Single salt buffer, buffer capacity, buffer action, Derivation of Henderson-Hasselbach Equation
- 4.3 Hydrolysis of Salts (weak acid & strong base, weak base & strong acid, weak acid & weak base), Hydrolysis Constant, Relation between  $K_h$ ,  $K_a$  ( $K_b$ ),  $K_w$  and Degree of hydrolysis

**Unit 5** (6 Hours)

**Solubility Equilibria**

- 5.1 Solubility, Solubility Product, relation between molar solubility and solubility product of a sparingly soluble salt, Common Ion effect
- 5.2 Applications of solubility product in determination of solubility of sparingly soluble salts, predicting precipitation reactions, precipitation of soluble salts and in qualitative semi micro inorganic salt analysis

**BOOKS FOR STUDY**

Atkins, P.W. *Physical Chemistry*. Oxford University, 2016.

Puri, B.R., Sharma, L.R. & Pathania, M.S., *Principles of Physical Chemistry*, Vishal Publishing Co, Jalandar, Delhi, 2018

**BOOKS FOR REFERENCE**

Bahl, A., Bahl, B.S. & Tuli, G.D., *Essentials of Physical Chemistry*, S.Chand 2018

Rogers, D. W. *Concise Physical Chemistry* Wiley 2010.

Silbey, R. J.; Alberty, R. A. & Bawendi, M. G. *Physical Chemistry* 4th Ed., John Wiley & Sons, Inc. 2005.

Barrow, Gordon, M. *Physical Chemistry*. The McGraw Hill companies, 2008.

Smart, L.E and Moore, E.A. *Solid State Chemistry: An Introduction*. CRC Press, 2012.

Donald Allan McQuarrie, John Douglas Simon. *Physical Chemistry: A Molecular Approach* University Science Books, 2013.

Moore, W.J. *Physical Chemistry*. Orient Longman, 2004.

Ball, D. W. *Physical Chemistry* Thomson Press, India 2007

Castellan, G. W. *Physical Chemistry* 4th Ed. Narosa 2004

**WEB RESOURCES**

<http://www.jce.acs.in>

<http://chemwiki.ucdavis.edu>

## **PATTERN OF ASSESSMENT**

**Continuous Assessment Test:                      Total Marks: 50                      Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the  
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Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:                                      Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving

MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:                      Total Marks: 100                      Duration: 3 hours**

**10 to 15% of portion must be numerical**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the  
Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH IV – CHEMISTRY

**SYLLABUS**

(Effective from the academic year 2019-2020)

**SEMI-MICRO QUALITATIVE ANALYSIS PRACTICAL II**

**CODE:19CH/MC/P332**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

**Unit 1**

- 1.1 Analysis of a Salt Mixture Containing two Cations and two Anions
- 1.2 Principles and Techniques in Semi-Micro Analysis of Acid and Basic Radicals:  
Solubility Product Principle, Common Ion Effect, use of Organic and Inorganic Reagents in Spot Tests (Equations Relating to Reactions and Confirmatory Tests)

**Theory, Principles and Equations involved behind the reactions to be tested periodically & along with the CA tests and also end semester exam for a maximum of five marks.**

**BOOKS FOR STUDY**

Sathian Jesurietta, *Semimicro Qualitative Analysis*. 2008.

Svehla.G, *Vogel's. Qualitative Inorganic Analysis*. Prentice Hall, 2008.

**PATTERN OF ASSESSMENT**

**Continuous Assessment Test:                      Total Marks: 50                      Duration: 3 Hours**

Two/three questions involved in analysis (First 10 min): 5 marks

General Procedure:	6 marks
Acid radicals:	20 (2x10) marks
Elimination procedure:	3 marks
Basic radicals:	16 (2x8) marks

**End-Semester Examination:                      Total Marks: 50                      Duration: 3 hours**

Two/three questions involved in analysis (First 10 min): 5 marks

General Procedure:	6 marks
Acid radicals:	20 (2x10) marks
Elimination procedure:	3 marks
Basic radicals:	16 (2x8) marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**Allied Core Offered by the Department of Chemistry to Plant Biology & Plant Biotechnology and Advanced Zoology & Biotechnology Degree Programme**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**FUNDAMENTALS OF BIOCHEMISTRY I**

**CODE:19CH/AC/FB33**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

**OBJECTIVES OF THE COURSE**

- To bring about an understanding of fundamental biochemical principles.
- To enable students to explain biological mechanisms, such as the processes and control of bioenergetics and metabolism, as chemical reactions
- To explain the significance of clinical hematological tests
- To enable students to understand the chemistry involved in enzyme action

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the specificity of enzymes and the chemistry of enzyme action
- Appreciate the significance of pH in blood
- Explain how the metabolism of glucose leads ultimately to the generation of large quantities of ATP
- Illustrate the importance of glucose in biological processes
- Describe the roles and pathways of coagulation factors in blood plasma in activating thrombin to promote coagulation

**Unit 1**

**Introduction to Biochemistry**

**(10 Hours)**

1.1 Molecular Logic of Living Organisms

1.2 Water – Physical Properties and Hydrogen Bonding of Water-Solvent Properties of Water, Hydrophobic Interactions, the Ionic Product of Water, the pH Scale. Acid Base Indicators- Phenolphthalein and Methyl Orange

1.3 Maintenance of pH of Blood, Bicarbonate Buffers, Acidosis and Alkalosis, Buffers and electrolytes in the body

**Unit 2**

**Blood**

**(5 Hours)**

2.1 Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia

2.2 Clinical significance of RBC, WBC and Platelet Count in blood



**Unit 3**  
**Bioenergetics** (4 Hours)

- 3.1 Enthalpy, Entropy, Free Energy, Standard Free Energy, Spontaneous and Non-Spontaneous. Exergonic and Endergonic Reactions  
3.2 High Energy Compounds ATP and ADP, Structural Basis for the Role of ATP as the currency of the cell

**Unit 4**  
**Carbohydrates** (15 Hours)

- 4.1 Classification of Carbohydrates  
4.2 Haworth's Structure and Reactions of Glucose, Fructose and Sucrose.  
Polysaccharides -Homopolysaccharides-Cellulose, Starch-Amylose and Amylopectin (Structural Elucidation not required)  
4.3 Digestion of di and polysaccharides in the body, maintenance of glucose level in Blood- significance of HbA1c  
4.4 Carbohydrate Metabolism - Metabolism of Glucose - Glycolysis, TCA Cycle (structures not required), Glycogenesis, Glycogenolysis, Gluconeogenesis. Oxidative phosphorylation and electron transport chain

**Unit 5**  
**Enzymes** (5 Hours)

- 5.1 Definition of Enzymes, Coenzymes and Apoenzymes  
5.2 Nomenclature and Classification of Enzymes  
5.3 Enzyme Specificity - Factors affecting Enzyme Action  
5.4 Mechanism of Enzyme Action - Michaelis- Menten Theory (No Derivation) – Fischer's lock and key model and Koshland's induced fit model

**BOOKS FOR STUDY**

- Berry, A.K. *Textbook of Biochemistry*. Emkay, 2001  
Jain, J.L. *Fundamentals of Biochemistry*. New Delhi: S. Chand, 2007.  
Doraiswamy Yesodha, Geetha Swaminathan and Nagamani, B. *Allied Biochemistry*. Chennai: Margham, 2015.  
Satyanarayana, U., *Biochemistry*, 2<sup>nd</sup> ed., Kolkata: Books and allied, 2005

**BOOKS FOR REFERENCE**

- Dushyant Kumar Sharma. *Biochemistry*. Alpha Science, 2009  
Lehninger A.L. *Principles of Biochemistry*. Delhi: CBS, 2006.  
Stryer, Lubert. *Biochemistry*. New York: W.H. Freeman, 2007.  
Conn, E E., and P.K Stumpf., *Outline of Biochemistry*, 5th ed., New Delhi: Wily Eastern, 2002.

**WEB RESOURCES**

- <https://www.rpi.edu/dept/bcbp/molbiochem/MBWeb/mb1/part2/bioener.htm>  
<http://www.rsc.org/Education/Teachers/Resources/cfb/enzymes.htm>  
<http://www.rsc.org/Education/Teachers/Resources/cfb/carbohydrates.htm>  
<http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html>

## **PATTERN OF ASSESSMENT**

### **Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

### **Other Components:**

**Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving

MCQ/Model Preparation/Short Answer Tests

### **End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**Allied Core Offered by the Department of Chemistry to students of Physics**

(Effective from the academic year 2019-2020)

**FUNDAMENTALS OF CHEMISTRY I**

**CODE:19CH/AC/FC33**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

**OBJECTIVES OF THE COURSE**

- To acquire introductory knowledge of organic compounds and concepts in organic chemistry
- To learn the fundamentals of polymer chemistry
- To understand the important structural aspects and functions of amino acids, proteins and carbohydrates
- To learn about the kinetics of zero, first and second order reactions and the effect of temperature on rates of reactions.
- To learn the basics of acid-base theories and buffer solutions.

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Gain basic knowledge on the functional groups in organic chemistry
- Appreciate the applications of different polymers
- Understand the structural aspects and functions of biomolecules
- Appreciate the importance of kinetics
- Analyse the kinetics of a chemical reaction
- Differentiate between the types of acids and bases

**Unit 1**

**Introduction to Organic Chemistry (6 Hours)**

- 1.1 Identification of common functional groups in Organic compounds (alcohols, amines, alkyl halides, aldehydes, ketones, carboxylic acids, esters and amides)
- 1.2 Nature of bond fission- homolytic and heterolytic, types of reagents-nucleophile and electrophile (examples)
- 1.3 Types of intermediates- carbocations, carbanions and free radicals –definition, structure and examples
- 1.4 Substitution, Addition and Elimination Reactions- definition with an example each.

**Unit 2**

**Polymer Chemistry (10 Hours)**

- 2.1 Classification of Polymers, types of Polymerisation – addition (cationic, anionic and free radical mechanism) and condensation
- 2.2 Thermosetting and Thermoplastics –Definition with examples, Structure and Applications of Polyethylene, Polyvinylchloride, Nylon 66 and Bakelite, Natural Rubber- Vulcanisation of rubber
- 2.3 Biodegradable and Non-biodegradable polymers

**Unit 3** (10 Hours)

**Chemistry of Biomolecules**

- 3.1 Amino acids – Classification based on R groups, Zwitter ion and isoelectric point- definition and illustrations, chemical reactions of amino acids-Ninhydrin test
- 3.2 Polypeptides-Introduction and nomenclature, Proteins-Structure (primary, secondary, tertiary and quaternary) and functions, Denaturation and Renaturation of proteins
- 3.3 Carbohydrates- Classification, structure of Glucose and Fructose –Fischer and Haworth projections, Structure and uses of Maltose and Sucrose, Starch- structure and reaction with iodine, Uses of starch and cellulose
- 3.4 Analysis for carbohydrates- Molisch, Barfoed, Tollen's and Fehling's tests, preparation of Osazone derivative

**Unit 4** (7 Hours)

**Chemical Kinetics**

- 4.1 Rate of reaction, Order and Molecularity
- 4.2 Zero order, First order, Pseudo-unimolecular and Second order reactions.
- 4.3 Determination of order – Graphical, Half - life, Integrated rate equation and Ostwald's isolation methods
- 4.4 Energy of activation- Effect of temperature on reaction rates-Arrhenius equation

**Unit 5** (6 Hours)

**Ionic Equilibrium**

- 5.1 Acid-base concept -Arrhenius, Lowry Bronsted and Lewis Concepts
- 5.2 Strength of acids and bases- Dissociation constants of acids ( $K_a$ ), bases ( $K_b$ ) and water ( $K_w$ ),  $pK_a$ ,  $pK_b$  and  $pK_w$
- 5.3 Definition of pH and pOH, significance of pH scale
- 5.4 Buffer solutions – Types, buffer action, Derivation and importance of Henderson-Hasselbach equation

**BOOKS FOR STUDY**

Puri, B.R., L.R. Sharma., Madan S. Pathania. *Principles of Physical Chemistry*. New Delhi: Vishal, 2018.

Puri B.R, Sharma L.R & Kalia K.C. *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2017.

Jain M.K, Sharma S.C., *Modern Organic Chemistry*, Vishal Publishing & Co, 2015

Jain. J.L, Sunjay Jain, Nitin Jain, *Fundamentals of Biochemistry*, S. Chand & Company Ltd, New Delhi, 2006.

Subramanian, P.S, R. Gopalan, K. Rengarajan, *Elements of Analytical Chemistry*, Sultan Chand & Sons, New Delhi, 2007.

Yesodha Doraiswamy, Swaminathan Geetha and V. Radhakrishnan, *Allied Biochemistry*, Chennai, Margham Publications, 2002.

**BOOKS FOR REFERENCE**

Furniss *et al*, *Vogel's Text Book of Practical Organic Chemistry*, London, ELBS, 2006.

Morrison.R.T. Boyd R.N & Bhattacharjee.S.K, *Organic Chemistry*, 7<sup>th</sup> Edition, Pearson, Dorling Kindersley (India) Pvt Ltd., 2012.

## **WEBSITES**

<http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch20/electro.php>

<http://www.cliffsnotes.com/sciences/biology/biochemistry-i/the-importance-of-weak-interactions/acid-base-reactions-in-living-systems>

## **PATTERN OF ASSESSMENT**

### **Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

### **Other Components:**

**Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/MCQ

Model Preparation/Short Answer Tests

### **End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 Hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10,

Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**Allied Core Offered by the Department of Chemistry to Physics, Plant Biology & Plant Biotechnology and Advanced Zoology & Biotechnology Degree Programme**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**BIOCHEMISTRY PRACTICAL I**

**CODE:19CH/AC/P132**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL HOURS:39**

**Unit 1**

1. Reactions of Carbohydrates – Glucose, Fructose, Maltose, Sucrose and Starch
2. Reactions of Amino Acids - Reactions of Tryptophan, Tyrosine, Arginine and Cysteine
3. Reactions of Proteins - Reactions of Casein and Egg Albumin
4. Identification of Unknown Organic Compound

**BOOKS FOR STUDY**

Swaminathan Geetha and Mary George. *Laboratory Chemical Methods in Food Analysis*. Chennai: Margham, 2010.

**PATTERN OF ASSESSMENT**

<b>Continuous Assessment Test:</b>	<b>Total Marks: 50</b>	<b>Duration: 3 hours</b>
Analysis	50 marks	
Preliminary reaction	15 marks	
Confirmatory tests with all colour tests	30 marks	
Final report	5 marks	

<b>End-Semester Examination:</b>	<b>Total Marks: 50</b>	<b>Duration: 3 hours</b>
Analysis	50 marks	
Preliminary reaction	15 marks	
Confirmatory tests with all colour tests	30 marks	
Final report	5 marks	

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH IV – CHEMISTRY

### SYLLABUS

(Effective from the academic year 2019–2020)

### ORGANIC CHEMISTRY II

CODE:19CH/MC/OC44

CREDITS:4

L T P:4 1 0

TOTAL TEACHING HOURS:65

#### OBJECTIVES OF THE COURSE

- To understand the structure and reactivity of carboxylic acid and their derivatives
- To provide a basic understanding of the synthesis of nitrogen containing organic compounds
- To introduce the classification and preparation of dyes
- To enable students to understand the structure and reactivity of alcohol, phenol, and ether functional groups.

#### COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- Assign IUPAC names for different types of organic compounds
- Predict and explain the structural difference between alcohols and phenols which affect their physical characteristics and reactivity
- Account for the basicity and nucleophilicity of amines.
- Recognize the synthetic importance of benzene diazonium salts and diazomethane
- Describe and discuss the reactions of carboxylic acid derivatives

#### Unit 1 (13 Hours)

##### Alcohols, Phenols and Ethers

- 1.1 Aliphatic Alcohols: Reactions with reference to C-OH Bond Cleavage and O-H Bond Cleavage. Di and Trihydric Alcohols- Action of  $\text{HIO}_4$  and Uses
- 1.2 Phenols: Nomenclature, acidity of phenols- Effects of substituents – Comparison of Acidity with Alcohols. Hydrogen Bonding
- 1.3 Reactions: Acid Character, Ether Formation, Ester Formation, Reactions involving Benzene Ring- Nitration, Sulphonation, Halogenation, Nitrosation, Friedel–Crafts reaction, Coupling reactions, Kolbe’s and Riemer-Tiemann reactions
- 1.4 Reactions of Ethers and Epoxides. Cleavage of Ether Linkages by HI.

#### Unit 2 (15 Hours)

##### Carboxylic Acids and their Derivatives

- 2.1 Nomenclature and Classification of Aliphatic and Aromatic monocarboxylic Acids, Preparation and Reactions. Acidity (Effect of Substituents on Acidity) and Salt formation, mechanism of Reduction and substitution in Alkyl or Aryl Group
- 2.2 Preparation and Properties of Unsaturated Carboxylic acids- Acrylic, Crotonic and

- Cinnamic acids. Preparation and Properties of Dicarboxylic Acids - Oxalic, Malonic, Succinic, Glutaric, Adipic and Phthalic Acids
- 2.3 Action of heat on  $\alpha$ ,  $\beta$ ,  $\gamma$  - Hydroxy and Amino carboxylic acids. Stereospecific addition reaction of maleic and fumaric acids
- 2.4 Preparation and Reactions of Acid Chlorides, Acid Anhydrides, Amides and Esters. Acid and Alkaline Hydrolysis of Esters. Trans-Esterification

**Unit 3 (15 Hours)**

**Nitro and Amino Compounds**

- 3.1 Aliphatic and Aromatic Nitro Compounds- Classification, general properties and preparation by nitration. Nitroalkanes – Tautomerism and reactions- Distinction from alkyl nitrite
- 3.2 Aromatic Nitro Compounds - reduction of Nitrobenzene in acidic, neutral and alkaline media and electrolytic reduction
- 3.3 Aliphatic and Aromatic Amines – Preparation, Reactions- Basicity of Amines, Effect of substituents on basicity of amines. Separation of Mixture of Amines by Hinsberg and Hofmann method
- 3.4 Distinguishing primary, secondary and tertiary amines. Ascent and descent of series in aliphatic amines
- 3.5 Diazonium Salts-Preparation and reactions - Replacement reactions (Sandmeyer, Gattermann and Gomberg reactions) and Coupling Reactions

**Unit 4 (12 Hours)**

**Synthesis involving Active Methylene Group**

- 4.1 Malonic, Acetoacetic and Cyanoacetic Ester: Characteristic reactions of active methylene group and synthetic applications
- 4.2 Diazomethane and Diazoacetic Ester: Preparation, Structure and Synthetic Applications

**Unit 5 (10 Hours)**

**Colours and Dyes**

- 5.1 Complementary Colours and Photochemistry of Vision
- 5.2 Theories of Dyes, Classification of Dyes based on chemical structure and application
- 5.3 Preparation and uses of Azo Dye - Methyl Orange and Bismarck Brown; Triphenyl Methane Dye -Malachite Green, Para Rosaniline and Crystal Violet; Phthalein Dye - Phenolphthalein and Fluorescein; Vat Dye – Indigo; Anthraquinone Dye - Alizarin

**BOOKS FOR STUDY**

- Jain M.K, Sharma S.C., *Modern Organic Chemistry*, Vishal publishing & Co, 2015
- Morrison .R.T. Boyd R.N & Bhattacharjee.S.K. *Organic Chemistry*, Pearson, Dorling Kindersley,2016.
- Sachin Kumar Gosh. *Advanced General Organic Chemistry (A Modern Approach) (Set I & II)*, 3<sup>rd</sup> Edition, New Central Book Agency, Kolkatta, 2010

**BOOKS FOR REFERENCE**

- Michael B. Smith, Jerry March. *March's Advanced Organic Chemistry Reactions, Mechanisms, and Structure*. Wiley, 2007.
- Francis A. Carey, Richard A. Sundberg. *Advanced Organic Chemistry*.Springer, 2007.
- Ahluwalia V K. *Organic Reaction Mechanisms*.New Delhi: Narosa, 2011.
- Finar I.L. *Organic Chemistry Vol. I& II* London:ELBS,2002.



Paula Y. Bruice. *Organic Chemistry*. Prentice Hall, 2010.  
Jonathan Clayden, Nick Greeves, Stuart Warren. *Organic Chemistry*. Oxford University Press, 2012.

### WEB RESOURCES

<http://www.organic-chemistry.org/>

<http://www.chemguide.co.uk/orgmenu.html>

<http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>

### PATTERN OF ASSESSMENT

**Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components: Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving

MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination: Total Marks: 100 Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086  
B.Sc. DEGREE: BRANCH IV - CHEMISTRY

SYLLABUS

(Effective from the academic year 2019-2020)

ORGANIC CHEMISTRY PRACTICAL I

CODE:19CH/MC/P442

CREDITS:2

L T P:0 0 3

TOTAL TEACHING HOURS:39

Unit 1

**Analysis of Organic Compounds**

- 1.1 Qualitative analysis of unknown organic compounds containing simple functional groups -Acids, Phenols, Carbohydrates, Aldehydes, Ketones, Esters, Amines, Amides, Nitro Compounds, Anilides, Halo Compounds, Sulphur Compounds (Thiourea).
- 1.2 Preparation of Derivatives of Organic Compounds

**Theory and principles behind the experiments concerned to be tested periodically (equations involved) and along with the CA tests and end semester exam for a maximum of five marks**

**BOOKS FOR STUDY**

Sathian Jesurietta, *Organic Chemistry Practicals – Lab Manual*. 2010.

Vogel.A. *Vogel's Textbook of Practical Organic Chemistry* India: Pearson, 2005.

**BOOKS FOR REFERENCE**

Mann F.G. & Saunders B.C. *Practical Organic Chemistry* India: Pearson, 2009.

Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.*, Pearson Education 2012

Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*, University Press 2000.

Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, University Press 2000.

Vogel A.I., Tatchell, A.R., Furnis B.S. Hannaford A.J. & Smith P.W.G., *Textbook of Practical Organic Chemistry, 5th Ed.*, Prentice-Hall 1996.

**PATTERN OF ASSESSMENT**

<b>Continuous Assessment:</b>	<b>Total Marks: 50</b>	<b>Duration: 3 Hours</b>
Two-Three questions related to the Theory of analysis of Organic Compounds		5 marks
Aliphatic/Aromatic:		6 marks
Saturated/Unsaturated:		6 marks
Special Elements:		8 marks
General Procedure:		10 marks
Derivative:		5 marks
Functional Group test and relevant confirmatory test:		8 marks
Report:		2 marks

<b>End-Semester Examination:</b>	<b>Total Marks: 50</b>	<b>Duration: 3 hours</b>
Two-Three questions related to the Theory of analysis of Organic Compounds		5 marks
Aliphatic/Aromatic:		6 marks
Saturated/Unsaturated:		6 marks
Special Elements:		8 marks
General Procedure:		10 marks
Derivative:		5 marks
Functional Group test and relevant confirmatory test:		8 marks
Report:		2 marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**

**Soft Skills Course Offered to students of  
B.A. / B.Sc. / B.Com. / B.B.A. / B.V.A. / B.S.W. / B.C.A. Degree Programme**

**SYLLABUS  
(Effective from the academic year 2019 - 2020)**

**LIFE SKILLS: PERSONAL AND SOCIAL**

**CODE: 19BT/SS/PS13**

**CREDITS: 3**

**L T P: 3 0 0**

**TOTAL TEACHING HOURS: 39**

### **OBJECTIVES OF THE COURSE**

- To enable students to understand the working of Indian Governance and laws
- To empower students as citizens by teaching them how to use the RTI, the PIL and the FIR
- To provide students an insight into the strengths and virtues essential to improve wellbeing
- To bring about awareness of societal dynamics
- To create awareness, impart knowledge and hone skills necessary to make sound financial decisions

### **COURSE LEARNING OUTCOMES**

On successful completion of this course, students will be able to

- demonstrate knowledge of the working of the government
- file RTIs, PILs and FIRs
- improve their quality of life
- exhibit social consciousness
- exhibit prudent behaviour in managing personal finance

**Unit 1 (13 Hours)**

#### **Legal Literacy**

- 1.1 Structure of Government- Central and State, Urban and Rural
- 1.2 Laws pertaining to Women (CEDAW) and Children (POCSO)
- 1.3 Right to Information Act 2005, drafting and filing an RTI
- 1.4 Introduction to PIL, Landmark PIL cases -Vishaka Vs. State of Rajasthan, Hussainara Khatoon Vs. State of Bihar, MC Mehta Vs. Union of India
- 1.5 Importance of FIR and lodging an FIR

**Unit 2 (13 Hours)**

#### **2.1 Understanding Self**

- 2.1.1 Psychological wellbeing - meaning, components and barriers
- 2.1.2 Gratitude- meaning, nature and expression
- 2.1.3 Resilience- meaning, nature, benefits and simple techniques for building resilience.

## **2.2 Understanding Society**

- 2.2.1 Concepts of class, caste, gender, disability, race, culture, religion, ethnicity, context and language
- 2.2.2 Importance of societal analysis
- 2.2.3 Social indicators of development – HDI, GDI, Poverty Index, Hunger Index
- 2.2.4 Issues and challenges for social change in India

## **Unit 3**

**(13 Hours)**

### **Personal Financial Planning**

- 3.1 Meaning, Need and Importance of Personal Financial Planning
- 3.2 Core concepts in Financial Planning – Budget, Savings and Investment
- 3.3 Converting non-essential expenditure into Savings and Investment
  - 3.3.1 Forms of Savings – Deposits, Insurance
  - 3.3.2 Types of Investments – Securities, Real Estate and Gold
- 3.4 Digital transformation in Finance
  - 3.4.1 De-Mat Account
  - 3.4.2 Net Banking and Mobile Banking

### **BOOKS FOR REFERENCE**

Agarwal, R.C. Constitutional Development and National Movement of India. New Delhi: S. Chand, 1988.

Ahuja Ram. Social Problems in India. Rawat Publications. 3<sup>rd</sup> Edition, 2014

Allan, R. Modern Politics and Government. New York: Palgrave MacMillan, 2000.

Baumgardner, S., & Crothers, M. Positive Psychology. Chennai: Pearson. 1<sup>st</sup> Edition, 2015.

Grenville-Cleave, B. *Positive Psychology A practical Guide*. United Kingdom: Icon Books Ltd, 2012.

Pandey, J.N. Constitutional Law of India. Allahabad: Central Law Agency, 2014.

Weiner, M. The Indian Paradox. New Delhi: Sage , 1989.

### **PATTERN OF ASSESSMENT**

#### **Continuous Assessment:**

**Total Marks: 50**

- Two to three Task based components
- Task based classroom activities
- Case studies
- Group discussions
- Group presentation
- Role play

#### **No End Semester Examination**

**No CA test**

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**Allied Core Offered by the Department of Chemistry to students of Plant Biology and Plant Biotechnology and Advanced Zoology and Biotechnology**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**FUNDAMENTALS OF BIOCHEMISTRY II**

**CODE:19CH/AC/FB43**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

**OBJECTIVES OF THE COURSE**

- To provide an understanding of the biochemical importance of lipids, proteins, hormones and nuclei acids
- To enable students to acquire skills in simple laboratory testing of blood samples
- To enable students to understand the structure of DNA and RNA and explain the difference between the constituent bases, sugars, nucleosides and nucleotides

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Summarise the mechanism of DNA replication and learn the significance of discontinuous synthesis
- Demonstrate an understanding of the principles involved in important biochemical techniques
- Describe the mechanism for activation and transport of fatty acids into mitochondria for catabolism.
- Explain the mechanism for the formation of ketone bodies and identify the physiological and pathological roles of those molecules
- Distinguish between primary, secondary, tertiary, and quaternary protein structure
- Describe the effect of hormones on the processes and pathways that regulate blood glucose level

**Unit 1 (8 Hours)**

**Lipids**

- 1.1 Classification of Lipids and Fats
- 1.2 Definitions and Significance of Iodine Value, Acid Value, Saponification Value, RM Value and Acetyl Value
- 1.3 Lipid Metabolism- Oxidation of  $\beta$  fatty acids, Biosynthesis of Fatty Acids, Ketone bodies and Ketosis. Digestion and Absorption of Lipids
- 1.4 Risk factor of HDL, LDL and total cholesterol in the body

**Unit 2 (12 Hours)**

**Proteins**

- 2.1 Amino Acids - Classification based on R Groups
- 2.2 Chemical Reactions of amino acids - with ninhydrin, mineral acid, formaldehyde, FDNB and CO<sub>2</sub>
- 2.3 Structure of Proteins - Peptide Bond, Primary, Secondary and Tertiary structures.

- 2.4 Classification of proteins based on shape, composition and solubility. Properties of proteins - denaturation, amphoteric nature, ion binding capacity and solubility
- 2.5 Protein Metabolism - transamination, oxidative deamination and Urea Cycle.  
Digestion and absorption of proteins

**Unit 3 (5 Hours)**

**Hormones**

- 3.1 Definition, Classification of Hormones (Steroid and Non-Steroid Only)
- 3.2 Mechanism of Hormone Action
- 3.3 Functions of Insulin and Thyroxin. Clinical significance of TSH, T<sub>3</sub> and T<sub>4</sub>

**Unit 4 (8 Hours)**

**Nucleic Acids**

- 4.1 Nucleosides, Nucleotides, DNA – Structure (Watson and Crick model) and Functions
- 4.2 RNA – Structure, Types and Functions
- 4.3 Comparison of DNA and RNA with reference to occurrence, composition, structure and functions
- 4.4 DNA as Genetic Material, DNA Replication and Protein Synthesis

**Unit 5 (6 Hours)**

**Analytical techniques in Biochemistry**

- 5.1 Centrifugation – Principle and applications of sedimentation and Ultracentrifugation
- 5.2 Electrophoresis – Principle and applications of SDS-PAGE
- 5.3 Ultrafiltration – Principle and applications of Dialysis
- 5.4 Chromatography – Principle and applications of Thin layer (TLC) and High Performance Liquid Chromatography (HPLC)

**BOOKS FOR STUDY**

- Berry, A.K. *Textbook of Biochemistry*. Emkay, 2001.
- Doraiswamy Yesodha, Geetha Swaminathan and Nagamani, B. *Allied Biochemistry*. Chennai: Margham, 2015.

**BOOKS FOR REFERENCE**

- Lehninger A.L. *Principles of Biochemistry*. New Delhi: CBS, 2006.
- Stryer Lubert, *Biochemistry*. New York: W.H. Freeman, 2007.
- Satyanarayana U, (2005), *Biochemistry*, 2<sup>nd</sup> ed., Books and allied (P) ltd, Kolkata
- Dushyant Kumar Sharma. *Biochemistry*. Alpha Science, 2009
- Satyanarayana, U., *Biochemistry*, 2<sup>nd</sup> ed., Kolkata: Books and allied, 2005

**WEB RESOURCES**

- <http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/protein/>
- <http://e.hormone.tulane.edu/learning/types-of-hormones.html>
- <https://www2.chemistry.msu.edu/faculty/reusch/virtxtjml/nucacids.htm>
- <http://library.med.utah.edu/NetBiochem/nucacids.htm>

**PATTERN OF ASSESSMENT**

**Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 90 minutes**

Section A –  $15 \times 1 = 15$  Marks (All questions to be answered) Multiple choice - 5, Fill in the  
Blanks - 5, T/F or Match the following or single line answer - 5

Section B –  $3 \times 5 = 15$  Marks (3 out of 5 to be answered)

Section C –  $2 \times 10 = 20$  Marks (2 out of 3 to be answered)

**Other Components:**

**Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/  
MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 hours**

Section A –  $30 \times 1 = 30$  Marks (All questions to be answered) Multiple choice - 10, Fill in the  
Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B –  $5 \times 6 = 30$  Marks (5 out of 7 to be answered)

Section C –  $2 \times 20 = 40$  Marks (2 out of 3 to be answered)



**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**Allied Core Offered by the Department of Chemistry to students of Plant Biology and Plant Biotechnology and Advanced Zoology and Biotechnology**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**BIOCHEMISTRY PRACTICAL II**

**CODE:19CH/AC/P242**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL TEACHING HOURS:39**

**Unit 1**

**Estimations**

1. Estimation of Oxalic Acid /  $\text{Fe}^{2+}$  (Permanganimetry)
2. Estimation of Glucose
3. Estimation of Glycine by Sorensen's Titration
4. Estimation of Ascorbic Acid
5. Estimation of Acid Value / Saponification Value / Iodine Value of Edible Oil
6. Estimation of Enzyme Catalase in Chowchow / Radish

**Unit 2**

**Group Experiments**

1. Estimation of Phosphorus by Colorimetry
2. Estimation of DNA/RNA by Colorimetry
3. Separation of Amino Acids by Paper Chromatography

**BOOKS FOR STUDY**

Sathian Jesurietta. *Volumetric Estimations – Lab Manual*. 2010.

Vogel A.I. *Vogel's Textbook of Quantitative Chemical Analysis*. Prentice Hall, 2000.

Mendhan,J., *Vogel's Textbook of Quantitative Chemical Analysis*, Pearson 2009.

**PATTERN OF ASSESSMENT**

**Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 3 Hours**

Equations and short Procedure (10 minutes) 10 marks

Experiment

upto 2% error - 40 marks

2.1 – 3.0% - 35marks

3.1 – 4.0 25 marks

4.1 -5% 20 marks

Above 5% 15 marks

**End-Semester Examination:**

**Total Marks: 50**

**Duration: 3 hours**

Equations and short Procedure (10 minutes) 10 marks

Experiment

upto 2% error - 40 marks

2.1 – 3.0% - 35 marks

3.1 – 4.0 25 marks

4.1 -5% 20 marks

Above 5% 15 marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**Allied Core Offered by the Department of Chemistry to students of Physics**

(Effective from the academic year 2019-2020)

**FUNDAMENTALS OF CHEMISTRY II**

**CODE:19CH/AC/FC43**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

**OBJECTIVES OF THE COURSE**

- To learn various concentration terms and apply them for numerical calculations
- To comprehend the basics of electrochemistry
- To appreciate the importance of phase diagrams
- To gain fundamental knowledge of coordination complexes
- To learn the basics of thermoanalytical methods

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Apply numerical concepts related to mole concept and concentrations to practical exercises
- Prepare standard solutions based on stoichiometry of a chemical reaction
- Acquire introductory knowledge on Electrochemistry, Coordination Chemistry, Phase diagrams and Thermoanalytical methods
- Differentiate between Conductance, Conductivity, Molar Conductivity and Equivalent Conductivity
- Analyse TG curves of simple inorganic compounds

**Unit 1 (7 Hours)**

**Mole concept**

- 1.1 Definition of mole and applications of mole concept in stoichiometry
- 1.2 Equivalent weight – calculation of equivalent weight of oxidants and reductants in redox reactions, acids and bases, molecular volume
- 1.3 Concentration terms used to express strength of solutions- Normality, Molarity, Mole fraction and Molality, ppm and ppb

**Unit 2 (10 Hours)**

**Electrochemistry**

- 2.1 Definition of specific, equivalent & molar conductance, effect of dilution on Conductance
- 2.2 Ostwald dilution law, Kohlrausch's law –applications
- 2.3 Conductometric titration –principle and types
- 2.4 Electrochemical cells-definition, representation of cells and cell reactions, types of electrodes-standard hydrogen and calomel electrodes, Nernst equation-significance, standard electrode potential and its measurement, electrochemical series-applications
- 2.5 Commercial cells – Primary and Secondary cells, Fuel cells- Hydrogen-Oxygen, Batteries- Lead storage battery, Nickel-Cadmium battery

**Unit 3** **(6 Hours)**

**Phase rule**

- 3.1 Definitions - Phase, component and degree of freedom, Derivation of phase rule.
- 3.2 Application of phase rule to one component systems (water and carbon dioxide)
- 3.3 Two component systems: simple eutectic (Pb-Ag) and (Bi-Cd)

**Unit 4** **(8 Hours)**

**Coordination Chemistry**

- 4.1 Coordination complexes- definition, types of ligand, IUPAC nomenclature of simple mononuclear complexes
- 4.2 Isomerism- Structural- ionisation, linkage, ligand, coordination and hydrate isomerism. Stereoisomerism- geometrical and optical isomerism of four coordinated complexes.
- 4.3 Pauling theory (VBT)-geometry of complexes based on hybridization (coordination number 4 and 6) magnetic moment of complexes.
- 4.4 Biological coordination compounds- structural features (figurative representation only), functions of Haemoglobin and Vitamin B<sub>12</sub>

**Unit 5** **(8 Hours)**

**Thermoanalytical Methods**

- 5.1 TGA and DTA- Principle, Instrumentation, methods of obtaining Thermograms, factors affecting TGA/DTA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate
- 5.2 DSC- Principle, Instrumentation and applications.

**BOOKS FOR STUDY**

Puri, B.R., L.R. Sharma., Madan S. Pathania. *Principles of Physical Chemistry*. New Delhi: Vishal, 2018.

Puri B.R, Sharma L.R & Kalia K.C. *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2017.

Bahl, Arun, Bahl. B.S and Tuli, J.D, *Essentials of Physical Chemistry*, New Delhi, S.Chand & Co., 2018

Gopalan.R and Ramalingam.V *Concise Coordination Chemistry*, New Delhi, Vikas Publishing 2011

**BOOKS FOR REFERENCE**

Barrow, Gordon, M., *Physical Chemistry*, McGraw Hill & Co., 5<sup>th</sup> Ed., 2008.

Skoog, Douglas, West, Donald, Holler. James and Crouch, Stanley, *Fundamentals of Analytical Chemistry*, 9<sup>th</sup> Edition, Cengage Technology Edition, 2013

**WEBSITES**

[http://gibbs.uio.no/phase\\_rule.html](http://gibbs.uio.no/phase_rule.html)

<http://www.chem1.com/acad/webtext/elchem/ec2.html>

<http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch22/rate.php>

## **PATTERN OF ASSESSMENT**

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving  
MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

Allied Core Offered by the Department of Chemistry to students of Physics

**SYLLABUS**

(Effective from the academic year 2019–2020)

**GENERAL CHEMISTRY PRACTICAL**

**CODE:19CH/AC/P342**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL TEACHING HOURS:39**

**Unit 1**

**Phase Equilibria and Kinetics (Group Experiments)**

- 1.1 Kinetics Study of Acid Hydrolysis of an Ester
- 1.2 Determination of Molecular Weight by Rast Method

**Unit 2**

**Conductometry and Potentiometry (Group Experiments)**

- 2.1 Determination of Strength of Weak Acid Conductometrically
- 2.2 Determination of  $\text{Fe}^{2+}$  potentiometrically using Potassium Dichromate

**Unit 3**

**Volumetric Estimations**

- 3.1 Estimation of Oxalic Acid (Permanganimetry)
- 3.2 Estimation of Magnesium (Complexometry)
- 3.3 Estimation of Ferrous Ion (Permanganimetry)
- 3.4 Estimation of Glycine (Sorensen's method)

**BOOKS FOR STUDY**

Venkateswaran, V. R. Veeraswamy, and A. R. Kulandaivelu. *Basic Principles of Practical Chemistry*. New Delhi: Sultan Chand, 1993.

Sundaram. S, P.Krishnan, and P.S. Raghavan. *Practical Chemistry*. Chennai: S.Viswanathan, 1993.

Swaminathan Geetha and Mary George. *Laboratory Chemical Methods in Food Analysis*. Chennai: Margham, 2010.

**BOOK FOR REFERENCE**

Vogel, A.I. *A Text Book of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis*. London: ELBS, 1989.

Mendhan,J., *Vogel's Textbook of Quantitative Chemical Analysis*, Pearson 2009.

**PATTERN OF ASSESSMENT**

**Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 3 Hours**

Equations and short Procedure (10 minutes) 10 marks

Experiment

upto 2% error - 40 marks

2.1 – 3.0% - 35 marks

3.1 – 4.0 25 marks

4.1 -5% 20 marks

Above 5% 15 marks

**End-Semester Examination:**

**Total Marks: 50**

**Duration: 3 hours**

Equations and short Procedure (10 minutes) 10 marks

Experiment

upto 2% error - 40 marks

2.1 – 3.0% - 35marks

3.1 – 4.0 25 marks

4.1 -5% 20 marks

Above 5% 15 marks

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH IV – CHEMISTRY

**SYLLABUS**

(Effective from the academic year 2019–2020)

**ORGANIC CHEMISTRY III**

**CODE:19CH/MC/OC54**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To enable the students to understand the structure, synthesis and properties of heterocyclic compounds and their application as intermediates of industrial importance
- To enable students to identify the functional groups and study how reactions can be carried out chemoselectively.
- To provide a better understanding of the mechanisms involved in various rearrangements and organic syntheses
- To interpret the pattern of reactivity, mechanism and the ability to analyze the products of organic reactions

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Discuss and predict the reactivity of different heterocycles
- Classify carbohydrates and describe their reactivity by structural elucidation of simple monosaccharides
- Recognize organic molecules by their functional groups and identify the various agents that can be used to carry out reactions selectively and perform simple functional group transformations
- Identify the various types of molecular rearrangement reactions
- Interpret the pattern of reactivity, mechanism and predict the products of different organic reactions

**Unit 1 (12 Hours)**

**Heterocyclic Compounds**

- 1.1 Classification, Preparation of Furan, Pyrrole, Thiophene and Pyridine. Reactions - Electrophilic and Nucleophilic Substitutions, Oxidation and Reduction reactions.
- 1.2 Condensed Ring Systems- Indole, Quinoline, Isoquinoline - Comparison of Reactions. Preparation of Quinoline by Skraup's Synthesis and Isoquinoline by Bischler-Napieralsky Synthesis. Mechanism of Electrophilic and Nucleophilic substitutions, oxidation and reduction reactions. Relationship between Indole, Isatin and Indigo

**Unit 2 (15 Hours)**

**Carbohydrates**

- 2.1 Classification by various methods. Explanation of Diastereomer, Enantiomer,

- Anomer, Epimer, Building of Carbohydrates from D-Glyceraldehyde, D and L Sugars
- 2.2 Monosaccharides-  $\text{HIO}_4$  Oxidation, Mechanism of mutarotation, osazone formation. Haworth structure, structural elucidation of Glucose and Fructose, Determination of configuration and ring size. Interconversion of Glucose and Fructose. Ascending and Descending the Sugar Series
- 2.3 Disaccharides -Formation of Glycosidic Bond: Haworth's Structure of Sucrose, Maltose, Lactose. Difference between Maltose and Cellobiose. Polysaccharides- Structure and Reactions of Starch and Cellulose. Applications of Cellulose- acetate and xanthate

**Unit 3 (18 Hours)**

**Natural Products**

- 3.1 Occurrence and Extraction of Terpenoids, Carotenoids, Steroids and Alkaloids in nature
- 3.2 Alkaloids- Definition and Classification, General Properties, Determination of the chemical constitution of the alkaloids, functional group analysis, estimation of groups- OH,  $\text{NH}_2$  and  $\text{OCH}_3$ , degradation and synthesis. Structural Elucidation of Piperine, Nicotine
- 3.3 Terpenoids- Classification, Isoprene Rule, General Properties, Structure Determination of the following Monoterpenoids – Citral,  $\alpha$ -Terpeneol and  $\alpha$ -Pinene

**Unit 4 (10 Hours)**

**Molecular Rearrangements**

- 4.1 Classification-Anionotropic, Cationotropic, Free Radical, Inter and Intramolecular rearrangements
- 4.2 Pinacol-Pinacolone, Beckmann, Hoffmann, Curtius, Lossen, Wolff and Benzilic acid rearrangements (mechanism, evidence for intermediate formation- migratory aptitude)
- 4.3 Claisen and Cope (Sigmatropic rearrangement). Fries rearrangement (- evidence for intramolecular nature and allylic carbon attachment)

**Unit 5 (10 Hours)**

**Functional Group interconversion and Designing Organic Synthesis**

- 5.1 Protection of Functional Groups – Need for and methods of protection of –  $\text{NH}_2$ , -OH,  $>\text{C}=\text{O}$ ,  $>\text{C}=\text{C}$  and -COOH Groups
- 5.2 Functional Group Modifications by Reduction, Oxidation, Addition, Elimination, Displacement and Addition – Elimination Processes

**BOOKS FOR STUDY**

Agarwal O. P. *Chemistry of Organic Natural Products Vol 1 and 2*. Goel Publishing house, 2002.

Sachin Kumar Gosh. *Advanced General Organic Chemistry (A Modern Approach) (Set I & II)*, 3<sup>rd</sup> Edition, New Central Book Agency, Kolkatta, 2010

Tewari, K.S. and Vishnoi, N. K. *A Text Book of Organic Chemistry*, 4<sup>th</sup> edition, Vikas Publishing 2017

**BOOKS FOR REFERENCE**

Michael B. Smith, Jerry March. *March's Advanced Organic Chemistry Reactions, Mechanisms, and Structure*. Wiley, 2007.



Morrison .R.T,Boyd R.N &Bhattacharjee.S.K.*Organic Chemistry*. Pearson, Dorling Kindersley, 2012.

Ahluwalia V K.*Organic Reaction Mechanisms*.NewDelhi:Narosa Publishing House, 2011.

GurdeepChatwal. *Chemistry of Organic Natural Products*Vol 1 and 2, Goel Pub.House,2002.

Finar I.L. *Organic Chemistry* Vol. I& II. London:ELBS,2002.

Jonathan Clayden, Nick Greeves, Stuart Warren.*Organic Chemistry*.Oxford University, 2012.

Paula Y. Bruice.*Organic Chemistry*.Prentice Hall, 2010.

ReinhardBrückner.*Organic Mechanisms - Reactions, Stereochemistry and Synthesis*. Springer, 2010.

### WEB RESOURCES

<http://www.organic-chemistry.org/>

<http://www.chemguide.co.uk/orgmenu.html>

<http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>

### PATTERN OF ASSESSMENT

**Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components: Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/ MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination: Total Marks: 100 Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**  
**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**PHYSICAL CHEMISTRY II**

**CODE:19CH/MC/PC54**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To provide basic concepts in physical chemistry including Fundamental Concepts of Thermodynamics, Heat, Work, Internal Energy, Enthalpy, and the First Law of Thermodynamics
- To impart the basic concepts of Thermodynamics and Thermochemistry
- To bring an understanding of the second law of Thermodynamics
- To provide an understanding of Gibbs phase rule and phase equilibria
- To understand the theory and technique of separation of miscible and immiscible liquids
- To enlighten the students on the theory of colligative properties

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Define the various terms involved in Thermodynamics
- Explain basic thermodynamic properties and units.
- Apply the second law of thermodynamics to thermal cycles
- Determine the enthalpy of formation from bond energies of molecules
- Apply the principle of phase equilibria to one and two component systems
- State how two liquids can be separated by various physical methods
- Appreciate the significance of colligative properties

**Unit 1**

**(15 Hours)**

**Introduction to Thermodynamics**

- 1.1 Types of Systems, Extensive and Intensive Properties, Different Forms of Energy. First Law – Statements, Internal Energy and Enthalpy, State and Path Functions and their characteristics
- 1.2 Isothermal and Adiabatic Changes for ideal gases - Work Done, Internal Energy Changes, Thermodynamics of Real Gases obeying van der Waal's Equation of State, Isothermal and Adiabatic Changes for Real Gases- Work Done, Internal Energy Changes, Difference between Heat Capacities at Constant Pressure and Volume of ideal and real gases
- 1.3 Joule- Thomson Effect, Inversion Temperature
- 1.4 Thermochemistry- Change in enthalpy of Chemical reaction, Endothermic and Exothermic reactions, Kirchoff's equation (Variation of enthalpy with temperature), Enthalpy of formation, Enthalpy of combustion and bond energy, resonance energy

**Unit 2 (15 Hours)**

**Second Law of Thermodynamics**

- 2.1 Need for Second Law, Different Forms of stating the Law, Carnot's Cycle and Carnot's Theorem, Thermodynamic Scale of Temperature
- 2.2 Concept of Entropy, S as a Function of T&P, P&V and T&V. Entropy Changes in a Phase change (Trouton's Rule), Entropy Change for Irreversible Processes (Clausius Inequality) Comparison of  $\Delta S$  for Reversible and Irreversible Processes, Criteria for Spontaneity of Process in Terms of  $\Delta S$ , Entropy of Mixing and Entropy as a Measure of Disorder, Third Law Statement
- 2.3 Helmholtz and Gibb's Energies, Maximum and Net Work done, Variation in A & G in Terms of P, V and T, Condition for Equilibrium and Spontaneity, Maxwell's Relations, Standard Free Energies, Gibbs-Helmholtz Equation and its Application in Chemistry
- 2.4 Chemical Equilibria: Law of Mass Action, Equilibrium Constant and Free Energy, Significance of K, Application of Law of Mass Action to Homogenous systems, Le Chatelier's Principle, van't Hoff Equation (Reaction Isochore) and van't Hoff's Reaction Isotherm.

**Unit 3 (12 Hours)**

**Introduction to Phase Equilibria**

- 3.1 Phase, Component, Degree of freedom, Gibbs Phase rule, Thermodynamic derivation of Phase rule, Phase diagram of One component system – water, sulphur and carbon dioxide, application of Clausius-Clapeyron Equation to phase systems
- 3.2 Measures of Concentration- Molality and Mole Fraction, Partial Molal Properties, Concept of Chemical Potential, Gibbs-Duhem Equation
- 3.3 Raoult's Law (with conditions for deviations) and Henry's Law, Real Solutions, Concept of Activity and Activity Coefficient

**Unit 4 (9 Hours)**

**Separation of Liquid Mixtures using Phase Equilibria**

- 4.1 Phase Diagrams of Binary liquids -Mixtures of Volatile Liquids (Fractional Distillation, Low and High Boiling Azeotrope), Lever Rule and fractional distillation
- 4.2 Distillation of immiscible liquids - Steam Distillation, Solubility of partially miscible liquids- Phase Diagram (Nitrobenzene & Hexane and Water & Triethylamine)
- 4.3 Nernst Distribution Law, Conditions, Derivation, Applications

**Unit 5 (14 Hours)**

**Phase Equilibria in Real Systems**

- 5.1 Two-component systems- Cooling curves, Simple eutectic system (Pb-Ag), Phase diagram of compound with congruent melting point ( $\text{FeCl}_3$  -water system)
- 5.2 Phase diagram of compounds with incongruent melting points (sodium sulphate water system) efflorescence, deliquescence
- 5.3 Colligative Properties – Depression in Freezing Point, Elevation in Boiling Point and Osmosis van't Hoff Factor, Abnormal Molar Mass, Degree of Dissociation and Association

## BOOKS FOR STUDY

Rajaram, J & Kuriakose, J. C. *Chemical Thermodynamics - Classical, Statistical and Irreversible Thermodynamics*. Pearson, 2013.

Peter Atkins & Julio de Paula, *Physical Chemistry* 10 th Ed., Oxford University Press 2016.

## BOOKS FOR REFERENCE

Puri, B.R., Sharma, L.R.& Pathania, M.S., *Principles of Physical Chemistry*, Vishal Publishing Co, Jalandar, Delhi, 2018

Bahl,A, Bahl,B.S.& Tuli, G.D., *Essentials of Physical Chemistry*, S.Chand, 2018

Donald Allan McQuarrie, John Douglas Simon. *Physical Chemistry: A Molecular Approach*. University Science Books, 2013.

Zundhal, S.S. *Chemistry concepts and applications* Cengage India 2011.

Ball, D. W. *Physical Chemistry* Cengage India 2012.

Mortimer, R. G. *Physical Chemistry* 3rd Ed., Elsevier: NOIDA, UP 2009.

Levine, I. N. *Physical Chemistry* 6th Ed., Tata McGraw-Hill 2011.

Metz, C. R. *Physical Chemistry* 2nd Ed., Tata McGraw-Hill 2009.

Klotz, I.M. *Introduction to Chemical Thermodynamics*. New York: W.A. Benjamin, 2000.

Rastogi, R.P. & R.R. Misra. *An Introduction to Chemical Thermodynamics*. New Delhi: Vikas, 1990.

Barrow, Gordon, M. *Physical Chemistry*. McGraw Hill, 2008.

Glasstone, Samuel, *Thermodynamics*, Tata McGraw-Hill, 2000

## WEB RESOURCES

<http://www.chem.uci.edu>

[http://serc.carleton.edu/research\\_education/equilibria/phaserule.html](http://serc.carleton.edu/research_education/equilibria/phaserule.html)

<http://www.chem1.com/acad/webtext/thermeq/>

<http://www.jce.acs.in>

## PATTERN OF ASSESSMENT

**Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components: Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving/MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination: Total Marks: 100 Duration: 3 hours**  
**10 to 15% of portion must be numerical**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**BIOCHEMISTRY**

**CODE:19CH/MC/BC54**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To provide knowledge on concepts of Biochemistry
- To enable an understanding of Biomolecules, metabolic pathways and bioenergetics
- To enable students to understand the chemistry involved in enzyme action

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the composition of blood
- Appreciate the significance of biomolecules
- Comprehend and explain the various metabolic processes in the human body
- Appreciate the features of enzymes
- Describe the mechanism of hormone action

**Unit 1 (10 Hours)**

**Introductory Biochemistry**

- 1.1 Molecular Logic of Living Organisms
- 1.2 Relationship of Biochemistry and Medicine
- 1.3 Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia
- 1.4 Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis

**Unit 2 (18 Hours)**

**Structure of Biomolecules**

- 2.1 Amino Acids– Classification Based on R Groups and their Metabolism, Zwitter ions, isoelectric point, peptide bond formation, Chemical Reactions - with Mineral Acid, (HNO<sub>2</sub>) Formaldehyde, FDNB, and CO<sub>2</sub>, Ninhydrin Test, Action of Heat on  $\alpha$ ,  $\beta$  and  $\gamma$  - Amino acids
- 2.2 Proteins - Primary, Secondary, Tertiary and Quaternary Structures. Sequencing of Proteins -N Terminal and C Terminal Determination. Ramachandran Plot
- 2.3 Lipids– Classification of Lipids as Saponifiable and Non-Saponifiable, Definitions and Significance of Iodine Value, Acid Value, Saponification Value, RM Value and Acetyl Value
- 2.4 Nucleic Acids – Structure and Functions. Nucleosides, Nucleotides, Structure of DNA, RNA - Types and Differences. DNA Replication and Protein Synthesis
- 2.5 Genetic Engineering: Definition, overview of tools (type II restriction enzymes) and techniques (creating genetically modified organism through microinjection and agrobacterium mediated recombination), Applications

**Unit 3 (15 Hours)**

**Metabolism**

- 3.1 Carbohydrate Metabolism - Glycolysis, TCA Cycle, Glycogenesis, Glycogenolysis, Gluconeogenesis, Oxidative Phosphorylation, Electron Transport Chain
- 3.2 Proteins - Transamination, Oxidative Deamination and Urea Cycle. Inborn Errors of Amino Acid Catabolism – Albinism, Alkaptonuria and Phenyl Ketonuria
- 3.3 Amino Acids: Synthesis - Gabriel's Synthesis, Strecker's Synthesis. Preparation of Tryptophan from Indole
- 3.4 Lipids - Oxidation of Fatty Acids, Biosynthesis of Fatty Acids, Ketone Bodies

**Unit 4 (14 Hours)**

**Enzymes**

- 4.1 Definition of Enzymes and Coenzymes (TPP, NAD, NADP, FAD, ATP) Cofactors-Prosthetic Group of Enzymes
- 4.2 Classification of Enzymes (with Examples)
- 4.3 Enzyme Specificity - Factors affecting Enzyme Action
- 4.4 General Mechanism of Enzyme Catalysis - Michaelis - Menten Theory – Fischer's Lock and Key Model, Koshland's Induced Fit Model
- 4.5 Mechanism of Inhibition (Competitive, Non-Competitive, Allosteric)
- 4.6 Structure and Function of Carboxypeptidase A

**Unit 5 (8 Hours)**

**Vitamins and Hormones**

- 5.1 Vitamins: Definition, Classification (as water and fat soluble), sources, structure and functions of Vitamins A and C
- 5.2 Definition, Classification of Hormones (Steroid and Non-Steroid Only) Source and Functions of Insulin, Thyroxin and Sex Hormones, Mechanism of Hormone Action

**BOOKS FOR STUDY**

Jain J.L. *Fundamentals of Biochemistry*. New Delhi: S. Chand, 2001.  
Doraiswamy Yesodha, Swaminathan Geetha and V. Radhakrishnan. *Allied Biochemistry*. Chennai: Margham, 2002.

**BOOKS FOR REFERENCE**

Berry, A.K. *Textbook of Biochemistry*. Emkay, 2001.  
Lehninger A.L. *Principles of Biochemistry*. New Delhi: CBS Publishers, 2006.  
Satyanarayana, U, U. Chakrapani. *Biochemistry*. Delhi: New Central Book Agency, 2006.  
Stryer Lubert. *Biochemistry*. New York: W.H. Freeman, 2007.

**WEB RESOURCES**

<https://www.rpi.edu/dept/bcbp/molbiochem/MBWeb/mb1/part2/bioener.htm>  
<http://www.rsc.org/Education/Teachers/Resources/cfb/enzymes.htm>  
<http://www.rsc.org/Education/Teachers/Resources/cfb/carbohydrates.htm>  
<http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/protein/>  
<http://e.hormone.tulane.edu/learning/types-of-hormones.html>

## **PATTERN OF ASSESSMENT**

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the  
Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/  
MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the  
Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH IV – CHEMISTRY

**SYLLABUS**

(Effective from the academic year 2019–2020)

**BIOCHEMISTRY PRACTICAL**

**CODE:19CH/MC/P551**

**CREDITS:1**

**L T P:0 0 2**

**TOTAL TEACHING HOURS:26**

**Unit 1**

**Estimation of**

- 1.1 Glycine by Sorensen's formalin method
- 1.2 Glucose by Benedicts method
- 1.3 Ascorbic acid by Dye method
- 1.4 Protein by Biuret method
- 1.5 Catalase activity
- 1.6 Vitamin A by colorimetry
- 1.7 DNA/RNA (Spectrophotometry)

**Unit 2**

**Chromatography (Demonstration only)**

- 2.1 Separation of amino acids by paper chromatography
- 2.2 Separation of o-and p-nitrophenol by thin layer chromatography (TLC)/column chromatography

**BOOKS FOR STUDY**

Vogel, A.I. *Quantitative Organic Analysis*, Part 3, Pearson Education (2012).  
Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education (2009)

**BOOKS FOR REFERENCE**

Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.*, Pearson Education (2012)  
Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*, University Press (2000).  
Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, University Press (2000)  
Vogel, A.I., Tatchell, A.R., Furnis, B.S. Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.



## **PATTERN OF ASSESSMENT**

### **Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 3 Hours**

Equations and short Procedure (10 minutes) 10 marks

Experiment

upto 2% error

40 marks

2.1 – 3.0%

35 marks

3.1 – 4.0

25 marks

4.1 -5%

15 marks

Above 5%

10Marks

### **End-Semester Examination:**

**Total Marks: 50**

**Duration: 3 hours**

Equations and short Procedure (10 minutes) 10 marks

Experiment

upto 2% error

40 marks

2.1 – 3.0%

35 marks

3.1 – 4.0

25 marks

4.1 -5%

15 marks

Above 5%

10Marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**PHYSICAL CHEMISTRY PRACTICAL I**

**CODE:19CH/MC/P652**

**CREDITS:2**

**L T P:0 0 3**

**TOTAL TEACHING HOURS:39**

**Unit 1**

**Thermometry**

Determination of enthalpy of neutralization of strong acid by strong base

**Unit 2**

**Phase Equilibria**

2.1 Determination of Molecular Weight by Rast Method

2.2 Construction of the Phase Diagram of Phenol - Water system and determination of Critical Solution Temperature (CST), Critical Solution Composition (CSC) and the composition of the given mixture

**Unit 3**

**Chemical Kinetics**

Determination of Rate Constant of Acid Catalyzed hydrolysis of ester

**Unit 4**

**Adsorption Isotherm**

Verification of the Freundlich isotherm for the adsorption of acetic acid on activated charcoal

**Unit 5**

**Conductometry, pH and Potentiometry**

5.1 Verification of Ostwald's dilution law

5.2 Verification of Hendersons' Equation

5.3 Determination of  $\text{Fe}^{2+}$  in the given sample potentiometrically using potassium dichromate

5.4 Determination of strength of the given acid using quinhydrone potentiometrically

**Theory and principles behind the experiments concerned to be tested periodically and along with the CA tests for a maximum of five marks.**

**BOOKS FOR STUDY**

Viswanathan, B. and Raghavan, P.S., *Practical Physical Chemistry*, New Delhi, Viva Books 2005.

Venkateswaran, V. R. Veeraswamy, and A. R. Kulandaivelu. *Basic Principles of Practical Chemistry*. New Delhi: Sultan Chand, 1993.

### **BOOKS FOR REFERENCE**

Vogel, A.I., *Vogel's Textbook of Quantitative Chemical Analysis*. Prentice Hall, Science, 2000.

### **PATTERN OF ASSESSMENT**

**Continuous Assessment Test:**                      **Total Marks: 50**                      **Duration: 3 Hours**

Two- Three questions on Principles involved in Physical Chemistry Experiments	5 marks
Procedure and experimental principles	5 marks
Tabulation, calculation and graph	15 marks
Experimental Result	25 marks

**End-Semester Examination:**                      **Total Marks: 50**                      **Duration: 3 hours**

Two- Three questions on Principles involved in Physical Chemistry Experiments	5 marks
Procedure and experimental principles	5 marks
Tabulation, calculation and graph	15 marks
Experimental Result	25 marks

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600086.**

**Interdisciplinary Core Course Offered by the Departments of Chemistry and Botany to  
B.Sc. Chemistry and B.Sc. Plant Biology and Plant Biotechnology Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**BIOANALYTICAL TECHNIQUES**

**CODE:19ID/IC/BA55**

**CREDITS:5**

**L T P: 5 1 0**

**TOTAL TEACHING HOURS: 78**

**OBJECTIVES OF THE COURSE**

- To provide an understanding of extraction and separation techniques
- To use spectroscopic techniques to understand the structure of phytochemicals
- To understand cell size and morphology using microscopy
- To understand the basic principles of various instrumentation

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Extract and separate phytochemicals using separation techniques
- Isolate biomolecules using centrifugation and gel electrophoresis
- Characterize and analyse the extracted product
- Examine and check the purity of a sample
- Separate a substance based on its solubility
- Estimate the metal ions by spectrophotometry and Flame photometry
- Assess water quality using turbidimetry.

**Unit 1 (16 Hours)**

**Microscopy: Principle, Construction and Application**

- 1.1 Light microscopes – Compound, Phase Contrast, Differential Interference Contrast and Confocal Microscopes.
- 1.2 Preparation of Specimen for Light Microscopy – Paraffin Techniques – Fixatives: FAA, Carnoy's, Dehydration and Infiltration, Embedding and Sectioning (Paraffin Blocks), Staining and Mounting.
- 1.3 Electron Microscopes – TEM, specimen preparation for TEM.

**Unit 2 (15 Hours)**

**Centrifugation: Principle, Instrumentation and Application**

- 2.1 Bench, Ultracentrifuge, Refrigerated, Continuous flow centrifuge and Microfuge.
- 2.2 Density gradient and differential centrifugation
- 2.3 Isolation of Chloroplast (practical)

**Unit 3 (16 Hours)**

**Separation Techniques**

- 3.1 Separation by solvent extraction: Principle, Extraction by chemically active solvents, Soxhlet extraction, Factors Influencing the Extraction Efficiency.
- 3.2 Capillary Electrophoresis (Capillary Zone and Capillary Gel), Gel Electrophoresis – Agarose and Polyacrylamide, Orthogonal-Field-Alternation, Gel Electrophoresis (OFAGE), Field Inversion Gel Electrophoresis (FIGE), Immunoelectrophoresis.
- 3.3 Separation of Proteins/ DNA using Gel Electrophoresis (Practical)
- 3.4 Separation by Precipitation, methods of Filtering, Drying- Ignition & Incineration of Precipitate, Nucleation, Crystal Growth, Solubility Product, Principle, Factors affecting Solubility, Purity of Precipitates, Co-precipitation and Post Precipitation

**Unit 4 (14 Hours)**

**Purification techniques**

- 4.1 Desiccants: Types, efficiency, regeneration and choice of desiccants
- 4.2 Technique of drying of solids, Distillation: Types, Theory and techniques of fractional, Steam and Vacuum distillation
- 4.3 Recrystallisation, Sublimation - Types, techniques and applications
- 4.4 Criteria and test for purity- melting point, boiling point and density

**Unit 5 (17 Hours)**

**Spectroscopic Techniques and Spectrochemical Methods**

- 5.1 Introduction to Spectroscopy, Beer-Lambert's law-statement and deviation; UV-Visible-instrumentation and applications-estimation of  $Mn^{2+}$
- 5.2 Nephelometry and Turbidimetry Principle, Instrumentation and Applications-determination of TDS of water sample
- 5.3 Principle, Instrumentation and Applications of Atomic absorption Spectroscopy (estimation of Ca), Flame photometry (estimation of K/Na) and Fluorimetry (estimation of Fluorescein)

**BOOKS FOR STUDY**

- Gopalan, R, Subramanian, P.S and Rengarajan, K. *Elements of Analytical Chemistry*. New Delhi: Sultan Chand, 2004.
- Skoog, D.A, West, D.M. *Fundamentals of Analytical Chemistry*. Thomson Asia, 2014.
- Steven, E Ruzin, *Plant Microtechnique and Microscopy*, USA: Oxford University, 1999.
- Jensen, W.A. *Botanical Histochemistry*. New Delhi: TataGraw – Hill, 1962.
- Vogel, A.I. *Vogel's Textbook of Quantitative Chemical Analysis*. Prentice Hall, Science, 2000.

**BOOKS FOR REFERENCE**

- Beckman Coulter, Daniel, C Liebler. *Introduction to Proteomics: Tools for new biology*, Human, 2002.
- Day R.A.Jr. & A.L. Underwood. *Quantitative Analysis*. New Delhi: Prentice Hall of India, 1993.
- Herb Schwartz and Andras Guttman. *Separation of DNA by Capillary Electrophoresis*, USA

James P. Landers, *Handbook of Capillary and Microchip Electrophoresis and Associated Microtechniques*, USA: CRC, 2008.

Karp Gerald. *Cell and Molecular Biology: Concepts and Experiments*. USA: Wiley, 2013.

Landers, James P. *Handbook of Capillary Electrophoresis*. USA: CRC, 1996.

Mendhan, J., *Vogel's Textbook of Quantitative Chemical Analysis*. New Delhi: Pearson 2009.

Skoog, Douglas A, James F. Holler & Timothy A. Nieman. *Principles of Instrumental Analysis*. Singapore: Haracourt Asia, 2001.

Srivastava, T.N & P.C.Kamboj. *Systematic Analytical Chemistry*. New Delhi: Shobanlal Nagin Chand, 1999.

Usharani, S. *Analytical Chemistry*. New Delhi: Macmillan, 2006.

## WEB RESOURCES

<https://www.britannica.com/science/separation-and-purification>

<http://www.britannica.com/EBchecked/topic/108875/separation-and-purification>

<http://www.chemistry.co.nz/stoichiometry.htm>

## PATTERN OF ASSESSMENT

**Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

## Other Components:

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving

MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination: Total Marks: 100 Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**  
**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**INORGANIC CHEMISTRY II**

**CODE:19CH/MC/IC64**

**CREDITS:4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To enable the students to understand the importance of transition metal ions in biological systems
- To enable a comprehensive understanding of the theories of bonding in coordination compounds.
- To apply the acquired knowledge of coordination chemistry in solving problems related to electronic and magnetic properties of transition metal complexes
- To enable students to understand the structure and bonding of organometallic compounds
- To give an insight on inner transition elements

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Identify the role played by transition metal complexes in Inorganic Chemistry.
- Explain the theories of bonding, structure, electronic and magnetic properties of coordination compounds and their kinetics.
- Appreciate the importance of coordination compounds in qualitative and quantitative analysis
- Recognize and explain the role of metal ions in living systems and their significance in diagnosis and medicinal therapy
- Appreciate the chemistry of Lanthanides and Actinides series in the periodic table

**Unit 1**

**(10 Hours)**

**Transition Elements**

- 1.1 General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and EMF (Latimer & Ebsworth diagrams) Difference between the first, second and third transition series
- 1.2 Ti, V, Cr, Mn Groups, Fe, Co, Ni Groups - A Comparative Study with respect to Oxidation States, Oxides and Complexes
- 1.3 Biological Importance of Transition Metals-Biological Roles of Mo, Fe, Co, Cu, Zn (Metal Containing Proteins, Vitamins and Enzymes and their Biological Roles)

**Unit 2 (18 Hours)**

**Chemistry of Coordination Compounds**

- 2.1 Introduction – Ligands- Monodentate, Bidentate and Polydentate Ligands, Coordination Sphere, Coordination Number, Chelate Effect, Nomenclature of Coordination Compounds
- 2.2 Isomerism – Linkage, Ionization, Hydrate, Coordination, Coordination Position Isomerism, Geometrical and Optical Isomerism of 4 and 6 – Coordinate Complexes

**Unit 3 (18 Hours)**

**Theories and Applications of Coordination Compounds**

- 3.1 Sidgwick's Effective Atomic Number Rule (EAN), 18 Electron Rule, Valence Bond Theory (VBT), Hybridization, Geometry and Magnetic Properties of Coordination Compounds, Drawbacks of VBT
- 3.2 Crystal Field Theory - Crystal Field Splitting in Octahedral, Tetrahedral and Square Planar Complexes, Crystal Field Stabilization Energy, Spectrochemical Series, Low and High Spin Complexes, factors influencing the magnitude of Crystal Field Splitting, Jahn Teller Effect
- 3.3 Applications of Coordination Compounds in Qualitative and Quantitative Analyses Potassium Ferrocyanide, Potassium Ferricyanide, Alizarin, Ferrioin, DMG, Oxine, Cupferron and EDTA

**Unit 4 (9 Hours)**

**Inner Transition Elements**

- 4.1 Lanthanides – Lanthanide Series, their position in the Periodic Table, Properties of Lanthanides with respect to electronic configuration, oxidation states, colour, spectral and magnetic properties
- 4.2 Lanthanide Contraction and its consequences
- 4.3 Isolation of Lanthanides - Ion Exchange Chromatography
- 4.4 Actinides – Actinide Series, Position in the Periodic Table, Properties of Actinides with respect to electronic configuration, oxidation states, colour, spectral and magnetic properties. Actinide Contraction and its Consequences. Comparison between Lanthanides and Actinides
- 4.5 Extraction of Thorium from Monazite and Uranium from Pitch Blende

**Unit 5 (10 Hours)**

**Organometallic Compounds**

- 5.1 Metal Carbonyls - Preparation, Properties and Structures of Ni and Fe Carbonyls
- 5.2 Preparation and Structures of Metal Alkyls and Aryls of Li, Al and Ti. Structure of Metal Alkene Complexes –Ziese's salt
- 5.3 Ferrocene - Preparation and reactions (acetylation, alkylation, metallation, Mannich Condensation), Structure and Aromaticity - Comparison of aromaticity and reactivity with that of benzene (No MO treatment)

**BOOKS FOR STUDY**

- Gopalan R, V. Ramalingam. *Concise Coordination Chemistry*. New Delhi: Vikas, 2001.
- Lee J.D. *Concise Inorganic Chemistry*. London: ELBS, 2008.
- Puri. B.R., L.R. Sharma., & C.I. Kalia *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2008.



## BOOKS FOR REFERENCE

- Atkins, P.W., Fraser Armstrong, Jonathan Rourke, Mark Weller & Tina Overton. *Inorganic Chemistry*. Oxford Press, 2010
- Cotton, F.A., and G. Wilkinson. *Advanced Inorganic Chemistry*. New Delhi: Wiley Eastern, 2008.
- James, E., Huheey & Ellen A. Keiter. *Principles of Structure and Reactivity*. Pearson, India, 2011.
- Purcell, K.F and J.C Kotz., *Inorganic Chemistry* W.B. Saunders, 1977.
- Lippard, S.J. and J.M. Berg, *Principles of Bioinorganic Chemistry* Panima 1994.
- Basolo, F, and R.C Pearson, *Mechanisms of Inorganic Chemistry*, New York: John Wiley, 1967.
- Greenwood, N.N. and A. Earnshaw., *Chemistry of the Elements*, Butterworth- Heinemann, 1997
- Miessler, G. L. & Donald, A. Tarr, *Inorganic Chemistry 4th Ed.*, Pearson, 2010.
- Crabtree, Robert H. *The Organometallic Chemistry of the Transition Metals. j* New York, NY: John Wiley, 2000
- Huheey, J. E.; Keiter, E.A. & Keiter, R.L. *Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed.*, Harper Collins 1993, Pearson, 2006.
- Spessard, Gary O., & Gary L. Miessler. *Organometallic Chemistry*. Upper Saddle River, NJ: Prentice-Hall, 1996
- Sharpe, A.G. *Inorganic Chemistry*, 4th Indian Reprint (Pearson Education) 2005

## WEB RESOURCES

- <http://www.chem1.com/acad/webtext/chembond/cb09.html>
- <http://www.britannica.com/EBchecked/topic/602775/transition-element/81116/Biological-functions-of-transition-metals>
- <https://www2.chemistry.msu.edu/faculty/reusch/virtxtjml/orgmetal.htm>

## PATTERN OF ASSESSMENT

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**  
Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**  
Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving  
MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**  
Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5  
Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)  
Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**  
**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-20)

**PHYSICAL CHEMISTRY III**

**CODE:19CH/MC/PC64**

**CREDITS:4**

**L T P :4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To develop an understanding of the key concepts of Electrochemistry
- To impart knowledge on various types of cells and their significance
- To give complete understanding of rate of a chemical reaction
- To give an insight into adsorption and catalysis
- To impart skills to solve numerical problems

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the key concepts involved in Electrochemistry
- Describe the operations of different types of electrochemical cells and electrodes
- Appreciate the importance of Kinetics in chemical reactions
- Develop an interest in Surface Chemistry and Catalysis
- Solve numerical problems

**Unit 1 (10 Hours)**

**Electrochemistry I**

- 1.1 Migration of Ions, Conductivity, Ostwald's Dilution Law, Variation of Conductance with Dilution, Types of Conductometric titration, Kohlrausch's Law, Ionic Mobility, Transport Number and Ionic Conductance
- 1.2 Transport Number - Determination by Hittorf's and Moving Boundary Methods,
- 1.3 Debye Hückel Theory of Strong Electrolytes, Debye-Falkenhagen effect, Wien effect
- 1.4 Activity Coefficient, Mean Activity Coefficient and Ionic Strength

**Unit 2 (15 Hours)**

**Electrochemistry II**

- 2.1 Concept of Electrochemical Cell, Galvanic Cell, Reversible and Irreversible Cells, Half Cells, Electrode and Cell Reactions, Nernst Single Electrode Potential, Cell Representation, Terminology and Conventions
- 2.2 Reversible Electrodes, Standard Hydrogen Electrode, Calomel Electrode, and Equation of EMF of Cells- Standard Electrode Potentials, Sign Convention, Electrochemical Series, Significance, Applications. Weston Cadmium Cell, EMF – Measurement Poggendorff's Compensation Method, Redox Potential
- 2.3 Applications of EMF Measurements: Application of Gibbs - Helmholtz Equation in the Calculation of  $\Delta G$ ,  $\Delta H$ ,  $\Delta S$ , Temperature Coefficient of EMF of Galvanic

- Cells, Equilibrium Constant, Determination of pH using Glass, Hydrogen and Quinhydrone Electrodes, Potentiometric Titration
- 2.4 Types of Reversible Cells, Concentration Cells with and without Transference. Liquid Junction Potential (cell reversible with respect to cations and anions) Derivation - Significance of Salt Bridge

**Unit 3 (16 Hours)**

**Chemical Kinetics**

- 3.1 The Rate Equation, Order and Molecularity of Reactions with Examples, Derivation of Rate Constants for Zero, First, Second (Equimolar and Non-Equimolar Reactant Concentrations) and  $n^{\text{th}}$  Order Reactions, Characteristics of Fractional Order Reactions, Half Life Time, Methods of Determination of Order of Reaction
- 3.2 Collisions and Encounters, Effect of Temperature on Reaction Rate, Concept of Activation Energy, Energy Barrier, Effect of Catalyst, Arrhenius Equation, Calculation of Arrhenius Parameters
- 3.3 Theories of Reaction Rates, Collision Theory of Bimolecular Reactions, Limitations of Collision Theory, Activated Complex Theory of Bimolecular Reactions, Transition State Theory – Thermodynamic Derivation of Rate Constant for TS, Eyring's Equation (No Derivation), Significance of  $\Delta H^*$ ,  $\Delta G^*$  &  $\Delta S$
- 3.4 Photochemical Rate Law, Kinetics of Hydrogen-Chlorine, Jablonski diagram - Laws of photochemistry- Quantum Efficiency

**Unit 4 (12 Hours)**

**Catalysis**

- 4.1 Catalytic Reactions-Characteristics, Homogenous Catalysis- Acid-Base Catalysis, Kinetics of catalysis
- 4.2 Enzyme Catalysis- Michaelis – Menton Mechanism, Effect of Temperature, pH and substrate concentration on catalysis
- 4.3 Heterogenous Catalysis- Kinetics of Surface Reactions, Unimolecular and Bimolecular Surface Reactions, Effect of pH on Catalysed Reactions

**Unit 5 (12 Hours)**

**Colloids and Surface Chemistry**

- 5.1 Colloidal systems- classification, preparation and properties of colloids
- 5.2 Adsorption - Physisorption and Chemisorption- Types of Adsorption Isotherms, factors affecting adsorption
- 5.3 Freundlich Adsorption Isotherm -Limitations. Derivation of Langmuir Adsorption Isotherm; BET Adsorption Isotherm - Postulates and Equation. Determination of Surface Area

**BOOKS FOR STUDY**

Atkins, P.W. *Elements of Physical Chemistry*. Oxford University, 2013.

Bajpai.S. *Physical Chemistry*. New Delhi: Shobanlal Nagin Chand, 2006.

Puri, B.R., Sharma, L.R.& Pathania, M.S., *Principles of Physical Chemistry*, Vishal Publishing Co, Jalandar, Delhi, 2018

**BOOKS FOR REFERENCE**

Donald Allan McQuarrie, John Douglas Simon. *Physical Chemistry. A Molecular Approach*. University Science Books, 2013.

Moore, W.J. *Physical Chemistry*. Orient Longman, 2004.

Samuel H. Maron & Jerome B.Lando. *Fundamentals of Physical Chemistry*. New York: Macmillan, 2004.

Bahl,A, Bahl,B.S.& Tuli, G.D., *Essentials of Physical Chemistry*, S.Chand 2018

Engel, T. & Reid, P. *Physical Chemistry* 3rd Ed., Prentice-Hall 2012.

Rogers, D. W. *Concise Physical Chemistry* Wiley 2010.

J. C. Kotz, P. M. Treichel, J. R. Townsend, *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi 2009

Adamson Arthur W, Alice P. G. *Physical Chemistry of Surfaces*. India: Pearson, 2007.

### WEB RESOURCES

<http://bouman.chem.georgetown.edu/S02/lect25/lect25.htm>

<http://www.tau.ac.il/~advanal/Polarography.htm>

<http://www.chm.davidson.edu/vce/Kinetics/ReactionRates.html>

<http://www.chem1.com/acad/webtext/elchem/ec2.html>

<http://www.wwnorton.com/college/chemistry/chemistry3/ch/15/chemtours.aspx>

<http://www.jce.acs.in>

### PATTERN OF ASSESSMENT

**Continuous Assessment Test:** **Total Marks: 50** **Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

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Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components:** **Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving

MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination:** **Total Marks: 100** **Duration: 3 hours**

**10 to 15% of portion must be numerical**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**  
**B.Sc. DEGREE : BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**SPECTROSCOPY**

**CODE:19CH/MC/SP64**

**CREDITS: 4**

**L T P:4 1 0**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To bring about an understanding of the basics of spectroscopy and its approach in characterization of compounds
- To give an overview of the various spectroscopic instrumentation techniques
- To interpret the spectra of molecules and predict the structures of compounds

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the various regions of the Electromagnetic Spectrum
- Understand the interaction of electromagnetic radiation with matter
- Analyse and interpret data collected by different spectroscopic methods.
- Solve problems related to the structure, purity and concentration of chemicals
- Identify molecular interactions by choosing suitable spectroscopic methods and interpret corresponding data.

**Unit 1 (10 Hours)**

**Introduction**

- 1.1 Electromagnetic Spectrum
- 1.2 Microwave Spectroscopy: Rotational Transitions, Theory of Rotational Spectroscopy, Rotation of Homonuclear and Heteronuclear Diatomic Molecules, Selection Rule, Forbidden Transitions, Instrumentation
- 1.3 Calculation of Moment of Inertia and Reduced Mass

**Unit 2 (15 Hours)**

**Vibrational Transitions: FTIR and Raman Spectroscopy**

- 2.1 Principle, Instrumentation, Modes of Vibration, Conditions of Sensitivity to IR
- 2.2 Characteristic Frequencies of Functional Groups and Aromatic Compounds
- 2.3 IR Pattern of Simple Organic Compounds
- 2.4 Theory of Raman Spectroscopy, Instrumentation, Comparison with IR, Mutual Exclusion Principle

**Unit 3 (15 Hours)**

**Electronic Transitions: UV Visible Spectroscopy**

- 3.1 Theory of Electronic Spectroscopy, Instrumentation, Laws of Light Absorption-Beer-Lambert's Law, Definitions of chromophore, auxochrome, bathochromic and hypsochromic shifts. Franck Condon Principle, Block Diagram of Double

- Beam Spectrophotometer
- 3.2 Factors Affecting UV Absorption, Solvents, Parameters of UV Plot
- 3.3 Woodward - Fieser Rules as Applied to Aliphatic Dienes and  $\alpha,\beta$ -Unsaturated Aldehydes and Ketones
- 3.4 UV Spectra of Simple Organic Compounds -Toluene and Cresol

**Unit 4 (15 Hours)**

**Nuclear Magnetic Resonance Spectroscopy**

- 4.1 Theory of NMR Absorption- Magnetic Properties of Nuclei (Magnetic Moment, g Factor) and Theory of Nuclear Resonance. Larmor Precession Frequency, Resonance Condition and Relaxation Processes
- 4.2 Standards Employed in NMR, Factors Affecting Chemical Shift – Electronegativity, Hybridization, Shielding and Deshielding, van der Waals Deshielding, H-Bonding, Diamagnetic and Paramagnetic Anisotropy
- 4.3 Spin-Spin Coupling, (n+1) Rule and its Origin, Pascal's Diagram, Chemical Shift Values
- 4.4 Instrumentation and Sample Handling. Factors Influencing Spin Coupling Constants, Vicinal and Geminal Coupling.
- 4.5  $^{13}\text{C}$  NMR Spectra, Spin Decoupling Techniques – Advantages
- 4.6 NMR Spectra of Simple Organic Compounds –  $\text{CH}_3\text{Cl}$ ,  $\text{CH}_3\text{CH}_2\text{OH}$ ,  $\text{C}_6\text{H}_5\text{CH}_3$ ,  $\text{CH}_3\text{CHO}$  and  $\text{CH}_3\text{COOH}$

**Unit 5 (10 Hours)**

**Mass Spectrometry**

- 5.1 Theory and Rules of Fragmentation, Molecular Ion, Base Peak, Nitrogen Rule, Isotope Peaks and Metastable Peaks, Instrumentation
- 5.2 McLafferty Rearrangement, Retro Diel's Alder Rearrangement
- 5.3 Fragmentation Patterns of Various Functional Groups in Simple Organic Compounds

**Visit to R&D labs**

**BOOKS FOR STUDY**

- Banwell, C.N. *Fundamentals in Molecular Spectroscopy*. Tata McGraw Hill, 2007.
- Pavia D. L., Lampman G.M., Kriz G. S. *Spectroscopy*. Pearson, 2010.
- Sharma, Y.R., *Elementary Organic Spectroscopy Principles and Chemical Applications*, New Delhi: S.Chand, 2013

**BOOKS FOR REFERENCE**

- Dudley H Williams and Ian Fleming. *Spectroscopic Methods in Organic Chemistry*. Tata McGraw-Hill, 2005.
- Kemp W. *Organic Spectroscopy*. India Macmillan, 2007.
- Sathyanarayana, D.N. *Vibrational spectroscopy*. New Age International Publishers, 2007.
- Silverstein, Morrill Bassler. *Spectrometric Identification of Organic Compounds*. India: John Wiley, 2008.
- Jag Mohan, *Organic Spectroscopy: Principles & Applications*, Narosa, 2009

**WEB RESOURCES**

- <http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/nmr/nmr1.htm>
- <http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/infrared.htm>
- <http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/UV-Vis/spectrum.htm>

## **PATTERN OF ASSESSMENT**

### **Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

### **Other Components:**

**Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving/MCQ  
Model Preparation/Short Answer Tests

### **End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**  
**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**ORGANIC CHEMISTRY PRACTICAL II**

**CODE:19CH/MC/P761**

**CREDITS:1**

**L T P:0 0 2**

**TOTAL TEACHING HOURS:26**

**Unit 1**

**Organic Preparations**

- 1.1 Acetylation of Aniline
- 1.2 Benzoylation of amines/phenols
- 1.3 Preparation of glucosazone
- 1.4 Hydrolysis of ester
- 1.5 Oxidation of benzaldehyde
- 1.6 Preparation of methyl orange
- 1.7 Nitration of nitrobenzene to m-dinitrobenzene

Mechanism of various reactions involved to be discussed.  
Recrystallisation and calculation of quantitative yield to be done

**Unit 2**

**Purification of organic compounds**

- 2.1 Crystallisation (from water and alcohol)
- 2.2 Distillation
- 2.3 Determination of melting and boiling points

**Unit 3**

**Spectral analysis of simple organic compounds (To be tested internally)**

Identification of functional groups using UV-visible and IR spectral techniques (Spectra to be provided).

**BOOKS FOR STUDY**

Vogel, A.I. *Quantitative Organic Analysis*, Part 3, Pearson Education (2012).  
Swaminathan Geetha and Mary George. *Laboratory Chemical Methods in Food Analysis*. Chennai: Margham, 2010.



## BOOKS FOR REFERENCE

- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education (2009)
- Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.*, Pearson Education (2012)
- Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*, University Press (2000).
- Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, University Press (2000)
- Vogel, A.I., Tatchell, A.R., Furnis, B.S. Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.

## PATTERN OF ASSESSMENT

**Continuous Assessment Test:                      Total Marks: 50                      Duration: 3 Hours**

**Procedure with equations: 10 marks**

**Practical work    40 marks**

Experimental (colour, texture and yield)

Crude - 30 marks

Recrystallised – 10 marks

**End-Semester Examination:                      Total Marks: 50                      Duration: 3 hours**

**Procedure with equations: 10 marks**

**Practical work    40 marks**

Experimental (colour, texture and yield)

Crude - 30 marks

Recrystallised – 10 marks

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086  
B.Sc. DEGREE: BRANCH IV – CHEMISTRY

SYLLABUS

(Effective from the academic year 2019–2020)

PHYSICAL CHEMISTRY PRACTICAL II

CODE:19CH/MC/P862

CREDITS:2

L T P:0 0 3

TOTAL TEACHING HOURS: 39

Unit 1

**Distribution Law**

- 1.1 Distribution Coefficient of  $I_2$  between  $CCl_4$  &  $H_2O$  and determination of equilibrium constant of the reaction,  $I_2 + I^- = I_3^-$
- 1.2 To determine the concentration of the given KI in the equilibrium  $I_2 + I^- = I_3^-$  by partition coefficient method

Unit 2

**Chemical Kinetics**

To study the kinetics of iodide – persulphate reaction (equal concentration) and determine the rate constant of the reaction

Unit 3

**Phase Equilibria**

- 3.1 To study the effect of added impurity (NaCl / Succinic Acid) on UCST and determine percentage composition
- 3.2 Determination of eutectic composition and eutectic temperature of biphenyl & naphthalene

Unit 4

**Conductometry**

Conductometric Acid-Base Titration (Strong Acid vs Strong Base, Weak Acid vs Strong Base / Mixture of Weak & Strong Acid vs Strong Base)

Unit 5

**Spectrophotometry and Flame Photometry**

- 5.1 Spectrophotometric estimation of copper ions using EDTA
- 5.2 Determination of *Na/K ions* using Flame Photometer

Note : Theory and principles behind the experiments concerned to be tested periodically and along with the CA tests for a maximum of five marks.

**BOOKS FOR STUDY**

Venkateswaran, V. R. Veeraswamy, and A. R. Kulandaivelu. *Basic Principles of Practical Chemistry*. New Delhi: Sultan Chand, 1993.

## **BOOKS FOR REFERENCE**

Viswanathan, B and Raghavan, P.S. *Practical Physical Chemistry*. New Delhi: Viva Books, 2005.

## **PATTERN OF ASSESSMENT**

<b>Continuous Assessment:</b>	<b>Total Marks: 50</b>	<b>Duration: 3 Hours</b>
Two- Three questions on Principles involved in Physical Chemistry Experiments	5 marks	
Procedure and experimental principles	5 marks	
Tabulation, calculation and graph	15 marks	
Experimental Result	25 marks	

<b>End-Semester Examination:</b>	<b>Total Marks: 50</b>	<b>Duration: 3 hours</b>
Two- Three questions on Principles involved in Physical Chemistry Experiments	5 marks	
Procedure and experimental principles	5 marks	
Tabulation, calculation and graph	15 marks	
Experimental Result	25 marks	

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**

**DEPARTMENT OF VALUE EDUCATION**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**LIFE SKILLS : AN APPROACH TO A HOLISTIC WAY OF LIFE**

**CODE:19VE/SS/HL63**

**CREDITS:3**

**L T P:3 0 0**

**TOTAL TEACHING HOURS:39**

**OBJECTIVES OF THE COURSE**

- To help students grow in spirituality and to experience themselves as integrated persons
- To help students understand themselves as relational beings and appreciate their role in family and society
- To help students recognize the commonality and differences of the different religions in India
- To help students grow in an awareness of the protective laws regarding women
- To prepare students to make informed choices in family and career

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Appreciate themselves as integrated persons
- Recognize their role in family and society and become aware of the different protective laws in favour of women
- Make prudent choices for career and family
- Manage work life balance
- Live a harmonious life and be a channel of peace

**Unit 1**

**Spiritual Self (10 Hours)**

- 1.1 Understanding spirituality-Understanding the Spiritual side of oneself
- 1.2 Role of religious practices and growing in spirituality
- 1.3 Acceptance of self – self-identity, self-worth, self-respect, self-appreciation and self- presentation
- 1.4 Nurturing self - being at home with self, being able to connect with the inner self
- 1.5 Relationship with the Divine:  
Discovering the Divine in self, creation, and others – St. Francis of Assisi-  
Canticle of creatures Seeking the Divine through meditation, prayer and  
worship

**Unit 2**

**Relational Self: Women in the family (17 Hours)**

- 2.1 Understanding one's self in the context of family
- 2.2 Family networks
- 2.3 Family time – prayer, meals, and relaxation

- 2.4 Family and social values: respect for others, understanding individual needs and responsibilities – give and take
- 2.5 Understanding different parenting styles – authoritarian, permissive and democratic
- 2.6 Appreciating the gift of womanhood – foundress-Mary of the Passion’s vision of womanhood
- 2.7 Opting for marriage, single, religious or a life committed to a cause
- 2.8 Marriage and family, choice of life partner, marital relationships, planning of family
- 2.9 Other types of relationships - pre-marital relationships, live-in relationship and LGBT issues
- 2.10 Roles and responsibilities of women as home makers and career woman, work life balance (WLB)
- 2.11 Marriage as a sacred bond and fidelity in marriage

**Unit 3**

**Integrated Self**

**(12 Hours)**

- 3.1 Integrating the spiritual, relational, social/political self
- 3.2 Integrating one’s past with the present and the future for holistic living
- 3.3 Social Issues- crimes against women, harassment, gender discrimination, dowry, abortion, separation, divorce and cyber-crimes
- 3.4 Legal rights of women-property, marital and adoptive rights
- 3.5 Sensitization to different religions and religious practices in family and society
- 3.6 Challenges of inter caste and inter religious marriages
- 3.7 Integration of self with family, community and society

**Retreat/Workshop – Required for course completion.**

**BOOKS FOR REFERENCE**

Davidar(Eds). Human Values. All India Association of Christian Higher Education. (AIACHE) New Delhi: 2013.

James, G.M. et.al. In Harmony-Value Education at College Level. Chennai: Prakash, 2011.

James, G.M. Personality Development For Life Issues and Coping Strategies. Chennai: 2011

**Teaching / Learning Methods**

Lectures /Group Discussions/Presentations/Seminars/Guest Lectures

**PATTERN OF ASSESSMENT:**

**Marks: 50**

Task based/Seminars/Poster Making/Scrap book/Assignment

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600086.**

**B.Sc DEGREE: BRANCH IV- CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**PHARMACEUTICAL CHEMISTRY**

**CODE:19CH/ME/PH45**

**CREDITS:5**

**L T P:4 0 1**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To familiarise students with the fundamental concepts of drug discovery and development
- To give an understanding of pharmacokinetics and pharmacodynamics of drugs
- To give an overview of common and important diseases and their treatment

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Explain the scientific basis associated with quantitative and qualitative analytical techniques applied in Pharmaceutics
- Categorise different diseases and their treatment
- Demonstrate the importance of chemistry in the development and application of therapeutic drugs.
- Assess the physico-chemical properties of active pharmaceutical ingredients (API) to justify their formulation into dosage form
- Predict chemical, biochemical, and pharmaceutical properties applicable to dosage forms using quantitative methods

**Unit 1**

**(12 Hours)**

**Introduction to Pharmaceutical Chemistry**

- 1.1 Definitions - Pharmacy, Pharmacology, Pharmacodynamics, Pharmacokinetics, Antimetabolites, Bacteria, Virus, Fungi, Mutation, Pharmacognosy, Toxicology, Pharmacotherapeutics, Chemotherapy, Therapeutic Index. Classification of Drugs
- 1.2 Drug Targets: Cell structure in brief, drug target- Proteins, nucleic acids, drug targets at molecular level, intermolecular bonding forces - electrostatic bonding forces, hydrogen bonding, dipole-dipole and ion-dipole interactions, van der Waals interaction, Repulsive interaction, role of water and hydrophobic interactions
- 1.3 Routes of administering drug, Dosage forms, Slow release drug formulation. Storage of drugs- factors affecting stability of drugs, storage requirements.

**Unit 2**

**(14 Hours)**

**Common Diseases and their treatment**

- 2.1 Diseases - insect borne - Malaria; air borne - measles, tuberculosis ; waterborne – Cholera, typhoid, dysentery-Causes, symptoms, treatment, precautions
- 2.2 Common disorders of the digestive system –Jaundice; respiratory system-

- Asthma; nervous system- Epilepsy – causes, prevention and treatment.
- 2.3 Haematological agents - Anaemia – Causes and Control - Antianaemic Drugs. Blood Pressure, Hypo and Hypertension - Causes, Prevention and Treatment; antihypertensive Agents - Aldomet, Reserpine.
- 2.4 Cardiovascular diseases: Cardiac glycosides-Digoxin; antiarrhythmic drugs- Quinidine- structure, dosage, therapeutic uses; Antagonists of Ca
- 2.5 Antianginal agents- nitriles; vasodilators-Sodium Nitroprusside, Papaverine, nicotinic acid

**Unit 3 (16 Hours)**

**Drugs of Importance**

- 3.1 Analgesics: Narcotic- Morphine- Source, Structure-Activity Relationship and Uses. (Pethidine) and Non-Narcotic Drugs, Antipyretic and Anti-Inflammatory Agents – synthesis, characteristics and uses (Asprin, Paracetamol, Phenylbutazone, Ibuprofen)
- 3.2 Anaesthetics- Conditions of an Ideal Anesthetic Agent, Types-General (Ether, CHCl<sub>3</sub>, Halothane, Nitrous Oxide), Local (Cocaine) and Intravenous (Barbiturates)
- 3.3 Antibiotics: Therapeutic uses of Penicillin, Streptomycin, Tetracycline, Chloramphenicol
- 3.4 Diabetes - Types and Causes, Hypoglycemic Agents
- 3.5 Types and Treatments of Cancer, Antineoplastic Drugs - Antimetabolites, Plant Products, Hormone Therapy and Radioactive Isotopes
- 3.6 HIV – Causes, Prevention and Treatment

**Unit 4 (10 Hours)**

**Pharmacological Aids**

- 4.1 Preservatives-Sodium Benzoate; Antioxidants - Esters of Gallic Acid; Sequestrants-Calcium Complex of EDTA; Emulsifying Agents-Sorbitan Monolaurate - Colouring Agents - Caramel, Amaranth (Permitted Colours); Flavouring Agents - Vanillin, (Permitted Flavors); Sweetening Agents - Sucrose, Sorbitol, Saccharin; Stabilising and Suspending Agents - Gelatin, Pectin
- 4.2 Ointment Bases - Hydrocarbon Bases, Absorption Bases – Emulsions

**Unit 5 (13 Hours)**

**Practicals (to be tested internally)**

- 5.1 Synthesis of Aspirin
- 5.2 Estimation of Iron / Vitamin A by Colorimetry / Spectrophotometry
- 5.3 Separation of Analgesics (Ibuprofen, Paracetamol, Aspirin) by Thin Layer Chromatography (TLC)
- 5.4 Identification of Blood Group
- 5.5 Estimation of Blood Glucose by o-Toluidine Method

**Industrial visit: Visit to Industry**

**BOOKS FOR STUDY**

- Chatwal. G.R. *Pharmaceutical Chemistry Inorganic (Volume 1)*. New Delhi: Himalaya, 2006.
- Jayasree Ghosh. *A text book of Pharmaceutical Chemistry*. New Delhi: S.Chand, 2014.





**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV - CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**POLYMER CHEMISTRY**

**CODE:19CH/ME/PL45**

**CREDITS:5**

**L T P:4 0 1**

**TOTAL TEACHING HOURS:65**

**OBJECTIVES OF THE COURSE**

- To learn the basic techniques and mechanisms of polymerisation
- To understand the chemistry of polymers and their manufacturing techniques

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Classify polymers and describe their structural features
- Correlate the properties of polymeric materials with their structure
- Distinguish between the different methods of polymer synthesis and their mechanisms
- Illustrate the importance of the properties of polymers in their applications
- Carry out the synthesis of simple polymers

**Unit 1 (10 Hours)**

**Introduction to Polymers**

- 1.1 Classification of Polymers Based on Origin/Occurrence, Chemical Structure, Physical Properties, Mechanical Behaviour, Polymerisation Process, Arrangement of Monomers and Thermal Properties
- 1.2 Natural and Synthetic Fibers: Types, Regenerated Cellulose Acetate Fibers, Nylon
- 1.3 Structure, Properties and Applications of PU, PVC, Poly Acrylates, PMMA, Silicones, Plastics, Emulsions, Resins

**Unit 2 (16 Hours)**

**Chemistry of Polymerisation**

- 2.1 Types and Mechanism of Addition, Condensation, Free Radical, Ionic and Coordination Polymerisation
- 2.2 Kinetics of Free Radical and Ionic Polymerisation – Kinetic Chain Length
- 2.3 Synthesis of Graft and Block Co-Polymers
- 2.4 Techniques of Polymerisation- Bulk, Solution, Suspension, Emulsion, Melt Polycondensation, Solution Polycondensation, Interfacial Condensation, Solid and Gas Phase Polymerisation
- 2.5 Stereospecificity in Polymers, Tacticity

**Unit 3 (16 Hours)**

**Molecular Weight and Properties of Polymers**

- 3.1 Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight
- 3.2 Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors Influencing Glass Transition Temperature, Importance of Glass Transition Temperature, Heat Distortion Temperature
- 3.3 Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity
- 3.4 Reactions of Polymers-Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each)
- 3.5 Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer

**Unit 4 (13 Hours)**

**Polymer Degradation**

- 4.1 Types of Degradation - Thermal, Mechanical, Ultra Sound, Photo Radiation and Chemical Degradation Methods
- 4.2 Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation
- 4.3 Biodegradable and Non-Biodegradable Polymers

**Unit 5 (10 Hours)**

**Practicals (To be assessed internally)**

- 5.1 Synthesis of Phenol-Formaldehyde Resin/Urea Formaldehyde Resin
- 5.2 Synthesis of Polymethylmethacrylate ( PMMA)
- 5.3 Synthesis of Polyester
- 5.4 Determination of the Molecular Weight of Polyvinyl Alcohol (PVA)/Polyvinyl Chloride (PVC)

**Industrial visit: Visit to polymer industry / CLRI**

**BOOKS FOR STUDY**

Gowariker V.R, N.V. Viswanthan and Jayadev Sreedhar. *Polymer Science*.

New Delhi: New Age International, 2015.

Misra G.S. *Introductory Polymer Chemistry*. New Delhi: Wiley Eastern, 2010.

**BOOKS FOR REFERENCE**

Billmeyer, F.W. *Polymer Science*. India: Wiley-Interscience, 2007.

Joel Fried. *Polymer Science and Technology*. New Delhi: Prentice hall, 2005.

Bahadur P and Sastry N V. *Principles of Polymer Science* . New Delhi: Narosa Publishing House, 2005

**WEB RESOURCES**

<https://polymerdatabase.com>

<https://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=1>

## **PATTERN OF ASSESSMENT**

### **Continuous Assessment Test:**

**Total Marks: 50**

**Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

### **Other Components:**

**Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/  
Problem Solving/MCQ/Model Preparation/Short Answer Tests

### **End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 hours**

## **QUESTION PAPER PATTERN**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**COMPUTERS IN CHEMISTRY**

**CODE:19CH/ME/CC45**

**CREDITS:5**

**L T P:3 0 2**

**TOTAL TEACHING HOURS:65**

**OBJECTIVE OF THE COURSE**

- To apply computing techniques and software to solve problems in Chemistry

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Demonstrate proficiency in using computers to solve chemical and basic mathematical problems
- Use ChemDraw and ChemDraw 3D to draw and manipulate chemical structures
- Describe the basic principles of molecular modelling
- Solve Physical chemistry problems using MS-Excel
- Use MS-Excel and ORIGIN for plotting curves

**Unit 1 (15 Hours)**

**Data Processing and Analysis**

- 1.1 Elements of Computer Architecture - Creating, Editing, Naming, Renaming and Locating Files, Folders, Directory
- 1.2 Components of Excel - Spreadsheets, Database, Chart & Building Workbooks
- 1.3 Building Formulae, User Made and Statistical Functions, Formatting Cells
- 1.4 Managing and Organizing Data - Creating Link, Analyzing Data
- 1.5 Solving Problems from Physical and Analytical Chemistry (Precision and Accuracy), Standard Deviation using Spectral Data

**Unit 2 (15 Hours)**

**Introduction to Graphs**

- 2.1 Introduction to Charts - Types, Creating Charts from a Table, Reviewing Graphs
- 2.2 Solving Problems in Chemistry
- 2.3 Plotting Graphs using Theoretical and Experimental Data. Trend Line Addition and Determining the Slope and Intercept
- 2.4 Using ORIGIN 9.5 for plotting graphs

**Unit 3 (10 Hours)**

**Introduction to MathCad**

- 3.1 Eigen Values and Eigen Vectors of Matrices
- 3.2 Differential and Integral Calculus
- 3.3 Histograms, Extrapolation and Interpolation in Graphs, Curve Cutting Integration Methods
- 3.4 Regression Analysis of Experimental Data and its Related Techniques

- 3.5 Solutions for Simultaneous Equations by Matrix Methods
- Unit 4 (15 Hours)**  
**CHEM Draw & CHEM 3D Pro**  
4.1 Using CHEM DRAW for Writing Chemical Equations and Representing Schemes of Reaction Mechanisms, Editing, Transporting as Picture to Word Document  
4.2 Using CHEM 3D PRO for Building Molecules and for Measurement of Bond Angles, Bond Energy, Energy Minimization  
4.3 Use of Internet in Chemical Research- XRD, IR, NMR Data

- Unit 5 (10 Hours)**  
**Molecular Mechanics**  
5.1 Introduction to Cheminformatics in Drug Discovery - 2D Databases and Database searching, Substructure search, property searching, similarity searching  
5.2 Representation and manipulation of 2D Molecular Structures, 3D Databases: experimental data sources, Chemical Databases - CHEMDB, KEGG LIGAND, CAS REGISTRY, Chemical searching methods - exact searching, sub structure searching, similarity searching, reaction searching

### BOOKS FOR STUDY

Ramesh Kumari. *Computers and applications to Chemistry*. New Delhi: Narosa, 2005.  
F. James Holler, Stanley R. Crouch, *Applications of Microsoft Excel in Analytical Chemistry*, UK Cengage Learning : 2013

### BOOK FOR REFERENCE

Raman K.V. *Computers in Chemistry*. Tata McGraw-Hill, 2002.  
Andrew R. Leach, Valerie J. Gillet. *An Introduction to Chemoinformatics*. UK: Springer, 2007.  
Bunin, Barry A. Dordrecht. *Chemoinformatics: Theory, Practice, and Products*. UK: Springer, 2010.

### WEB RESOURCES

[https://www.cambridgesoft.com/Ensemble\\_for\\_Chemistry/ChemDraw/](https://www.cambridgesoft.com/Ensemble_for_Chemistry/ChemDraw/)  
<http://www.sciencesoftware.se/en/>  
<http://www.analytictech.com/networks/graphtheory.htm>

### PATTERN OF ASSESSMENT

**Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes**

Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5

Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)

Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

**Other Components: Total Marks: 50**

Seminars/Quiz/Open Book Tests/Group Discussion/Assignments /Problem Solving/  
MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination: Total Marks: 100 Duration: 3 hours**

### QUESTION PAPER PATTERN

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH IV - CHEMISTRY

### SYLLABUS

(Effective from the academic year 2019–2020 Onwards)

### FOOD CHEMISTRY

CODE:19CH/ME/FC45

CREDITS:5

L T P:4 01

TOTAL TEACHING HOURS:65

#### OBJECTIVES OF THE COURSE

- To create an awareness of the chemistry of different constituents of food – Carbohydrates, Proteins, Vitamins, Lipids, Enzymes
- To give an understanding about the effects of processing of Fats, Oils, Vitamins and Minerals
- To provide an optimum environment for students to understand the chemical bases of food component reactivity and functionality.
- To develop skills in testing the various approaches for manipulating the chemical and/or functional properties of foods.
- To provide an opportunity to enhance and test their critical thinking skills through structured problem solving.

#### COURSE LEARNING OUTCOMES

On successful completion of the course, students will be able to

- Understand the enzymatic reactions that influence food quality in the food industry
- Identify the various components of food along with their structure and reactivity
- Give a molecular rationalization for the observed physical properties and reactivity of major food components.
- Evaluate the effect of additives and processing on various food materials
- Predict how processing conditions are likely to change the activity of food components.

#### Unit 1

(20 Hours)

##### Constituents of foods

- 1.1 Types of water in food and their specific functions, Water activity and Shelf life of food, Water Balance, Moisture content in foods, Role of Water in food preparation
- 1.2 **Carbohydrates** – Classification, Chemical reactions, Properties of Sugars and Polysaccharides in foods, Applications of Sugars and Polysaccharides. Maillard Reaction. Pectin, Gums and Hydrocolloids, Artificial Sweetening Agents
- 1.3 **Proteins**- Essentials of amino acids, Sources of protein, physicochemical properties, Denaturation and its implications, Gel formation and its theories. Chemical changes in proteins during processing, Functional properties of proteins in foods. Wheat proteins – dough formation. Milk proteins
- 1.4 **Lipids** - Classification and use of lipids in foods. Sources of fats, functions and storage of fats. Structure and classification of fatty acids, Chemistry of fats and oil processing, emulsions and emulsifiers, rancidity of fats, Hydrogenation

- 1.5 **Minerals and Vitamins** - Sources, functions, bioavailability and deficiency of the following minerals - calcium, iron, iodine, fluorine, sodium and potassium (elementary treatment). Vitamins - classification, sources, functions and deficiencies (A, D, E, K, C, B complex - riboflavin, thiamin, Folic acid, B<sub>6</sub> and B<sub>12</sub>). Effect of cooking on vitamins and minerals

**Unit 2 (15 Hours)**  
**Food Additives**

- 2.1 Definitions of Food Additives, Classification and Functions - Legitimate uses of additives in foods, Intentional and Non Intentional additives, Indirect food additives Food additive in formulations: Additives such as colour, preservatives (Class I and Class II preservatives as per FSSAI, antioxidants, emulsifiers, sequesterants, Humectants and stabilizers. Uses and functions in formulations.
- 2.2 Significance of natural pigments in food – Chlorophylls, Carotenoids, Haemoglobin and Myoglobin, Anthocyanins, Flavonoids, Betalains and Tannins, Pigments in food and their industrial applications.
- 2.3 Flavours – Types of food flavours-natural and artificial, flavours generated during processing – reaction, stability of flavours during food processing Low calorie and non-nutritive sweeteners, flour improvers and acidulants with respect to chemistry, uses and functions in formulations
- 2.4 Toxicological evaluation of food additives

**Unit 3 (10 Hours)**  
**Nutrition and Balanced Diet**

- 3.1 Nutrition – calorific value of food –Respiratory quotient of food – basal metabolic rate – factors influencing BMR (Body Metabolic Rate), specific dynamic action (SDA) of food.
- 3.2 Thermogenic effect – energy requirements of individuals – diet and its components – the protein requirements – biological value of proteins, supplementary value of proteins. Diseases associated with protein malnutrition.
- 3.3 Nutritional value of carbohydrates. – Fibre in the diet, dietary sugars – nutritional aspects of lipids.

**Unit 4 (10 Hours)**  
**Food Quality Control**

- 4.1 Quality Control and its importance, Quality Assurance, HACCP (Hazard Analysis Critical Control Point)) Food Laws: Prevention of Food Adulteration Act, BIS Act, FPO Act, Essential Commodities Act, Consumer Protection Act, Agricultural Produce Act (AGMARK), FSSAI, Drug License and WHO Standards. Salient Features of P.F.A., Misbranded Food, Brief Outline of Labeling Provisions Under P.F.A
- 4.2 Role and Functions of Implementing Agencies with references to Indian Scenario. Tips to Consumers for Buying Safety Food
- 4.3 Sensory Characteristics of Food, Factors affecting Food Acceptance - Sensory and Psychological. Objective Method of Sensory Evaluation

**Unit 5 (10 Hours)**  
**Practical (To be assessed internally)**

- 5.1 Estimation of ascorbic acid in lime / sweet lime / gooseberry
- 5.2 Estimation of glucose and total sugars
- 5.3 Estimation of oxalic acid in guava fruit

- 5.4 Estimation of iodine value, acid value and RM value of an edible oil.  
5.5 Estimation of food colours (by colorimetric method).

#### **BOOKS FOR STUDY**

Swaminathan. M. *Textbook on Food Chemistry*. Bangalore: Printing and Publishing Co. Ltd., 2010  
Owen R. Fennema. *Food Chemistry*, New York: Marcel Decker Inc., 2006  
Srilakshmi. B. *Food Science*, III ed., New Delhi: New Age International Pvt. Ltd. Publishers, 2003

#### **BOOKS FOR REFERENCE**

John M. deMan. *Principles of Food Chemistry*. Maryland USA: ASPEN Publication, 2006  
Norman. N. Potter. *Food Science*, New Delhi: CBS Publishers and Distributors, 2004  
William Hogoland Mayer. *Food Chemistry*, New Delhi: CBS Publishers and Distributors, 1994  
Damodaran, S., Parkin, K. L., and Fennema, O.R. *Fennema's Food Chemistry* 4th Edition, CRC Press, 2008.  
Belitz, H-D., Grosch, W. & Schieberle, P. *Food Chemistry* 3rd Ed. (translation of fifth German edition), Springer, 2004.  
DeMan, J.M. *Principles of Food Chemistry* 3rd Ed. Aspen Publisher 1999.

#### **WEB RESOURCES**

<https://nptel.ac.in/courses/103107088/module4/lecture1/lecture1.pdf>  
[https://link.springer.com/chapter/10.1007/978-1-349-06153-2\\_10](https://link.springer.com/chapter/10.1007/978-1-349-06153-2_10)  
<https://www.who.int/news-room/fact-sheets/detail/food-additives>  
<https://www.nutrition.org.uk/healthyliving/healthydiet/healthybalanceddiet.html>  
<https://www.indeed.com/q-Food-Quality-Control-jobs.html>  
<http://videos.howstuffworks.com/discovery-health/36937-bob-greene-manon-the-streets-nutrition-quiz-video.htm>  
<http://www.who.int/dietphysicalactivity/publications/trs916/summary/en/>

#### **PATTERN OF ASSESSMENT**

**Continuous Assessment Test: Total Marks: 50 Duration: 90 minutes**  
Section A – 15 x 1 = 15 Marks (All questions to be answered) Multiple choice - 5, Fill in the Blanks - 5, T/F or Match the following or single line answer - 5  
Section B – 3 x 5 = 15 Marks (3 out of 5 to be answered)  
Section C – 2 x 10 = 20 Marks (2 out of 3 to be answered)

#### **Other Components:**

**Total Marks: 50**  
Seminars/Quiz/Open Book Tests/Group Discussion/Assignments/Problem Solving/MCQ/Model Preparation/Short Answer Tests

**End-Semester Examination: Total Marks: 100 Duration: 3 hours**

#### **QUESTION PAPER PATTERN**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5  
Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)  
Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)



**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**B.Sc. DEGREE: BRANCH IV – CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**PROJECT**

**CODE:19CH/ME/PR45**

**CREDITS:5**

**GUIDELINES FOR PROJECT**

Project should be done individually. Each student will choose a topic of her interest and the student will be assigned to a supervisor

The project will require practical work with the submission of a project report. It should include experimental lab work. The duration of the project work is one semester

The project report should be submitted in the prescribed format containing a minimum of 30 pages. The report should be enhanced with graphs, spectra, tables and/or photographs

Each candidate has to give three periodical reviews to the internal guide on the scheduled dates prescribed by the Department

Each candidate will submit 3 hard copies of the project thesis and submit on the scheduled date. The student will appear for viva voce before a panel comprising the External Examiner, supervisor and Head of the Department

**PATTERN OF ASSESSMENT**

**Continuous Assessment Test:                      Total Marks: 50**

Periodical review and submission of reports

**End Semester Examination:                      Total Marks: 50**

Dissertation and Viva-Voce

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**General Elective Course Offered by Department of Chemistry for  
B A. / B.Sc. / B.Com./B.S.W. / B.V.A Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**COSMETICS AND PERSONAL CARE**

**CODE:19CH/GE/CP22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To introduce the concept of cosmetology
- To understand the importance of personal care

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Appreciate the importance of skin care in the maintenance of good health
- Understand the health hazards of cosmetics
- Choose the proper beauty product for both skin and hair maintenance
- Distinguish between various beauty treatments

**Unit 1**

**Skin Care**

**(8 Hours)**

- 1.1 Skin- Structure and Functions- pH and Moisture Balance, Maintenance of Skin
- 1.2 Types of Skin: Dry Skin, Oily Skin, Wrinkled Skin
- 1.3 Cleansing of Skin, Creams and Lotions, Astringent and Skin Tonics, Skin Lighteners, Depilatories, Food Habits Related to Skin Care

**Unit 2**

**Scalp and Hair Treatments**

**(8 Hours)**

- 2.1 Structure of Hair, Growth and Type of Hair
- 2.2 Shampoos and Conditioners, Hair Styling Products, Hair Ironing and Methods of Colouring /Dyeing- Precautionary Measures
- 2.3 Personal Care and Cleanliness of Hair

**Unit 3**

**Beauty Treatments**

**(10 Hours)**

- 3.1 Facials-Types-Advantages and Disadvantages
- 3.2 Lipstick, Eyeliner, Mascara, Eye Shadow - Chemical Composition
- 3.3 AHA Exfoliation, Facial - Galvanic, High Frequency, Aroma Therapy
- 3.4 Toxicology of Cosmetics
- 3.5 Demonstration by Experts in the Field of Cosmetology

## **BOOKS FOR STUDY**

Gem Mathew, G.D. *Chemistry in Everyday Life*. Vishal, 2014

Wilkinson J B E and Moore R J. *Harry's Cosmetology*. London: Chemical Publishers, 2000.

## **WEB RESOURCES**

[http://www.abpschools.org.uk/page/modules/skin/.cfm?coSiteNavigation\\_allTopic=1](http://www.abpschools.org.uk/page/modules/skin/.cfm?coSiteNavigation_allTopic=1)

<http://health.howstuffworks.com/skin-care/nail-care>

[http://www.chemistryviews.org/details/ezone/4007741/Shampoo\\_Science.html](http://www.chemistryviews.org/details/ezone/4007741/Shampoo_Science.html)

[http://www.webhealthcentre.com/HealthyLiving/personal\\_hygiene\\_index.aspx](http://www.webhealthcentre.com/HealthyLiving/personal_hygiene_index.aspx)

## **PATTERN OF ASSESSMENT**

### **No End-Semester Examination**

#### **Continuous Assessment Test:**

**Total Marks: 25**

**Duration: 60 minutes**

Section A 10 x 1 = 10 marks

Section B 2 x 3 = 6 marks

3x3 = 9 marks

#### **Other Components:**

**Total Marks: 25**

Seminars/Quiz/Assignments/Group Discussions

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086**

**B.Sc DEGREE: BRANCH IV- CHEMISTRY**

**General Elective Course Offered by Department of Chemistry to  
B A. / B.Sc. / B.Com./B.S.W. / B.V.A Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**NUTRACEUTICALS AND HEALTH CARE**

**CODE:19CH/GE/NH22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To provide an understanding of Food Science and Human Nutrition
- To develop functional foods for the market

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the importance on functional foods
- Be aware of Probiotics
- Appreciate diet for healthy living
- Identify Nutraceutical Rich Supplements from plant extract

**Unit 1**

**Introduction**

**(8 Hours)**

- 1.1 Definition and Classification of Nutraceuticals
- 1.2 Relationship between Nutraceuticals, Food and Medicine
- 1.3 Prebiotics: Definition, Sources, Bioavailability, Effects on Human Health and Applications-Non-Digestible (Carbohydrates/Oligosaccharides), Dietary Fibre and Resistant Starch
- 1.4 Probiotics: Probiotic Microorganisms, Foods - Fermented Milk Products, Non-Milk Products, Quality Assurance of Probiotics and Safety

**Unit 2**

**Phytonutrients**

**(10 Hours)**

- 2.1 Role of Isoprenoids, Flavonoids, Carotenoids and Polyunsaturated Fatty Acids.
- 2.2 Functional Foods – Vegetables, Cereals, Milk and Dairy Products
- 2.3 Nutraceutical Rich Supplements – Caffeine, Green Tea, Mushroom Extract, Chlorophyll and Spirulina
- 2.4 Nutraceutical Remedies – Bronchitis, Circulatory Problems, Hypoglycemia, Nephrological Disorders, Liver Disorders, Psoriasis and Ulcers

### Unit 3

#### Diet Therapy and Health Care

(8 Hours)

3.1 Basic Concepts of Diet Therapy –Principles and Classification of Therapeutic Diets

3.2 Nutritional Care for Weight Management –Etiological Factors Contributing to Obesity, Low Energy Diets, Balanced Energy Reduction and Behavioural Modification - Underweight – Etiology and Assessment, High Energy Diets For Weight Gain

#### BOOKS OF STUDY

Robert E.C. Wildman, Robert Wildman, Taylor C. Wallace. *Handbook of Nutraceuticals and Functional Foods*. Boca Raton: CRC, 2012.

#### BOOK FOR REFERENCE

Aluko, Rotimi E. *Functional Foods and Nutraceuticals*. Boca Raton: CRC, 2012.

#### WEB RESOURCES

<http://www.ijppsjournal.com/Vol2Issue3/599.pdf>

<http://www.ajpcr.com/Vol3Issue1/265.pdf>

[http://sphinxsai.com/Vol.3No.1/pharm\\_jan-mar11/pdf/JM11%28PT=74%29%20pp%20442-448.pdf](http://sphinxsai.com/Vol.3No.1/pharm_jan-mar11/pdf/JM11%28PT=74%29%20pp%20442-448.pdf)

#### PATTERN OF ASSESSMENT

##### No End-Semester Examination

Continuous Assessment Test:

Total Marks: 25

Duration: 60 minutes.

Section A 10 x 1 = 10 marks

Section B 2 x 3 = 6 marks

3x3 = 9 marks

Other Components:

Total Marks: 25

Seminars/Quiz/Assignments/Group Discussions

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**General Elective Course Offered by Department of Chemistry for B.A. /  
B.Sc. / B.Com. B.S.W. / B.V.A Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019- 2020)

**FOOD QUALITY AND DETECTION OF FOOD ADULTERATION**

**CODE:19CH/GE/FA22**

**CREDITS:2**

**L T P:1 0 1**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To educate students on the health hazards associated with food adulterants
- To enable students to use the simple Home Kit to detect food adulteration in common food items
- To provide an understanding of the legislative aspects and the role and functions of regulatory agencies in India

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the label of a food product
- Identify the adulteration in food products
- Analyse food Adulteration at home
- Understand the significance of various food laws

**Unit 1**

**Food Quality Control**

**(9 Hours)**

- 1.1 Quality Control and its importance, Quality Assurance, HACCP
- 1.2 Food Laws: Prevention of Food Adulteration Act, BIS Act, FPO Act, Essential Commodities Act, Consumer Protection Act, Agricultural Produce Act (AGMARK), FSSAI, Drug License and WHO Standards
- 1.3 Salient Features of P.F.A., Misbranded Food, Brief Outline of Labeling Provisions Under P.F.A
- 1.4 Role and Functions of Implementing Agencies with references to Indian Scenario. Tips to Consumers for Buying Safety Food
- 1.5 Sensory Characteristics of Food, Factors affecting Food Acceptance - Sensory and Psychological. Objective Method of Sensory Evaluation

**Unit 2**

**Food Additives**

**(4 Hours)**

- 2.1 Artificial Sweeteners – Saccharin, Cyclamate, Aspartame, Food Flavours – MSG, Esters, Aldehydes and Heterocyclic Compounds, Antioxidants, Food Colours – Permitted and Non Permitted Colours, Emulsifying Agents, Preservatives, Leavening Agents- Baking Powder and Yeast

### Unit 3

#### Practicals (to be tested internally)

(13 Hours)

- 3.1 Assessment of Food Quality - Sensory Evaluation: Threshold Test, Dilution Test - Colour Comparison, Scoring Test, Difference Test – Paired Difference Test, Duo-Trio Test, Triangle Test. Rating Test – Hedonic, Numerical Scoring Test, Descriptive Test – Flavour Profile
- 3.2 Detection of Adulterants: Chicory and Tamarind Seed Powder in Coffee Powder, Non Permitted Colours in Tea and Dhal, Metanil Yellow in Turmeric Powder, Kesari Dhal and Thoor Dhal, Castor Oil in Coconut Oil, Papaya Seeds and Rotten Pepper in Pepper, Brick Powder in Chilli Powder, Washing Soda in Jaggery, Vanaspathi in Ghee, Chalk Powder in Salt and Sugar, Non Permitted Colours in Jams, Jelly, Juices and Saccharin in Supari

#### BOOKS FOR STUDY

Swaminathan Geetha and Mary George. *Laboratory Chemical Methods in Food Analysis*. Chennai: Margham, 2010.

Thankamma Jacob, *Food Adulteration*. Macmillan Company, 1976

#### BOOKS FOR REFERENCE

Lilian Hoagland Meyer. *Food Chemistry*. CBS Publishers & Distributors, 2004.

Mudambi, R, Sumathi and Raja Gopal, M.V. *Fundamentals of Foods and Nutrition*. India: Wiley Eastern, 2004

Sri Lakshmi, B. *Food Science*. New Age International, 2005.

Swaminathan, M. *Handbook of Food and Nutrition*. Bangalore: Bangalore Printing and Pub, 2001.

#### WEB RESOURCES

<http://agmarknet.nic.in/adulterants.htm>

<http://www.fssai.gov.in/>

<http://www.foodafactoflife.org.uk/sheet.aspx?siteId=19&sectionId=83&contentId=308>

#### PATTERN OF ASSESSMENT

##### No End-Semester Examination

**Continuous Assessment Test:**

**Total Marks: 25**

**Duration: 60 minutes**

Section A 10 x 1 = 10 marks

Section B 2 x 3 = 6 marks

3x3 = 9 marks

##### Other Components:

**Total Marks: 25**

Seminars/Quiz/Assignments/Group Discussions

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

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B.S.W. / B.V.A Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**BASIC NUTRITIONAL CHEMISTRY**

**CODE:19CH/GE/BN22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To educate students on the fundamental aspects of nutrition
- To enlighten students on healthy living through right food

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Understand the importance of nutrition in maintenance of good health
- Analyse the labels on food products
- Understand different types of diets
- Calculate BMI and know its importance

**Unit 1**

**Nutrition and Health (9 Hours)**

- 1.1 Definition- Nutrition, Health and Disease; Nutrients – Macronutrients - Carbohydrate, Protein, Fat, Water- Micronutrients - Vitamins and Minerals
- 1.2 Under Nutrition, Over Nutrition, and Malnutrition; Diet Recommendations for Optimal Health
- 1.3 Mandatory and Optional Inclusions on Nutrition Labels, Claims on Labels, Allergy Warnings

**Unit 2**

**Indicators of Health (7 Hours)**

- 2.1 Body Mass Index [BMI] – Calculation, Limitations; Body Fat and its Distribution
- 2.2 Health Risk – Obesity, Underweight-Anorexia Nervosa, Bulimia, Binge-Eating Disorder
- 2.3 Recommendations for Weight Management -Dietary, Behavioural, and Physical Activity

**Unit 3**

**Nutrition through Life (10 Hours)**

- 3.1 From Childhood to Adulthood
- 3.2 Dietary Food Trends- Functional Foods, Conventional Foods, Modified Foods and Medical Foods
- 3.3 Popular Diets- GM Diet, DASH Diet, Gluten-Free Diet, Low-Carb Diets, The Macrobiotic Diet, the Mediterranean Diet, Vegetarian and Vegan Diets



### **BOOKS FOR STUDY**

Maureen Zimmerman and Beth Snow. *An introduction to Nutrition*. Creative Commons, 2012.

Srilakshmi, B. *Nutrition Science*. New Delhi: New Age International, 2014.

Swaminathan, M. *Textbook on Food Chemistry*. Bangalore: Printing and Publishing, 2006.

### **BOOKS FOR REFERENCE**

William Hogoland Mayer. *Food Chemistry*. New Delhi: CBS Publishers and Distributors, 2002

Owen R. Fennema. *Food Chemistry*. New York: Marcel Decker Inc, 2000.

### **WEB RESOURCES**

<http://videos.howstuffworks.com/discovery-health/36937-bob-greene-manon-the-streets-nutrition-quiz-video.htm>

<http://www.who.int/dietphysicalactivity/publications/trs916/summary/en/>

### **PATTERN OF ASSESSMENT**

#### **No End-Semester Examination**

#### **Continuous Assessment Test:**

Section A 10 x 1 = 10 marks

Section B 2 x 3 = 6 marks

3x3 = 9 marks

**Total Marks: 25**

**Duration: 60 minutes**

#### **Other Components:**

**Total Marks: 25**

Seminars/Quiz/Assignments/Group Discussions

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086**

**General Elective Course Offered by Department of Chemistry for B A. / B.Sc. / B.Com.  
B.S.W. / B.V.A Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**FORENSIC CHEMISTRY**

**CODE:19CH/GE/FC22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To enable the students to understand the fundamentals concepts of Criminalistics
- To understand the method of searching, collecting, preserving and analyzing arson evidence
- To familiarize with the classification of explosives

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Identify the various types of evidences
- Collect and handle evidences
- Categorize various explosives

**Unit 1**

**Introduction to Criminalistics (6 Hours)**

- 1.1 Investigating the Crime Scene - Documenting the Scene and the Evidence, Recognition of Physical Evidence Collection, Preservation, Inventory, and Transportation of Physical Evidence
- 1.2 Investigating and Processing Physical Evidence- Types of Evidence, the Modern Crime Lab, Functions of a Forensic Scientist, Characteristics of Physical Evidence

**Unit 2**

**Trace, Physical and Biological Evidence (10 Hours)**

- 2.1 Forensic Identification of Hair, Fibre, Paint and Glass
- 2.2 Fingerprints - Characteristics of Fingerprints, Methods for Developing Fingerprints, Preservation of Fingerprints, Handwriting, Typed and Word-Processed Documents, Photocopied Documents
- 2.3 Forensic Methods for Determination of Metals and Gunshot Residue, Techniques for the Analysis of Inorganic Materials, Drugs of Abuse
- 2.4 Forensic Toxicology- Measurement of Blood, Alcohol Breath Test for Alcohol
- 2.5 Biological Fluids - Blood, Semen, Saliva. Forensic DNA Typing

**Unit 3**

**Fire-Arson and Explosives (10 Hours)**

- 3.1 Firearms - Ammunition, Ballistics, Laboratory Examination of Firearm Evidence

- 3.2 Arson - Evidence from Fire affected Area – Combustible Burning Characteristics – Nature of Combustion
- 3.3 Explosives – Classification of explosives – low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents, Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Bomb scene management. Evidence from the Scene of Explosion, Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives

### **BOOKS FOR STUDY**

Bapuly, A.K. *Forensic Science – Its Applications in Crime Investigation*. Hyderabad: Paramedical Publisher, 2006.

Sharma B.R. *Forensic Science in Criminal Investigation and Trials*. New Delhi: Universal law publication, 2006.

### **BOOKS FOR REFERENCE**

Henry C. Lee, Timothy Palmbach and Marilyn C. Miller. *Henry Lee's Crime Scene Handbook*. Amsterdam: Elsevier Academic Press, 2001.

Russel Max M Houck and Jay A Siegel. *Fundamentals of Forensic Science*. Amsterdam: Elsevier Academic Press, 2006.

Tilstone W.J., Hastrup, M.L. Hald, and C. Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, 2013.

### **WEB RESOURCES**

[http://www.remondini.net/newsite/?q=system/files/forensic%20chemistry\\_0.pdf](http://www.remondini.net/newsite/?q=system/files/forensic%20chemistry_0.pdf)

<http://www.legalindia.in/cyber-crimes-and-the-law/>

### **PATTERN OF ASSESSMENT**

#### **No End-Semester Examination**

#### **Continuous Assessment Test:**

**Total Marks: 25      Duration: 60 minutes**

Section A 10 x 1 = 10 marks

Section B 2 x 3 = 6 marks

3x3 = 9 marks

#### **Other Components:**

**Total Marks: 25**

Seminars/Quiz/Assignments/Group Discussions

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.**

**General Elective Course Offered by Department of Chemistry for B A./ B.Sc. /  
B.Com. B.S.W. / B.V.A Degree Programmes**

**SYLLABUS**

(Effective from the academic year 2019–2020)

**CHEMISTRY IN EVERYDAY LIFE**

**CODE:19CH/GE/CE22**

**CREDITS:2**

**L T P:2 0 0**

**TOTAL TEACHING HOURS:26**

**OBJECTIVES OF THE COURSE**

- To help students visualise the importance of Chemistry in daily life
- To give an understanding of the classification of drugs
- To bring about an understanding of drug-target interaction of enzymes and receptors
- To be aware of how drugs function in the body
- To know artificial sweetening agents and food preservatives

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Appreciate the significance of food additives
- Understand and explain the use of drugs
- Exhibit knowledge of chemicals in cosmetics
- Use cosmetics safely

**Unit 1**

**Food Additives (9 Hours)**

- 1.1 Food Colours - Permitted and Non Permitted, Artificial Sweeteners – Aspartame, Saccharin and Cyclamate, Preservatives - Natural and Synthetic, Flavours – Monosodium glutamate.
- 1.2 Stabilising and Suspending Agents - Gelatin, Pectin. Toxic Effects of Food Additives

**Unit 2**

**Pharmaceuticals (8 Hours)**

- 2.1 Antimalarials, Antipyretics, Analgesics, Antiseptics, Antibiotics-Antacids, Antihistamines, Chemotherapy –Definition and Therapeutic Uses. Diabetes-Types and Causes
- 2.2 Nutraceuticals – Vitamins - Water and Fat Soluble, Minerals and Trace Elements, Antioxidants. Role of Nutraceuticals in Disease Prevention- Diabetes and Cancer

**Unit 3**

**Cosmetics (9 Hours)**

- 3.1 Skin Products, Soaps and Shampoos –Creams and Lotions, Lipstick and Hair Dye
- 3.2 Perfume – General Formulation, Deodorants and Antiperspirants
- 3.3 Toxicology of Cosmetics

**BOOKS FOR STUDY**

Gem Mathew G.D. *Chemistry in Everyday Life*. Jalandhar-Delhi: Vishal, 2009

### **BOOKS FOR REFERENCE**

Chakrabarty, B.N. Industrial Chemistry. New Delhi: Shiv Narain, 2002.

Sharma B. K. Industrial Chemistry. Meerut: GOEL Publishing House, 2000.

### **WEB RESOURCES**

<http://chemistry.about.com/od/everydaychemistry/>

<http://dwb4.unl.edu/Chem/CHEM869A/CHEM869ALinks/www.sdahq.org/sdalatest/html/soapchemistry1.htm>

### **PATTERN OF ASSESSMENT**

#### **No End-Semester Examination**

#### **Continuous Assessment Test:**

**Total Marks: 25**

**Duration: 60 minutes**

Section A 10 x 1 = 10 marks

Section B 2 x 3 = 6 marks

3x3 = 9 marks

#### **Other Components:**

**Total Marks: 25**

Seminars/Quiz/Assignments/Group Discussions

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086**

**B.Sc DEGREE: BRANCH IV- CHEMISTRY**

**SYLLABUS**

(Effective from the academic year 2019-2020)

**INDUSTRIAL CHEMISTRY**

**CODE:19CH/UI/IC23**

**CREDITS:3**

**OBJECTIVES OF THE COURSE**

- To enable the students to understand the process of development, optimization and monitoring of fundamental chemical processes in petrochemical and polymer industries
- To understand the sources of solid and hazardous wastes and methods of disposal of waste
- To provide an understanding of the environment and health impacts of solid waste mismanagement
- To study the generation of energy from various sources

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Classify the different types of fuels and their applications
- Recognise health and environmental issues related to solid waste management
- Contrast the types of polymers and how to recycle them
- Compare the properties and applications of oils, fats, waxes and soaps
- Appreciate the role of dyes in the fabric and food industries

**Unit 1**

**Fuels and Combustion**

- 1.1 Introduction - Classification of Fuels -Characteristics of a Good Fuel. Calorific Value, Theoretical Calculation Value of a Fuel-Solid Fuels-Wood
- 1.2 Coal - Classification of Coal, Analysis of Coal and Its Significance
- 1.3 Liquid Fuels: Petroleum - Cracking - Advantages of Catalytic Cracking Over Thermal Cracking - Synthetic Petrol

**Unit 2**

**Industrial Waste and Treatment Process**

- 2.1 Types of Industrial Waste, Treatment of Disposal of Industrial Waste or Effluent with Organic and Inorganic Impurities.
- 2.2 Characterization of Waste Water by Physical and Chemical Characteristics
- 2.3 Primary Treatment: Sedimentation, Neutralization, Coagulation, Equalization, Grid Removal, Secondary Treatment: Aerobic Treatment, Oxidation Ponds, Oxidation Ditches, Trickling Filters, Activated Sludge Process, Aerated Lagoons, Anaerobic Treatment. Tertiary Treatment: Reverse Osmosis, Electrodialysis, Desalination
- 2.4 Industrial Effluents: Characteristics and Treatment Options for Effluents from Various Industries: Textiles and Dyes, Paper and Pulp, Leather, Food and Dairy, Fertilizers, Electroplating Industries, Distilleries
- 2.5 Sewage Treatment

2.6 Water Conservation, Recycling of Waste Water and Rain Water Harvesting

### Unit 3

#### Synthetic Polymers

- 3.1 Requirement of a Fibre, Difference between Natural Fiber and Synthetic Fiber, Properties
- 3.2 Applications of Synthetic Fiber – Nitro Cellulose, Rayon, Cuprammonium Acetate, Rayon, Viscose Rayon, Nylon 66 and Terylene.
- 3.3 Different Types of Plastics, Recycling of Plastics

### Unit 4

#### Oils, Fats, Waxes and Soaps

- 4.1 Distinction between Oils and Fats. Classification and Properties of Animal Fats and Oils. Difference Between Animal, Vegetable and Mineral Oil, Essential Oils and Classification of Waxes
- 4.2 Soaps and Detergents- Classification, Cleansing Action of Soaps and Detergents. Enzymatic Detergents, Non-Degradable and Biodegradable Detergents

### Unit 5

#### Papers and Dyes

- 5.1 Types of Paper- Paper Stability, Environmental Impact of Paper, Applications of Paper- Thickness, Weight and Size of Paper
- 5.2 Classification of Dyes, General Methods of Applications of Dyes on Fibre
- 5.3 Dyes as Food Colours-Yellow Aniline Dyes, Metanil Yellow, Beta-Oxalyl-Amino Alanine and Lead Chromate

### BOOKS FOR STUDY

Gem Mathew G.D. Chemistry in Everyday Life. Jalandhar-Delhi: Vishal, 2009.  
Sharma B. K. Industrial Chemistry. Meerut: GOEL, 2013.

### BOOKS FOR REFERENCE

Norris Shreve, R and Joseph A. Brink, Jr. Chemical Process Industries. Kogakusha: McGraw Hill, 2002.  
Jain, P. C and Jain M. Engineering Chemistry. Delhi: Dhanpat Rai, 2001.

### WEB RESOURCES

<http://www.ignou.ac.in/upload/unit-3.pdf>  
<http://www.epa.gov/waste/nonhaz/industrial/guide/index.htm>  
<http://www.epa.gov/osw/conserves/materials/plastics.htm>  
<http://www.epa.gov/epawaste/hazard/testmethods/sw846/index.htm>

### PATTERN OF EVALUATION

**End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 Hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-600 086**

**B.Sc DEGREE: BRANCH IV- CHEMISTRY**

**SYLLABUS**

(Effective from the Academic Year 2019-2020)

**DRUGS AND DISEASES**

**CODE:19CH/UI/DD23**

**CREDITS:3**

**OBJECTIVES OF THE COURSE**

- To give an overview of medicines in day to day life
- To enlighten students on the application of chemistry to the maintenance of good health

**COURSE LEARNING OUTCOMES**

On successful completion of the course, students will be able to

- Define important terms in Pharmaceutical Chemistry
- Identify common diseases and their treatment
- Explain the mechanism of blood coagulation
- Classify different drugs based on their mechanism of action
- Appreciate the significance of hypoglycemic agents and artificial sweeteners

**Unit 1**

**General Introduction to Drugs**

- 1.1 Definitions: Pharmacy, Pharmacology, Pharmacodynamics, Pharmacokinetics, Antimetabolites, Bacteria, Virus, Fungi, Mutation, Pharmacognosy, Toxicology, Pharmacotherapeutics, Chemotherapy, Therapeutic Index
- 1.2 Classification of Drugs-Biological, Chemical and Commercial Classification, Prescribed Drugs and over - the Counter-Drugs. Side Effects and Contra Indications

**Unit 2**

**Common Diseases and their Treatment by Drugs**

- 2.1 Some Common Diseases: Insect Borne – Malaria; Air Borne Diseases - Whooping Cough, Measles, Common Cold and TB; Waterborne Diseases - Cholera, Typhoid, Dysentery - Etiology, Symptoms, Prevention and Remedy
- 2.2 Some Common Disorders of the Digestive System – Jaundice; Respiratory System- Asthma; Nervous System - Epilepsy - Prevention and Treatment
- 2.3 Aids – Causes, Prevention and Treatment

**Unit 3**

**Blood and Hematological agents**

- 3.1 Blood Pressure, Hypertension - Cause, Prevention and Treatment, Antihypertensive Agents – Aldomet and Reserpine
- 3.2 Clotting of Blood - Mechanism, Haematological Agents, Anaemia – Causes and Control, Antianaemic Drugs
- 3.3 Cardiovascular Diseases - Cardiac Glycosides – Digoxin, Antiarrhythmic Drugs - Quinidine - Dosage and Therapeutic uses, Calcium Blockers



## Unit 4

### Drugs of Importance – I

- 4.1 Anesthetics: Types - General – Nitrous Oxide, Ether, CHCl<sub>3</sub>, Halothane; Local - Cocaine, Intravenous - Advantages and Disadvantages
- 4.2 Antiseptics and Disinfectants - (Phenols, Chloramines, Bleaching Powder, Boric Acid, Iodine, Zinc Oxide, Dyes-Crystal Violet)
- 4.3 Analgesics, Anti Pyretic and Anti-Inflammatory Agents - Narcotic and Non-Narcotic Drugs – Morphine. Source, Activity and uses of Pethadine, Aspirin, Paracetamol, Phenyl Butazone and Ibuprofen

## Unit 5

### Drugs of Importance – II

- 5.1 Antibiotics - Classification - Therapeutic uses of Chloramphenicol, Penicillin - Streptomycin, Tetracyclines, Erythromycin, Amoxycillin, Ciproflaxin
- 5.2 Antidepressants - Sedatives and Hypnotics - (Barbiturates); Hypoglycemic Drugs: Types of Diabetes, Hypoglycemic Agents, Sugar Substitutes
- 5.3 Antineoplastic Drugs - Types, Common Causes and Treatment of Cancer - Antineoplastic Agents; Antihistamines

## BOOKS FOR STUDY

Jayasree Ghosh. *A Text Book of Pharmaceutical Chemistry*. New Delhi: S.Chand, 2014.  
Chatwal, G.R. *Pharmaceutical Chemistry* (Volume 1). New Delhi: Himalaya, 2006.

## BOOKS FOR REFERENCE

David A., Williams, Thomas L. Lemke. Foye's *Principles of Medicinal Chemistry*. Lippincott: Williams & Wilkins, 2005.  
Graham Patrick. *An Introduction to Medicinal Chemistry*. Oxford University, 2001.  
John H. Block, John M. Beale, Jr. *Organic Medicinal and Pharmaceutical Chemistry*. Lippincott: Williams & Wilkins, 2004.

## WEB RESOURCES

[http://www.rightdiagnosis.com/medical/hematologic\\_agent.htm](http://www.rightdiagnosis.com/medical/hematologic_agent.htm)

<http://www.drugs.com/forum/alternative-medicine/importance-drugs-29012.html>

## PATTERN OF ASSESSMENT

**End-Semester Examination:**

**Total Marks: 100**

**Duration: 3 Hours**

Section A – 30 x 1 = 30 Marks (All questions to be answered) Multiple choice - 10, Fill in the Blanks - 10, T/F or Match the following - 5, single line answer - 5

Section B – 5 x 6 = 30 Marks (5 out of 7 to be answered)

Section C – 2 x 20 = 40 Marks (2 out of 3 to be answered)