

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

SYLLABUS

(Effective from the academic year 2015–16)

GENERAL CHEMISTRY

CODE: 15CH/MC/GC14

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To understand the fundamentals of Chemical Bonding, Gaseous state and Thermochemistry
- To create an awareness of Nuclear Chemistry
- To provide an overview of Organic Chemistry

Unit 1

Chemical Bonding

(13 hrs.)

- 1.1 Types of Bonds - Ionic, Covalent Metallic, Co-ordinate Bonds and their Properties.
Ionic Bond - Lattice Energy - Born-Lande Equation (No Derivation) - Factors affecting Lattice Energy, Born Haber Cycle and its Applications
- 1.2 Covalent Bond – Lewis Structures of Simple Molecules and Ions, Valence Shell Electron Pair Repulsion Theory{ $[\text{BF}_4^-]$, NH_3 , H_2O , PCl_5 , SF_4 , ClF_3 , I_3^- }. Covalent Character in Ionic Compounds - Polarization and Fajan's Rules
- 1.3 Valence Bond Theory (VBT) – Hybridization (BeF_2 , BF_3 , CH_4)
- 1.4 Molecular Orbital Theory (MOT) – Bonding, Antibonding and Nonbonding Orbitals.
Application of MOT to He_2 , N_2 , O_2 , O_2^- , O_2^{2-} , CO , NO , HF , Comparison between VBT and MOT

Unit 2

Nuclear Chemistry

(8 hrs.)

- 2.1 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
- 2.2 Radioactive Elements, Modes of Decay – Neutron, Positron Theory of α , β and γ emission, Characteristics of α , β and γ particles, K-Electron Capture and Positron emission. Half-Life Period, Geiger – Nuttal Rule. Radioactive Displacement Laws – Soddy, Fajan and Russel. Radioactive Decay Series $4n$, $4n+1$, $4n+2$ and $4n+3$
- 2.3 Detection and Measurement of Radioactivity - Ionization Chamber, Geiger-Muller Counter and Scintillation Counter. Artificial Radioactivity - Artificial Transmutation of Elements
- 2.4 Nuclear Reactions – Nuclear Fusion and Fission, Principles of Nuclear Energy Production

Unit 3

Introductory Organic Chemistry

(13 hrs.)

- 3.1 IUPAC Nomenclature of Organic Compounds
- 3.2 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)
- 3.3 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
- 3.4 Concept of Aromaticity – Definition, Huckel's Rule – Application to Benzenoid and Non-Benzenoid Compounds - Benzene, Naphthalene, Cyclopropenyl Cation, Cyclopentadienyl Anion and Tropylium Cation

Unit 4

Gaseous State

(10 hrs.)

- 4.1 Comparison of Different States of Matter, the Perfect Equation of State, Mixture of Gases (Partial Pressures)
- 4.2 Kinetic Model of Gases, Average Speed of Gas Molecules, Maxwell Distribution of Speeds
- 4.3 Real Gases, Critical Temperature, Compression Factor, Vander Waal's Equation of State, Liquefaction of Gases

Unit 5

Thermochemistry

(8 hrs.)

- 5.1 Thermochemistry: Standard Enthalpy Changes, the Combination of Reaction Enthalpies
- 5.2 Standard Enthalpy of Formation, Variation of Reaction Enthalpy with Temperature

TEXT BOOKS

J.D. Lee. *Concise Inorganic Chemistry*. New Delhi: Oxford University Press, 2008.

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

Puri,B.R., L.R. Sharma., Madan S. Pathania. *Principles of Physical Chemistry*. New Delhi: Vishal, 2008.

Puri B.R, Sharma L.R & Kalia K.C. *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2008.

BOOKS FOR REFERENCE

Arinikar H.J. *Essentials of Nuclear Chemistry*. New Delhi: New Age International, 1995.

Madan R.D. *Satyaprakash's Modern Inorganic Chemistry*. New Delhi: Sultan Chand, 2004.

Solomons & Fryhle, *Organic Chemistry*, New Delhi, Wiley India, 2004.

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/course-introductory-organic-chemistry-part-1>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 2015- 2016)

ANALYTICAL CHEMISTRY

CODE: 15CH/MC/AC14

CREDITS : 4

L T P : 4 0 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 chromatographic and thermoanalytical methods

Unit 1

Stoichiometry, Sampling and Errors (13 hrs.)

- 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
- 1.2 Sampling Techniques-Sampling and Sample Handling of Liquids and Gases, Particulate Solids, Metals and Alloys. Preparation of a Laboratory Sample
- 1.3 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 2

Separation Techniques (13 hrs.)

- 2.1 Solvent Extraction – Liquid - Liquid Extraction - Nernst Distribution Law, Factors affecting Solvent Extraction, Soxhlet and Rotovapour Extraction
- 2.2 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 3

Classical Methods of Analysis (10 hrs.)

- 3.1 Titrimetry – Calibration of Burette, Pipette, Standard Flask, Titrant, Titrand, Indicators, Equivalence Point, End Point. Primary and Secondary Standards- Criteria and Preparation
- 3.2 Types of Titrimetric Analysis - Neutralization, Precipitation, Redox and Complexometric Titrations. Limitations of Volumetric Analysis

- 3.3 Gravimetry: Separation by Precipitation, Types of Filtering Crucible, Drying, Ignition, Incineration of Precipitate, Nucleation, Particle Size, Crystal Growth and Colloidal State
- 3.4 Solubility Product, Principle and its Applications, Factors affecting Solubility, Gravimetric Factor, Purity of Precipitates, Von Weiman Ratio. Co-precipitation and Post Precipitation

Unit 4

Thermoanalytical Methods (8 hrs.)

- 4.1 TGA/DTA - Principle and Instrumentation, Thermal Analysis of Silver Nitrate, Calcium Oxalate and Calcium Acetate, Methods of obtaining Thermograms, Factors affecting TGA/DTA
- 4.2 DSC - Principle and Applications
- 4.3 Thermometric Titrations: Principle, Instrumentation and Applications

Unit 5

Dipole Moment and Magnetic Susceptibility (8 hrs.)

- 5.1 Dipole Moment - Definition - Units - Significance - Factors influencing Dipole Moment - Clausius - Mosotti Equation - Determination of Dipole Moment by Temperature Method
- 5.2 Magnetic Susceptibility - Origin of Magnetic Properties - Types of Magnetic Properties – Magnetic Susceptibility - Definition - Curie Weiss Law - Temperature and Magnetic Susceptibility - Determination of Magnetic Moment by Guoy's and VSM Method – Applications of Magnetic Moment

TEXT BOOKS

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, 2004.

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

BOOKS FOR REFERENCE

Day R.A.Jr. & A.L. Underwood. *Quantitative Analysis*. New Delhi: Prentice Hall of India, 1988.

Skoog, Douglas A, James F. Holler & Timothy A. Nieman. *Principles of Instrumental Analysis*. Singapore: Haracourt Asia, 2000.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

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Third Component:

List of evaluation modes:

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
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B.Sc. DEGREE: BRANCH IV – CHEMISTRY

SYLLABUS

(Effective from the academic year 2015- 2016)

VOLUMETRIC ANALYSIS – PRACTICAL

CODE: 15CH/MC/P112

CREDITS : 2

L T P: 0 0 3

TOTAL HOURS: 39

Unit 1

Calibration

1.1 Calibration of Burettes / Pipettes

Unit 2

Theory of Volumetric Estimations

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

Unit 3

Volumetric Estimation

3.1 Estimation of Na_2CO_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 Estimation of Chloride (Argentometry)

3.7 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.

Combination of two types of titration also to be tried out.

TEXT BOOKS

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

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Equations and short Procedure (10 minutes) 10 marks
Experiment 40 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Equations and short Procedure (10 minutes) 10 marks
Experiment 40 marks

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B.Sc. DEGREE: BRANCH IV – CHEMISTRY

SYLLABUS

(Effective from the academic year 2015-16)

ORGANIC CHEMISTRY – I

CODE: 15CH/MC/OC24

CREDITS: 4

L T P : 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To enable a comprehensive understanding of mechanisms and stereochemistry of organic reactions
- To understand the chemistry of carbonyl compounds

Unit 1

Stereochemistry (12 hrs.)

- 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-Conformations of Molecules- Newman Projection, Fischer, Flying Wedge and Sawhorse Projections. Conformational Analysis of Ethane, n-Butane and Cyclohexane
- 1.4 Stereospecific and Stereoselective Reactions of Addition of Halogens to Alkenes-Syn and Anti Addition

Unit 2

Electrophilic and Nucleophilic Substitution Reactions (15 hrs.)

- 2.1 Aliphatic Nucleophilic Substitution Reaction Mechanism - S_N1 , S_N2 S_Ni . 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 - General Mechanism- 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

Elimination and Addition Reactions (12 hrs.)

- 3.1 Elimination: $E1$, $E2$ and $E1cB$ Mechanisms, Orientation and Reactivity (Hoffmann and Saytzeff Rule) and Evidences. Stereochemistry of $E2$ Reaction., Syn- and Anti-Elimination, Elimination vs Substitution

3.2 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

Unit 4

Aliphatic, Aromatic and Unsaturated Carbonyl Compounds (8 hrs.)

- 4.1 Structure of Carbonyl Group, Acidity of Alpha Hydrogen, Keto-Enol Tautomerism – Evidence for the Two Forms. Nucleophilic Addition Reaction-Acid and Base Catalyzed. Relative Reactivity of Aldehydes and Ketones. A Comparison of Reactivity with Aromatic Carbonyls and its Derivatives
- 4.2 Addition of Carbanions: Aldol Condensation, Cannizaro, Crossed Cannizaro, Claisen- Schmidt Reactions – their use in Synthesis
- 4.3 Houben - Hoesch Synthesis of Phenolic Ketone
- 4.4 Benzoin Condensation, Reimer-Tiemann, Haloform, Knoevenegal, Reformatsky and Perkin Reactions
- 4.5 Acrolein, Crotonaldehyde, Cinnamaldehyde – Preparation and Reactions

Unit 5

Oxidation and Reduction Reactions of Carbonyl Compounds (5 hrs.)

- 5.1 Reagents for Oxidation and Reduction of Carbonyl Compounds and their Corresponding Products. Meerwein-Ponndorf Verley, Clemmensen, Oppenaur, Baeyer- Villiger, Wolff- Kishner, LiAlH_4 and NaBH_4 Reductions

TEXT BOOKS

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

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.

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

BOOKS FOR REFERENCE

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

Paula Y. Bruic. *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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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

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

SYLLABUS

(Effective from the academic year 2015- 2016)

SEMI MICRO QUALITATIVE ANALYSIS PRACTICAL - I

CODE: 15CH/MC/P221

CREDIT: 1

L T P: 0 0 2

TOTAL HOURS: 26

Unit 1

- 1.1 Reactions of the Following Acid Radicals: Carbonate, Sulfate, Sulphide, Nitrate, Chloride, Bromide, Fluoride, Oxalate, Phosphate, Arsenite, Arsenate, Chromate and Borate
- 1.2 Elimination of Interfering Radicals - 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 (Interfering Ion)

TEXT BOOKS

Sathian Jesurietta, *Semi Micro Qualitative Analysis*. 2008.

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

General Procedure	15 marks
Acid Radical (1x15)	15 marks
Elimination Procedure	5 marks
Basic Radical (1x15)	15 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

General Procedure	15 marks
Acid Radical (1x15)	15 marks
Elimination Procedure	5 marks
Basic Radical (1x15)	15 marks

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

SYLLABUS

(Effective from the academic year 2015 – 16)

PHYSICAL CHEMISTRY – I

CODE: 15CH/MC/PC34

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To introduce students to basic concepts of Quantum Chemistry
- To provide an understanding of the principles of Solid State Chemistry
- To give an overview of the field of Catalysis

Unit 1

Basics of Quantum Mechanics (10 hrs.)

- 1.1 Black Body Radiation, Photoelectric Effect, Diffraction of Electrons, Debroglie Relation
- 1.2 Theory of Wave Motion, Classical Wave and the Wave Equation, Stationary Waves in a Clamped String, Classical Equation and Schrodinger Wave Equation (Derivation not expected)
- 1.3 Operator Concept in Quantum Mechanics, Properties of Operators
- 1.4 Postulates of Quantum Mechanics, Eigen Value, and Eigen Functions

Unit 2

Solid State (13 hrs.)

- 2.1 Crystalline and Amorphous Solids, Isotropy and Anisotropy, Interfacial Angles,
- 2.2 Symmetry in Crystal Systems, Elements of Symmetry
- 2.3 Space Lattice and Unit Cell, Bravais Lattices, Seven Crystal Systems, Lattice Energy
- 2.4 Law of Rational Indices, Miller Indices, X-Ray Diffraction, Bragg Law, Derivation of Bragg's Equation, Representation of Planes, Space Lattice, Reciprocal Lattice
- 2.5 Bragg Equation, Experimental Technique-Powder Method, X-Ray Diffraction Patterns of a Cubic System- Primitive, Body Centered and Face Centered Cubic Lattice
- 2.6 Electron and Neutron Diffraction- An Introduction and their Applications

Unit 3

Closed Packed Structures of Ionic Crystals (13 hrs.)

- 3.1 Closed Packed Structures- CCP & HCP, Percentage Void, Packing Efficiency, Radius Ratio Rule
- 3.2 Simple Type Structures AX (NaCl, ZnS, NiAS), AX₂ (CaF₂, TiO₂ and CdCl₂ and CdI₂)
- 3.3 Pauling's Rule for Structures adopted by Ionic Compounds, Point Defects – Schottky and Frenkel Defects, Non-Stoichiometric Defects
- 3.4 Liquid Crystals – Types, Structures, Textures and Applications

Unit 4
Surface Chemistry (6 hrs.)

- 4.1 Physisorption and Chemisorption- Types of Adsorption Isotherms
4.2 Freundlich Adsorption Isotherm -Limitations. Derivation of Langmiur Adsorption Isotherm; BET Adsorption Isotherm - Postulates and Equation. Determination of Surface Area, Applications

Unit 5
Catalysis (10 hrs.)

- 5.1 Catalytic Reactions-Characteristics, Homogenous Catalysis- Acid-Base Catalysis, Enzyme Catalysis- Michaelis – Menton Mechanism, Effect of Temperature
5.2 Heterogenous Catalysis- Kinetics of Surface Reactions, Unimolecular and Bimolecular Surface Reactions, Effect of pH on Catalysed Reactions

TEXT BOOKS

- Adamson Arthur W, Alice P. G. *Physical Chemistry of Surfaces*. India: Pearson, 2007.
Atkins, P.W. *Physical Chemistry*. Oxford University, 2013.
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.

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.

WEB RESOURCES

- <http://www.jce.acs.in>
<http://chemwiki.ucdavis.edu>
<http://www.amazon.com/Elements-Physical-Chemistry-Peter-Atkins>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins

Section A – $15 \times 1 = 15$ Marks (All questions to be answered) Multiple choice - 5, Fill in the
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Problem Solving

MCQ

Model Preparation

Short Answer Tests

End Semester Examination:

Total Marks: 100

Duration: 3 hours

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SYLLABUS

(Effective from the academic year 2015 – 16)

INORGANIC CHEMISTRY – I

CODE: 15CH/MC/IC34

CREDITS : 4

L T P : 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVE OF THE COURSE

- To give an overview of concepts in comparative studies of s and p block elements

Unit 1

Periodicity of Properties and the Hydrides (12 hrs.)

- 1.1 Periodic Table, Horizontal, Vertical and Diagonal Relationships in the Periodic Table
- 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 (8 hrs.)

- 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 (8 hrs.)

- 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 hrs.)

- 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 (6 hrs)

- 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

TEXT BOOKS

- Gopalan. R. *Inorganic Chemistry for Undergraduates*. Hyderabad: Universities Press, 2009.
- Puri. B.R., L.R Shama, & C.I. Kalia. *Principles of Inorganic Chemistry*. New Delhi: Milestone, 2008.
- Soni. P.L. and Katyal. Mohan. *Text Book of Inorganic Chemistry*. New Delhi: Sultan Chand, 2008.

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.
- Jayashree Ghosh. *Fundamental Concepts of Applied Chemistry*. New Delhi. S.Chand, 2008.
- Lee J.D. *Concise Inorganic Chemistry*. New Delhi: Oxford University Press, 2008.

WEBSITES

<http://www.chemicool.com/>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 2015- 2016)

SEMI MICRO QUALITATIVE ANALYSIS PRACTICAL- II

CODE: 15CH/MC/P332

CREDITS : 2

L T P : 0 0 3

TOTAL HOURS : 39

Unit 1

Preparation of Inorganic Complexes:

1.1 Tetraamminecopper (II) Sulphate hydrate

1.2 Tris(Thiourea) Copper(II) Sulphate Dihydrate / Hexaamminecobalt (III) Chloride

Unit 2

2.1 Analysis of a Salt Mixture Containing two Cations and two Anions

2.2 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)

TEXT BOOKS

Sathian Jesurietta, *Semimicro Qualitative Analysis*. 2008.

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

General Procedure:

6 marks

Acid radicals:

20 (2x10) marks

Elimination procedure:

3 marks

Basic radicals:

16 (2x8) marks

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

End Semester Examination:

Total Marks: 50

Duration: 3 hours

General Procedure:

6 marks

Acid radicals:

20 (2x10) marks

Elimination procedure:

3 marks

Basic radicals:

16 (2x8) marks

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

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
Allied Core Offered to the Departments of Plant Biology & Plant Biotechnology and
Advanced Zoology & Biotechnology

SYLLABUS

(Effective from the academic year 2015- 2016)

FUNDAMENTALS OF BIOCHEMISTRY - I

CODE: 15CH/AC/FB33

CREDITS: 3

L T P: 3 0 0

TOTAL TEACHING HOURS: 39

OBJECTIVES OF THE COURSE

- To introduce the basics of Biochemistry
- To understand the metabolic concepts and disease conditions
- To study the thermodynamic parameters involved in biological reactions

Unit 1

Introduction to Biochemistry (10 hrs.)

- 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 Techniques used in Biochemistry- SDS-PAGE, Sedimentation and Dialysis

Unit 2

Blood (5 hrs.)

- 2.1 Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia
- 2.2 Maintenance of pH of Blood, Bicarbonate Buffers, Acidosis and Alkalosis, Buffers and Electrolytes in the body

Unit 3

Bioenergetics (4 hrs.)

- 3.1 Free Energy, Enthalpy, Entropy, Standard Free Energy, Spontaneous and Non-Spontaneous Exergonic and Endergonic Reactions, Steady State Principle
- 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 hrs.)

- 4.1 Classification of Carbohydrates
- 4.2 Haworth's Structure and Reactions of Glucose, Fructose, Maltose and Sucrose
Polysaccharides - Homopolysaccharides-Cellulose, Starch (Amylose and Amylopectin) (Structural Elucidation not necessary), Heteropolysaccharides
Chondroitin Sulphate and Hyaluronic Acid
- 4.3 Digestion of Di and Polysaccharides in the Body, Maintenance of Glucose Level in Blood

4.4 Carbohydrate Metabolism - Metabolism of Glucose - Glycolysis, TCA Cycle, Glycogenesis, Glycogenolysis, Glyconeogenesis. Oxidative Phosphorylation, Electron Transport Chain

Unit 5

Enzymes

(5 hrs.)

5.1 Definition of Enzymes, Coenzymes and Apoenzymes

5.2 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, Koshland's Induced Fit Model

TEXT BOOKS

Berry, A.K. *Textbook of Biochemistry*. Emkay, 2001.

Jain, J.L. *Fundamentals of Biochemistry*. New Delhi: S. Chand, 2007.

Doraiswamy Yesodha, Geetha Swaminathan and V. Radhakrishnan. *Allied Biochemistry*. Chennai: Margham, 2010.

BOOKS FOR REFERENCE

Lehninger A.L. *Principles of Biochemistry*. Delhi: CBS, 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>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 to the Department of Physics

SYLLABUS

(Effective from the academic year 2015-2016)

FUNDAMENTALS OF CHEMISTRY - I

CODE: 15CH/AC/FC33

CREDITS: 3

L T P: 3 0 0

TOTAL TEACHING HOURS: 39

OBJECTIVE OF THE COURSE

- To enable an understanding of the fundamental concepts of Chemistry

Unit 1

Polymer Materials (8 hrs.)

- 1.1 Types of Polymerisation – Addition and Condensation. Mechanism of Free Radical Polymerisation
- 1.2 Liquid Crystalline Polymers and Conducting Polymers
- 1.3 Structure and Application- Polyethylene, PVC, Nylon, Phenol Formaldehyde Resin, Bakelite, Rubber- Vulcanization
- 1.4 Biodegradable and Non-Biodegradable Polymers

Unit 2

Chemistry in Living System (12 hrs.)

- 2.1 Carbohydrates – Classification, Haworth Structure of Glucose, Fructose, Sucrose, Starch, Cellulose. Colour Tests for the above. Hypo and Hyper Glycemia
- 2.2 Aminoacids - Zwitter Ion, Isoelectric Point, Ninhydrin Test
- 2.3 Proteins - Formation of Peptides, Importance of Aminoacid Sequence, Denaturation and Renaturation of Proteins
- 2.4 Biological Role of Haemoglobin, Vitamin B₁₂ & Chlorophyll with their Structure (Figurative Representation only)

Unit 3

Ionic Equilibrium (7 hrs.)

- 3.1 Acid-Base Concept - Arrhenius, Lowry-Bronsted and Lewis Concepts
- 3.2 Ionic Product of Water, pH, pOH, Strengths of Acids and Bases, K_a and K_b, PK_a and PK_b, Buffer Solution (Elementary Idea only)
- 3.3 Solvation, Solubility, Solubility Product, Common Ion Effect, Application

Unit 4

Electrochemistry (6 hrs.)

- 4.1 Definition of Specific, Equivalent and Molar Conductance, their Determination, Effect of Dilution on Conductance
- 4.2 Ostwald Dilution Law, Debye-Huckel Theory, Kohlrausch's Law
- 4.3 Transport Number, Conductivity Determination of Acidity Constant, Conductometric Titration

Unit 5

Thermoanalytical Methods

(6 hrs.)

5.1 Principle - Thermal Analysis of Silver Nitrate, Calcium Oxalate and Calcium Acetate – Methods of obtaining Thermograms, Factors affecting TGA/DTA and DSC

5.2 TGA and DTA - Instrumentation and Applications

5.3 Thermometric Titrations, Principle, Instrumentation and Applications

TEXT BOOKS

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

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

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

Doraiswamy Yesodha, Geetha Swaminathan and V. Radhakrishnan. *Allied Biochemistry*, Chennai: Margham, 2010.

BOOKS FOR REFERENCE

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

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

WEB RESOURCES

<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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 to the Departments of Plant Biology & Plant Biotechnology and
Advanced Zoology & Biotechnology

SYLLABUS
(Effective from the academic year 2015 - 2016)

BIOCHEMISTRY PRACTICAL – I

CODE: 15CH/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

TEXT BOOK

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Analysis -	50 marks
Preliminary reaction -	15 marks
Confirmatory tests with all colour tests -	30 marks
Final report -	5 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

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
Allied Core Offered to the Department of Physics

SYLLABUS

(Effective from the academic year 2015- 2016)

ORGANIC ANALYSIS PRACTICAL

CODE: 15CH/AC/P232

CREDITS: 2

L T P: 0 0 3

TOTAL HOURS: 39

Unit 1

- 1.1 Identification of Polymers by simple tests - Solubility, Flame test, Aromaticity,
Detection of Cl, N, S and OH

Unit 2

- 2.1 Reactions of Carbohydrates - Glucose, Fructose, Maltose, Sucrose and Starch
2.2 Reactions of Amino Acids - Tryptophan, Tyrosine, Arginine and Cysteine
2.3 Reactions of Proteins - Casein and Egg Albumin
2.4 Identification of Unknown Organic Compound

TEXT BOOK

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Preliminary reaction	-	15 marks
Confirmatory tests with all colour tests	-	30 marks
Final report	-	5marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Preliminary reaction	-	15 marks
Confirmatory tests with all colour test	-	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 2015 onwards)

ORGANIC CHEMISTRY - II

CODE: 15CH/MC/OC44

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To understand the Chemistry of phenols and carboxylic acids
- To learn the synthesis of nitrogen containing organic compounds
- To introduce the classification and preparation of dyes

Unit 1

Alcohols, Phenols and Ethers (12 hrs.)

- 1.1 Aliphatic Alcohols: Reactions with reference to C-OH Bond Cleavage and O-H Bond Cleavage. Di and Trihydric Alcohols, Action of HIO_4 , 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, Friedel-Craft's Reaction, Nitrosation, Coupling Reactions, Kolbe's Reaction and Riemer-Tiemann Reaction
- 1.4 Cleavage of Ether Linkages by HI- Ziesels Method of Estimation of Groups. Reactions of Ethers and Epoxides

Unit 2

Carboxylic Acids and their Derivatives (13 hrs.)

- 2.1 Nomenclature and Classification of Aliphatic and Aromatic Carboxylic Acids, Preparation and Reactions. Acidity (Effect of Substituents on Acidity) and Salt Formation, Mechanism of Reduction, Substitution in Alkyl or Aryl Group
- 2.2 Preparation and Properties of Dicarboxylic Acids - Oxalic, Malonic, Succinic, Glutaric, Adipic and Phthalic Acids and Unsaturated Carboxylic Acids - Acrylic, Crotonic and Cinnamic Acids. Action of Heat on Hydroxy, Amino Acids and Saturated Dicarboxylic Acids. Stereospecific addition to Maleic and Fumaric Acids
- 2.3 Preparation and Reactions of Acid Chlorides, Acid Anhydrides, Amides and Esters. Acid and Alkaline Hydrolysis of Esters, Trans-Esterification

Unit 3

Nitro and Amino Compounds (13 hrs.)

- 3.1 Aliphatic and Aromatic Nitro Compounds, Classification, General Properties, Preparation by Nitration. Nitro Alkanes - Tautomerism, Reactions, Distinction From Alkyl Nitrite
- 3.2 Aromatic Nitro Compounds - Reduction Products of Nitrobenzene in Acidic, Neutral and Alkaline Media, Electrolytic Reduction
- 3.3 Aromatic Amines – Preparation, Reactions - Basicity of Amines, Effect of Substituents on Basicity of Aromatic Amines. Separation of Mixture of Amines by Hinsberg and Hofmann Method

- 3.4 Methods of Preparation of Primary, Secondary and Tertiary Amines. Distinguishing Primary, Secondary and Tertiary Amines. Ascent and Descent of Series in Aliphatic Amines
- 3.5 Diazonium Salts - Preparation, Diazotisation Reactions, Replacement Reactions (Sandmeyer, Gatterman and Gomberg Reactions), Coupling Reactions

Unit 4

Synthesis involving Active Methylene Group (7 hrs.)

- 4.1 Malonic and Acetoacetic Esters: Characteristic Reactions of Active Methylene group, Synthetic uses of Malonic, Acetoacetic and Cynaoacetic Ester
- 4.2 Diazomethane and Diazoacetic Ester: Preparation, Structure and Synthetic Applications

Unit 5

Colors and Dyes (7 hrs.)

- 5.1 Complementary Colors and Photochemistry of Vision
- 5.2 Classification of Dyes Based on Chemical Structure and Application
- 5.3 Preparation and uses of Azo Dye-Methyl Orange and Bismark Brown; Triphenyl Methane Dye - Malachite Green, Para Rosaniline and Crystal Violet; Phthalein Dye - Phenolphthalein and Fluorescein; Vat Dye – Indigo; Anthraquinone Dye - Alizarin

TEXT BOOKS

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

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.

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

BOOKS FOR REFERENCE

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.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 2015-16 onwards)

ORGANIC CHEMISTRY PRACTICAL - I

CODE :15CH/MC/P442

CREDITS: 2

L T P : 0 0 3

TOTAL HOURS: 39

Unit 1

Analysis of Organic Compounds:

Acids, Phenols, Carbohydrates, Aldehydes, Ketones, Esters, Amines, Amides, Nitro Compounds, Anilides, Halo Compounds, Sulphur Compounds (Thiourea). Preparation of Derivatives of Organic Compounds

Unit 2

Preparations involving Oxidation, Nitration, Hydrolysis and Bromination

Unit 3

Determination of Melting Point and Boiling Point

TEXT BOOKS

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

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

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

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: 10 marks

Report : 5 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

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:	10 marks
Report :	5 marks

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 2015 - 2016)

FUNDAMENTALS OF BIOCHEMISTRY - II

CODE: 15CH/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

Unit 1

Lipids

(8 hrs.)

- 1.1 Classification of Lipids and Fats
- 1.2 Definitions and Significance of Iodine Value, Acid Value, Saponification Value, RM Value, Acetyl Value
- 1.3 Digestion and Absorption of Lipids
- 1.4 Lipid Metabolism - Oxidation of Fatty Acids, Biosynthesis of Fatty Acids, Ketone Bodies, Ketosis

Unit 2

Proteins

(13 hrs.)

- 2.1 Amino Acids - Classification based on R Groups and based on their Metabolism
- 2.2 Chemical Reactions of Amino Acids - with Mineral Acid, Formaldehyde, FDNB and CO₂, Ninhydrin Test, Action of Heat on α , β and γ - Aminoacids
- 2.3 Peptide Bond, Primary, Secondary and Tertiary Structure of Proteins. Ramachandran Plot. Properties of Proteins - Denaturation, Amphoteric Nature, Ion Binding Capacity, Solubility
- 2.4 Classification of Proteins based on Shape, Composition and Solubility
- 2.5 Digestion and Absorption of Proteins and Protein Metabolism, Transamination, Oxidative Deamination and Urea Cycle

Unit 3

Hormones

(5 hrs.)

- 3.1 Definition, Classification of Hormones (Steroid and Non-Steroid Only)
- 3.2 Mechanism of Hormone Action
- 3.3 Functions of Insulin and Thyroxin

Unit 4**Nucleic Acids****(8 hrs.)**

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

Unit 5**Laboratory Techniques****(5 hrs.)**

- 5.1 HBA1c, TSH, RBC, WBC, Platelet Count, T₃ and T₄
- 5.2 Risk Factor of HDL, LDL and Total Cholesterol

TEXT BOOKS

Berry, A.K. *Textbook of Biochemistry*. Emkay, 2001.

Doraiswamy Yesodha , Geetha Swaminathan and V. Radhakrishnan. *Allied Biochemistry*. Chennai: Margham, 2010.

BOOKS FOR REFERENCE

Lehninger A.L. *Principles of Biochemistry*. New Delhi: CBS, 2006.

Stryer Lubert, *Biochemistry*. New York: W.H. Freeman, 2007.

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/virttxtjml/nucacids.htm>

PATTERN OF EVALUATION**Continuous Assessment:****Total Marks: 50****Duration: 90 mins.**

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)

Third Component:**List of evaluation modes:**

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 2015-2016)

FUNDAMENTALS OF CHEMISTRY - II

CODE:15CH/AC/FC43

CREDITS: 3

L T P: 3 0 0

TOTAL TEACHING HOURS: 39

OBJECTIVES OF THE COURSE

- To learn the concepts of kinetics and phase rule.
- To provide an understanding of the applications of electrochemistry photochemistry and catalysis

Unit 1

Chemical Kinetics (10 hrs.)

- 1.1 Rate of Reaction, Order of Reaction, Molecularity
- 1.2 First Order Reactions, Radiodating, Pseudo-Unimolecular Reactions, Second Order and Zero order Reaction Rates, Measurement of Reaction Rates
- 1.3 Determination of Order – Graphical Method, Half - Life Method, Integrated Rate Equation Method, Ostwald's Isolation Method
- 1.4 Factors affecting the Rate of Reaction and Energy of Activation

Unit 2

Electrochemical Cells and its Application (10 hrs.)

- 2.1 Galvanic Cells (Electrodes, Cell, E.M.F.), Electrochemical Cells, Nernst Equation. Standard Electrode Potential and its Measurement, Electrochemical Series
- 2.2 Liquid Junction Potential, Commercial Cells – the Primary and Secondary Cells. Fuel Cells- Hydrogen-Oxygen; Polarization, Decomposition Potential and Over-Voltage
- 2.3 Batteries- Laclanche Cell, Alkaline Battery, Nickel-Cadmium Battery, Mercury Battery, Lead Storage Battery, Solar Battery; Corrosion and Prevention

Unit 3

Phase Rule (8 hrs.)

- 3.1 Definition of Phase, Component, Degree of Freedom Derivation of Phase Rule
- 3.2 Application of Phase Rule to One Component Systems (Water and Sulphur)
- 3.3 Two Component Systems: Simple Eutectic (Ag, Pb) Solid Solution (Ni, Cu)

Unit 4

Photochemistry (6 hrs.)

- 4.1 Photochemical Rate Laws, Quantum Yield, Kinetics of Hydrogen-Chlorine and Hydrogen-Bromine Reactions
- 4.2 Photosensitization, Florescence, Phosphorescence and Chemiluminisence

Unit 5

Catalysis

(5 hrs.)

- 5.1 Homogenous and Heterogeneous Catalysis – Acid Base Catalysis and Enzyme Catalysis
- 5.2 Examples of Catalysis- Hydrogenation, Oxidation, and Cracking/Pyrolysis

TEXT BOOKS

- Adamson Arthur W, Alice P. G. *Physical Chemistry of Surfaces*. India: Pearson, 2007
- Atkins, P.W. *Physical Chemistry*. Oxford University press, 2013.
- Bajpai.S. *Physical Chemistry*. New Delhi: S.Chand, 2006.
- Jain and Jain, *Engineering Chemistry*. Dhanpat Rai, 2012.

BOOKS FOR REFERENCE

- Barrow, Gordon, M. *Physical Chemistry*. McGraw Hill, 2008.
- Castellan G.W. *Physical Chemistry*. Narosa, 2004.

WEB RESOURCES

- 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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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

Third Component:

List of evaluation modes:

- 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 Plant Biology and Plant
Biotechnology and Advanced Zoology and Biotechnology**

SYLLABUS

(Effective from the academic year 2015- 2016)

BIOCHEMISTRY PRACTICAL– II

CODE: 15CH/AC/P342

CREDITS : 2

L T P : 0 0 3

TOTAL HOURS : 39

Unit 1

Estimations

1. Estimation of Oxalic Acid / Fe^{2+} (Permanganimetry)
2. Estimation of Glucose
3. Estimation of Glycine by Sorrensen's Titration
4. Estimation of Ascorbic Acid
5. Estimation of Acid Value / Saponification Value / Iodine Value of Edible Oil
6. Estimation of the 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

TEXT BOOKS

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

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

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Short Procedure (10 Minutes) - 10 marks
Experiment - 40 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Short Procedure (10 Minutes) - 10 marks
Experiment - 40 marks

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 2015 - 2016)

GENERAL CHEMISTRY PRACTICAL

CODE: 15CH/AC/P442

CREDITS: 2

L T P : 0 0 3

TOTAL HOURS : 39

Unit 1

Phase Equilibria and Kinetics

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

Unit 2

Conductometry and Potentiometry

- 2.1 Determination of Strength of Weak Acid Conductometrically
- 2.2 Determination of Fe^{2+} in the given sample using Potassium Dichromate Potentiometrically

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

TEXT BOOKS

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.

REFERENCE BOOK

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

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Short Procedure (10 Minutes) -
Experiment -

10 marks
40 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Short Procedure (10 Minutes) -
Experiment -

10 marks
40 marks

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086
Allied Elective Course Offered by the Department of Chemistry for
students of Physics / Plant Biology and Plant Biotechnology /Advanced
Zoology and Biotechnology

SYLLABUS

(Effective from the academic year 2015 - 2016)

APPLIED CHEMISTRY

CODE: 15CH/AE/AP45

CREDITS: 5

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

- To understand the chemistry of materials used in everyday life
- To provide an overview of the practical applications of Chemistry

Unit I

Chemical Concentrations (10 hrs.)

- 1.1 Concept of 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
Volume Ratios for Dilution Procedures, Buffer Solutions
- 1.2 Standard Solutions, Primary and Secondary Standards

Unit 2

Basics of Nanochemistry (15 hrs.)

- 2.1 Classification of Nanomaterials, Properties and Applications
- 2.2 Self Assembly – Materials and Molecules, Self Assembled Monolayers (SAM)
- 2.3 Types of Nanoparticles – Preparation, Properties and uses of Gold, Silver and Nanoparticles
- 2.4 Techniques to Synthesise Nanoparticles – Top Down and Bottom Up Approaches, Green Synthesis, Applications and Toxic Effects of Nanomaterials
- 2.5 Characterisation of Nanomaterials – Principle and Applications - Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning Probe Microscopy, Atomic Force Microscopy (AFM), Scanning Tunneling Electron Microscope (STEM)

Unit 3

Adsorption and Catalysis (10 hrs.)

- 3.1 Adsorption - Physisorption and Chemisorption; Factors affecting Adsorption of Gases on Solids
- 3.2 Catalysis - General Principles and Properties of Catalysts; Homogenous and Heterogeneous Catalysis, Enzyme Catalysis
- 3.3 Application of Zeolites as Catalysts

Unit 4

Chemicals used in Daily Life (15 hrs.)

- 4.1 Polymers: Natural and Synthetic Polymers and their Applications - Starch, Cellulose, Collagen, Silk Fibroin, Clays, Rubber, PE, PVC, PVA and Silicones
- 4.2 Dyes - Classification Based on Structure and Application. Synthesis of Congo Red and Malachite Green. Dyes Used in Foods
- 4.3 Pharmaceuticals - Analgesics - Narcotics (Morphine, Codeine), Non- Narcotics (Aspirin, Ibuprofen); Antipyretic (Phenacetin, Paracetamol) Antiseptics and Disinfectants (Dettol, Salol), Antibiotics (Pencillin, Chloramphenicol), Antacids, Antihistamines
- 4.4 Chemicals as Food Preservatives, Artificial Sweetening Agents
- 4.5 Leather Processing - Process before Tanning - Vegetable Tanning and Chrome Tanning, Tannery Effluent and by product

Unit 5

Practicals (to be tested internally) (15 hrs.)

- 5.1 Measurement of pH of different solutions like Aerated Drinks, Fruit Juices, Shampoos and Soaps using pH -Meter/ pH Paper
- 5.2 Green Synthesis of Zinc Oxide / Iron Oxide Nanoparticles
- 5.3 Synthesis of Azo Dye Methyl Orange - Congo Red
- 5.4 Determination of Dissolved Oxygen, Biochemical Oxygen Demand (BOD)
- 5.5 Synthesis of Aspirin

TEXT BOOKS

- Gem Mathew G.D. *Chemistry in Everyday Life*. Jalandhar-Delhi: Vishal, 2009.
- Jayashree Ghosh. *Fundamental Concepts of Applied Chemistry*. New Delhi: S.Chand , 2008.
- Pradeep T. *Nano: The Essentials*. New Delhi: Mc Graw Hill, 2007.

REFERENCE BOOKS

- Muraleedharan V. S and Subramania A. *Nanosciene and Nanotechnology*. New Delhi: Ane Books, 2009.
- Rao C. N. R and Govindraj A. *Nanotubes and Nanowires*. Royal Society of Chemistry, 2005.

WEB RESOURCES

- <http://crescentok.com/staff/jaskew/isr/chemistry/class14.htm>
- http://water.me.vccs.edu/courses/env211/lesson8_3.htm
- http://nanoyou.eu/attachments/188_Module-1-chapter-1.pdf
- <http://nanoyou.eu/>
- <http://chemistry.about.com/od/everydaychemistry/>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 2015 - 2016)

ORGANIC CHEMISTRY - III

CODE: 15CH/MC/OC54

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To study the structure, synthesis and properties of heterocyclic compounds and their application as intermediates of industrial importance
- To learn the structural determination of natural products
- To provide a better understanding of the mechanisms involved in various rearrangements and organic syntheses

Unit 1

Heterocyclic Compounds

(10 hrs.)

- 1.1 Classification, Preparation of Furan, Pyrrole, Thiophene and Pyridine. Reactions - Electrophilic and Nucleophilic Substitutions, Oxidation and Reduction Reactions.
- 1.2 Porphyrin and Corrin Ring Structure -Haemoglobin, Vitamin B₁₂, Chlorophyll.
- 1.3 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

Carbohydrates

(10 hrs.)

- 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 - HIO₄ 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

Unit 3

Natural Products

(13 hrs.)

- 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, Degradation and Synthesis. Structural Elucidation of

- Piperine, Nicotine
- 3.3 Terpenoids - Classification, Isoprene Rule, General Properties, Structure Determination of the following Monoterpenoids – Citral, α -Terpeneol, α - Pinene

Unit 4

Molecular Rearrangements

(10 hrs.)

- 4.1 Classification as Anionotropic, Cationotropic, Free Radical, Inter and Intramolecular
- 4.2 Pinacol-Pinacolone Rearrangement (Mechanism, Evidence for Carbonium Ion Intermediate Formation - Migratory Aptitude)
- 4.3 Beckmann, Hoffmann, Curtius and Benzilic Acid Rearrangements
- 4.4 Claisen Rearrangement (Sigmatropic - Evidence for Intramolecular Nature and Allylic Carbon Attachment) - Cope and Oxy-Cope Rearrangements and Fries Rearrangement

Unit 5

Functional Group interconversion and Designing Organic Synthesis

(9 hrs.)

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

TEXT BOOKS

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

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

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

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.

BOOKS FOR REFERENCE

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.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 - 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 2015-2016)

BIOCHEMISTRY

CODE: 15CH/MC/BC54

CREDITS : 4

L T P : 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To provide knowledge on concepts of Biochemistry
- To enable an understanding of Bio molecules and metabolism

Unit 1

Introductory Biochemistry (8 hrs.)

- 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

Structure of Biomolecules (13 hrs.)

- 2.1 Amino Acids – Classification Based on R Groups and Based on Their Metabolism, Chemical Reactions - with Mineral Acid, Formaldehyde, FDNB, and CO₂, Ninhydrin Test, Action of Heat on α , β and γ - Aminoacids
- 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 their Differences. DNA Replication and Protein Synthesis

Unit 3

Metabolism (13 hrs.)

- 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: Reactions of Amino Acids, Zwitterions, Isoelectric Point, Peptide Bond Formation. Action of Heat, Reaction with HNO₂, HCHO, Cu²⁺ and Ninhydrin. 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**Enzymes****(12 hrs.)**

- 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**Hormones****(6 hrs.)**

- 5.1 Definition, Classification of Hormones (Steroid and Non-Steroid Only)
- 5.2 Source and Functions of Insulin, Thyroxin and Sex Hormones
- 5.3 Mechanism of Hormone Action

TEXT BOOKS

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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
B.Sc. DEGREE : BRANCH IV – CHEMISTRY

SYLLABUS

(Effective from the academic year 2015 - 2016)

PHYSICAL CHEMISTRY - II

CODE: 15CH/MC/PC54

CREDITS: 4

L T P : 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVES OF THE COURSE

- To study Thermodynamics and its applications in real life
- To provide an understanding of phase equilibria

Unit 1

Thermodynamics - an Introduction (13 hrs.)

- 1.1 Types of Systems, Extensive and Intensive Properties, Different Forms of Energy.
First Law - Statements. Internal Energy and Enthalpy, State and Path Functions.
Complete Differentials
- 1.2 Isothermal and Adiabatic Changes, Work Done, Internal Energy Changes, Difference between Heat Capacities of Ideal Gases
- 1.3 Thermodynamics of Real Gases Obeying Van der Waal's Equation of State, Joule-Thomson Effect, Inversion Temperature
- 1.4 Work Done in Isothermal and Adiabatic Changes for Real Gases, Internal Energy Changes, Difference between Heat Capacities at Constant Pressure and Volume for Real Gases

Unit 2

Second Law of Thermodynamics (13 hrs.)

- 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 State (Trouton's Rule), Entropy Change for Irreversible Processes (Inequality of Clausius) Comparison of ΔS for Reversible and Irreversible Processes, Criteria for Spontaneity of Process in Terms of ΔS , Entropy of Mixing and Entropy as a Measure of Disorder, Third Law Statement
- 2.3 Helmholtz and Gibb's Energies, Maximum and Network Done, Variation in A & G in Terms of P, V and T, Condition for Equilibrium and Spontaneity, Maxwell's Relations
- 2.4 Standard Free Energies, Gibbs-Helmholtz Equation and its Application in Chemistry

- Unit 3**
Introduction to Phase Equilibria (8 hrs.)
3.1 Phase Diagrams, Phase Boundaries, Phase Diagrams of Water, Carbon Dioxide and Helium. Clausius Clapeyron Equation
3.2 Measures of Concentration- Molality and Mole Fraction Partial Molal Properties, Concept of Chemical Potential, Gibbs Duhem's Equation
3.3 Raoult's Law and Henry's Law, Real Solutions, Concept of Activity and Activity Coefficient
- Unit 4**
Phase Equilibria in Real System (10 hrs.)
4.1 Colligative Properties – Depression in Freezing Point, Elevation in Boiling Point and Osmosis Vant Hoff Factor, Abnormal Molar Mass, Degree of Dissociation and Association
4.2 Phase Diagrams of Mixtures of Volatile Liquids (Fractional Distillation, Low and High Boiling Azeotrope) Liquid-Liquid Phase Diagram (Nitrobenzene & Hexane and Water & Triethylamine), Lever Rule and Liquid-Solid Phase Diagram (Antimony - Bismuth)
4.3 Nernst Distribution Law, Conditions, Derivation, Applications
- Unit 5**
Chemical Equilibrium (8 hrs.)
5.1 Law of Mass Action, Equilibrium Constant and Free Energy
5.2 Equilibrium in Ideal Gases, Significance of K
5.3 Application of Law Mass Action to Homogenous, Heterogeneous Equilibria
5.4 Le Chatelier's Principle, Vant Hoff Equation (Reaction Isochore) and Vant Hoff's Reaction Isotherm

TEXT BOOKS

Atkins, P.W. *The Elements of Physical Chemistry*. Oxford University, 2001.

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

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

BOOKS FOR REFERENCE

Atkins, P.W and Paula Jones. *Physical Chemistry*. Oxford University, 2012.

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.

WEB RESOURCES

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

http://serc.carleton.edu/research_education/equilibria/phaserule.html

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

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

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 2015 - 2016)

PHYSICAL CHEMISTRY PRACTICAL– I

CODE: 15CH/MC/P652

CREDITS: 2

L T P : 0 0 3

TOTAL HOURS: 39

Unit 1

Partition Coefficient

1.1 Distribution Coefficient of I₂ between CCl₄ & H₂O

Unit 2

Chemical Kinetics

2.1 Determination of Rate Constant Reaction - Acid Catalyzed Hydrolysis of Ester

Unit 3

Phase Equilibria

3.1 Determination of Molecular Weight by Rast Method

3.2 Determination of Critical Solution Temperature (CST) for Phenol-Water System

3.3 Tracing the Phase Diagram, CST, CSC

3.4 Given the Phase Diagram, Determine the Concentration of the Unknown Mixture of Phenol and Water

Unit 4

Conductometry

4.1 Determination of equivalent conductance at infinite dilution for strong electrolytes

4.2 To verify Oswald's dilution law

Unit 5

Potentiometry

5.1 Determination of Fe²⁺ in the given sample potentiometrically using potassium dichromate

5.2 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.

TEXT BOOK

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

Continuous Assessment:**Total Marks: 50****Duration: 3 hours****Procedure with principle 10 marks****Practical work 40 marks**

Experiment 25 Marks

Execution 15 Marks (includes tabulation, attestation, calculation and graph)

END SEMESTER EXAMINATION:**Total Marks: 50****Duration: 3 hours****QUESTION PAPER PATTERN****Procedure with principle 10 marks****Practical work 40 marks**

Experiment 25 Marks

Execution 15 Marks (includes tabulation, attestation, calculation and graph)

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE : BRANCH IV - CHEMISTRY

(Effective from the academic year 2015-2016)

SYLLABUS

(Effective from

ORGANIC CHEMISTRY PRACTICAL – II

CODE: 15CH/MC/P551

CREDIT: 1

L T P : 0 0 2

TOTAL HOURS: 26

Unit 1

Estimations of Vitamins, Glucose and Organic Molecules

- 1.1 Estimation of Vitamin C by 2, 6-Dichlorophenol Indophenol Dye Method
- 1.2 Quantitative Estimation of Glucose using Fehling's Solution Method
- 1.3 Estimation of Phenol/Aniline

Unit 2

Estimation of Amino Acid, Enzyme and Lipids

- 2.1 Estimation of Glycine by Sorrensen's Titration
- 2.2 Estimation of Acid Value
- 2.3 Estimation of the Enzyme Catalase in Chowchow/ Radish
- 2.4 Estimation of Ketones

TEXT BOOKS

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

Vogel, A.I. *Textbook of Practical Organic Chemistry*. Longman, 2002.

REFERENCE BOOKS

Ahluwalia V.K and Dhingra S. *Comprehensive Practical Organic Chemistry*. Universities Press, 2004.

Mann F. G and Saunders B.C. *Practical Organic Chemistry*. Pearson, 2009.

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Equations and short Procedure (10 minutes) 10 marks

Experiment 40 marks

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Equations and short Procedure (10 minutes) 10 marks

Experiment 40 marks

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

SYLLABUS

(Effective from the academic year 2015–16)

PROJECT

CODE :15CH/ME/PR55

CREDITS : 5
L T P : 0 0 5
TOTAL HOURS : 65

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 External Examiner, supervisor and Head of the Department

Guidelines for Evaluation

The maximum marks for the dissertation is 100 and this will be converted to 50 marks by Controller of Examination

Internal evaluation: 50 marks

* Attendance, log book, experimental work and project report

External evaluation: 50 marks

* Project report and *viva voce*

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

B.Sc. DEGREE: BRANCH IV - CHEMISTRY

SYLLABUS

(Effective from the academic year 2015 - 2016)

POLYMER CHEMISTRY

CODE: 15CH/ME/PL55

CREDITS: 5

L T P : 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVES OF THE COURSE

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

Unit 1

Introduction to Polymers (10 hrs.)

- 1.1 Classification of Polymers Based on Origin/Occurrence, Chemical Structure, Physical Properties, Mechanical Behavior, Polymerization 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

Chemistry of Polymerisation (16 hrs.)

- 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

Molecular Weight and Properties of Polymers (16 hrs.)

- 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 Crystallineability

- 3.4 Reactions of Polymers-Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each)
3.5 Cyclisation, Cross-Linking and Reactions of Specific Groups in the Polymer

Unit 4
Polymer Degradation (10 hrs.)

- 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
Practicals (To be assessed internally) (10 hrs.)

- 5.1 Synthesis of Phenol-Formaldehyde Resin
5.2 Synthesis of Polymethyl Methacrylate (PMMA)/Polystyrene (PS)
5.3 Synthesis of Nylon 66
5.4 Synthesis of Polyester
5.5 Determination of the Molecular Weight of Polyvinyl Alcohol (PVA)/Polyvinyl Chloride (PVC)

Industrial visit: Visit to polymer industry / CLRI

TEXT BOOKS

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

New Delhi: New Age International, 2014.

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.

WEB RESOURCES

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

<http://www.chem.tamu.edu/class/majors/tutorialnotefiles/polymer.htm>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins

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)

Third Component:

List of evaluation modes:

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 - 600086.
B.Sc DEGREE: BRANCH IV- CHEMISTRY

SYLLABUS

(Effective from the academic year 2015 - 2016)

PHARMACEUTICAL CHEMISTRY

CODE: 15CH/ME/PH55

CREDITS: 5

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVE OF THE COURSE

- To provide an understanding of the fundamentals of Pharmaceutical Chemistry

Unit 1

Introduction to Pharmaceutical Chemistry (13 hrs.)

- 1.1 Definitions - Pharmacy, Pharmacology, Pharmacodynamics, Pharmacokinetics, Antimetabolites, Bacteria, Virus, Fungi, Mutation, Pharmacognosy, Toxicology, Pharmacotherapeutics, Chemotherapy, Therapeutic Index. Classification of Drugs
1.2 Diseases: Malaria, Plague, Whooping Cough, Measles, Common Cold, TB, Cholera,
1.3 Typhoid and Dysentery - Cause, Symptoms, Treatment, Prevention
1.4 Biological Role of Trace Elements - K, Ca, I₂, Cu, Zn

Unit 2

Blood and Hematological Agents (12 hrs.)

- 2.1 Composition of Blood, Blood Grouping, Clotting of Blood - Mechanism, Haematological Agents - Anaemia – Causes and Control - Antianaemic Drugs
2.2 Role of Blood as Oxygen Carrier, Blood Pressure, Hypo and Hypertension - Cause, Prevention and Treatment; Antihypertensive Agents - Aldomet, Reserpine
2.3 Cardiovascular Drugs: Cardiac Glycosides - Digoxin; Antiarrhythmic Drugs- Quinidine - Structure, Dosage and Therapeutic Uses; Antagonists of Calcium
2.4 Antianginal Agents- Nitriles; Vasodilators - Sodium Nitroprusside, Papaverine and Nicotinic Acid

Unit 3

Drugs of Importance (16 hrs.)

- 3.1 Analgesics : Narcotic- Morphine- Source, Structure-Activity Relationship and Uses (Pethidine) and Non-Narcotic Drugs, Antipyretic and Anti-Inflammatory Agents – (Asprin, Paracetamol, Phenylbutazone, Ibuprofen)
3.2 Anaesthetics- Conditions of an Ideal Anesthetic Agent, Types-General (Ether, CHCl₃, 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**Pharmacological Aids (10 hrs.)**

- 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**Practicals (to be tested internally) (14 hrs.)**

- 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

TEXT BOOKS

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.

BOOK FOR REFERENCE

Craig, Robert, R. E. Stitzel. *Modern Pharmacology*. Boston: Little Brown, 2000.

WEB RESOURCES

<http://www.oocities.org/srn251/weng.htm>

http://www.rightdiagnosis.com/medical/hematologic_agent.htm

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins

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)

Third Component:

List of evaluation modes:

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 2015-2016)

COMPUTERS IN CHEMISTRY

CODE: 15CH/ME/CC55

CREDITS : 5

L T P: 4 1 0

TOTAL TEACHING HOURS: 65

OBJECTIVE OF THE COURSE

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

Unit 1

Data Processing and Analysis (15 hrs.)

- 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

Introduction to Graphs (15 hrs.)

- 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

Unit 3

Introduction to MathCad (10 hrs.)

- 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

CHEM Draw & CHEM 3D Pro (15 hrs.)

- 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

Computer Programmes

(10 hrs.)

- 5.1 Fundamentals – Introduction to C Language, C Characters, Constants and Variables
5.2 C-Statements – Conditional Statement – Simple C Programs - Calculation of Molecular Mass of Organic Compounds - Calculation of Normality, Molality and Molarity - Factorial of a Number - Determination of Half Life and Average Life of Radioactive Element- Determination of pH

TEXT BOOK

Ramesh Kumari. *Computers and applications to Chemistry*. New Delhi: Narosa, 2005.

BOOK FOR REFERENCE

Raman K.V. *Computers in Chemistry*. Tata McGraw-Hill, 2002.

WEB RESOURCES

https://www.cambridgesoft.com/Ensemble_for_Chemistry/ChemDraw/

<http://www.sciencesoftware.se/en/>

<http://www.analytictech.com/networks/graphtheory.htm>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

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 2015 – 2016)

INORGANIC CHEMISTRY – II

CODE: 15CH/MC/IC64

CREDITS: 4

L T P: 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVE OF THE COURSE

- To understand the nature of bonding in coordination compounds and their application in biological system and industry

Unit 1

Transition Elements (10 hrs.)

- 1.1 General Properties of Transition Metals
- 1.2 Ti, V, Cr, Mn Groups, Fe, Co, Ni Groups - A Comparative Study with respect to the Oxidation States, Oxides and Complexes
- 1.3 Biological Importance of Transition Metals-Biological Roles of Mo,Fe,Co,Cu,Zn (Metal Containing Proteins and Enzymes and their Biological Roles)

Unit 2

Chemistry of Coordination Compounds (8 hrs.)

- 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

Theories and Applications of Coordination Compounds (18 hrs.)

- 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, Ferroin, DMG, Oxine, Cupferron and EDTA

Unit 4

Inner Transition Elements (8 hrs.)

- 4.1 Lanthanides – Lanthanide Series, their Position in the Periodic Table, Properties of Lanthanides, Lanthanide Contraction and its Consequences
- 4.2 Isolation of Lanthanides - Ion Exchange Chromatography
- 4.3 Actinide – Actinide Series, Position in the Periodic Table, Properties of Actinides. Comparison between Lanthanides and Actinides
- 4.4 Extraction of Thorium from Monazite and Uranium from Pitch Blende

Unit 5**Organometallic Compounds****(8 hrs.)**

- 5.1 Metal Carbonyls - Preparation, Properties and Structure of Ni and Fe Carbonyls
5.2 Preparation and Structure of Metal Alkyls and Aryls of Li, Al and Ti. Structure of Metal Alkene Complexes
5.3 Ferrocene - Preparation, Properties and Structure

TEXT BOOKS

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.

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/virttxtjml/orgmetal.htm>

PATTERN OF EVALUATION**Continuous Assessment:****Total Marks: 50****Duration: 90 mins.**

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)

Third Component:**List of evaluation modes:**

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 – $30 \times 1 = 30$ 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
B.Sc. DEGREE : BRANCH IV – CHEMISTRY

SYLLABUS

(Effective from the academic year 2015 onwards)

PHYSICAL CHEMISTRY – III

CODE : 15CH/MC/PC64

CREDITS: 4

L T P : 4 0 0

TOTAL TEACHING HOURS: 52

OBJECTIVE OF THE COURSE

- To develop an understanding of the fundamentals of Kinetics, Ionic equilibria and Electrochemistry

Unit 1

Ionic Equilibria (12 hrs.)

- 1.1 Proton Transfer Equilibria- Bronsted Lowry Theory, Protonation and Deprotonation pK_a , (pK_b , pH, pOH, K_w and pK_w), Polyprotic Acids, Amphiprotic Systems, Henderson-Hasselbalch Equation, Buffer Action, Solubility Equilibria, Solubility Product, Common Ion Effect and Solubility
- 1.2 Hydrolysis of Salts, Hydrolysis Constant, Relation between K_b , K_a and K_w , Degree of Hydrolysis, Salts of Weak Bases and Strong Acid and Degree of Acid Base Indicators
- 1.3 Migration of Ions- Conductivity, Ostwald's Dilution Law, Variation of Conductance with Dilution, Kohlrausch's Law, Ion Mobility, Transport Number & Ionic Conductance, Transport Number - Determination by Hittorf's and Moving Boundary Methods
- 1.4 Debye Huckel Theory of Strong Electrolytes, Activity Coefficient, Mean Activity Coefficient and Ionic Strength

Unit 2

Electrochemistry (15 hrs.)

- 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 ΔG , ΔH , ΔS , 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 Derivation - Significance of Salt Bridge

Unit 3**Chemical Kinetics****(8 hrs.)**

- 3.1 The Rate Equation, Order and Molecularity of Reactions with Examples
- 3.2 Derivation of Rate Constants for Zero, First, Second (Equimolar and Non-Equimolar Reactant Concentrations) and n^{th} Order Reactions, Characteristics of Fractional Order Reactions, Half Life Time
- 3.3 Methods of Determination of Order of Reaction
- 3.4 Collisions and Encounters, Effect of Temperature on Reaction Rate, Concept of Activation Energy, Energy Barrier, Effect of Catalyst, Arrhenius Equation, Calculation of Arrhenius Parameters

Unit 4**Theories of Reaction Rates****(9 hrs.)**

- 4.1 Theories of Reaction Rates, Collision Theory of Bimolecular Reaction, Limitations of Collision Theory
- 4.2 Activated Complex Theory of Bimolecular Reactions, Transition State Theory – Thermodynamic Derivation of Rate Constant for TS, Eyring's Equation (No Derivation), Significance of ΔH^* , ΔG^* & ΔS^* , Lindemann Theory of Unimolecular Reactions
- 4.3 Photochemical Rate Law, Kinetics of Hydrogen-Chlorine, Photosensitization and Quenching of Florescence, Chemiluminisence

Unit 5**Electroanalytical Techniques****(8 hrs.)**

- 5.1 Polarography - Basic Principles, Dropping Mercury Electrode - Advantages and Disadvantages, Ilkovic Equation (Derivation not Required) and its Significance - Experimental Assembly, Current – Voltage Curve, Polarographic Maxima, Oxygen Interference, Polarography as an Analytical Tool in Qualitative and Quantitative Analysis
- 5.2 Amperometry - Basic Principles and Applications

TEXT BOOKS

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

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

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.

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>

PATTERN OF EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component:

List of evaluation modes:

Seminars

Quiz

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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 2015 - 2016)

SPECTROSCOPY

CODE: 15CH/MC/SP64

CREDITS: 4

L T P : 4 0 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To enable the students to understand the basics of spectroscopy and its approach in characterization of compounds
- To give an overview of the various spectral and instrumentation techniques

Unit 1

Introduction

(7 hrs.)

- 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 Problems Involving Calculation of Moment of Inertia and Reduced Mass

Unit 2

Vibrational Transitions: FTIR and Raman Spectroscopy

(10 hrs.)

- 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

Electronic Transitions: UV Visible Spectroscopy

(10 hrs.)

- 3.1 Theory of Electronic Spectroscopy, Instrumentation, Laws of Light Absorption- Beer and Lambert's Law, 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 α,β -Unsaturated Aldehydes and Ketones
- 3.4 UV Spectra of Simple Organic Compounds -Toluene and Cresol

Unit 4

Nuclear Magnetic Resonance Spectroscopy (15 hrs.)

- 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, Vander Waals Deshielding, H-Bonding, Diamagnetic and Paramagnetic Anisotropies
- 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 C_{13} NMR Spectra, Spin Decoupling Techniques – Advantages
- 4.6 NMR Spectra of Simple Organic Compounds – CH_3Cl , CH_3CH_2OH , $C_6H_5CH_3$, CH_3CHO , CH_3COOH , Diborane

Unit 5

Mass Spectrometry (10 hrs.)

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

Visit to R&D labs

TEXT BOOKS

Banwell, C.N. *Fundamentals in Molecular Spectroscopy*. New Delhi: Tata McGraw Hill, 2007.

Pavia D. L., Lampman G.M., Kriz G. S. *Spectroscopy*. Pearson, 2010.

REFERENCE BOOKS

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.

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 EVALUATION

Continuous Assessment:

Total Marks: 50

Duration: 90 mins.

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)

Third Component Tests:

List of evaluation modes:

Seminars

Quiz

Open Book Tests

Group Discussion

Assignments

Problem Solving

MCQ

Model Preparations

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 2015 - 2016)

PHYSICAL CHEMISTRY PRACTICAL – II

CODE: 15CH/MC/P762

CREDITS: 2

L T P : 0 0 3

TOTAL HOURS: 39

Unit 1

Distribution Law

1.1 Determination of Equilibrium Constant of the Reaction. $I_2 + I^- = I_3^-$

1.2 Determination of Concentration of the Given KI

Unit 2

Chemical Kinetics

2.1 Determination of Rate Constant of Iodide - Persulphate Reaction

Unit 3

Phase Equilibria

3.1 To Study the Effect of Added Impurity on UCST and Determination of the Unknown Concentration of the Impurity NaCl / Succinic Acid

3.2 Determination of Eutectic Composition and Eutectic Temperature of Biphenyl & Naphthalene

Unit 4

Conductometry & pH metry

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

4.2 Verification of Henderson's Equation

Unit 5

Spectrophotometry & Flame Photometry

5.1 Estimation of Iron as Iron Thiocyanate Spectrophotometrically

5.2 Determination of Concentrations of Na/K 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.

TEXT BOOK

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

Continuous Assessment:

Total Marks: 50

Duration: 3 hours

Procedure with principle 10 marks

Practical work 40 marks

Experimental value : 25 marks

Execution : 15 marks (includes tabulation, attestation, calculation, and graph)

End Semester Examination:

Total Marks: 50

Duration: 3 hours

Procedure with principle 10 marks

Practical work 40 marks

Experimental value : 25 marks

Execution : 15 marks (includes tabulation, attestation, calculation, and graph)