SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

UG - COURSES – AFFILIATED COLLEGES Course Structure for **B.Sc CHEMISTRY**

(Choice Based Credit System) (with effect from the academic year 2017- 2018 onwards)

Semester-V							
Part	Subject Status	Subject Title	Subject Code	Credit			
III	Core	ORGANIC CHEMISTRY - III	SMCH51	4			
	Core	PHYSICAL CHEMISTRY _ III	SMCH52	4			
	Elective	POLYMER CHEMISTRY	SECH5A	4			
	Elective	ANALYTICAL CHEMISTRY	SECH5C	2			
IV	Common	PERSONALITY DEVELOPMENT	SSCSB5A	2			
	Practical	MAJOR PRACTICAL -V	SMCHP5	2			
	Practical	MAJOR PRACTICAL -VI	SMCHP6	2			



Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. Scheme for internal Assessment:

Maximum marks for written test: **20 marks 3 internal tests**, each of **I hour** duration shall be conducted every semester. To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be: Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination

3 hrs. examination at the end of the semester

- A Part : 1 mark question two from each unit
- B-Part: 5 marks question one from each unit
- C Part: 8 marks question one from each unit

> Conversion of Marks into Grade Points and Letter Grades

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	0	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	А	8	Very Good
4	60-69	B+	7	Good
5	50-59	В	6	Above Average
6	40-49	С	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

<u>Cumulative Grade Point Average (CGPA)</u>

$$\mathsf{CGPA} = \frac{\Sigma \left(\mathsf{GP} \times \mathsf{C}\right)}{\Sigma \mathsf{C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

: CGPA ≥ 6.0

> Classification

- a) First Class with Distinction : $CGPA \ge 7.5^*$
- b) First Class
- c) Second Class : CGPA \ge 5.0 and < 6.0
- d) Third Class : CGPA< 5.0



ORGANIC CHEMISTRY-III

Objectives

To learn about stereochemistry To understand aromaticity To study dyes

UNIT - I

OPTICAL ISOMERISM

Representation of molecules in saw horse, Fischer, flying-wedge and Newman formulae and their inter translations. Symmetry elements - chirality – asymmetric molecules and molecular dissymmetry-pseudo asymmetry.

Optical rotation – specific rotation –optical purity – racemisation (through cationic and anionic and radicalintermediates), resolution of acids, bases and alcohols via diastereomeric salt formation.

Optical isomers - enantiomers - diastereomers - epimers - notation of optical isomers - Cahn-Ingold-Prelog rules, R and S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations - D and L representations

Optical activity in compounds without asymmetric carbon atoms namely biphenyls, allenes and spiranes. Stereo selectivity – stereo specificity – partial asymmetric synthesis. point,dipolemoment – chemical method – dehydration and cyclisation.

UNIT -II

GEOMETRICAL & CONFORMATIONAL ISOMERISM

Geometrical isomerism – nomenclature of geometrical isomers – cis – trans ,E-Z notation and syn-anti for C=C,C=N compounds. Methods to assign configurations. Stability of geometrical isomers and heats of hydrogenation.

Conformation: Conformational nomenclature - eclipsed, staggered, gauche and anti; dihedral angle, torsion angle, energy barrier of rotation – potential energy diagram. Relative stability of conformers on the basis of steric effect, dipole-dipole interaction, H-bonding; Conformational analysis of ethane, propane, n-butane, haloethane, 1,2-dihaloethane, 1,2-glycol and 1,2-halohydrin, cyclopentane, cyclohexane and mono substituted cyclohexanes.

UNIT - III

AROMATICITY & AROMATIC SUBSTITUTION

Aromaticity – definition – Huckel's rule – consequence of aromaticity – stability, carbon-carbon bond lengths of benzene, resonance energy and participation of substitution vs addition – examples.Non-benzenoid aromatic compounds

Aromatic electrophilic substitution – general pattern of the mechanism, role of σ and π complexes, Mechanism of nitration, halogenation, sulphonation and Friedel-Crafts reaction. Activating and deactivating substituents, orientation in mono substituted benzenes, ortho/para ratio- Orientation- Korner's absolute method, dipole moment method – direct influence of substituents – rules of orientation - Aromatic



Nucleophilic substitutions- unimolecular, bimolecular and benzyne mechanisms

UNIT – IV

HETEROCYCLIC COMPOUNDS

Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Comparison of basicity of pyridine, piperidine and pyrrole. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution and mechanism of nucleophilic substitution reaction in pyridine derivatives.

Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis, mechanism of electrophilc substitution reactions of indole, quinoline and isoquinoline.

UNIT – V

DYES & POLYNUCLEAR HYDROCARBONS

Dyes - theory of color and constitution - chromophore, auxochrome, classification according to application and structure - preparation and uses of azo dyes - methyl orange, triphenyl methane dyes -malachite green, indigo dyes - Indigotin, anthraquinone dyes - alizarin, phthalein dyes –Phenolphthalein-Synthesis reactions & Structure of Naphthalene & Anthracen

Text Books

- 1. Textbook of Organic Chemistry P.L.Soni Sultan Chand
- 2. Advanced organic Chemistry B.S.Bahl S. Chand

Reference Books

- 1. Principles of Organic Chemistry A.K.Bansal New Age
- 2. A Textbook of Organic Chemistry A.K.Bansal New Age
- 3. Organic Chemistry I.L.Finar Volume I & II Addision Welsey
- 4. Organic Chemistry R.T.Morrison and Boyd Prentice Hall
- 5. Stereochemistry of Organic Compounds D.Nasipuri New Age
- 6. Stereochemistry, Conformation and Mechanisms Kalsi New Age
- 7. Advanced General Organic Chemistry Sachin K.Ghosh Books and Allied (P) Ltd
- 8. Textbook of Organic Chemistry P.S.Kalsi Macmillan
- 9. Organic Chemistry Bhupinder Mehta and Manju Mehta PHI Learning (P) Ltd.



PHYSICAL CHEMISTRY-III

Objectives

To learn about thermodynamics, electrochemistry and surface chemistry To understand group theory and spectrochemistry

UNIT I:

THERMODYNAMICS-III

Van't Hoff isotherm and isochore - Clapeyron equation-Clapeyron-Clausius equation-Applications of Clapeyron-Clausius equation. Third law of thermodynamics: Nernst heat theorem- statement of III law and itsapplications. Exception to third lawexperimental verification of the law-residual entropy-Evaluation of absolute entropy from heat capacity measurements. Partial molar properties: Partial molar free energy. The concept of chemical potential – variation of chemical potential with T and P-Gibbs Duhem equation- concept of fugacity and activity- activity coefficient- standard states.

UNIT – II

ELECTROCHEMISTRY –II

Galvanic cells – Reversible and Irreversible cells – EMF and its measurement – Weston Standard cell – types of reversible single electrodes – standard Hydrogen electrode – calomel electrode –Derivation of Nernst equation both for emf of cells and single electrode potentials – Nernst theory for single electrode potential –standard reduction potentials – electro chemical series –significance.Application of emf measurements – Application of Gibbs –Helmholtz equation to galvanic cells – calculation of thermodyamic quantities – pH using hydrogen, quinhydrone and glass electrodes – potentiometric titrations. Concentration cells – electrode concentration cells- electrolyte concentration cells- concentration cells with and without transference – LJP expression –polarization – over voltage- decomposition voltage.

UNIT - III

SURFACE CHEMISTR

Adsorption - physisorption and chemisorptions - adsorption of gases by solids adsorption isotherms - Freundlich adsorption isotherm - derivation of Langmuir adsorption isotherm, statement and explanation of BET isotherm - applications of adsorption - determination of surface area – adsorption indicators. General characteristics of catalytic reactions – phase transfer catalysis - acid base catalysis enzyme catalysis - mechanism and kinetics of enzyme catalyzed reactions - Michaelis-Menten equation.

UNIT - IV GROUP THEORY

Concept of symmetry in chemistry - symmetry operations and symmetry elements - rotational axis of symmetry and types of rotational axes - planes of symmetry and types of planes - improper rotational axis of symmetry - identity element - groups and their basic properties –Abelian and cyclic groups - classification



of molecules into point groups - the symmetry operations of a molecule form a group – H2Oand NH3point groups - group multiplication tables.

UNIT – V SPECTROSCOPY- I

Introduction - various types of molecular spectra - electronic, vibrational and rotational energy levels - Born-Oppenheimer approximation. Rotation spectra of diatomic molecules - determination of bond length and moment of inertia from rotational spectra - numerical problems - selection rule, effect of isotopic substitution. UV-visible spectroscopy: theory - types of transitions in molecules - selection rules for electronic spectra - factors affecting absorption maximum and intensity – applications. IR spectroscopy : theory - stretching and bending vibrations - factors affecting vibrational frequencies - important spectral regions for the characterization of functional groups - finger print region - determination of force constant - qualitative relation of force constant to bond energies - selection rules - modes of vibrations in polyatomic molecules - vibrational modes of H2O and CO2 – applications - numerical problems.

Text books :

- 1. B.R. Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., Jalandhar.
- 2. P.L. Soni, O.P. Dharmarha & U.N. Dash, Text book of Physical Chemistry, 22ndEdn., Sultan Chand & Sons, New Delhi

Reference books :

- 1. Essentials of Physical Chemistry– B.S.Bahl, Arun Bahl, G.D.Tuli, Reprint 2006, S.Chand & Company Ltd., New Delhi-110055.
- 2. Physical Chemistry volumes I & II- S.Pahari, 2004, New Central Book Agency,Kolkotha.
- 3. Physical Chemistry-G.M.Barrow, 2005, Tata McGraw Hill Publishing Company, New Delhi.
- 4. Physical Chemistry-G.K.Vemulapalli, 2004, Prentice Hall of India. Kemp, W. Organic Spectroscopy Jag Mohan Organic Spectroscopy
- 5. Group theory and its Chemical Applications P.K.Bhattacharya Himalaya publishing House



Major Elective –I POLYMER CHEMISTRY

Objectives:

- To know the concept of polymerization and types of polymers
- To understand the characteristics of polymers
- To acquire knowledge about the polymerization techniques and polymer processing
- To know the chemistry of individual polymers
- To have an idea about the recent advances in polymer sciences

UNIT I – INTRODUCTION TO POLYMERS

Definition - Monomer, polymer and polymerisation - classification of polymers on the basis of

- i. origin Natural, semi synthetic, synthetic,
- ii. Physical properties and applications Rubbers, plastic, fibres
- iii. Thermal response thermoplastics, thermosetting
- iv. Structure Homopolymers (linear, branched, cross link or network), Copolymers (Random, Alternate, Block, Graft)
- v. Crystallinity non-crystalline (amorphous), semi-crystalline
- vi. Mode of formation Addition, Condensation Polymerisation (definition and examples only)
- vii. Methods of polymerization Bulk, Solution, Suspension Polymerisation (definition and examples only) Chemistry of polymerization: Chain polymerization, free radical, ionic, co-ordination, step polymerization, polyaddition and polycondensaion, miscellaneous ring opening and group transfer polymerizations.

UNIT II – CHARACTERISTICS OF POLYMERS

Glass transition temperature (Tg) - definition – Factors affecting Tg – relationships between Tg and molecular weight and melting point. Importance of Tg. Molecular weight of polymers. Number average, weight average (problems), sedimentation and viscosity average molecular weights. Molecular weights and degree of polymerization - chemical reaction - hydrolysis - hydrogenation - addition - substitution – cross-linking, vulcanisation and cyclisation reactions. Polymer degradation - basic idea of thermal, photo and oxidative degradation of polymers.

UNIT III - POLYMERIZATION TECHNIQUES AND PROCESSING

Bulk, solution, suspension, emulsion, melt condensation and interfacial poly condensation polymerizations. polymer processing - calendaring - die-casting, rotational casting - compression moulding - injection moulding - blow moulding extrusion moulding and reinforcing.



UNIT IV - CHEMISTRY OF SOME COMMERCIAL POLYMERS

Preparation, properties and uses of the following polymers. Thermoplastics, polyethylene, polypropylene, polystyrene, polyacrylonitrile, polyvinyl chloride, nylon, polyester. Thermosetting plastics: Phenol formaldehyde resin, urea formaldehyde resin, melamine formaldehyde, epoxy resin, polycarbonate. Elastomers: Natural rubber and synthetic rubber, Styrene and neoprene rubber.

UNIT V - ADVANCES IN POLYMER

Biopolymers - Biomedical polymers - contact lens, dental polymers, artificial heart, kidney, skin and blood cells - High temperature and fire resistant polymers - silicones - conducting polymers - (elementary idea) - polysulphur nitrile, polyphenylene, polypyrrole and polyacetylene. Polymer industry in India.

Text books:

- 1. V.R. Gowarikar, N.V. Viswanathan and J. Sreedhar. Polymer Science, Wiley Eastern, 1995.
- 2. F.N. Billmeyer, Textbook of Polymer Science, Wiley Interscience, 1971.

References books:

- 1. Material Science II edition, P.K. Palanisamy SCITECH Publications India Pvt., Ltd., Chennai-600001.
- 2. Engineering Chemistry, V Srinivasan, S.D. Uma Maheshwari, M. Meena. SCITECH Publications India Pvt., Ltd., Chennai-600001.
- 3. Introduction to Organic Chemistry. John McMurry Brooks/cole Cenage Learning India Private Limited. First Reprint 2008.
- 4. Modern Chemistry, David. W. Oxtoby, H.P. Gills, Alan Campion Brooks/cole Cenage Learning India Private Limited. First Reprint 2008.



Elective -II ANALYTICAL CHEMISTRY

Objective :

To know the importance of analytical chemistry and to study about the different types of analytical techniques

UNIT I

ERRORS AND DATA ANALYSIS

Definition and explanation with examples of the terms – mean, median, mode, range, deviation, mean deviation, relative mean deviation, standard deviation, coefficient of variation and variance – accuracy and precision – types of errors – random and systematic errors – methods of detection and elimination of systematic errors – student's t-test – confidence levels – Q-test for rejection of result – curve fitting – method of least squares – significant figures and computational rules.

UNIT II

WATER ANALYSIS

Sampling and preservation of water samples – physical examination of water : color, odour, turbidity, taste and electrical conductivity – chemical characterisation : pH, acidity, alkalinity, TDS, total, temporary, permanent, calcium and magnesium hardness, chloride, fluoride, BOD, COD, detergents and pesticides – residual chlorine and chlorine demand – Bacteriological examination : total and faecal coliforms.

UNIT III

FUEL ANALYSIS

Solid fuels : coal – classification – proximate analysis : moisture content, ash content, volatile matter and fixed carbon – ultimate analysis : carbon, hydrogen, nitrogen, sulphur and oxygen – heating values – grading of coal – comparison of coal and coke – liquid fuels : flash point, aniline point, octane number and carbon residues – gaseous fuels : producer gas and water gas – calorific values.

UNIT IV - ELECTROANALYTICAL TECHNIQUES

Electrogravimetry : principle, instrumentation and applications. Coulometry : constant current coulometry – coulometric titrations – applications – potentiostatic coulometry – Polarography : principle – experimental assembly – working – advantages and disadvantages of DME – applications to qualitative and quantitative analysis. Amperometric titrations : theory – apparatus – general procedures – applications – advantages.

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UNIT V

SPECTROANALYTICAL AND THERMOANALYTICAL METHODS

Spectroanalytical methods : principle, instrumentation and applications of colorimetry, spectrophotometry and fluorimetry – light scattering techniques: nephelometry and turbidimetry.

Thermo analytical methods : principle, instrumentation and applications of TGA and DTA – characteristic features of TGA and DTA curves – factors affecting TGA and DTA curves – simultaneous DTA - TGA curves – thermometric titrations.

Text books:

- 1) D.A.Skoog, D.M.West and Holler, *Analytical Chemistry : An introduction*, 6th Ed., Saunders College Publising.
- 2) Gary D. Christian, Analytical Chemistry, 6th Ed., John Wiley & Sons.

Reference books:

- 1. S.M.Khopkar, Environmental Pollution Analysis, 1st Ed., Wiley Eastern Ltd.,
- 2. APHA, *Standard Methods for Estimation of Water and Waste water*, 19th Ed., American Public Health Association.
- 3. O.P.Vermani and A.K. Narula, *Applied Chemistry*, 2nd Ed., New Age International Publishers.
- 4. A.K.Shaha, *Combustion Engineering and Fuel Technology*, Oxford & IBH Publising Company.
- 5. D.A.Skoog, Holler and Nieman, *Principles of Instrumental Analysis*, 5th Ed., Saunders College publishing.
- Hobart H.Willard, Lynne L.Merritt, John A.Dean and Frank A. Settle, *Instrumental Methods of Analysis*, 7th Ed., CBS Publishers & Distributors Pvt. Ltd.,



SKILL BASED PERSONALITY DEVELOPMENT

Course objective :

- To develop the skills of the professional undergraduate students for proper self expression, social communication, spoken English, correct pronunciation, voice modulation and business etiquettes.
- The students should improve their personality, communication skills and enhance their self-confidence.
- To develop the presentation skills of the undergraduate students.
- The students should be able to act with confidence, should be clear about their own personality, character and future goals.

UNIT-I:

PERSONALITY

Definition – Determinants - Personality Traits – Theories Of Personality – Importance Of Personality Development - SELF AWARENESS – Meaning – Benefits Of Self – Awareness – Developing Self- Awareness. SWOT – Meaning – Importance – Application – Components. GOAL SETTING: Meaning – Importance – Effective Goal Setting – Principles Of Goal Setting – Goal Setting At The Right Level .

UNIT-II:

SELF MONITORING-

Meaning-High Self – Monitor Vs. Low-Self Monitor-Advantages & Disadvantages of Self- Monitor- Self Monitoring And Job Performance. PERCEPTION – Definition – Factors Influencing Perception – Perception Process – Errors In Perception – Avoiding Perceptual Errors. ATTITUDE- Meaning – Formation Of Attitude – Types Of Attitude – Measurement Of Attitude – Barriers To Attitude Change- Methods To Attitude Change. ASSERTIVENESS - Meaning – Assertiveness In Communication - Assertiveness Techniques – Benefits Of Being Assertive – Improving Assertiveness.

UNIT-III

TEAM BUILDING

Meaning – Types Of Teams – Importance of Team Building - Creating Effective Team. LEADERSHIP – Definition – Leadership Style – Theories Of Leadership – Qualities Of An Effect Leader. NEGOTIATION SKILLS – Meaning – Principles Of Negotiation - Types Of Negotiation – The Negotiation Process – Common Mistakes In Negotiation Process.CONFLICT MANAGEMENT – Definition – Types Of Conflict – Levels Of Conflict – Conflict Resolution – Conflict Management.



UNIT-IV COMMUNICATION

Definition – Importance Of Communication – Process Of Communication – Communication Symbols – Communication Network – Barriers In Communication -Overcoming Communication Barriers. TRANSACTIONAL ANALYSIS –Meaning – EGO states – Types Of Transactions – Johari Window – Life Positions. EMOTIONAL INTELLIGENCE – Meaning – Components Of Emotional Intelligence – Significance Of Managing Emotional Intelligence – How Develop Emotional Quotient. STRESS MANAGEMENT – Meaning – Sources Of Stress – Symptoms Of Stress – Consequences Of Stress – Managing Stress.

UNIT – V:

SOCIAL GRACES

Meaning – Social Grace At Work – Acquiring Social Graces. TABLE MANNERS – Meaning – Table Etiquettes In Multicultural Environment – Do"s And Don"ts Of Table Etiquettes. DRESS CODE – Meaning – Dress code for selected Occasions – Dress Code for an Interview – GROUP DISCUSSION: Meaning -Personality Traits Required For Group Discussion – Process Of Group Discussion – Group Discussion Topics. INTERVIEW – Definition – Types Of Skills – Employer Expectations – Planning For The Interview – Interview Questions – Critical Interview Questions.

REFERENCE BOOKS:

- 1. Personality Development Dr. S. Narayanarajan, Dr. B. Rajasekaran, G. Venkadasalapathi, V. VijueshNayaham and Herald M.Dass
- 2. Organisational Behaviour Stephan P. Robbins
- 3. Organisational Behaviour Jit S. Chandran
- 4. From campus to Corporate Dr.K.K. Ramachandran and Dr. K.K. Karthick

