ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

I SEMESTER **CHEMISTRY** **Time:4Hrs/Week**

CH 1202 (3) **INORGANIC & PHYSICALCHEMISTRY** **Max.Marks:100**

w.e.f.20-21 admitted batch-"20AH"

SYLLABUS

COURSE OBJECTIVES: To enable the students to

- Describe the trends in the physical and chemical properties and
- preparations of P-block elements of groups 13,14,15 & 16 which are used in the manufacture of various products in daily life.
- Discuss the special properties of transition elements and inner transistion elements and Predict the trends in properties
- Describe general characteristics of solids, classification and imperfections, assessing the packing efficiency of different types of cubic unit cells.
- Predict the behavior of real gases and liquid crystals under varied conditions and use them optimally to match the needs
- Explain the formation of different types of solution, examine concentrations, describe the colligative properties and correlate them with molar masses of solutes.
- Explain theories of bonding in metals, describe conductors, semi conductors and insulators which helps in building their career in battery industry.

COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Understand the basic concepts of p-block elements
2. Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
3. Apply the concepts of gas equations, pH and electrolytes while studying other chemistry courses.

INORGANIC CHEMISTRY: 24

UNIT– I:

CHEMISTRY OF P-BLOCK ELEMENTS: 8h

Group 13: Preparation & structure of Diborane, Borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of Phosphonitrilic halides $\{(PNCl_2)_n$ where n=3, 4

Group 16: Oxides and Oxoacids of Sulphur (structures only)

Group 17: Pseudohalogens, Structures of Interhalogen compounds. —- **employability & skill development**

UNIT – II:

1. **CHEMISTRY OF D-BLOCK ELEMENTS: 6h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states.--- **employability**

2. **CHEMISTRY OF F-BLOCK ELEMENTS: 6h**

Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3.THEORIES OF BONDINGINMETALS: 4h

Valence bond theory and Free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.----**employability**

PHYSICALCHEMISTRY 36h

UNIT- III

SOLID STATE: 10h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Powder method. Defects in crystals. Stoichiometric and non-stoichiometric defects.-------**skill development and employability.**

UNIT – IV:

1. GASEOUS STATE 6h

van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.----**employability**

2.LIQUID STATE 4h

Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals as LCD devices.----**employability**

UNIT – V:

SOLUTIONS, IONIC EQUILIBRIUM & DILUTE SOLUTIONS

1. SOLUTIONS 6h

Azeotropes -HCl-H2O system and ethanol-water system. Partially miscible liquids-phenol- water system. Critical solution temperature (CST), Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.-----**skill development & employability.**

2. IONIC EQUILIBRIUM 3h

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.----**skill development**

3. DILUTE SOLUTIONS 7h

Colligative properties- RLVP, Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.---**skill development**

CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. Semester- end Examination: critical indicator of student's learning and teaching methods adopted by teachers through out the semester.

List of Reference Books

1. Principles of physical chemistry 4th edition, 2017 by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R.West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl andTuli
6. Inorganic Chemistry by J.E.Huheey
7. Basic Inorganic Chemistry by Cotton and Wilkinson
8. A textbook of qualitative inorganic analysis by A.I.Vogel
9. Atkins, P.W.&Paula,J.deAtkin'sPhysicalChemistryEd.,OxfordUniversityPress 10thEd(2014).
10. Castellan,G.W.PhysicalChemistry4thEd.Narosa(2004).
11. Mortimer,R. G.PhysicalChemistry3rdEd. Elsevier:NOIDA,UP(2009).
12. Barrow,G.M.PhysicalChemistry

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

I SEMESTER CHEMISTRY Time:2Hrs/Week

CH 1252(2) INORGANIC&PHYSICALCHEMISTRY Max.Marks:50

20-21 admitted batch-"20AH" PRACTICAL SYLLABUS – IA

Qualitative inorganic analysis (Minimum of Six mixtures should be analysed)

50 M

Course Objectives:

- **To train students in 'semi micro level qualitative analysis and develop their skill of identifying the ions in salt mixtures with interfering anions.**

Course outcomes:

At the end of the course, the student will be able to;

- Adopt & apply standardised procedures for the semimicro level analysis of inorganic salt mixtures containing more than one anion and cation.
- Efficiently eliminate interfering anions
- Identify the anions and cations present in the unknown salt mixture based on critical observation and logical inference
- Optimally utilise the consumable and non consumable laboratory resources without wastage.
- Comply with the regulations involved in safe handling and disposal of hazardous chemicals.

Analysis of SALT MIXTURE 50M

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate. **Cations:** Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Potassium and Ammonium.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

II SEMESTER **CHEMISTRY** **Time:4Hrs/Week**

CH 2202 (3) **ORGANIC & GENERAL CHEMISTRY** **Max.Marks:100**

w.e.f.20-21 admitted batch-"20AH" **SYLLABUS**

Course objectives: To enable the students to

- Compare and contrast the structure, type of reaction, mechanism andchemical behaviour of organic compound during the conversion of reactants to products.
- identify the reason for aromaticity of various organic compounds used as raw materials for the synthesis of many products
- recognise geometry of compounds based on their structural arrangements and bonding
- Identify various theories involved in the bonding of inorganic molecules which are used for their higher studies
- Predict the basic mechanism involved in the reaction of organic compounds
- Differentiate the types of colloids and their applications.

Course outcomes:

At end of the course, the student will be able to;

- Understand and explain the differential behaviour of organic compounds based on fundamental concept learnt.
- Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
- Learn and identify many organic reaction mechanism including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.
- Correlate and describe the stereochemical properties of organic compounds and reactions.

ORGANIC CHEMISTRY: **36Hrs**

UNIT- I: RECAPITULATION OF BASICS OF ORGANIC CHEMISTRY

CARBON-CARBON SIGMA BONDS (ALKANES AND CYCLOALKANES)

General methods of preparation of alkanes- Wurtz and WurtzFittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Isomerism and its effect on properties, Free radical substitutions ; Halogenation, Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane). General molecular formulae of cycloalkanes and relative stability, Bayer strain theory.

Carbon-Carbon pi Bonds (Alkenes and Alkynes)

General methods of preparation, physical and chemical properties. Mechanism of E1, E2, E1cb reactions, Saytzeff and Hoffmann eliminations,Electrophilic Additions, mechanism (Marownokoff/Antimakownikoff addition) with suitable examples,,*syn and* the *anti*-addition; addition of H_2, X_2, HX. Diels Alder reaction 1,2- and 1,4- addition reactions in conjugated dienes.Reactions of alkynes;acidity. electrophilic and nucleophilic addition

UNIT-II: BENZENE AND ITS REACTIVITY

Concept of aromaticity,Huckle's rule-application to Benzenoid (Benzene, Naphthalene) and Non-Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropyliumcation)

Reactions – General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedel – Craft's alkylation and acylation. Orientation of aromatic substitution – ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and phenoic). Orientation of (i) Amino, methoxy and methyl groups (ii) Caboxyl, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

(Expained by taking minimum of one example from each type)

UNIT-III: CHEMISTRY OF HALOGENATED HYDROCARBONS

Alkylhalides: Methods of preparation and properties, nucleophilic substitution reactions-SN1,SN2 and SNi mechanisms with stereochemical aspects and effect of solvent etc.;nucleophilic substitution vs elimination, Williamson's synthesis.

Arylhalides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitutions;SNAr,Benzyne mechanism.

Relative reactivity of alkyl,allyl,benzyl,vinyl and aryl halides towards nucleophilic substitution reactions.

GENERAL CHEMISTRY

UNIT-IV: SURFACE CHEMISTRY

Colloids- Coagulation of colloids- Hardy-Schulze rule. Stability of colloids,Protection of colloids, Gold number.

Adsorption-physical and chemical adsorption, Langmuir adsorption isotherm,applications of adsorption.

UNIT-V: CHEMICAL BONDING

1 .Valence bond theory,hybridization, VB theory as applied to ClF_3,$Ni(CO)_4$, Molecukar orbital theory-LCAO method, construction of M.O diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, CO and NO)

2. HSAB: Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

List of Reference Books:

1.**Text book of Organic chemistry**

Morrison,R.N.& Boyd, R. N. Organic Chemistry, Dorling Kindersley (india) Pvt,Ltd.

2. **Text book of Organic chemistry** (Pearson Education).

Finar,I. L. Organic Chemistry (Volume 1), Dorling Kindersley(india)Pvt. Ltd.(Pearson Education)

3. **Text book of Organic chemistry**Finar,I. L. Organic Chemistry(Volume2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (india) Pvt. Ltd. (Pearson Education).

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

II SEMESTER **CHEMISTRY** **Time:3Hrs/Week**

CH 2252 (2) **ORGANIC & GENERAL CHEMISTRY** **Max.Marks:50**

20-21 admitted batch-"20AH" PRACTICAL SYLLABUS – I B

Course objectives: To enable the students to –

- Conduct experiments designed for volumetric analysis
- Interpret experimental/investigative data
- Apply theory-based tools to solve simple chemical problems related to subject areas

Course outcomes:

At the end of the course, the student will be able to;

- Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
- Understandandexplainthevolumetricanalysisbasedonfundamentalconceptslearnt in ionicequilibria
- Learnandidentifythe concepts of a standard solutions, primary and secondary standards
- Facilitate the learner to make solutions of various molar concentrations. This may
- include:
- The concept of the mole; Converting moles to grams; Converting grams to moles;
- Definingconcentration; Dilution of Solutions; Making different molar concentrations.

Volumetric analysis 50 M

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using KMnO4 with oxalic acid as primary standard.
3. Determination of Cu (II) using Na2S2O3 with K2Cr2O7 as primary standard.
4. Estimation of water of crystallization in Mohr's salt by titrating with KmnO4

REFERENCE BOOKS:

1. Vogel's Text Book of Quantitative Inorganic Analysis, IV Edition J.Bassett, R.C.Denny, G.H.Jeffery, J.Mendhan ELBS/Longman, England.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER **CHEMISTRY** **Time:4Hrs/Week**

CH 3201(3) **PHYSICAL CHEMISTRY** **Max.Marks:100**

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES: To enable students to

- Apply physical laws to chemical phenomena and derive rate constants for first, second and third order reactions and train them to solve numericals based on kinetics
- Understand and apply concepts of speeds of reactions including higher order reactions, derive their rate constants and predict the course of the reaction.
- apply concepts and laws of Photochemistry and photo processes in day to day processes.
- apply Van Der Waal's equation, reduced equation of state and critical constants in predicting the behaviour of gases and liquids.
- understand and explain the significance of adsorption isotherms, catalytic efficiency, catalytic specificity, turnover number and Michaelis Constant in optimising the appropriate adsorbents and chemical/enzyme catalysts for chosen processes.

COURSE OUTCOMES: By the end of the course, students will be able to

- Derive Rate constants for I, II and III order reactions and solve numerical problems of first and second order reactions.
- Classify different types of colloids and examine the properties of colloids, emulsions, and gels.
- Discuss the laws of photochemistry and predict various photo processes based on Jablonski diagram.
- Predict the behavior of real gases and liquid crystals under varied conditions and use them optimally to match the needs
- Select suitable chemical & biochemical catalysts based on their efficiency and apply them to targeted in vivo & in vitro processes
- critically examine and apply Gibb's Phase Rule Equation and reduced phase rule equationto one and two component heterogeneous equilibria
- Apply Gibb's phase rule equation to heterogeneous systems at equilibrium and optimise the conditions to generate the desired output

COURSE:

UNIT – I:

1. **GASEOUS STATE:** Ideal and real gases ; Deviation of Real gases from ideal behaviour, deviation from Boyle's law, P-V Isotherms of real gases, compressibility factor Z , causes for deviation ; Vanderwaal's equation of state, volume and pressure corrections, Andrew's isothems of CO_2, continuity of state, critical phenomenon, critical constants, Vanderwaal's equation and critical state, Relationship between critical constants and Vanderwaal's constants, Law of corresponding states (Reduced equation of state), Joule Thomson effect. **employability and skill development**

LIQUID STATE: Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals.**employability and skill development**

2. CHEMICAL KINETICS: Introduction – Types of reactions – Rate of reaction – rate law - order of reaction – molecularity – zero order reactions : explanation, examples and derivation of rate constant – I order reactions : derivation of rate constant, examples and numerical problems – II order reactions : derivation of rate constant, examples and numerical problems – III order reaction : derivation of rate constant and examples – Units of rate constant – pseudo molecular reactions – methods of determination of order of reaction : Integration method, fractional change method, Van't Hoff's differential method, Graphical method & Ostwald's isolation method. Collision theory of bimolecular reactions (qualitative treatment) Effect of temperature on the rate of reaction. Arrhenius equation and calculation of activation energy. **employability and skill development**

UNIT – II:

3. SURFACE CHEMISTRY-COLLOIDAL STATE: Introduction, Classification of colloids, lyophilic and lyophobic colloids; preparation, purification. General properties of colloids : kinetic (Brownian movement) , optical (Tyndall effect) and electrical(Electrophoresis) properties of colloids ; Origin of charge on colloidal particles, preferential adsorption of common ion, Electric double layer (Helmholtz and Stern) theories, Zeta potential, coagulation of colloids, Hardy – Schulze's rule, flocculation value, stability of colloids, protection of colloids, gold number. Emulsions : Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.**employability and skill development**

4. ADSORPTION: Physical adsorption, chemisorption. differences, Freundlisch, Langmuir adsorption isotherms. Applications of adsorption.**employability and skill development**

CATALYSIS: Introduction, general characteristics of catalytic reactions, homogeneous and heterogeneous and autocatalysis reactions, comparison with examples, Examples for acid/ base catalyzed reactions -inversion of cane sugar; conversion of acetone to diacetone alcohol, hydrolysis of esters, mutarotation of glucose; Catalytic activity at surfaces, mechanisms of heterogenous catalysis, Langmuir – Hinshel Wood mechanism. **employability and skill development**

ENZYME CATALYSIS: Characteristics of enzyme catalysis, Kinetics of enzyme catalyzed reactions, Michaelis – Menten law, significance of Michaelis constant (Km), factors affecting enzyme catalysis, effect of temperature, pH, concentration and inhibitor, catalytic efficiency.

UNIT – III:

5. PHASE EQUILIBRIUM: Introduction, phase, component and degrees of freedom, Gibb's phase rule equation, Thermodynamic Derivation of Gibbs phase rule. Construction of phase diagram-Application of phase rule to : i. One component system - water system ii. Two component systems: simple eutectic systems, Lead –Silver system, desilverisation of lead (Pattinson's process), NaCl -water system, freezing mixtures.**employability and skill development**

6. PHOTOCHEMISTRY: General features of absorption - Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam

spectrophotometers. Application of Beer-Lambert law. Interaction of radiation with matter, photoprocesses, differences between photochemical and thermochemical reactions; photophysical processes and photochemical processes. Laws governing photo chemical reactions, Grotthus – Draper's law, Stark – Einstein's law of photochemical equivalence ; Quantum efficiency, high and low quantum yields, photochemical reactions – H_2,Cl_2 and H_2,Br_2 reactions ; Jablonski diagram depicting various processes occurring in the excited state, Luminescence, Fluorescence, Phosphorescence.Employability and skill development.

REFERENCE BOOKS:

1. Text Book of physical chemistry – P.L.Soni and O.P. Dharmarha, 20th Edition, 2016,Sultan Chand and Sons, New Delhi .
2. Elements of Physical Chemistry – B.R. Puri, L.R. Sharma & Madan S. Pathania, 43rd Edition, 2008,Vishal Publishing Co., Jalandhar.
3. Essentials of physical chemistry – B.S.Bahl and G.D. Tuli, 25th Edition, Sultan Chand and Sons, 2016,New Delhi.
4. Physical Chemistry , Part – II ,2001,R.K.Prasad, Bharati Bhawan, Patna.
5. Numerical Chemistry – Dr. P.Bahadur –-2017,G.R.Bathia and Sons , Muzaffarnagar, U.P.
6. Principles of physical chemistry by Prutton and Marron IV Edition,2017
7. Text book of physical chemistry by K L Kapoor
8. Unified Chemistry (Vol.2) (B.Sc. I) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhjana. Sixth Revised Edition, 2010.
9. Unified Chemistry (Vol.2) (B.Sc. II) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhjana. Sixth Revised Edition, 2010.
10. Unified Chemistry (Vol.2) (B.Sc. III) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhjana. Sixth Revised Edition, 2010

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

III SEMESTER **CHEMISTRY** **TIME:3Hrs/Week**

CH 3252 (2) **VOLUMETRIC ANALYSIS** **Max.Marks:50**

19-20 admitted batch-"19AG" **PRACTICAL SYLLABUS – II A**

COURSE OBJECTIVES: To enable the students to –

- Conduct experiments designed for volumetric analysis
- Interpret experimental/investigative data
- Apply theory-based tools to solve simple chemical problems related to subject areas

COURSE OUTCOMES: By the end of the course, students will be able to

- Calibrate accurately measurement equipment like volumetric flask, pipette, burette etc.
- Analyse accurately and estimate precisely the concentrations of solutions of acids, bases and salts
- Conduct volumetric estimations titrimetrically through manual and instrumental methods
- Optimally utilise the consumable and non consumable laboratory resources without wastage.
- Comply with the regulations involved in safe handling and disposal of chemicals.

Course:

1. Determination of Fe (II) using KMnO4 with oxalic acid as primary standard.

2. Determination of Zn using EDTA

3. Determination of $CuSO_4$ using Hypo

4. Determination of concentration of Hydrochloric acid conductometrically using standard NaOH solution.**skill development**

REFERENCES:

1. Vogel's Text Book of Quantitative Inorganic Analysis, IV Edition J.Bassett, G.H.Jeffery, J.Mendhan ELBS/Longman, England
2. Practical Monograph prepared by the Department.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

IV SEMESTER **CHEMISTRY** **Time: 4 Hrs/Week**

CH 4201 (3) **INORGANIC CHEMISTRY** **Max. Marks:100**

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES:

- Knowledge of Transition metals & Inner Transition metals, the former having many differences yet grouped together, contrasting with the latter in which separation of the elements is very difficult. Uniqueness in complex formation and very importantly the catalytic ability, which is still a thrust area for research and development. To draw inspiration to synthesize newer elements and stretch the horizon of science.
- A colourful intriguing field of compounds, whose study posed problems for long time and continue to do so in some areas even today, is the Coordination Chemistry. An evergreen field of growth and flourish is the world of coordination compounds. To get attracted and to find the solutions for the complex issues.
- Knowledge of crystals provides a way of approach for the study of any topic of Chemistry one wants to learn or master.

COURSE OUTCOMES: At the end of the course students will be able to

- To describe general characteristics of solids, classification and imperfections, assessing the packing efficiency of different types of cubic unit cells.
- Outline the general characteristics, properties and construct the comparative account of lanthanoids and actinoids and realise their application in laser beam, pacemakers, nuclear power plant and petroleum industry
- Explain substitution reaction in octahedral and square planar complexes, significance of trans effect and its applications in synthesis of different metal complexes.
- Identify the Significance metal ions in biological processes and correlate with their functional roles including concentration effect and physiological effect on biological systems

COURSE:

UNIT – I:

1. **D –BLOCK ELEMENTS:** Introduction, position of transition elements and significance of their name. Electronic configuration and anomalies of electronic configuration in all the three series. Variable oxidation states – reason for variability - Stability of various oxidation states-magnetic properties – para, dia & ferro magenetism and classification of transition elements. Complex forming ability of d-block elements and advantages of complex formation. Colour and formation of interstitial compounds – catalytic activity of the elements and their compounds - reasons for the ability of them to catalyze and applications. General properties such as atomic and ionic radii, ionization energy and metallic properties. Comparative treatment of second and third transition series with their 3d analogues i.e. trends in physical and chemical properties in passing from I to the II and to the III series**.skill development**

2. F – BLOCK ELEMENTS :

General discussion, electronic configuration and anomalies in electronic configuration. Ionic size Oxidation states, magnetic properties. Lanthanide contraction – effects of Lanthanide Contraction within the series and on the post lanthanide elements. Rare – earth minerals composition of Cerium group and Yttrium groups in them. Methods of separation of lanthanides Fractional Crystallization, Solvent Extraction, Ion – exchange methods. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides. **employability and skill development.**

UNIT – II:

3. COORDINATION COMPOUNDS- I :

Introduction and review of early theories, Werner's theory of complex compounds, Sidgwick's concept of coordination, Electronic interpretation and EAN rule - Nomenclature adopting IUPAC rules. Valence bond theory. Geometries of Coordination numbers 4 – tetrahedral and square planar and 6 – octahedral and limitations of Valence bond theory. , crystal filed theory - splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes - low spin and high spin complexes - Crystal Field Stabilization energy.factors affecting crystal-field Stabilization energy, merits and demerits of crystal-field theory.**skill development**

4. COORDINATION COMPOUNDS - II

Structural isomerism – Polymerization Isomerism, Coordination, Ionisation, Hydrate, Ligand and Linkage Isomerism - Stereo Isomerism – Optical Isomerism of Complexes with Coordination numbers 4 and 6. Geometrical Isomerism of complexes with Coordination numbers 4 and 6. Stability of metal complexes Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method. Spectral and magnetic properties of metal complexesTypes of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility -Gouymethod. **skill development and employability**

UNIT – III:

5. REACTIVITY OF METAL COMPLEXES AND BIOINORGANIC CHEMISTRY

Labile and inert complexes, ligand substitution reactions - SN^1 and SN^2,substitution reactions of square planar complexes - Trans effect and applications of trans effect. Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl^-. Metalloporphyrins – Structure and functions of hemoglobin, Myoglobin and Chlorophyll.**skill development**

6. SOLIDSTATE

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravis lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Defects in crystals. Stoichiometric and non-stoichiometric defects.**skill development**

REFERENCE BOOKS:

1. Advanced Inorganic chemistry by Gurudeep Raj
2. Concise Inorganic Chemistry by J.D.Lee
3. Unified Chemistry (Vol.) (B.Sc. I) – Y.R.Sharma & Dr. K.Rama Rao – Kalyani Publishers, Ludhjana. Fourth Revised and Enlarged Edition (2013 , Reprint)
4. Unified Chemistry (Vol.2) (B.Sc. II) – Y.R.Sharma & Dr. K.Rama Rao – Kalyani Publishers, Ludhjana. Fourth Revised and Enlarged Edition (2013, Reprint)
5. Unified Chemistry (Vol.2) (B.Sc. III) – Y.R.Sharma & Dr. K.Rama Rao – Kalyani Publishers, Ludhjana. Fourth Revised and Enlarged Edition (2013, Reprint)
6. Advanced Inorganic Chemistry – F.A.Cotton & G.Wilkinson – Inter Science Publishers, New York.
7. Modern Aspects of Inorganic Chemistry – IV Edition – H.J.Emeleus & A.G.Sharpe – ELBS, Great Britain.
8. Inorganic Chemistry – 20th Edition – P.L.Soni – Sultan Chand & Sons, New Delhi.
9. Man-made Transuranium Elements – Glenn T.Seaborg – Prentice – Hall, N.J.
10. Coordination Compounds – D.F.Martin & B.B.Martin – McGraw-Hill Book Company, New York.
11. Coordination Chemistry – F.Basolo & R.Johnson-W.A.Benjamin Inc. , California.
12. Test Book of Physical Chemistry – 2nd Edition – S.Glasstone – Macmillan & Co.Ltd., London.

13. Solid State Chemistry and its applications by Anthony R. West

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

IV SEMESTER CHEMISTRY Time: 3 Hrs/Week

CH 4252 (2) TITRIMETRIC AND INSTRUMENTAL ANALYSIS Max.Marks: 50

19-20 admitted batch-"19AG" PRACTICAL SYLLABUS – II B

COURSE OBJECTIVES:

- To enable students to examine and ascertain water quality through qualitative and quantitative estimation of specific water quality parameters

COURSE OUTCOMES:

- Determine unknown concentrations through Colorimetric method by measuring absorbance at known concentrations and calibration graph
- Estimate the amount of total dissolved solids in water samples by measuring conductivity.
- Establish the temporary, permanent and total hardness along with Ca & Mg in the given
- sample via complexometric titration.
- Determine total alkalinity by deploying standard titrimetric procedures
- Compute the bicarbonate and carbonate amounts in any given sample
- Ascertain water quality wrt potability and other concerns

course:

1. Determination of.Iron by thiocyanate using visible spectrophotometer
2. Determination of concentration of Calcium and Magnesium using EDTA .
3. Determination of total chlorides present in water sample
4. Determination of Carbonates and bicarbonates present in the given water sample **skill development**

REFERENCE BOOKS:

1. Vogel's Text Book of Quantitative Inorganic Analysis, IV Edition J.Bassett, R.C.Denny, G.H.Jeffery, J.Mendhan ELBS/Longman, England.
2. Instrumental methods of chemical analysis B.K.Sharma GOEL publishing House, Meerut, 26th
3. Practical Monograph prepared by the Department

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER **CHEMISTRY** **Time:3Hrs/Week**

CH 5201(3) **ORGANIC CHEMISTRY** **Max.Marks:100**

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES: To enable the students to –

- describe the synthesis, properties and synthetic applications of various organic compounds.
- gain conceptual knowledge on fundamentals of molecular spectroscopy to identify the functionality based on UV,IR and NMR spectral data.

COURSE OUTCOMES: By the end of the course, students will be able to

- Adopt and apply general methodology reactions and industrial applications of nitro compounds, amines and benzene diazonium chloride
- Compare the Aromaticity, preparation and Electrophilic substitution reactions of Pyrrole furan, thiophene and Pyridine
- Describe the structure and of Glucose and fructose and interpret the synthetic procedures for inter conversions of five membered monosaccharide to six membered ones and vice versa
- Describes and exposit the functionality of Organic Compounds by molecular spectroscopic studies, UV, IR, NMR along with conceptual knowledge which is incorporated in the industrial manufacturing as the raw materials

COURSE:

UNIT – I:

1. **NITROGEN COMPOUNDS: a.nitro hydro carbons:** Nomenclature and classification of nitro hydrocarbons – structure. Tautomerism of nitro alkanes leading to aci and ketoform. Preparation of nitroalkanes. Reactivity – halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction. B**. Amines** (Aliphatic and Aromatic): Nomenclature, classification into 1^0, 2^0, 3^0 Amines and quarternary ammonium compounds. A. Preparative methods – i. Ammonolysis of alkyl halides ii Hoffman's bromamide reaction (mechanism) iii. Reduction of Amides and Schmidt reaction. B. Physical properties and basic character – comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline – comparative basic strength of aniline – N-methyl aniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. C. Chemical properties: Alkylation, Acylation, Carbylamine reaction, Hinsberg separation, Reaction with Nitrous acid of 1^0,2^0,3^0 (Aliphatic and aromatic amines), Electrophilic substitutions of Aromatic amines – Bromination and Nitration. Oxidation of aryl and 3^0 Amines. Diazotization.-----**Employability and skill development**

2. **DIAZONIUM COMPOUNDS:** a. Preparation of Benzene diazonium chloride from Aniline (mechanism). b. Synthetic Applycations of Benzene diazonium chloride i. chloro benzene ii. bromo benzene iii. fluro benzene iv. benzoic acid v. benzene vi. Phenol—- **employability and skill development**

UNIT – II:

3. **HETEROCYCLIC COMPOUNDS:** Introduction and definition, classification – five membered Heterocyclic compounds-pyrrole, Furan, Thiophene- Aromatic character – Preparation from 1,4,- dicarbonyl compounds, Paul-Knorr synthesis. Pyrrole: Acidic character, electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions, friedel crafts acylation. Diels Alder reaction in furan. Pyridine: - Preparation by Dehydrogenation of piperidine, - Structure, Basicity - Aromaticity – Comparison with benzene and pyrrole - and electrophillic substitution reactions Nitration, Sulphonation, Halogenation. Reactivity towards Nucleophilic substitution reactions.**Employability and skill development**

4. **CARBOHYDRATES:** Introduction, 1. Definition, 2.Classification 3. Monosaccharides: Glucose (aldo hexose) –preparation-Chemical properties – Acetylation, cyanohydrin formation, oxidation, Reduction, NH_2OH, osazone formation. Structure of glucose - Objections to open chain

Structure.Evidence for cyclic structure of glucose (negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) - Pyranose structure (Haworth formula and chair conformational formula). 4. Fructose (ketohexose) - preparation, - Chemical properties – Acetylation, cyanohydrin formation, oxidation, Reduction, NH_2OH, osazone formation. - Structure of fructose Definition of anomers with examples. 5. Interconversion of Monosaccharides: (a) Killiani's synthesis- Aldopentose to Aldohexose (Arabinose to D- Glucose, D-Mannose) Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. (b) Ruff degradation- Aldohexose to Aldopentose (D-Glucose to D- Arabinose). (c) Aldohexose to Ketohexose (Glucose to Fructose) d) Ketohexose to Aldohexose (Fructose to Glucose)**Employability and skill development**

UNIT – III:

5. **MOLECULAR SPECTROSCOPY:** Introduction **Electronic spectroscopy:** Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals (σ, π, n). Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore and auxochrome. **Infra red spectroscopy:** Different Regions in Infrared radiations. Modes of vibrations in diatomic and polyatomic molecules. Characteristic absorption bands of various functional groups. Interpretation of spectra-Alkanes, Aromatic, Alcohols carbonyls, and amines with one example to each. **skill development**

6. **PROTON MAGNETIC RESONANCE SPECTROSCOPY (H-NMR)** – Principles of nuclear magnetic resonance; equivalent and non-equivalent protons; position of signals ; Chemical shift; NMR splitting of signals-spin-spin coupling, coupling constants. Applications of NMR with suitable examples-ethyl bromide, ethanol, acetaldehyde, 1, 1, 2 –tri-bromo ethane, ethyl acetate, toluene and Acetophenone.**Employability and skill development**

REFERENCES:

1. Advanced Organic Chemistry – B.S.Bahl & Arun Bahl – XVIII Edn.- S.Chand & Company, New Delhi – 110055.2006
2. Organic Chemistry – Robert T. Morrison & Robert N. Boyd – V Edn. – Prentice-Hall of India Pvt. Ltd., New Delhi – 110001. 1989
3. Organic Chemistry (Vol.I) – Stereochemistry and the Chemistry of Natural Products – I.L.Finar – VI Edn – (ELBS) English Language Book Society / Longman, Longman Scientific & Technical , Longman Group UK Ltd., England . 2003
4. Organic Chemistry (Vol.II) – Stereochemistry and the Chemistry of Natural Products – I.L.Finar – VI Edn – (ELBS) English Language Book Society / Longman, Longman Scientific & Technical , Longman Group UK Ltd., England . 2003
5. Organic Spectroscopy – William Kemp – II Edn – The Macmillan Education Ltd., Hampshire. 1978
6. Unified Chemistry (Vol. II) - Y.R.Sharma IV Edn. – Kalyani Publishers, Ludhiana – 141008. 2010
7. Unified Chemistry (Vol. III) - Y.R.Sharma -III Edn. – Kalyani Publishers, Ludhiana – 141008. 2015.
8. Spectroscopy by William Kemp III Edn, Red Globe Press, 2018
9. Spectroscopy of Organic Compounds by P.S.Kalsi VI Edn, 2018 reprints New age international (P).,Publishers

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER **CHEMISTRY** **TIME: 3Hrs/Week**

CH 5251 (2) **ORGANIC QUALITATIVE ANALYSIS** **Max.Marks:50**

19-20 admitted batch-"19AG" **PRACTICALSYLLABUS – III A**

OBJECTIVES:

- To enable the students to identify organic compounds through application of systematic qualitative procedure for functional group identification

COURSE OUTCOMES: By the end of the course, students will be able to

- Analyse organic compound by deploying standardised procedures
- Acquire skills needed for the identification of functional groups
- Identify the unknown organic compound through functional group derivatization
- Purify as well as ascertain purity through distillation and MP/BP determination
- Safely handle and dispose volatile, corrosive & inflammable substances

COURSE: Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic Primary Amines, Amides and Simple sugars, alkyl aryl halides. **skill development**

REFERENCES:

1. Practical Organic Chemistry – G Mann & B.C.Saunders ELBS & Long man Group Ltd – IV Edition.
2. Vogels's T.B. of Practical Organic Chemistry B S Furnis A J Hannaford, PWG Smith & AR Tatchell – ELBS V Edition.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER **CHEMISTRY** **Time:** 3Hrs/ Week

CH 5202 (3) **PHYSICAL & INORGANIC CHEMISTRY** Max.Marks:100

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES: To enable the students to

- apply physical laws to chemical phenomena understand principles of electricity, most essential commodity of man, and further it to prosperity. Similarly dry cells are centre of attention and usefulness presently.
- Correlate characteristic chemical behaviour of metals, organometallic compounds as well as the nature of bonding present in them.

COURSE OUTCOMES: At the end of the course students will be able to

- Use the Nernst equation to calculate cell potentials for reactions occurring under nonstandard conditions.
- Describe the functions of the various components of voltaic and electrolytic cells and Design Hittorf's hypothetical tank to examine electrolysis process.
- Classify different types of organometallics and explain the synthesis and properties of Grignard regent and organolithium reagents.
- Explain the formation of different types of solution, examine concentrations, describing the colligative properties correlating them molar masses of solutes.
- Explain theories involved in bonding in metals, describe conductors, semi conductors and insulators which helps in building their career in battery industry.
- Explain EAN rule, classification, structures and shapes of metal carbonyls which help in the basis of medicinal uses.

COURSE:

UNIT – I:

1. SOLUTIONS:

Liquid-liquid - ideal solutions, Raoult's law, ideally dilute solutions, Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure - temperature curves. Azeotropes- HCl-H_2O, ethanol-water systems and fractional distillation. Partially miscible liquids- phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.**employability and skill development**

2. COLLIGATIVE PROPERTIES:

Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of

dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor. **SKILL DEVELOPMENT**

UNIT – II

3. ELECTRO CHEMISTRY – I:

Electrical transport- Conductors – electronic conductors and electrolytic conductors Conduction in metals and in electrolyte solutions, Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorfs method. Application of conductivity measurements- conductometric titrations. method and explanation of strong acid Vs strong base and mixture of acids (strong and weak) Vs strong base titrations.**SKILL DEVELOPMENT**

ELECTRO CHEMISTRY – II:

Electrochemical cell, cell notation, cell reactions, reversible cells, , irreversible cells – differences between electrolytic and electro chemical cells. . Single electrodes**:** Types of single electrodes like metal-metal ion single electrode, calomel electrode, standard hydrogen electrodes. Construction and working of calomel electrode and normal hydrogen electrode. Standard electrode potentials Single electrode potential,-- Determination of EMF of cell, Nernst equation and calculation of electrode potentials at different concentrations. Applications of EMF measurements - Potentiometric titrations.**SKILL DEVELOPMENT AND EMPLOYABILITY**

UNIT – III:

5. A. THEORIES OF BONDING IN METALS: Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

B. METAL CARBONYLS : EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni.

6. ORGANOMETALLIC COMPOUNDS: Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.**SKILL DEVELOPMENT AND EMPLOYABILITY**

REFERENCES:

1. Text Book of physical chemistry – P.L.Soni and O.P. Dharmarha, 20th Edition, Sultan Chand and Sons, New Delhi .
2. Elements of Physical Chemistry – B.R. Puri, L.R. Sharma & Madan S. Pathania, 43rd Edition, 2008,Vishal Publishing Co., Jalandhar.
3. Essentials of physical chemistry – B.S.Bahl and G.D. Tuli, 25th Edition, Sultan Chand and Sons, New Delhi.
4. Physical Chemistry, Part – II – R.K.Prasad, Bharati Bhawan, Publishers and Distributers Patna.
5. Unified Chemistry (Vol.2) (B.Sc. I) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhiana. Sixth Revised Edition, 2010.
6. Unified Chemistry (Vol.2) (B.Sc. II) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhiana. Sixth Revised Edition, 2010.
7. Unified Chemistry (Vol.2) (B.Sc. III) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhiana. Sixth Revised Edition, 2010.
8. Basic Inorganic Chemistry by Cotton and Wilkinson VI Edition 2007,John-Wiley and Sons, A Wiley-Interscience Publication New York
9. Concise Inorganic Chemistry by J.D.Lee,V Edition,2007, John-Wiley and Sons, A Wiley-Interscience Publication New York

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER	**CHEMISTRY**	**TIME: 2 Hrs/Week**
CH 5252 (2)	**GRAVIMETRIC ANALYSIS**	**Max. Marks: 50**
19-20 admitted batch-"19AG"	**PRACTICAL SYLLABUS-III B**	

COURSE OBJECTIVES: To enable the students to –

- Apply gravimetric principles for quantitative estimation of Barium and Nickel
- Use IR spectral data for characterization of organic functional groups

COURSE OUTCOMES: By the end of the course students will be able to

- Use Analyical balance to determine wights accurately upto fourth decimal place.
- Quantitativelt estimate the amounts of Barium and Nickel through gravimetric Techniques.
- Identify and characterise functional groups in IR spectra and utilize the data towards identification of compounds
- Handle and dispose chemicals safely

COURSE:

1. Estimation of Barium
2. Estimation of Nickel
3. Interpretation of IR Spectral Analysis of the following functional groups with examples (Demonstration only) a) Hydroxyl groups, b) Carbonyl groups, c) Amino groups, d) Aromatic groups **SKILL DEVELOPMENT AND EMPLOYABILITY**

REFERENCES :

1. Instrumental methods of chemical analysis B.K.Sharma GOEL Publishing House, Meerut, 26th Edition 2018.
2. Practical Organic Chemistry – G Mann & B.C.Saunders ELBS & Long man Group Ltd – IV Edition 2018.
3. Vogels's T.B. of Practical Organic Chemistry B S Furnis A J Hannaford, PWG Smith & AR Tatchell – ELBS V Edition 2017.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER **CHEMISTRY** **TIME: 3 Hrs/Week**

CH-E1-6201 (3) **SOME SPECIAL ASPECTS OF CHEMISTRY** **Max.Marks:100**

W.e.f. 2015 – 2018 ('15AC' Batch) **SYLLABUS**

OBJECTIVES: To enable the students to

- gain thorough knowledge on advanced topics of Physical Chemistry such as Thermodynamics.
- understand the principles of Stereochemistry, the knowledge of which is essential for understanding organic reaction mechanism.
- Gain an insights on structure and functions of nitrogenous biomolecules

OUTCOMES: By the end of the course, students will be able to

- Deduce and quantify the work done by a system under isothermal, adiabatic, reversible and irreversible conditions.
- Correlate the functioning of cooling devices to the inversion temperature of the coolant gas and to the isoenthalpic nature of the process
- Predict process feasibility, extent and also determine the efficiency of a heat engine
- Depict, notate and explain stereoisomerism aspects of 3 dimensional molecules on two dimensional surfaces and examine stereospecific & stereoselective reactions that produce desired products in larger yield.

COURSE:

UNIT – I: 1. FIRST LAW OF THERMODYNAMICS: The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule-Thomson effect- coefficient. Calculation of w, for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. Conditions for maximum work. Temperature dependence of enthalpy of formation- Kirchoff s equation. **Skill development and employability**

2. SECOND LAW OF THERMODYNAMICS: Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes.

UNIT – II: 3. STEREO ISOMERISM – I:

STEREOCHEMISTRY OF CARBON COMPOUNDS: Molecular representations - Wedge, Fischer, Newman and Saw - Horse formulae. D,L and R,S configuration notations. Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements) - Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3 - dibromobutane. **Skill development**

4. **STEREO ISOMERISM – II:** Geometrical Isomerism of Alkenes – Cis-Trans & E-Z Configurations – Maleic and Fumaric Acids. Asymmetric synthesis - Definition – Asymmetric synthesis, enantiomeric excess, diastereomeric excess, stereospecific reactions definition, example, dehalogenation of 1,2 dibromides, Stereoselective reactions, definition, example, acid catalysed dehydration of I-phenyl propanol. **Skill development**

UNIT – III: 5. NITROGENOUS BIOMOLECULES

AMINO ACIDS AND PROTEINS INTRODUCTION: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis.**Skill development and employability**

6. **PHYSICAL AND CHEMICAL PROPERTIES**: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins. **Skill development**

REFERENCES:

1. 'Stereochemistry and Mechanism through Solved Problems' – P.S.Kalsi, III Edn. Wiley Eastern Limited, New Delhi 1995
2. 'Unified Chemistry' – Y.R. Sharma and R. Rama Rao, Part-II, Andhra Edition – Kalyani Publishers, New Delhi 2003
3. Organic Chemistry – Robert T. Morrison and Robert N. Boyd, VI Edition – Prentice Hall of India Pvt. Ltd., New Delhi 1989
4. Text Book of Physical Chemistry – P.L. Soni and O.P. Dharmarha, XXEdn, Sultan Chand & Sons, New Delhi 1994
5. Essential of Physical Chemistry – B. S. Bahl and G. D. Tuli, 25th Edition, Sultan Chand & Sons, New Delhi 2005

6. Text Book of Organic chemistry by I L Finar Vol I.
7. Elements of Physical Chemistry – B.R. Puri, L.R. Sharma & Madan S. Pathania, 43rd Edition, 2008,Vishal Publishing Co., Jalandhar.
8. Stereochemistry by P.S.Kalsi
9. Stereochemistry of Organic compounds by D. Nasipuri
10. Advanced physical chemistry by Bahl and Tuli

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
VI SEMESTER CHEMISTRY TIME: 2 Hrs/Week
CH-E1-6251 (2) PHYSICAL EXPERIMENTS Max. Marks: 50
w.e.f 2015 – 2018 ('15AC' batch) PRACTICAL SYLLABUS – IV

OBJECTIVES : To equip students with the ability to establish specific temperature dependent physical constants of liquid substances.

OUTCOMES: By the end of the course, students will be able to

- Deploy standardised procedures and optimally utilise equipment for the detection of certain temperature dependent p hysical constants.
- Determine density, surface tension, viscosity and distribution coefficient of unknown substances.
- Deduce the order of a reaction by computing rate constants at definite time intervals in the hit and trial method via hydrolysis of methyl acetate
- Conduct project studies on real time samples and establish their physical constants
- Handle and dispose chemicals safely

COURSE:

1. Determination of rate constant for acid catalyzed ester hydrolysis.
2. Determination of partition coefficient of Iodine between organic liquid and water.
3. Determination of surface tension of liquid.
4. Determination of Viscosity of liquid.**employability and skill development**
5. Demonstration of Adsorption of acetic acid on animal charcoal, verification of Freundlisch isotherm.

REFERENCES:

1. Senior practical physical Chemistry – B.D.Khosla, V.C.Garg Adarsh Khosla, R.Chand &Co.Delhi V edition.
2. Expts. In Physical Chemistry – JC Ghosh – Bharati Bhawan (Publishers& Distributers), Patna, II Edition.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER CHEMISTRY TIME: 2 Hrs/Week

CH-E1-6251 (2) PHYSICAL EXPERIMENTS Max. Marks: 50

w.e.f 2015 – 2018 ('15AC' batch) PRACTICAL SYLLABUS – IV

OBJECTIVES : To equip students with the ability to establish specific temperature dependent physical constants of liquid substances.

OUTCOMES: By the end of the course, students will be able to

- Deploy standardised procedures and optimally utilise equipment for the detection of certain temperature dependent physical constants.
- Determine density, surface tension, viscosity and distribution coefficient of unknown substances.
- Deduce the order of a reaction by computing rate constants at definite time intervals in the hit and trial method via hydrolysis of methyl acetate
- Conduct project studies on real time samples and establish their physical constants
- Handle and dispose chemicals safely

COURSE:

1. Determination of rate constant for acid catalyzed ester hydrolysis.
2. Determination of partition coefficient of Iodine between organic liquid and water.
3. Determination of surface tension of liquid.
4. Determination of Viscosity of liquid.
5. Demonstration of Adsorption of acetic acid on animal charcoal, verification of Freundlisch isotherm.

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1. Senior practical physical Chemistry – B.D.Khosla, V.C.Garg Adarsh Khosla, R.Chand &Co.Delhi V edition.
2. Expts. In Physical Chemistry – JC Ghosh – Bharati Bhawan (Publishers& Distributers), Patna, II Edition.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER CHEMISTRY TIME: 3Hrs/week

CH-E2- 6201 (3) ANALYTICAL METHODS IN CHEMISTRY Max. Marks: 60

W.e.f. 2019 – 2020 '19AG' SYLLABUS

OBJECTIVES: To enable the students to –

- Study analytical principles and understand the various steps and mechanisms involved in the conduct of reactions, titrations and –other laboratory processes.
- adopt and apply separation techniques in chemical analysis.
- Acquire knowledge on the applicability of Chromatography.

OUTCOMES: By the end of the course, students will be able to

- Distinguish between various separation techniques and identify the most appropriate among the available options for a given separation.
- Classify and examine various chromatographic techniques and prioritize the most suitable one for identification/separation/estimation etc. tasks.
- Correlate, explain and illustrate with examples the principles involved in acid-base, redox, complexometric, iodometric and precipitation titrations used in quantitative estimations.
- Identify the most suitable indicator for any given titration based on the theory of indicators.
- Examine and establish gravimetry as the most accurate accurate estimation technique and deploy it appropriately.

COURSE:

UNIT-I

1. QUANTITATIVE ANALYSIS:

a) Importance in various fields of science, steps involved in chemical analysis**.** Principles of volumetric analysis :. Theories of acid-base, redox, complexometric, iodometric and precipitation titrations - choice of indicators for these titrations.

b) Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and washing of precipitate, drying and ignition.

2. TREATMENT OF ANALYTICAL DATA:

Types of errors, significant figures and its importance, accuracy - methods of expressing accuracy, error analysis and minimization of errors, precision - methods of expressing precision, standard deviation and confidence limit.

UNIT-II

3. SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS:

SOLVENT EXTRACTION: Introduction,principle,techniques,factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism., Application - Determination of Iron (III)

ION EXCHANGE :Introduction,action of ion exchange resins,separation of inorganic mixtuers,applications,Solvent extraction: Principle and process,

4. CHROMATOGRAPHY: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, R_f values, factors effecting R_f values.

Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.

UNIT -III

5.THIN LAYER CHROMATOGRAPHY (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

6.COLUMN CHROMATOGRAPHY: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications. HPLC : Basic principles and applications.

LIST OF REFERENCE BOOKS

1. Analytical Chemistry by Skoog and Miller

2. A textbook of qualitative inorganic analysis by A.I. Vogel

3. Nanochemistry by Geoffrey Ozin and Andre Arsenault

4. Stereochemistry by D. Nasipuri

5. Organic Chemistry by Clayden

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER CHEMISTRY TIME: 3Hrs/week

CH-E2-6251(1) INSTRUMENTAL ANALYSIS & CHROMATOGRAPHY TECHNIQUES

w. e .f 2019-2020'19AG' PRACTICAL IV SYLLABUS Max. Marks: 50

Objectives: The purpose of the course is to

- Impart the knowledge and skill required for conducting quantitative estimations by using electric & electronic instruments.
- Train the students in IR spectral data analysis & interpretation

OUTCOMES: By the end of the course, students will be able to

- Determine equivalence point and estimate concentration in acid-base & red-ox titrations using pH Meters & Potentiometers
- Estimate concentrations of unknown solutions through Colorimetric method by measuring absorbance at known concentrations and calibration graph
- Deploy thin layer and column chromatography techniques for separation & estimation

COURSE:

1. Acid-base titrations using pH meter.
2. Red-ox titration of iron (II) with dichromate using Potentiometer
3. Determination of iron using Colorimeter
4. Checking the purity of compounds by TLC.
5. Determination of Rf values and identification of organic compounds by TLC.

REFERENCES :

1. Instrumental methods of chemical analysis B.K.Sharma GOEL Publishing House, Meerut, 26th Edition.
2. Instrumental methods of Analysis – H.H.Willard, L.L. Merritt, J.A.Dean&F.A.Settle – CBS Publishers & Distributors, Delhi – VI Editions.
3. Senior Practical Physical Chemistry – B.D.Khosla, V.C.Garg& Adarsh Khosla, R.Chand& Co., Delhi, V Edition.
4. Instrumental methods of Chemical Analysis – GR Chatwal SK Anand, Himalaya Publishing House V Edition.
5. C N Banwell: Fundamentals of Molecular Spectroscopy

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER **CHEMISTRY** Time:3Hrs/Week

CH-A1-6201 (3) **PHARMACEUTICAL AND MEDICINAL CHEMISTRY** Max.Marks**:**100

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES: To enable the students to

- understand the terminology in pharmaceutical chemistry
- gain insights on the salient features of drug synthesis, morphology and physiological activity with respect to some important drugs.
- realise importance of Pharmacodynamic and HIV-AIDS drugs

COURSE OUTCOMES: By the end of the course students will be able to

- Recognise the importance of medicinal chemistry in daily life, identify the use of chemical compounds in drug designing and explain drug target interactions of enzymes and receptors .
- Classify and name drugs on scientific lines and apply principles of drug administration.
- Sketch the step wise mechanism for the synthesis of sulphanilamide, Penicillin G, Erythromycin, Chloroquine, Paracetamol, Salbutamol, diazepam and frusemide
- Identify the causes and effects for HIV, identify the most suitable confirmatory test- ELISA and discuss the structures of Nelfinavir and Indivanir.
- Use the analytical and synthetic skills for successful careers in production section of pharmaceutical industries.

COURSE:

UNIT – I : 1. Pharmaceutical chemistry: Terminology, Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME,Receptors - brief treatment) Metabolites and Anti metabolites.

2. Drugs: Nomenclature, Chemical name, Generic name and trade names with examples Classification: Classification based on structures and therapeutic activity with one example each, Administration of drugs. **skill development**

UNIT– II: 3. Chemotherapeutic Drugs: Synthesis and therapeutic activity of the compounds Sulphadrugs (Sulphanilamide only) 2.Antibiotics - β-Lactam Antibiotics (penicillin G.only) Macrolide Antibiotics, 3. Anti malarial Drugs (chloroquine only) **skill development and employability**

4. CNS Drugs: Definition-classification-Examples- Psycho therapeutic Drugs:

1. Antipyretics: Synthesis and therapeutic action of Paracetamol and structures of Hypnotics, Tranquilizers (Diazepam only) Levodopa **skill development and employability**

UNIT–III: 5. Pharmacodynamic Drugs: 1. Antiasthma Drugs (Solbutamol only) 3. Antianginals (Glycerol Trinitrate only) 4. Diuretics (Frusemide only)

6. HIV – AIDS: Immunity – CD - 4cells, CD-8cells, Retro virus, Replication in human body, Investigation available, prevention of AIDS, Drugs available - examples with structures: PIS: Indivanir (crixivan), Nelfinavir(Viracept).

List of Reference Books:

1. Text book of Medicinal Chemistry by V.Alagarsamy –III Edition Volume-I, 2017,Elsevier
2. Synthetic Drugs by O.D.Tyagi & M.Yadav Anamol Publications Pvt.ltd,2011 ISSN-10:8170413532
3. Medicinal Chemistry by Ashutoshkar- Newage International Publishers -2018
4. Medicinal Chemistry by P.Parimoo CBCS Publishes& Distributors,2006,ISSN-8123910355
5. Pharmacology& Pharmacotherapeutics R.S Satoshkar & S.D.Bhandenkar
6. Medicinal Chemistry –Opiod Analgesics e-book

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER CHEMISTRY TIME: 3 Hrs/Week

CH-A1-6252 (2) Organic compound synthesis Max.Marks: 50

19-20 admitted batch-"19AG" PRACTICAL SYLLABUS

COURSE OBJECTIVES: To enable the students to acquire skill in–

- synthesis of Organic compounds including single step synthesis
- techniques of recrystallization and purification of solid & liquid compounds
- Realize the industrial importance of bulk drug moiety as aspirin

COURSE OUTCOMES: By the end of the course students will be able

- Synthesize varied organic compounds with varied functional groups
- Deploy different purification techniques efficiently
- Optimally utilize safe, less hazardous, nontoxic chemicals and disposal
- eco cautiously

Course:

1.Preparation of Acetanilide

2.Preparation of Aspirin

3. Preparation of Paracetamol

4. Preparation of Iodoform

5. Preparation of Barbutiric acid

6.Preparation of Phenylazo-β-naphthol

7. Preparation of s-benzyl isothiouronium chloride **skill development and employability**

REFERENCES :

1. Practical Organic Chemistry – G Mann & B.C.Saunders ELBS & Long man Group Ltd – IV Edition 2016.

2. Vogels's T.B. of Practical Organic Chemistry B S Furnis A J Hannaford, PWG Smith & AR Tatchell – ELBS V Edition 2017.

3. Practical Monograph prepared by the Department.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER **CHEMISTRY** **Time:3Hrs/Week**

CH-A2-6201 (3) **GREEN CHEMISTRY** **Max.Marks:100**

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES: To enable the students to –

- emphasize the basic green chemistry principles & green reactions
- gain knowledge and to help in facing biggest challenges of 21st century by studying Green strategies and contribute to enhancing the environmental quality..
- acquire critical insight into green methods involving adoption of green catalysts and green solvents
- Alternative synthetic methods involving Microwave and Ultrasound conditions for some popular named reactions

COURSE OUTCOMES:

- Apply the twelve basic principles of Green Chemistry and compare the Conventional techniques with Green methods
- Differentiate between the conditional Microwave, Sonication and conventional aqueous phase reaction protocols and identify the most appropriate one
- Adopt and apply the solvent free, solid supported microwave reactions
- Identify the importance of recyclable feed stocks' usage in polymer, textiles, Food and beverage industries
- Establish the utility of recyclable feedstock, solvent and catalyst to promote use of biodegradable commodities in wide range of industries.

COURSE:

UNIT–I: **1. GREEN CHEMISTRY:** Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Green synthesis- Evalution of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).

2. SELECTION OF SOLVENT: i) Aqueous phase reactions ii) Reactions in ionic liquids, Heckreaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis. **Super critical CO_2**: Preparation, properties and applications, (decaffeination, dry cleaning) **skill development**

UNIT–II : 3. MICROWAVE AND ULTRASOUND ASSISTED GREEN SYNTHESIS: Apparatus required, examples of MAOS (synthesis of fused anthro quinones, Leukart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldol condensation-Cannizzaro reaction-Diels-Alder reactions-Strecker's synthesis **skill development and employability**

2. GREEN CATALYSIS: Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis-biocatalysis: Enzymes, microbes Phase transfer catalysis (micellar/surfactant) Crown Ethers **skill development and employability**

UNIT–III: 5. EXAMPLES OF GREEN SYNTHESIS / REACTIONS AND SOME REAL WORLD CASES: 1. Green synthesis of the following compounds: adipic acid , catechol , disodium imino di acetate (alternative Strecker's synthesis) 2. Microwave assisted reaction in water – Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols.**skill development and employability**

6. MICROWAVE ASSISTED REACTIONS IN ORGANIC SOLVENTS. Diels-Alder reactions and decarboxylation reaction. 3. Ultrasound assisted reactions – sonochemical Simmons –Smith reaction(ultrasonic alternative to iodine)

REFERENCE BOOKS:

1. Green Chemistry Theory and Practice. P.T.Anatas and J.C. Warner,1998,Oxford University Press, New York.
2. New trends inGreen Chemistry V.K. Ahluwalia ,Narosa Publishing House private limited , New Delhi,2018.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly, Vol II, American Chemical Society/ Hathi Trust Digital library, 2018
4. Green Chemistry: Introductory Text Mike Lancaster, Edition II Royal Society of Chemistry (London) 2010
5. Green Chemistry: Environmental friendly alternatives I Edition,R S Sanghli and M.M Srivastava, Narosa Publishing house Pvt. New Delhi,

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER **CHEMISTRY** **TIME:3Hrs/week**
CH-A2-6251(2) **REACTIONS WITH GREEN PROCEDURES** **Max Marks:50**
w. e .f 2015-2018 ('15AC' Batch) PRACTICAL SYLLABUS – IV A2

COURSE OBJECTIVE: To enable the students to

- apply the principles of green chemistry for the analysis and synthesis of organic compounds with emphasis on yield.

COURSE OUTCOMES: By the end of the course, students will be able to

- Adopt and optimally apply the conditional Microwave and conventional aqueous
- phase reaction protocols and
- acquire skills in standard operating procedures while using Microwave radiation with suitable solid
- support , Solvent free conditions, catalyst, to promote less time consuming reactions which promotes high yields .
- Optimally utilize safe, less hazardous, nontoxic chemicals and dispose them eco cautiously.

COURSE:

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Acetylation of 1^0 amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Electrophilic aromatic substitution reaction: Nitration of phenol
5. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
6. Green oxidation reaction: Synthesis of adipic acid
7. Green procedure for Diels Alder reaction between furan and maleic anhydride **skill development and employability**

REFERENCES :

1. Green Chemistry Theory and Practice. P Anatas and J C Warner. Oxford Science Publications, 1998.
2. Monograph on Green Chemistry Laboratory Experiments. Green Chemistry Task Force Committee, DST,

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER **CHEMISTRY** **Time:3Hrs/Week**

CH-A3-6201 (3) **POLYMER CHEMISTRY** **Max.Marks:100**

19-20 admitted batch-"19AG" **SYLLABUS**

COURSE OBJECTIVES: To enable the students with –

- various principles of polymers - classification, preparation techniques, mechanism, kinetics, and properties.
- Prepare them to identify and classify different types of polymers and correlate with their use in daily life.
- To provide them practical experience of polymerisation process through polymer industry visit

COURSE OUTCOMES: By the end of the course students will be able to

- Describe various principles of polymerisation - classification, preparation techniques, mechanism, kinetics, and properties.
- Determine the molecular weights of polymers using osmometry, viscometry and light scattering methods.
- Apply kinetics to free radical polymerization and establish optimal conditions.
- Explain the concept of Glass transition temperature and assess the factors effecting Tg
- Identify the functions and uses of various types of polymer additives.
- Compare and contrast synthetic and biodegradable polymers.

COURSE:

UNIT–I: 1. INTRODUCTION OF POLYMERS: Basic definitions, degree of polymerization ,classification of polymers- Natural, Synthetic polymers and Semisynthetic polymers, Organic and Inorganic polymers, Thermoplastic and Thermosetting polymers, Plastics, Elastomers , Fibers and Resins, Linear ,Branched and Cross Linked polymers.

2. MECHANISM OF POLYMERIZATION: Addition polymers and Condensation Polymers, Free radical, ionic and Zeigler – Natta polymerization. **skill development and employability**

UNIT–II: 3. KINETICS OF FREE RADICAL POLYMERIZATION: Glass Transition temperature (Tg) and Determination of Tg: factors affecting glass transition temperature (Tg).

4. TECHNIQUES OF POLYMERIZATION: Bulk polymerization, solution polymerization, suspension and Emulsion polymerization. Molecular weights of polymers: Number average and weight average molecular weights Determination of molecular weight of polymers by Viscometry, Osmometry and light scattering methods.**skill development and employability**

UNIT–III: 5. POLYMER ADDITIVES: Introduction to plastic additives – fillers, Plasticizers and Softeners, Lubricants and Flow Promoters, Anti aging additives, Flame Retardants , Colourants , Blowing agents , Cross linking agents, Photo stabilizers , Nucleating agents.

6. POLYMERS AND THEIR APPLICATIONS: Preparation and industrial applications of Polyethylene, Polyvinyl chloride, Teflon, Polyacrylonitrile, Terelene, Nylon6.6 silicones. Biodegradable Polymers - Examples-importance of biodegradable Polymers. **employability and skill development**

REFERENCE BOOKS:

1. Seymour, R.B. & Carraher, C.E. Polymer Chemistry: An Introduction, Marcel Dekker, Inc. New York, 1981.
2. Odian, G. Principles of Polymerization, 4th Ed. Wiley, 2004.
3. Billmeyer, F.W. Textbook of Polymer Science, 2nd Ed. Wiley Interscience, 1971.
4. Ghosh, P. Polymer Science & Technology, Tata McGraw-Hill Education, 1991.34
5. Lenz, R.W. Organic Chemistry of Synthetic High Polymers. Interscience Publishers, NewYork, 1967.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER **CHEMISTRY** **TIME: 3Hrs/week**

CH-A3-6252 (2) **Max. Marks: 50**

19-20 admitted batch-"19AG" **PRACTICAL SYLLABUS-IV A3**

COURSE OBJECTIVES:

- To provide the skills of quantitative estimations by deploying instrumental techniques

To enable the students to –

- Conduct experiments designed for volumetric analysis
- Interpret experimental/investigative data
- Apply theory-based tools to solve simple chemical problems related to subject areas
- Understand the use of conductometers and apply them to estimate the strength of acids

COURSE OUTCOMES:

- Make use of standardise procedures for Instrumental analysis.
- Acquire skills of preparing standard solutions, Handling Conductometer.
- Estimate the concentrations of the given substance Conductometrically.

COURSE:

1. Determination of concentration of HCl conductometrically using standard NaOH solution.
2. Determination of concentration of acetic acid conductometrically using standard NaOH Solution.
3. Determination of concentration of HCl and Acetic acid from a mixture using standard NaOH

skill development

REFRENCES :

1. L. H. Sperling, Introduction to Physical Polymer Science, 4th ed. John Wiley & Sons (2005)
2. Joel R. Fried, Polymer Science and Technology, 2nd ed. Prentice-Hall (2003) •

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER CHEMISTRY Time:3 Hrs/ Week

CH-B1-6201 (3) FUEL CHEMISTRY AND BATTERIESMax.Marks: 60

w.e.f 2019-2020 ('19AG' Batch) SYLLABUS

OBJECTIVES: To enable the students to

- distinguish between the renewable & non-renewable energy sources and optimize appropriately
- comprehend the principles involved in the working of batteries

OUTCOMES: By the end of the course, students will be able to

- Realize the importance of renewable energy
- compare the utility of sustainable and fossil energy resources identify the appropriate one
- Classify different types of lubricants and determine their properties.
- Differentiate between petroleum, non petroleum and biodegradable fuels and their methods of purification
- Distinguish between different types of batteries and identify their uses

COURSE:

UNIT –I

1. Review of energy sources (renewable and non-renewable) – classification of fuels and their calorific value. Coal: Uses of Coal (fuel and non fuel) in various industries , its composition , carbonization of coal - coal gas , producer gas and water gas – composition and uses

2. Fractionation of coal tar – uses of coal tar based chemicals , requisites of a good metallurgical coke , coal gasification (Hydro gasification and catalytic gasification) coal liquefaction and solvent refining.

UNIT-II

3. Petroleum and petrol chemical industry:Composition of crude petroleum , refining and different types of petroleum products and their applications.

4. Fractional distillation (principle and process) , cracking (Thermal and catalytic cracking). Reforming petroleum and non petroleum fuels (LPG , CNG , LNG , biogas) ,fuels derived from biomass , fuel from waste , synthetic fuels (gaseous and liquids) , clear fuels , petro chemicals : vinyl acetate , propylene oxide , isoprene , butadiene , toluene and its derivative xylene.

UNIT-III

5. Lubricants:Classification of lubricants , lubricating oils(conducting and non conducting) , solid and semi solid lubricants , synthetic lubricants. Properties of lubricants (viscosity index , cloud point , pore point) and their determination.

6. Batteries:

Primary and secondary batteries, battery components and their role, Characteristics of

Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery.

Fuel cells, Solar cell and polymer cell.

Reference books:

1. E.Stochi : Industrial chemistry , Vol-1,Ellis Horwood Ltd.UK 2012,2nd February.

2. P.C.Jain , M.Jain: Engineering chemistry, Dhanpat Rai publishing company Ltd.&sons , Delhi, 15th edition, 2005.

3. B.K.Sharma: Industrial Chemistry , Goel Publishing house,ISBN: 8187224002,9788187224006,2011, Meerut.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER CHEMISTRY TIME: 3 Hrs/Week

CH-B1-6251 (2) Organic compound Synthesis Max.Marks: 50

w.e.f.(19AG Batch) PRACTICAL SYLLABUS – IV B1

OBJECTIVE: To train students in

- varied techniques of organic synthesis and equip them with the skill of synthesizing organic compounds with focus on purity, yield and energy efficiency.

COURSE OUTCOMES: By the end of the course, students will be able to

- Apply standardized procedures effectively and synthesise efficiently desired organic compounds
- Achieve effective singlestep synthesis of organic compounds wherever possible
- Purify solid and liquid compounds via recrystalization, distillation & washing techniques
- Optimally utilise the consumable and non consumable laboratory resources without wastage.
- Comply with the regulations involved in safe handling and disposal of chemicals.

COURSE:

1.Preparation of Acetanilide

2.Preparation of Aspirin

3. Preparation of Paracetamol

4. Preparation of Iodoform

5. Preparation ofBarbutiric acid

6.Preparation ofPhenylazo-β-naphthol

7. Preparation of s-benzyl isothiouronium chloride

REFERENCES :

1. Practical Organic Chemistry – G Mann & B.C.Saunders ELBS & Long man Group Ltd – IV Edition.

2. Vogels's T.B. of Practical Organic Chemistry B S Furnis A J Hannaford, PWG Smith & AR Tatchell – ELBS V Edition.

3. Practical Monograph prepared by the Department.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER CHEMISTRY Time:3Hrs/Week

CH-B2-6201(3) INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE.Marks: 60

w.e.f 2019-2020 ('19AG' Batch) SYLLABUS

OBJECTIVES: To enable students to –

- gain insights on properties of s and p-block elements and the applicability of their compounds based on structure.
- recognise the importance of some industrially important materials with special properties and understand their manufacturing methods.
- realise the applicability of various types of surface coatings and alloys

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OUTCOMES: Students will be able to

- establish the basic characteristics of S and P block elements used in industry
- Relate the use of allotropes of C, Si, and P to their properties
- Identify and establish the use of chemical and biochemical fertilizers for sustainable and gainful agricultural production
- Understand and correlate the properties of alloys of aluminium, copper, iron etc which are useful in daily life activities
- Identify the applicability of explosive chemicals for manufacturing bombs, which in turn are used for rock blasts in quarries and for military purposes.

COURSE:

UNIT - I

1. RECAPITULATION OF S- AND P-BLOCK ELEMENTS

Periodicity in s- and p-block elements with respect to electronic configuration, atomic andionic size, ionization enthalpy, electronegativity (Pauling, Mulliken, and Alfred –Rochowscales). Allotropy in C, S, and P. Oxidation states with reference to elements in unusual and rare oxidation states like carbides and nitrides), inert pair effect, diagonal relationship and anomalous behaviour of first member of each group.

2. SILICATE INDUSTRIES

GLASS: Glassy state and its properties, classification (silicate and non-silicate glasses).Manufacture and processing of glass. Composition and properties of the following types ofglasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass,fluorosilicate, coloured glass, photosensitive glass.

CERAMICS: Important clays and feldspar, ceramic, their types and manufacture. Hightechnology ceramics and their applications, superconducting and semiconducting oxides,fullerenes carbon nanotubes and carbon fibre.

UNIT – II

3. CEMENTS: Classification of cement, ingredients and their role, Manufacture of cement and thesetting process, quick setting cements.

FERTILIZERS: Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammoniumnitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate,compound and mixed fertilizers, potassium chloride, potassium sulphate.

4. SURFACE COATINGS: Objectives of coatings surfaces, preliminary treatment of surface, classification of surfacecoatings. Paints and pigments-formulation, composition and related properties. Oil paint,Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels,emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plasticpaint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolyticand electroless), metal spraying and anodizing.

UNIT – III

5. ALLOYS: Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements inalloys. Manufacture of Steel (removal of silicon decarbonization, demanganization,desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment,nitriding, carburizing). Composition and properties of different types of steels.

6. CHEMICAL EXPLOSIVES: Origin of explosive properties in organic compounds, preparation and explosive properties oflead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.

REFERENCE BOOKS:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK,.2009
2. R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.20018
3. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi,2017.
4. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi,2018.
5. P. C. Jain & M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi,2017.
6. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi,2010.
7. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut 2012

ST.JOSEPH'SCOLLEGEFORWOMEN(AUTONOMOUS)VISAKHAPTNAM

VI SEMESTER CHEMISTRY TIME: 3Hrs/week

CH-B2-6251(2)REACTIONS WITH GREEN PROCEDURES Max. Marks: 50

w. e .f 2019-2020 ('19AG' Batch) PRACTICAL SYLLABUS – IV B2

OBJECTIVE: To enable the students to

- apply the principles of green chemistry for energy efficient synthesis of organic compounds with minimal times and high yields

COURSE OUTCOMES: By the end of the course, students will be able to

- Differentiate the conditional Microwave and conventional aqueous phase reaction protocols.
- Adapt skills in standard operating procedures while using Microwave with suitable solid support , Solvent free,catalyst, to promote less time consuming reactionswhich promotes high yields .
- Optimally utilize safe, less hazardous, nontoxic chemicals and disposal eco cautiously.

COURSE:

1.Green procedure for organic qualitative analysis: Detection of N, S and halogens

2.Acetylation of 1^0 amine by green method: Preparation of acetanilide

3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement

4. Electrophilic aromatic substitution reaction: Nitration of phenol

5. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol

6. Green oxidation reaction: Synthesis of adipic acid

7. Green procedure for Diels Alder reaction between furan and maleic anhydride.

REFERENCES :

1. Green Chemistry Theory and Practice. PAnatas and J C Warner. Oxford Science Publications, 1998.
2. Monograph on Green Chemistry Laboratory Experiments. Green Chemistry Task Force Committee, DST,

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

VI SEMESTER CHEMISTRY Time:3 Hrs/ Week

CH-B3-6201 (3) ANALYSIS OF APPLIED INDUSTRIAL PRODUCTSMax.Marks: 60

w.e.f 2019-2020 ('19AG' Batch) SYLLABUS

OBJECTIVES: To enable the students to understand and examine the

- procedures involved in the analysis of soaps, paints, oils, fertilizers glass, cement etc.
- significance of different quality assurance methods that are used for varied industrial process
- good manufacturing practices

OUTCOMES: By the end of the course, students will be able to

- Identify the importance of chemical industry for human survival.
- Classify and identify the utility of various fertilizers.
- Identify and optimize on the most suitable methods for analysis of oils and paints.
- Compare and contrast the properties of different starches in food.
- Understand processes involved in the manufacture of cement, fertilizers, Glass, Soap and Detergents by modern methods.

Course

UNIT- I

1. Analysis of soaps: moisture and volatile matter,cobined alkali,total fatty matter, free alkali, total fatty acid, sodium silicate and chlorides.Analysis of paints :Vehicle and pigments ,Barium Sulphate ,total lead, lead chromate,iron pigments, zinc chromate

2. Analysis of oils:saponification value,iodine value,acid value,ester value, bromine value, acetyl value.Analysis of industrial solvents like benzene,acetone,methanol and acetic acid., Determination of methoxyl and N-methyl groups.

UNIT-II

3. **ANALYSIS OF FERTILIZERS:** urea,NPK fertilizer,super phosphate,Analysis of DDT,BHC,endrin,endosulfone,malathion,parathion. Analysis of starch,sugars,cellulose and paper.

4. **GAS ANALYSIS:** carbon dioxide, carbon monoxide, oxygen, hydrogen, saturated hydro carbon, unsaturated hydrocarbons, nitrogen, octane number, cetane number. Analysis of Fuel gases like: water gas,producer gas,kerosene (oil) gas.Ultimate analysis :carbon, hydrogen,nitrogen,oxygen,phosphorus and sulfur.

UNIT - III

5. ANALYSIS OF CEMENT- loss on ignition, insoluble residu, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydrid.

6. ANALYSIS OF GLASSES- Determinaiton of silica, sulphuur, barium, arsinic, antimony, total R_2O_3, calcium, magnesium, total alkalies,aluminium,chloride,floride

SUGGESTED BOOKS:

1.F.J.Welcher-Standard methods of analysis,editior 2, vol-III 6th edition van nostrand - 1966.

2.A.I.Vogel-A text book of quantitative Inorganic analysis-ELBS,

3.H.H.Willard and H.Diehal- Advanced quantitative analysis- Van Nostrand Co,publication date 1943/00/00 publisher: D.Van Nostrand company Inc (2005)

4.F.D.Snell & F.M.Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,

5.J.J.Elving and I.M.Kolthoff- Chemical analysis - A series of monographs onanalytical chemistry and its applications -- Inter Science- Vol I to VII.,

6.G.Z.Weig - Analytical methods for pesticides,plant growth regulators andfood additives - Vols I to VII,Herausgeg.V.H.Zweig band I Academic press Mew York London 1963.

7.Aanalytical Agricultrual Chemistry by S.L.Chopra & J.S.Kanwar--Kalyani Publishers ISBN 13 9789327246162(2014)

8.Mannual of soil, plant, water and fertilizer analysis, R.M.Upadhyay and N.L Sharma,Kalyani Publishers. Publication(2004) ISBN 10: 8127202185.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
VI SEMESTER CHEMISTRY TIME: 3Hrs/week
CH-B3-6251 (2) WATER ANALYSIS Max. Marks: 50
w. e .f 2015 – 2018 ('15AC' batch) PRACTICAL SYLLABUS-IV B3

OBJECTIVE: To enable students

- to examine and ascertain water quality through qualitative and quantitative estimation of specific water quality parameters

OUTCOMES: By the end of the course, students will be able to

- Standardise pH and conductivity meters and use them for the determination of pH and conductance of water samples.
- Estimate the amount of total dissolved solids in water samples by measuring conductivity.
- Establish the temporary, permanent and total hardness along with Ca & Mg in the given sample via complexometric titration.
- Determine total alkalinity by deploying standard titrimetric procedures
- Compute the bicarbonate and carbonate amounts in any given sample
- Ascertain water quality wrt potability and other concerns

COURSE:

1. Determination of carbonate and bicarbonate in water samples (acidity and alkalinity)
2. Determination of hardness of water using EDTA
   a) Permanent hardness
   b) Temporary hardness
3. Determination of Acidity
4. Determination of Alkalinity
5. Determination of chlorides in water samples

REFRENCES :

1. Vogel's T.B. of Quantitative Inorganic Analysis – J. Besseth R.C.Denney, GH Jeffery & J.Mendham. ELBS – IV Edition.
2. Standard Methods for the Examination of Water and Waste Water, 19th Edition, APHA, AWWA, WEF 1995.

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