MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Chemistry
(Choice Based Credit System)
(with effect from the academic year 2021-2022 onwards)

Semester-VI				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	**Core**	INORGANIC CHEMISTRY-III	CMCH61	4
III	**Core**	ORGANIC CHEMISTRY-III	CMCH62	4
III	**Core**	PHYSICAL CHEMISTRY-III	CMCH63	4
III	**Elective**	TEXTILE CHEMISTRY / NANO CHEMISTRY	CECH61/ CECH62	4
III	**Practical**	MAJOR PRACTICAL -VII	CMCHP7	2
III	**Project**	MAJOR PROJECT	CMCH6P	7

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	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

- **Cumulative Grade Point Average (CGPA)**

$$\mathbf{CGPA} = \frac{\mathbf{\Sigma\,(GP \times C)}}{\mathbf{\Sigma C}}$$

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

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

INORGANIC CHEMISTRY III

Course Objectives

The main objectives of this course are due to

- Study on nomenclature and theories of coordination compounds.
- Gain knowledge on stability and mechanisms of substitution reactions of complexes.
- Know various organometallic compounds and its uses.
- Study the application of spectra to metal complexes.
- Understand the metal ions and its compounds to biological system.

UNIT I NOMENCLATURE AND THEORIES OF COORDINATION COMPOUNDS

IUPAC Nomenclature-Bonding theories- Valence bond theory- geometry of coordination number 4 and 6 and its limitation, Crystal field theory-Splitting of d-orbitals in octahedral, tetrahedral and square planar complexes-low spin and high spin complexes-Factors affecting crystal field splitting energy-merits and demerits of CFT –Applications of CFT- - Colour and spectra of complexes- Magnetic properties of metal complexes. Isomerism in Coordination compounds-Structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

UNIT II STABILITY AND REACTION MECHANISM OF COMPLEXES

Stability of metal complexes-Stability constants- Labile and inert complexes-Thermo and kinetic stability - Factors affecting the stability of complexes -Substitution reactions and Mechanism of Octahedral complexes: aquation, base hydrolysis and anation reactions - Substitution in square planar complexes -Trans effect –Theories of Trans effect - Redox reaction: Inner and outer Sphere electron transfer reactions. Preparation and uses of Prussian blue, Turnball‟s blue, Sodium nitroprusside and Nickel DMG complex.

UNIT III ORGANOMETALLIC COMPOUNDS

Definition-Classification based on the nature of metal-carbon bond and the basics of hapticity- Nomenclature of organometallic compounds. The 18e- rule and stability - Ferrocene: Preparation and properties – Metal - alkene complexes : Zeise‟s Salt – Catalytic properties of organometallic compound : Wilkinson‟s Catalyst in hydrogenation of alkene – Insertion reaction: Hydroformylation - Zeigler Natta catalyst in the polymerization of alkene

Metal carbonyls: Definition- Classification - EAN rule- Preparation and properties of Mononuclear carbonyls-Structure of Mo(CO)6 , Fe(CO)5, Ni(CO)4 –Polynuclear carbonyls, bridged carbonyls and bonding in Carbonyls- Mn2(CO)10, Co2(CO)8,Fe2(CO)9 Fe3(CO)12.

UNIT IVAPPLICATION OF SPECTROSCOPY TO TRASITION METAL COMPLEXES

Eletronic spectroscopy: Term symbols- Selection rules –Orbital Selection rule-Spin Selection rule- Metal centered transitions – Charge transfer transitions – MLCT and LMCT - Jahn Teller Distrortion- Effect of Jahn-Teller Distortion on electronic spectra of [Cr(H2O)6]2+ and [Fe(H2O)6]2+

Electron spin resonance spectroscopy: Basic principle - g-value - Hyperfine splitting– Kramer‟s degeneracy & Zero-field splitting .

Mossbauer spectroscopy: Principles - Isomer shift - Quadrupole splitting- Selection rule – MB spectrum of FeSO4,. 7H2O, FeCl3, [K4Fe(CN)6], [K4Fe(CN)6].

UNIT V BIO INORGANIC CHEMISTRY

Metal ions present in biological system- Essential and trace elements in biological system- Structure and functions of Haemoglobin, Myoglobin and Vitamin B12. Electron carriers: Iron sulphur proteins, Chlorophyll and photosynthesis. Role of alkali and alkaline earth metals in biological system: Na/K pump, Importance of Ca & Mg. Biological functions and toxicity of metals-Fe, Cu, Zn, Cr, Mn, Ni, Co ,Cd , Hg and Pb. Applications of Therapeutic chelating drugs: Cis-Platin, carboplatin, platinum anticancer drugs.

Text Books

1. J.D. Lee Concise Inorganic Chemistry 5th Edition Blackwell Science Ltd, 2008.
2. J.E. Huheey, and A. Ellen Keiter, L. Richard Keiter, Inorganic Chemistry, 4th edition, Pearson Education Pvt Ltd. Harper Collens College publishers, Singapore, 2004.
3. W.U. Malik, G.D.Tuli, R.D.Madan, Selected Topics in Inorganic Chemistry 7th Edition, S.Chand and Company Ltd, NewDelhi, Reprint 2006.
4. Physical Methods for Chemists, Russel S.Drago, 2nd Edition ,Saunders College Publishing,1992.

Reference Books

1. F.A. Albert cotton, Advanced Inorganic Chemistry, Geofferey Wilkinson, Carlos, Murillo, Manfred Bochman, John- Wiley & Sons, New York, 1998.
2. Fred Basalo and Ralph G.Pearson , Mechanism of Inorganic Reactions: A study of metal complexes in solution, 2nd Edition, John Wiley and Sons, Inc.
3. I. Bertini, H.B. Gray, S.J. Lippard, Joan Selverstone Valentine, Bioinorganic chemistry I edition, Viva Books, Pvt. Ltd, 1998.

ORGANIC CHEMISTRY III

Course Objectives

The primary objectives of this course are to

- Study about the aromatic alcohols, aldehydes, Ketones and Acids.
- Gain Knowledge on rearrangements.
- Know the aromatic hydrocarbons and dyes.
- Acquire knowledge on natural Products.
- Study on UV, IR &NMR spectra of organic compounds.

UNIT I PHENOLS, AROMATIC ALDEHYDE, KETONE AND ACIDS

Phenols

Acidic character of phenols- effect of substituents on acidity of phenols - Mechanisms of Kolbe‟s reaction and Riemer-Tiemen reaction. Preparation of cresols, catechol, resorcinol, quinol and euginol.

Aldehydes and Ketones

Preparation and uses of cinnamaldehyde. Coumarin, vanillin, Michler‟s ketone, p-benzoquinone-Quinone mono oxime tautomerism. Mechanism of Cannizaro reaction, benzoin condensation, Perkin reaction, Claisen reaction, Knovenagel reaction,Gattermann aldehyde synthesis and Houben –Hoesch synthesis.

Aromatic acids

Ortho effect on acidity - preparation of mandelic acid, cinnamic acid and anthranilic acid. Preparation and uses of benzene-1,2- dicarboxylic acid, benzene-1,3-dicarboxylic acid and 1,4- dicarboxylic acid.

UNIT II REARRANGEMENT

Rearrangement to electron-deficient carbon – 1,2 shift (Wagner-Meerwein rearrangement, pinacol- pinacolone rearrangement,

Aromatic rearrangements from oxygen to ring carbon (Fries rearrangement, Claisen rearrangement and benzidine rearrangement).

Rearrangement to electron-deficient nitrogen (Beckmann rearrangement, Schmidt rearrangement, Hofmann rearrangement, Curtius rearrangement).

Rearrangement to electron-deficient oxygen (Baeyer-Villiger oxidation, rearrangement,Dakin reaction).

UNIT III P OLYNUCLEAR HYDROCARBONS AND DYES

Synthesis, reactions & Structure of Naphthalene & Anthracene

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.

UNIT IV ALKALOIDS AND TERPENOIDS

Alkaloids: Introduction, classification and general methods for the determination of structure.

Structural elucidation and synthesis of conine,piperine and nicotine

Terpenes and terpenoids - classification - isoprene rule.

Elucidation of structure and synthesis of citral , limonene, menthol, α-terpineol and camphor.

UNIT V ORGANIC SPECTROSCOPY

UV spectroscopy - chromophore – auxochrome – blue shift, red shift –hypochromic shift, hyperchromic shift – applications for studying functional groups,cis-trans isomerism and nature of double bonds- Woodward-Fischer rules as applied to conjugated dienes and α ,β unsaturated ketones.

IR spectroscopy–characteristics of IR absorption frequencies – intermolecular and intramolecular hydrogen bonding – functional group detection.

NMR Spectroscopy - interpretation of NMR spectra of simple organic compounds such as acetone, anisole, benzaldehyde, isobutene, mesitylene, 1-chloropropane, ethyl methyl ketone, benzyl alcohol, and propionic acid.

Text Books

1. K.S. Tewari, N.K. Vishnoi, S.N. Mehrotra. A Text Book of Organic Chemistry, Vikas publishing house (P) Ltd.2002.
2. Arun Bahl and B. S. Bahl Advanced Organic chemistry, S. Chand and Company Ltd., Reprint2005.
3. P.L. Soni, Text Book of Organic chemistry, Sultans chand, New Delhi, 1991.
4. M.K.Jain and S.C.Sharma , Modern Organic chemistry, Vishal Publishing Company, 2008.
5. N.Tewari, Advance Organic Reaction mechanism ,Books and allied (P) Ltd,India 2nd revised edition,Kolkata 2005.
6. Organic Reaction Mechanisms, V. K. Ahluwalia and Rakesh Kumar Parashar, Narosa Publishing House, NewDelhi 2011.
7. Gurdeep Chatwal, Chemistry of Organic Natural Products, Vol 1 and 2, Goel Pub. House,2002.
8. Y.R. Sharma, O.P.Vig, Elementary organic absorption spectroscopy – 1st edition, Goel Pulishers, Meerut 1997.

Reference Books

1. I.L. Finar Organic Chemistry Volume II, Stereochemistry and the Chemistry of

Natural Products, 5th Edition, Reprint,1986.
2. Jerry March, Advanced Organic Chemistry, Reactions Mechanisms and Structure, 4th Edition,2013.
3. P.S. Kalsi, Spectroscopy of Organic compounds, IV Edition, New Age International (P) Ltd., New Delhi, 1999.
4. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th Edition, PHI Limited, New Delhi, 1992.
5. C.N.Banwell, Fundamentals of Molecular Spectroscopy, McGraw Hill, Fourth Edition, 2003.
6. Robert. M. Silverstein, G.Clayton Bassler, Terrence .C. Morrill, . Spectroscopic Identification of Organic Compounds John Wiley and Sons, Inc., Newyork,1974.
7. Jag Mohan, Organic Spectroscopy- Principles and Applications, 2nd Edition, Alpha Science International Limited, Harrow, U.K.,2000.

PHYSICAL CHEMISTRY III

Course Objectives

The main objectives of this course are due to

- Study on EMF and its applications.
- Understand the Chemical equilibrium and Interface chemistry.
- Gain Knowledge on rate of the reaction.
- Understand the basics of Group theory
- Acquire knowledge in NMR, ESR and NQR Spectroscopy

UNIT I ELETROMOTIVEFORCE OF CHEMICAL CELLS

Galvanic cells - Reversible and Irreversible cells - EMF of cells and its measurement - Types of reversible single electrodes - Standard Hydrogen electrode - Calomel electrode - Nernst equation - Standard reduction potentials - Electro chemical series - Significance. - Concentration cells-Electrode concentration cells-Electrolyte concentration cells-Concentration cells with and without transference, liquid junction potential -Application of EMF measurements : Determination of (i) free energy, entropy, enthalpy of a cell reaction, (ii) equilibrium constants and (iii) pH using hydrogen and glass electrodes - Potentiometric titrations – Amperometric titrations- Fuel cells - Hydrogen-oxygen fuel cell.

UNIT II CHEMICAL EQUILIBRIUM AND INTERFACE CHEMISTRY

Chemical equilibrium

Standard free energy change - Law of Mass Action – Various equilibrium constants-

Relationship between Kp, Kc and Kx – Van‟t Hoff reaction Isotherm and Isochore - Le Chatelier‟s Principle - Applications – Linear free energy Relationships: Hammett equation – Substituent constant(□) – Reaction constant(□) – Applications.

Interface chemistry

Adsorption- Types of adsorption- adsorption of gases by solids- adsorption isotherms- Freundlich adsorption isotherm- Langmuir isotherm- BET adsorption isotherm equation- applications of adsorption- determination of surface area- adsorption indicators.

UNIT III CHEMICAL KINETICS

Rate of reaction-Expressing reaction rates-Factors influencing rates of reactions - order and molecularity of reactions - Setting up and solving simple differential equation for first order, second order, third order and zero order reactions. Characteristics of I, II, III and zero order reactions. Determination of order of reactions - Effect of temperature on rate constant - Arrhenius equation - determination of Arrhenius frequency factor and energy of activation. Theory of Reaction rates - Lindemann theory of unimolecular reactions - The collision theory of reaction rates and its limitation - The theory of Absolute Reactions Rates - Kinetics of fast reactions - Rate constants of fast reactions.

UNIT IV GROUP THEORY

Concept of symmetry in chemistry - symmetry operations and symmetry elements - rotational axis of symmetry and types of rotational axes - improper rotational axis of symmetry - planes of symmetry and types of planes - identity element - groups and their basic properties –Abelian and cyclic groups - classification of molecules into point groups - Symmetry operations of a molecule to form a group – matrix representations of symmetry operations-derivation of point groups of H2O, NH3 andBF3 molecules - group multiplication tables.

UNIT V SPECTROSCOPY II

Nuclear Magnetic Resonance (NMR) spectroscopy: Theory of NMR- spin-relaxation process - chemical shift -δ and τ scale-internal standards-factors influencing chemical shift - spin-spin coupling- coupling constants - applications of NMR . 13C NMR : Principle of 13C NMR and its applications

Electron Spin Resonance (ESR) spectroscopy: Principle – g value – Hyperfine splitting- ESR spectrum for Hydrogen, Deuterium, methyl, 1,4-semibenzoquinone and benzene anion radicals.

Nuclear Quadrupole Resonance (NQR) spectroscopy: Principle- Electric field gradient- Quadrupole splitting- Applications of NQR spectroscopy.

Text books

1. B.R. Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., Jalandhar, 2004
2. P.L. Soni, O.P. Dharmarha & U.N. Dash, Text book of Physical Chemistry, 23rd Edition., Sultan Chand & Sons, New Delhi,2007.
3. Essentials of Physical Chemistry, B.S.Bahl, Arun Bahl, G.D.Tuli, ,S.Chand & Company Ltd., New Delhi- Reprint, 2006.
4. Physical Chemistry volumes I & II- S.Pahari, New Central Book Agency, Kolkotha, 2004.

Reference Books

1. Physical Chemistry-G.M.Barrow, Tata McGraw Hill Publishing Company,NewDelhi-2005.
2. Physical Chemistry-G.K.Vemulapalli, Prentice Hall of India, 2004.
3. Group theory and its Chemical Applications - P.K.Bhattacharya - Himalaya publishing House
4. Principles and applications of Organic Spectroscopy, W.Kemp 3rd Edition 1993.
5. Principles and applications of Organic Spectroscopy, Jag Mohan 2nd edition, Alphascience and International Limited Harrow UK 2000
6. Fundamentals of Molecular Spectroscopy, C.N. Banwell, E.M. McCash, Tata McGraw-Hill Publishing Compoany Limited. NewDelhi, 2003.
7. Organic Spectroscopy, Principles and Chemical Applications, Y.R, Sharma, S, Chand & Company Limitted, New Delhi, 2013.

TEXTILE CHEMISTRY

Course Objectives:

The primary objective of the courses are to

- Learn types of fibres and removal of impurities in fibres
- Know briefly about natural and manmade fibres
- Study on Dyeing and printing fibres

UNIT I TEXTILE FIBERS

Introduction to textiles and essential requirements of textile fibres – Classification of textile fibres – Natural and Man-made fibres – Characteristics of textile fibres.

Advantanges and Disadvantages of natural and man- made fibres.
Impurities in fibres – General principle of removal of impurities in fibres – singeing – Scouring – Bleaching – Desizing – Kierboiling – Chemicking – Deguming.
Flow charts showing the process involved in textile industry.

UNIT II NATURAL FIBRES

Natural fibres – Types of natural fibres – Natural Cellulosic fibres : Cotton and Jute – Natural protein fibres : Wool and Silk.
Cellulosic fibres : Cotton fibres – Geographical distribution, Structure, Physical and Chemical properties, Grading of cotton fibres -Uses of cotton.
Protein fibres: Silk fibre –Study of life cycle of silkwarm – Extraction of silk fibre – Properties of silk fibre –Special features of silk fibre - Uses of silk– Wool- origin , different types of wool properties wool – Process involved in the removal of impurities from raw wool- Uses of wool.
Bast and leaf fibres – Types of bast fibres : Sisal and Ramie – Geographical distribution – Extraction – Properties of major bast fibres – Uses- Introduction to Coir , Hemp and Banana fibres.

UNIT III MAN-MADE FIBRES

Man-made fibres : General principle of manufacturing of Man-made fibres – Types of Man-made fibres – comparison of Man-made fibres with narural fibres.
Regenerated fibres – Cellulosic fibres (Rayon and Acetate fibres) – Protein fibres (Azlons) – Production – Properties and Uses
Synthetic fibres – Poly amide fibres (nylons) – Polyester fibres –Polynosic fibres, Polyacrylic fibres – PolyUrethane – Polypropylene- polyolefins -Important Physical and Chemical properties and applications.

UNIT IV DYES AND DYEING OF FIBRES

Introduction of dyes – Classification, Properties and Uses of dyes – Dyeing of textile materials (Cotton, Wool and Silk) by direct, acid, basic, vat, disperse and reactive dyes – Fastness of properties of Dyed materials.
Finishes given to fabrics – Methods used to process of mercerizing anticrease and Anti shrink finishes water proofing.

UNIT V TEXTILE PRIINTING

Textile printing – Difference between dyeing and printing – Different steps involved in printing : Preparation of materials , Preparation of printing paste, Different thickners, Drying of printing – Washing and drying of printed material – Printing procedure of fibres
Printing with direct and azoic colours.

Text Books

1. Chemical Technology of Fibrous Materials, F.Sadov, M.Kovchagin and A. Mateshy Mir Publishers,Moscow,1978.
2. Dyeing and Chemical technology of textile fibres – 5th edition, E.R.Trotman Charless – Griffin and Co Ltd,1975
3. A Textbook of Fibre and Science and Technology, S.P.Mishra, New Age International (P) Ltd-2000.
4. James Ronald, Printing and Dying of Fabrics and Plastics, Maharajan Book Distributors, 1996.

Reference Books

1. Chemistry of Dyes and Principles of Dyeing, 2nd Edition V.A.Shenai, Sevak Publications, Mumbai,1983.
2. Berns, R.Bill Meyer and Saltzmans, Principles of Colour Technology, 3rd edition, New York, NY; JohnWiley and Sons, Inc;2000.
3. V.A. Shenai, Introduction to the Chemistry of Dye Stuffs, Sevak, Mumbai 1991.
4. Textile Chemistry – Vol I and II, R.H. Peters Elsvier, Amsterdam, London,1963.
5. Introductory to Textile Science – 3rd edition, Maryory L.Joshep,3rd Edition, Holt, Rinehart and Winson,3 Publishers, 1977.

NANOCHEMISTRY

Course Objectives

The primary objectives of this course are to

- Know the fundamentals of nano chemistry.
- Study the methods of preparation of nanomaterial.
- Acquire the knowledge on characterization of nanoparticles.
- Know the important applications of nanomaterials in various fields.
- Gain the Knowledge on the nano materials and its uses.

UNIT I FUNDAMENTALS OF NANOCHEMISTRY

Introduction: Background to Nanoscience – Scientific Revolution – Feynman‟s Vision. Definition : Nanochemistry, Nanosized effects, Quantum effects – Surface to Volume ratio - Size dependence properties of Nanoparticles- Optical, Electrical, Magnetic and Chemical properties.

Nanomaterials : Definition and Classification of Nanomaterials -1D Nanomaterials : Quantum well -2D Nanomaterials : Nanowires, Nanotubes, Thinflim -3D Nanomaterials : Nanopaprticles, Quantum dots, Nanoclustors, Nanocrystals.

Nanocomposites: Definition and classification of Nanocomposites – Structure and specific properties of Nanocomposites.

UNIT IISYNTHESIS OF NANOMATERIALS AND NANOCOMPOSITES

Types of approaches : Topdown (physical) approach and Bottom-up (chemical) approach.

Physical methods: Laser ablation, Arc discharge and Sputtering methods.

Chemical methods: Chemical reduction, Colloidal and Chemical precipitation methods, Solgel, Sonochemical and Chemical vapour deposition methods

Biosynthesis :Synthesis of Nanoparticles by bacteria and fungi.

Greensynthesis : Synthesis of Nanoparticles using plant extracts.

UNIT III CRYSTALINITY, SURFACE AND OPTICAL CHARACTERIZATION TECHNIQUES

Determination of Particle size, Crystallinity and Surface area: Electron Microscope, Dinamic Light Scaterring (DLS), X-ray Diffraction techniques

Morphology:

Surface Topography : Scanning Electron Microscope (SEM) Transmission Electron Microscope (TEM)

Surface compositions: Atomic Force Microscope(AFM), X-ray Photoelectron spectroscopy (XPES).

Elemental Analysis : Energy dispersive X-ray spectra(EDXS)

Band gap Analysis : UV- visible spectroscopy

Unit IV APPLICATIONS OF NANOMATERIALS AND NANOCOMPOSITES

Nanomaterials: Energy Resources : Batteries, Fuel cells, Solar cells.

Medicinal uses : Nanomedicine, Drug delivery, Cancer drugs.

Catalytic uses: Water purification, Energy storage, Biodiesel production, Automobile industries.

Sensor Applications: Environmental (toxic gases, toxic metal ions).

Nanocomposites: Lubricants, Anti-corrosion barrier, Coatings, Aerospace, Food package, Gas barrier, Chemical resistant.

UNIT V PREPARATIONS, PROPERTIES, AND APPLICATIONS OF SPECIAL NANOSCALE MATERIALS

Nanoforms of carbon : Buck minster fullurene – Graphene – Carbon nanotubes : Single wall carbon nanotube (SWNT) , Multiwall carbon nanotubes (MWNT), Carbon nanofibers.

Nanometal oxides & Chalcogenides : ZnO , TiO2 , ZrO2 (Semiconductor oxides) ZnS,CdSe.

Nanocomposites: Clay nanocomposites - Polymer clay nanocomposoites, Kaolins clay nanocomposite, Montmoroillonite clay nanocomposite.

Text Books

1. Geoffy A. Ozin and Andre C. Arsenault " Nanochemistry : A Chemical approach to nano materials ", RSC Publishing U.K 2005.
2. Hari singh Nalwa, " Nano Materials and Nanotechnology" Academic press, New York ,2002.
3. C.N.R. Rao, A. Muller and A.K .Cheetham, " The Chemistry of Nanomaterials, Volume I and II", Wiley- VCH Verlag GmbH & Co, KGaA, Weinheim ,2004
4. Catalysis : Principles and Applications, Editied by B. Visvanathan, S.Sivasankar, A.V. Ramaswamy, Narosa publishing House, 2011.

Reference Books

1. Carbon nanotubes and Nanostructures techniques and applications, James E. Morries, Krzyshof, Iniewski, CRC Press, 2013.
2. Nanocomposite : Science and Technology P.M. Ajayan, L.S.Schadler,P.V Braun ,Wiley – VCH Verlag 2003.
3. Fundamentals of Nanotechnology, Hornyak G,, Louis Tibbals, H-F. Dutta,Toy deep, Press, 2000

MAJOR PRACTICAL PAPER VII
PHYSICAL CHEMISTRY EXPERIMENTS

Course Objectives

- To enable the students to understand the principles of physical chemistry experiments.

I Thermometric Experiments

1. Determination of molar mass of the given substance by Rast macro method
2. Determination of molecular weight of the given substance by Transition temperature method.
3. Study of phase equilibrium – Simple eutectic
4. Determination of CST of phenol-water system. Study of the effect of impurity on CST and determination of the strength of unknown.
5. Determination of solubility of a substance at different temperatures and calculation of heat of solution.

II Conductometric Titration

1. Study of adsorption of oxalic acid on charcoal and verification of Freundlich isotherm.

2. Estimation of HCl by conductometric method using standard oxalic acid (to be prepared) and link NaOH.
3. Determination of equivalent conductance of weak electrolyte and calculation of dissociation constant.

III Potentiometric Titration

1. Estimation of MgSO4 by conductometric method using standard MgSO4 (to be prepared) and link BaCl2
2. Estimation of Fe(II) by potentiometric method using standard ferrous ammonium sulphate (to be prepared) and link KMnO4
3. Estimation of KMnO4 by potentiometric method using standard K2Cr2O7 (to be prepared) and link ferrous ammonium sulphate.

IV Kinetics

1. Comparison of the strengths of acids by studying the kinetics of ester hydrolysis.

Internal – 50 marks

25 marks - Regularity

25 marks – Average of best six experiments in regular class work

External -50 marks

10 marks – Record (atleast six experiments)*

10 marks – Procedure (5+5)

30 marks – Experiment

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Text Books

1. J.N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987.
2. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt.,1996.
3. David P. Shoemaker, Carl W. Garland, Joseph W. Nibler, Experiments in Physical Chemistry, 5th Edition, McGraw- Hill Book company, 1989.

Reference books

1. Vogel‟s Text Book of Quantitative Chemical Analysis. 5th Edition., ELBS/Longman England,1989.
2. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand & Company Ltd, Reprint, 2009.
3. V.K.Ahluwalia, Sunitha Dhingra, Adarsh Gulate College Practical Chemistry, Universities Press (India) Pvt Ltd ,Reprint 2008.
4. P.R.Singh, D.C.Gupta, K.S.Bajpal, Experimental Organic Chemistry Vol.I and II, 1980.