MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Chemistry
(Choice Based Credit System)
(with effect from the academic year 2023-2024 onwards)

Semester-VI				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	CORE	ORGANIC CHEMISTRY - II	EMCH61	3
III	CORE	INORGANIC CHEMISTRY – II	EMCH62	3
III	CORE	PHYSICAL CHEMISTRY – II	EMCH63	3
III	CORE	PHYSICAL CHEMISTRY PRACTICAL	EMCHP5	3
III	ELECTIVE	FUNDAMENTALS OF SPECTROSCOPY / CHEMISTRY IN MEDICINE	EECH61/ EECH62	3
III	ELECTIVE	POLYMER SCIENCE / AGRO CHEMISTRY	EECH6A/ EECH6B	3
IV	NAAN MUDHALVAN	*TEXTILE CHEMISTRY		2
V	EXTENSION ACTIVITY	NSS, NCC, YRC, RRC, GAMES AND SPORTS/ YOUTH WELFARE ACTIVITY	E5EA61	1

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

ORGANIC CHEMISTRY-II

Objectives of the course

This course aims at providing knowledge on

- classification, isolation and discussing the properties of alkaloids and terpenes
- preparation and properties of saccharides
- biomolecules
- different molecular rearrangement
- preparation and properties of organometallic compounds

UNIT- I

Alkaloids

Classification, isolation, general properties-Hofmann Exhaustive Methylation; Structure elucidation –Coniine, piperine, nicotine.

Terpenes: Classification, Isoprenerule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.

UNIT-II

Carbohydrates

Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof).Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.

Monosaccharides–configuration–D and L hexoses –aldohexoses and ketohexoses.

Glucose, Fructose–Occurrence, preparation, properties, reactions, structural elucidation, uses.

Interconversions of sugar series –ascending, descending, aldose to ketose and ketose to aldose.

Disaccharides–sucrose, lactose, maltose- preparation, properties and uses (no structural elucidation).

Polysaccharides–Source, constituents and biological importance of homopolysaccharides –starch and cellulose, heteropolysaccharides– Hyaluronicacid, heparin.

UNIT-III

Molecular rearrangements:

Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement

UNIT-IV

Special reagents in organic synthesis

AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TBHP, TEMPO

Organometallic compounds in Organic Synthesis

Preparation, Properties and applications:

Grignard Reagents, Organo Lithium Compounds, Ziegler–Natta, Wilkinson, Metal Carbonyl, Zeiss's Salt

UNIT-V

Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media–green solvents, green reagents and catalysts; tools used like micro wave and ultra-sound in chemical synthesis.

Recommended Text

1. M.K.Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint, 2009.
2. S.M.Mukherji, and S.P.Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rdedition,2009
3. Arun Bahl and B.S.Bahl, Advanced organic chemistry, New Delhi, S.Chand& Company Pvt. Ltd., Multi colour edition, 2012.
4. P.L.Soni and H.M.Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.
5. C Bandyopadhya; An Insight into Green Chemistry; Published on 2020

Reference Books

1. R.T.Morrison and R.N.Boyd, Organic Chemistry, Pearson Education, Asia, 6th edition,2012.
2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, 11th edition, 2012.
3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi,7th edition,2009.
4. I.L.Finar, Organic Chemistry, Vol.(1&2), England, Wesley Longman Ltd, 6th edition, 2006.
5. J.A.Joule, and G.F.Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.

Website and e-learning source

1. www.epgpathshala.nic.in
2. www.nptel.ac.in
3. http:/swayam.gov.in
4. Virtual Textbook of Organic Chemistry
5. https://vlab.amrita.edu/

INORGANIC CHEMISTRY–II

Objectives of the course

The course aims to provide knowledge on

- tracer elements and their role in the biological system.
- Iron transport and storage
- Metallo enzymes, oxygen transport.
- silicates and their applications
- industrial applications of refractories, alloys, paints and pigments

UNIT-I

Bio inorganic Chemistry

Essential and trace elements: Role of Na+, K+, Mg2+, Ca2+, Fe3+,Cu2+ and Zn2+in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.

UNIT-II

Metal ion transport and storage

Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage-copper and zinc.

UNIT-III

Metallo enzymes

Isomerase and synthetases, structure of cyanocobalamin (VitaminB12), nature of Co-C bond; Metallo enzymes - functions of carboxy peptidase A, zinc metallo enzyme – mechanism and uses, Zn-Cu enzyme – structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Ironsulphur cluster enzymes.

Invivo and Invitro nitrogen fixation–biological functions of nitrogenase and molybdo enzymes.

UNIT-IV

Silicates

Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)

UNIT-V

Industrial Applications of Inorganic Compounds

Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners,

driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels.
Nanocomposite Hydrogels: synthesis, characterization and uses.
Industrial visits and internship are mandatory.

Recommended Text

1. Puri BR, Sharma L R, Kalia KC (2011), Principles of Inorganic Chemistry, 31th ed., Milestone Publishers & Distributors, Delhi.
2. Satya Prakash, Tuli G.D., Basu S.K., Madan R.D.(2009),Advancd Inorganic Chemistry,18thEdition, S.Chand& Co., NewDelhi
3. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS William Heinemann, London.
4. WV Malik, GD Tuli, RD Madan, (2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd.
5. A.K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992

Reference Books

1. Madan RD, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S.Chand and Company, New Delhi.
2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India)Private Limited, Hyderabad
3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson, Chennai
4. AlanG.Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition- Wesley, England
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.

Website and e-learning source

1. www.epgpathshala.nic.in
2. www.nptel.ac.in
3. http:/swayam.gov.in

PHYSICAL CHEMISTRY-II

Objectives of the course

The course aim at providing an overall view of the

- phase diagram of one and two component systems
- chemical equilibrium,
- Separation techniques for binary liquid mixtures.
- Electrical conductance and transport number.
- Galvanic cells, EMF and significance of electrochemical series.

UNIT-I

Phase rule

Definition of terms; derivation of phase rule; application to one component systems–water and sulphur- super cooling, sublimation; two component systems–solid liquid equilibria –simple eutectic(lead- silver and bismuth - cadmium), freezing mixtures

(potassium iodide- water),compound formation with- congruent melting points (magnesium–zinc and ferric chloride–water system), peritectic change (sodium–potassium), Solid solution (gold-silver); copper sulphate– water system.

UNIT-II

Chemical equilibrium

Law of mass action–thermodynamic derivation–relationship between Kpand Kc – application to the homogeneous equilibria – dissociation of PCl5 gas, N2O4gas – equilibrium constant and degree of dissociation - formation of HI, NH3 ,and SO3– heterogeneous equilibrium – decomposition of solid calcium carbonate–Lechatelier principle –van't Hoff reaction isotherm–temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clayperon equation – Clausius Clayperon equation and its applications

UNIT-III

Binary liquid mixtures

Ideal liquid mixtures–non ideal solutions–azeotropic mixtures– Fractional distillation–partially miscible mixtures–phenol-water, Triethyl amine-water, nicotine-water–effect of impurities on critical solution temperature; immiscible liquids- steam distillation; Nernst Distribution law–applications.

UNIT-IV

Electrical Conductance and Transference

Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – interionic effects – Debye Huckel theory –Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's theoretical device), transport number–determination– Hittorf's method, moving boundary method–factors affecting transport number – determination of ionic mobility; Kohlrausch's law- applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements–determination of-degree of dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of water, solubility and solubility product of sparingly soluble salts-conductometric titrations–acid basetitrations.

UNIT-V

Galvanic Cells and Applications

Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of are action, Thermodynamics and EMF–calculation of ΔG, ΔH, and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference

electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes– metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series – applications of electro chemical series. Chemical cells with and without transport, concentration cells with and without transport;

Applications of EMF measurements

Applications of EMF measurements–determination of activity

Coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations – acid base titrations, redox titrations, precipitation titrations,ionic product of water and degree of hydrolysis; redox indicators - use of diphenylamine indicator in the titration of ferrous iron against dichromate.

Industrial component

Galvanic cells-lead storage, Ni-Cd, Li and Zn-air, Al-air batteries Fuel cells – H2-O2cell – efficiency of fuel cells.

corrosion –mechanism, types and methods of prevention.

Recommended Text

1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021.
2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018.
3. Arun Bahl, B.S.Bahl, G.D.Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co.
4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition,1996.
5. J.Rajaram and J.C.Kuriacose, Thermodynamics, Shoban Lal Nagin Chand and CO., 1986.

Reference Books

1. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition, 2009.
2. Gilbert.W. Castellen, Physical Chemistry, Narosa Publishing House, third edition, 1985.
3. P. W. Atkins, and Juliode Paula, Physical Chemistry, Oxford University press, seventh edition, 2002.
4. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001
5. D.N. Bajpai, Advanced Physical Chemistry, S.Chand & Co., 2001.

Website and e-learning source

1. https://nptel.ac.inhttps://swayam.gov.in
2. https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_07_m.pdf
3. Thermodynamics-NPTEL https://www.youtube.com/watch?v=f0udxGcoztE Introductiontochemicalequilibrium – MIT open course ware

PHYSICAL CHEMISTRY PRACTICAL

Objectives of the course

This course aims at providing

- Basic principles of physical chemistry experiments
- Hands on experience in carrying out the experiments

UNIT-I

Thermometric experiments

1. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent
2. Determination of molecular weight of organic compound by transition temperature method.
3. Simple eutectic-determination of eutectic temperature and composition of naphthalene- Diphenyl amine or naphthalene-diphenyl system.
4. Determination of upper critical solution temperature of phenol– water system; Study of the effect of impurity on CST and determination of the strength of unknown

UNIT –II

Chemical kinetics

5. Determination of rate constant of acid catalyzed hydrolysis of an ester - methylacetate.
6. Determination of order of reaction between iodide and persulphate (initial rate method).
7. Polarimetry: Determination of rate constant of acid catalysed inversion of cane sugar

Thermochemistry

8. Determination of heat of neutralization of a strong acid by a strong base.
9. Determination of heat of hydration of copper sulphate.

UNIT -III

Electrochemistry–Conductance measurements

10. Conductometric titration of hydrochloric acid against sodium hydroxide
11. Potentiometric titration of ferrous ion against potassium dichromate using quinhydronde electrode.

Adsorption

12. Construction of Freundlich isotherm for the adsorption of acetic acid on activated charcoal.

Experiments for demonstration:

Distribution law

1. Determination of the distribution co-efficient of iodine between carbon tetrachloride and water.
2. Determination of equilibrium constant of the reaction I2 + I- ---□ I3- Determination of concentration of the given potassium iodide solution using the above equilibrium constant.

Electrochemistry

3. Determination of cell constant and molar conductance of strong electrolyte.
4. Determination of dissociation constant of acetic acid. Colorimetry
5. Determination of concentration of copper sulphate solution.

Reference Books

1. Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India: New Delhi, 2005.
2. Khosla, B. D. Garg,V. C.; Gulati,A. Senior Practical Physical Chemistry, R. Chand : New Delhi, 2011.
3. Gupta, Renu, Practical Physical Chemistry, 1st Ed.; New Age International: New Delhi, 2017.

Website and e-learning source

1. https://www.vlab.co.in/broad-area-chemical-sciences

ELECTIVE:**FUNDAMENTALS OF SPECTROSCOPY/ CHEMISTRY IN MEDICINE**

FUNDAMENTALS OF SPECTROSCOPY

Objectives of the course

This course is designed to provide knowledge on

- Electrical and magnetic properties of organic and inorganic compounds
- Basic principles of microwave, UV-Visible ,infrared, Raman, NMR and Mass spectrometry
- Instrumentation of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry
- applications of various spectral techniques in structural elucidation
- solving combined spectral problems

UNIT-I

Electrical and Magnetic properties of molecules

Dipole moment – polar and non-polar molecules – polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules.

Magnetic permeability, volume susceptibility, mass susceptibility and molar

susceptibility; diamagnetism, paramagnetism– determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism

Microwave spectroscopy

Rotationspectra- diatomicmolecules (rigid rotator approximation) selection rules– determination of bondlength, effect of isotopic substitution–instrumentation and applications

UNIT-II

Ultraviolet and Visible spectroscopy

Electronic spectra of diatomic molecules (Born Oppenheimer approximation)-vibrationalcoarsestructure–rotationalfinestructure of electronic vibration transitions – Frank Condon principle – dissociation in electronic transitions – Birge Sponer method of evaluation of dissociation energy–pre-dissociation transition-σ-σ*, π-π*,n-σ*, n-π* transitions.

Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β-unsaturated ketones. Elementary Problems.

Colorimetry –principle and applications(estimation of Fe3+)

UNIT-III

Infra redspectroscopy

Vibration spectra–diatomic molecules–harmonic oscillator and An harmonic oscillator; Vibration–rotation spectra–diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer Approximation oscillator)-selection rules, vibrations of polyatomic molecules–stretching and bending vibrations–applications–

Determination of force constant, moment of inertia and internuclear distance–isotopic shift–application of IR spectra to simple organic And inorganic molecules –(group frequencies)

Raman Spectroscopy

Rayleigh scattering and Raman scattering of light–Raman shift– Classical theory of Raman effect–quantum theory of Raman effect– Vibrational Raman spectrum–selection rules–mutual exclusion principle–n instrumentation (block diagram)–applications.

UNIT-IV

Nuclear magnetic resonance spectroscopy:

PMR–theory of PMR–instrumentation-number of signals–chemical shift–peak areas and proton counting–spin-spin coupling– applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple

Mono functional organic compounds; spin-spin splitting of neighbouring Protons in vinyl and allyl systems.

UNIT-V

Mass spectrometry

Principle–different kinds of ionisation–instrumentation–the mass spectrum–types of ions–determination of molecular formula- Fragmentation and structural elucidation–Mc Lafferty rearrangement; Retro Diels Alder reaction- illustrations with simple organic molecules.

Solving structure elucidation problems using multiple spectroscopic Data (NMR, MS, IR and UV-Vis).

Recommended Text

1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. Elements of Analytical Chemistry; S Chand: New Delhi, 2003.
2. Usharani,S. Analytical Chemistry, 1sted.; Macmillan:India, 2002.
3. Banwell, C.N.;McCash,E. M. Fundamentals of Molecular Spectroscopy, 4th ed.; Tata McGraw Hill, New Delhi, 2017.
4. U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand & Sons,2nd Ed., 2005
5. B.K.Sharma, Spectroscopy, 22nd ed., Goel Publishing House, 2011.

Reference Books

1. Srivastava, A.K.; Jain,P.C. Chemical Analysis an Instrumental Approach, 3rd ed.; S.Chand, NewDelhi, 1997.
2. Robert D Braun. Introduction to Instrumental Analysis; Mc.Graw Hill: New York, 1987.
3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. Fundamentals of Analytical Chemistry, 9th ed.; Har court college Publishers: USA, 2013.
4. Madan, R.L.; Tuli, G.D. Physical Chemistry, 2nd ed.; S.Chand: New Delhi, 2005.
5. Puri,B.R.; Sharma,L.R.; Pathania,M.S. Principles of Physical Chemistry, 43rd ed.; Vishal Publishing: Delhi, 2008.

Website and e-learning source

1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf2.http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html
2. www.epgpathshala.nic.in
3. www.nptel.ac.in
4. http:/swayam.gov.in

CHEMISTRY IN MEDICINE

Objectives of the course

This course is designed to provide knowledge on

- To have knowledge of first aid and the important rules.
- To know the common chemicals in medicine.
- To have awareness of common diseases.
- To learn the diagnostic tests and to know the importance of vitamins.

Unit-1: FIRST AID

First Aid for accidents - important rules-first aid kit, First aid for cuts, bruises, bleeding, fractures, burns, fainting and poisonous bites.

Common poisons Acid poisoning-antidote, Alkali poisoning-antidote, Poisoning by disinfectant-symptoms antidote, Alkaloid poisoning-symptoms-antidote, alcohol poisoning - symptoms - antidote, Mercury poisoning-antidote and Salicylate poisoning-antidote.

Unit-II: CHEMICALS IN MEDICINE

(Preparations and chemical equations not required) Alum - properties and uses - Aluminium hydroxide gel - uses - Dried Aluminium hydroxide gel - uses - Aluminium acetate - uses - Ferrous fumarate uses Ferric ammonium citrate uses. Ferrous gluconate uses, Ferrous sulphate. Biological importance of sodium, potassium, calcium, lodine and copper.

Unit-III: CAUSES AND TREATMENT OF SOME COMMON DISEASES

Insect borne diseases - malaria and filariasis - Prevention and treatment. Air borne diseases - diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis and leprosy - Prevention and treatment. Water borne diseases - cholera, typhoid and diarrhoeal diseases Prevention and treatment. Respiratory disorder - Prevention and treatment of asthma. Nervous disorder - epilepsy - Prevention and treatment - other diseases - Peptic ulcer - treatment.

Unit-IV: CLINICAL CHEMISTRY

Clinical chemistry-Composition of blood - blood grouping - determination of blood groups and matching - blood pressure - hypertension - determination.

Determination of glucose in serum - Folin and Wu's method - determination of serum cholesterol - Sackett's method - tests for cholesterol. Estimation of glucose in urine - Diagnostic test for sugar in urine Benedict's test - Clinistix strip test Diagnostic test for salts in and serum. Detection of diabetes, detection of anaemia. Estimation of hemoglobin (Hb concentration) - estimation of red blood cells - Normal RBC count in adults.

Unit-V: HEALTH CARE MEDICINES

Vitamins - Classification of Vitamins - Sources - deficiency diseases of Vitamins A, D, E, K, B,, B2, B3, B3, B_{12} and C - Therapeutic uses. Treatment of ulcers and skin diseases.

Recommended Text

1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. Elements of Analytical Chemistry; S Chand: New Delhi, 2003.
2. Usharani,S.Analytical Chemistry, 1sted.; Macmillan:India, 2002.
3. Banwell, C.N.; McCash,E. M. Fundamentals of Molecular Spectroscopy, 4th ed.; Tata McGraw Hill, New Delhi, 2017.
4. U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand & Sons, 2nd Ed., 2005
5. B.K.Sharma, Spectroscopy, 22nd ed., Goel Publishing House, 2011.

Reference Books

1. Srivastava, A.K.; Jain,P.C.Chemical Analysisan Instrumental Approach, 3rded.; S.Chand, NewDelhi, 1997.
2. Robert D Braun. Introduction to Instrumental Analysis; Mc.Graw Hill: New York, 1987.
3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. Fundamentals of Analytical Chemistry, 9th ed.; Har court college Publishers: USA, 2013.
4. Madan, R.L.; Tuli, G.D. PhysicalChemistry, 2nd ed.; S.Chand: New Delhi, 2005.
5. Puri,B.R.; Sharma,L.R.; Pathania,M.S. Principles of Physical Chemistry, 43rd ed.; Vishal Publishing: Delhi, 2008.

Website ande-learning source

1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf2.http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html
2. www.epgpathshala.nic.in
3. www.nptel.ac.in
4. http:/swayam.gov.in

ELECTIVE: **POLYMER SCIENCE / AGRO CHEMISTRY**

POLYMER SCIENCE

Objectives of the course

The course aims at providing an overall view of

- Classification of polymers, preparation of polymers
- Kinetics of polymerization and characterization of polymers
- Analytical techniques used to characterize polymers
- Reactions of polymers
- Speciality polymers like PVC, PMMA

UNIT-I

Introduction

Difference between polymer and macromolecule–classification– Synthetic and natural, organic and inorganic, thermoplastic and thermo setting. Plastics, elastomers, fibres and liquid resins.

Techniques of polymerization

Bulk, solution, emulsion and suspension polymerization

Unit–II

Kinetics of polymerization

Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerization and coordination polymerisation–reactivity

Ratios –block and graft copolymers.

Characterisation of polymers

Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, Thermo mechanical and rheological properties of polymers in Visco elastic state.

UNIT-III

Molecular Weight and Properties of Polymers

Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight poly dispersity index – membrane and vapour phase osmometry, light scattering –Zimmplot, ultra centrifuge– sedimentation velocity and sedimentation equilibrium–viscometry–gelpermeation chromatography

Thermal properties of polymers–Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors Influencing Glass Transition Temperature, Importance of Glass Transition Temperature, Heat Distortion Temperature, TGA / DTA, Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity

UNIT-IV

Reactions of Polymers- Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each)

Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer

Polymertechnology

Processing of polymers–casting, thermoforming, moulding– extrusion, compression, blow moulding– foaming, lamination, reinforcing –processing of fibres–melt, wet and dry spinning.

UNIT -V

Speciality polymers

Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electro luminescent polymers–two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber.

Polymer Degradation

Types of Degradation-Thermal, Mechanical, Ultra Sound, Photo Radiation and Chemical Degradation Methods.

Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.

Recommended Text

1. GowarikerV.R, N.V.Viswanthan and JayadevSreedhar. Polymer Science.
2. New Delhi: New Age International, 2015
3. MisraG.S. Introductory Polymer Chemistry .NewDelhi: Wiley Eastern, 2010.
4. Bahadur PandSastry NV. Principles of Polymer Science .New Delhi: Narosa Publishing House, 2005
5. Ahluwalia, V.K.AnuradhaMishra, Polymer Science A Text Book, Ane Books India: New Delhi, 2008.
6. Morrison,R.R.; Boyd,R.N.; Bhattacharjee, S.K. Organic Chemistry, 7thed.; Pearson: NewDelhi, 2011.

Reference Books

1. Billmeyer, F.W. Polymer Science. India: Wiley-Interscience, 2007.
2. Seymour, R. B.; CarraherJr.C.E. Polymer Chemistry: An Introduction, Marcel Dckker Inc: NewYork, 1981.
3. Sinha, R. Outlines of Polymer Technology, Prentice Hall of India: New Delhi, 2000.
4. Joel R. Fried, Polymer Science and Technology,3rd ed.; Prentice Hall of India: New Delhi, 2014.

Website and e-learning source

1. https://polymerdatabase.com
2. http://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=13.http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.htm4.http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weights+of+polymers.pdf

AGRO CHEMISTRY

Objectives of the course

The course aims at providing an overall view of

- To learn about fertilizers and pesticides
- To study the origin, characterization and testing of soil

UNIT - 1 Fertilizers

Classification, macronutrients -role of nitrogen, potassium and phosphorus on plant growth - manufacture of urea, muriate potash and triple superphosphate. Complex fertilizers, mixed fertilizers & biofertilizers - their composition. Micronutrients - their role in plants.

Manures: Bulky organic manures - Farm yard manure - oil cakes - blood meal - fish manures - Composting process - handling and storage

UNIT II Pesticides

Definition - Classification of Pesticides based on the use and chemical composition - examples - general methods of application - Benefits of pesticides - Potential hazards. Safety measures -first aid

Insecticides: Plant products - Nicotine, pyrethin- Inorganic pesticides - borates.

Organic pesticides - D.D.T. and BHC.

Fungicide: Sulphur compounds, Copper compounds, Bordeaux mixture.

Herbicides: Acaricides - Rodenticides. Attractants - Repellants.

UNIT -III Soil

Origin of soil - definition of soil - rock system - weathering of rocks and minerals- main components of soil - organic, inorganic constituents - soil formation – factors favouring soil formation.

UNIT -IV Characteristics of soil

Physical aspects - soil texture - pore space - bulk density, particle density - soil colour- surface area - soil colloids - plasticity, shrinkage - flocculation and deflocculation, soil air, soil temperature and their importance in plant growth. Acid, alkaline and saline soils - diagnosis - Methods of reclamation and after care.

UNIT -V Soil testing

Concept and objectives - soil sampling, tools, collection, processing, and dispatch of soil sample. Estimation of total organic compound, available nitrogen and phosphorus in the soil sample. Determination of pH, EC, moisture content, bulk density and particle density of the soil sample.

Recommended Text

1. A text book of Soil Science - Daji.A, Asia Publishing House, Madras 1970.
2. Textbook of soil Chemical Analysis - Hesse,P.R.A John Murray Newyork,1971

Reference Books

1. Textbook of Soil Science - Biswas, T.D and Mukherjee,S.K. Second edition, Tata McGraw-Hill Education
2. Chemistry for Agriculture and Ecology-Y.Mido M.Satake, Discovery Publishing
3. Soil Fertility &Fertilisers - Samuel L. Tisdale, Werner L. Nelson, James D.Beaton, John L. Havlin. Fifth edition, Macmillan
4. Nature and properties of soils-Harry, O Buckman N Yle C. Brandy, Macmillan
5. Insecticides, Pesticides and Agro based Industries - R.C.Paliwal, K.Goel, R.K.Gupta, Small Business Publications

Website and e-learning source

1. http://www.mcgill.ca-
2. http://naas.org.in

Naan Mudhalvan (substitute)
*TEXTILE CHEMISTRY

Objectives of the course

The primary objective of the courses is 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 textilefibres. 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 naruralfibres.

Regenerated fibres – Cellulose fibres (Rayon and Acetate fibres) - Protein fibres (Azlons) – Production - Properties and Uses

Synthetic fibres - Poly amide fibres (nylons) - Polyester fibres –Polynosicfibres, Polyacrylic fibres – Poly Urethane - 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 PRINTING

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

Recommended Text

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 - 5** edition, E.R.TrotmanCharless - Griffin and Co Ltd, 1975
3. A Textbook of Fibre and Science and Technology, S.P.Mishra, New Age International (P) Lid- 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, 2" Edition V.A. Shenai, Sevak Publications, Mumbai, 1983.
2. Berns, R.Bill Meyer and Saltzmans, Principles of Colour Technology, 3"* edition, New York, NY; John Wiley 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 - 3' edition, Maryory LJoshep,3"' Edition, Holt, Rinchart and Winson,3 Publishers, 1977.

Website and e-learning source

1. https://bteup.ac.in
2. https://www.esociety-conf.org