பகுதி – I, தமிழ்பருவம் I

17LSU101 : தமிழ்முதல்தாள் 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I :இக்காலஇலக்கியம்: (10 மணிநேரம்)

கல்வி	:	மகாகவிபாரதியார் – சுயசரிதை -ஆங்கிலக் கல்வி.
இன்றைய நிலை	:	கவிமணி தேசிக விநாயகம் பிள்ளை–ஒற்றுமையே உயிர்நிலை.
மனிதநேயம்	:	கவிஞர்சிற்பிபாலசுப்பிரமணியன் –மலையாளக் காற்று.
சூழலியல்	:	கவிஞர்வைதீஸ்வரன் - விரல் மீட்டிய மழை.
பெண்ணியம்	:	கவிஞர்சுகந்தி சுப்பிரமணியம் – புதையுண்ட வாழ்க்கை.

அலகு – II :அறஇலக்கியம்: (10 மணிநேரம்)

கொன்றை வேந்தன்: 1-50 பாடல்கள்

திருக்குறள்: பண்புடைமை, வினைத்திட்பம் – 20 குறள்கள்

பழமொழி நானூறு: 5 பாடல்கள்

அலகு - III :சிற்றிலக்கியம்: (10 மணிநேரம்)

மூவருலா: 1-26 கண்ணிகள்

திருச்செந்தூர் முருகன் பிள்ளைத்தமிழ்: 2 பாடல்கள்

கலிங்கத்துப் பரணி: போர்பாடியது - 9 பாடல்கள்

அலகு – IV :கட்டுரை: **(10 மணிநேரம்)**

1. உயர்தனிச் செம்மொழி - பரிதிமாற்கலைஞர்
2. கட்டிடக்கலை - அ. இராசமாணிக்கனார்
3. வாழ்க்கை - இளவழகனார்
4. ஆளுமைத்திறன் அறிவோம் - ஸ்ரீகண்ணன்
5. மணற்கேணி - நெ.து.சுந்தரவடிவேலு

அலகு- V :மொழிப்பயிற்சி: **(8 மணிநேரம்)**

1. படைப்பிலக்கியப் பயிற்சிகள் (கதை,கவிதை, கட்டுரை, உரைநடை)
2. மொழிபெயர்ப்பு
3. இலக்கணப் பயிற்சிகள்

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.கற்பகம்பல்கலைக்கழகத்தமிழ்த்துறைவெளியீடு.

Semester-I

17ENU101 **ENGLISH 4H 4C**

Instruction Hours/week:L:40 T:0 P:0 C:4Marks: Internal:40 External: 60 Total:100

Course Objectives

- To enable the learners to acquire English language skills at a faster pace.
- To train the learners to reflect on the literary works and communicate flexibly.
- Know about the Prose and Poetry
- To develop the Short Story:
- Learn about Vocabulary, Grammar and Composition:
- Know about Proverb Expansion

Course Outcomes

1. Enable the learners to acquire English language skills at a faster pace.
2. Trained the learners to reflect on the literary works and communicate flexibly.
3. Knowledge about the Prose and Poetry
4. Development of the Short Story:
5. Learnt about Vocabulary, Grammar and Composition:
6. Knowledge about Proverb Expansion

UNIT - I : PROSE

1. Morals in the Indian Context - Francis Nicholas Chelliah
2. How Comic Books help us to relive our Childhood - Benoit Peeters
3. Let's Do What India Needs From Us - Dr.A.P.J. Abdul Kalam

UNIT - II : POEM

1. The Stolen Boat - William Wordsworth
2. A River - A.K. Ramanujan
3. The Sailor - Safaa Fathy

UNIT - III : SHORT STORIES

1. Rapunzel - Brothers Grimm
2. The Romance of a Busy Broker - O.Henry
3. The Nightingale and the Rose - Oscar Wilde.

UNIT - IV

GRAMMAR : 1. Tenses
2. Auxiliaries (Primary and Modal)
3. Articles
4. Tag Questions

UNIT - V

FUNCTIONAL ENGLISH

1. Filling the blanks with the suitable form of verb in a conditional sentence.
2. Dialogue Writing
3. Changing positive to negative without altering the meaning
4. Fill in the blank with suitable modal

5. Framing a question to a statement
6. Rewrite the sentences changing the underlined word as directed

Prescribed Text: Reminisce, Published by the Department of English,Karpagam University.
Suggested Reading: Hewings Martin,1999 Advanced English Grammar, Cambridge University Press.

Semester-I

17CHU101 INORGANIC CHEMISTRY I: Atomic structure and chemical bonding 5H 5C

Instruction Hours/week:L: 5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

Students should be able

- To discuss the limitations of classical mechanics and its drawbacks.
- To discuss the radial and angular part of orbitals
- To explain the fundamentals of quantum mechanics and Schrödinger equation for simple atoms.
- To predict and write the electronic configuration of elements.
- To explain a different types of bonding like ionic and covalent bonding.
- To interpret a knowledge about the various theories of bonding like VSEPR, Valence Bond Theory and Molecular Orbital Theory of covalent bonding.

Course Outcomes

The students

1. Explain the atomic theory of matter, composition of the atom, which defines the identity of a given element.
2. Understood the radial and angular part of orbitals
3. Explain the relative sizes, masses, and charges of the proton, neutron, and electron, and their assembly to form different atoms.
4. Define the term isotope, and their atomic and mass numbers.
5. Use the Periodic Table to rationalize similarities and differences of elements, including physical and chemical properties and reactivity.
6. Predict common ionic charges of group 1A, 2A, 3A, 6A, and 7A elements based on position in the periodic table.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Atomic Structure:

UNIT I

Review of: Bohr's theory and its limitations, dual behaviour of matterand radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atomspectra. Need of a new approach to atomic structure.What is Quantum mechanics? Time independent Schrodinger equation and meaning ofvarious terms in it.Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom.Radialand angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for1*s*, 2*s*, 2*p*, 3*s*, 3*p* and 3*d* orbitals (Only graphical representation).Radial and angular nodesand their significance.Radial distribution functions and the concept of the most probabledistance with special reference to 1*s* and 2*s* atomic orbitals.

UNIT II

Significance of quantumnumbers, orbital angular momentum and quantum numbers *ml* and *ms*. Shapes of *s*, *p* and *d*atomic orbitals, nodal planes. Discovery of spin, spin quantum number (*s*) and magnetic spinquantum number (*ms*).Rules for filling electrons in various orbitals, Electronic configurations of the atoms.Stabilityof half-filled and completely filled orbitals, concept of exchange energy.Relative energies ofatomic orbitals, Anomalous electronic configurations.

Chemical Bonding and Molecular Structure
UNIT III

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Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionicbonding, lattice energy and solvation energy and their importance in the context of stabilityand solubility of ionic compounds.Statement of Born-Landé equation for calculation oflattice energy, Born-Haber cycle and its applications, polarizing power and polarizability.Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment andpercentage ionic character

UNIT IV

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basisof VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar,tetrahedral, trigonal bipyramidal and octahedral arrangements.Concept of resonance and resonating structures in various inorganic and organic compounds.

UNIT V

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and theircharacteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combinationof orbitals, MO treatment of homonuclear diatomic molecules of 1^{st} and 2^{nd} periods(including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO andNO^{+}. Comparison of VB and MO approaches.

Suggested Readings:

Text Books:

1. Lee, J.D. (2010). *Concise Inorganic Chemistry*.ELBS.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. (2008). *Basic Inorganic Chemistry*. 3rd ed.Hohn Wiley& sons.

Reference Books:

1. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. (2010).*Concepts and Models in InorganicChemistry*. John Wiley & Sons.
2. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. (2006).*Inorganic Chemistry: Principles of Structure and Reactivity*. Pearson Education India.

Semester-I

5H 5C

17CHU102 PHYSICAL CHEMISTRY I:States of matter and ionic equilibrium

Instruction Hours/week:L: 5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

Enable the students

- To understand the Kinetic molecular model of a gas and about the molecular velocities
- To provide a knowledge about the behaviour of real gases
- To provide knowledge about the structure of the liquid state and its properties like surface
- tension and viscosity.
- To provide knowledge about the solid state, symmetries present and different types of crystals.
- To provide a knowledge about the theory of ionic equilibria, ionisation of electrolytes and salt
- hydrolysis.
- To provide a knowledge about the buffer solutions and acid-base titrations.

Course outcomes (CO's)

Students are able to

1. Understand the postulates of Kinetic theory of gases, kinetic molecular model of gases and about the molecular velocities
2. Has the knowledge, why real gases deviate from ideal gases, Vander Waals equation of state
   and about critical constants.
3. Has the knowledge about the structure of the liquid state and its properties like surface tension
   and viscosity.
4. Understood about the solid state, symmetries present and different types of crystals.
5. Has knowledge about the theory of ionic equilibria, ionisation of electrolytes and salt hydrolysis.
6. Know to formulate the buffer solutions and the choice of indicators to acid-base titrations.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Gaseous state: Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity, calculation of ζ from η; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities.

UNIT II

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour.Van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with Van der Waals isotherms, continuity of states, critical state, relation between critical constants and Van der Waals constants, law of corresponding states.

Liquid state: Qualitative treatment of the structure of the liquid state; physical properties of liquids, vapour pressure, surface tension coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity.Explanation of cleansing action of detergents.Temperature variation of viscosity of liquids and comparison with that of gases.

UNIT III

Solid state: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl.

UNIT IV

Ionic equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; Ostwald dilution law,dissociation constants of mono and diprotic acids.Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts.

UNIT V

Buffer solutions; derivation of Henderson equation and its applications.Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations.

Suggested Readings:

Text Books:

1. Atkins, P. W. & Paula, J. de Atkin's. (2006).*Physical Chemistry Ed*. Oxford University Press.
2. Ball D. W. (2007).*Physical Chemistry*.India : Thomson Press.

Reference Books:

1. Castellan, G. W. (2004). *Physical Chemistry*. 4th Ed. Narosa.
2. Mortimer, R. G. (2009).*Physical Chemistry*. 3rd Ed. NOIDA, UP : Elsevier.

Semester-I

17CHU103 ORGANIC CHEMISTRY I:Basics and Hydrocarbons4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

- To describe knowledge on the basics of organic chemistry
- To gain knowledge in particularly the shapes of molecules, electron displacement effects, reagents, intermediates and fundamental types of reactions.
- To explain the students about the stereochemistry, projection formulae of molecules, geometrical isomerism and optical isomerism
- To explain the preparation and conformation analysis of alkanes.
- To paraphase a knowledge about the preparation and properties of alkenes and alkynes, mechanisms of reactions and rules behind the reactions.
- To summarise a knowledge about the aromaticity of molecules and about electrophilic aromatic substitutions.

Course outcomes

1. Describe molecular structure and bonding in organic molecules.
2. Classify organic compounds by structure, use the IUPAC nomenclature, and identify conformational effects in organic compounds.
3. Predict the products of reactions of alkenes and describe the mechanisms showing how the products are formed.
4. Draw and interpret reaction coordinate diagrams, and relate the energetic changes associated with chemical reactions to equilibrium constants and rate; and differentiate kinetic versus thermodynamic control of reactions.
5. Identify the types of isomerism in organic compounds, to identify and classify chiral centers, and explain the physical and chemical consequences of chirality.
6. Correctly represent the structures and bonding of alkynes, and describe the mechanisms for reactions of alkynes and predict the products of such reactions.
7. Identify compounds in which resonance is important, predict the effect of resonance on the stability of compounds and reactive intermediates, and draw resonance structures.
8. Identify conjugated pi systems and explain the effect of conjugation on molecular structure and reactivity; and predict the products of reactions of dienes.
9. Describe mechanisms for substitution and elimination reactions, and predict the effect of nucleophile, leaving group, and solvent on the relative rates of S 1 versus S 2 reactions, and E1 versus E2 reactions, as well as on the relative rates of substitution versus elimination.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Basics of Organic Chemistry

Hybridization, Shapes of molecules

Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation anddipole moment; Hydrogen bonding (Applications to be discussed with relevant topics) Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Types, shape and relative stability of

Carbocations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

UNIT II

Stereochemistry:

Fischer,Newmann and Sawhorse Projection formulae and their interconversions; Geometricalisomerism: cis–trans , syn-anti and E/Z notations with C.I.P rules.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers,Molecules with two or more chiral-centres, Diastereoisomers, meso structures, Racemic mixture and their resolution. Relative and absolute configuration: D/L and R/S designations.

UNIT III

Chemistry of Aliphatic Hydrocarbons

Carbon-Carbon sigma bonds

General methods of preparation, physical and chemical properties of alkanes: Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation-relative reactivity and selectivity.

Cycloalkanes and Conformational Analysis

Conformational analysis of alkanes: Relative stability and Energy diagrams. Types of cycloalkanes and their relative stability, Baeyer strain theory: Chair, Boat and Twist boat forms of cyclohexane with energy diagrams; Relative stability of mono substituted cycloalkanes.

Unit IV

Chemistry of Aliphatic Hydrocarbons

Carbon-Carbon pi bonds:

General methods of preparation, physical and chemical properties of alkenes and alkynes, Mechanism of E1, E2, E1cb reactions.Saytzeff and Hofmann eliminations. Electrophilic additions and their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration- oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation(oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT V

Aromatic Hydrocarbons

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Suggested Readings:

Text Books

1. Morrison, R. N. & Boyd, R. N. (1992). *Organic Chemistry*. India: Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

2. Finar, I. L. (2002). *Organic Chemistry.*Volume 1. India: Dorling Kindersley (India) Pvt. Ltd. (PearsonEducation).

Reference Books:

1. Finar, I. L. (2002).*Organic Chemistry:Stereochemistry and the Chemistry of Natural Products.*Volume 2. India: Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Eliel, E. L. &Wilen, S. H. (1994). Stereochemistry of Organic Compounds.London :Wiley.
3. Kalsi, P. S. (2005). *Stereochemistry Conformation and Mechanism*. New Age International.

Semester-I

17CHU111 ATOMIC STRUCTURE AND CHEMICAL BONDING - PRACTICAL **2H 1C**

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course objectives

- To illustrate the principles of volumetric analysis.
- To categorize a versatile knowledge of solution preparations
- To prepare solutions with appropriate concentrations, titrations
- How to handle the apparatus while doing a titration.
- To analyse the knowledge about the calculations involved in the estimation of compounds
- using volumetric analysis.
- To estimate the amount of solution present quantitatively.

Course outcomes (CO's)

The Students are able

1. Summarize the principles of volumetric analysis.
2. Gained knowledge about the preparations of solutions
3. Understood the preparation of appropriate concentrations, titrations
4. Handled the respective apparatus while doing a titration.
5. Analyse the calculations involved in volumetric analysis and in the estimation of compounds using volumetric analysis.
6. The lab will also provide hands-on opportunities to develop and apply this knowledge

Methodology

Titrations, Volumetric analysis.

Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with $KMnO_4$.
3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.
4. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$.

Suggested Readings:

Text Book:

1. Svehla, G. (2012).*Vogel's Qualitative Inorganic Analysis*. Pearson Education.

Reference Book:

1. Mendham, J. (2009) *Vogel's Quantitative Chemical Analysis*, Pearson.

Semester-I

17CHU112 STATES OF MATTER AND IONIC EQUILIBRIUM - PRACTICAL **2H 1C**

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students develop the skills to categorize

- Surface tension of a liquid
- Study the variation of surface tension with different concentration of detergent solutions.
- Viscosity of a liquid
- Prepare a buffer solution and to measure its pH.
- Monitor the pH of a solution during the course of a titration.
- Indexing of a given powder diffraction pattern of a cubic crystalline system.

Course Outcomes

The students develops the practical skill have categorized the

1. Determination of surface tension of a liquid
2. Determination the viscosity of a liquid
3. Prepare a buffer solution and to measure the pH of a solution
4. Monitor the pH of a solution during the course of a titration.
5. The lab will also provide hands-on opportunities to develop and apply this knowledge
6. Indexing of a given powder diffraction pattern of a cubic crystalline system**.**

Methodology

Surface tension & viscosity measurements, XRD data, PH meter and buffer solutions.

1. **Surface tension measurements**
   a. Determination of the surface tension of a liquid.
   b. Study the variation of surface tension with different concentration of detergent solutions.

2. **Viscosity measurement.**
   a. Determination of co-efficient of viscosity of an unknown aqueous solution.
   b. Study the variation of co-efficient of viscosity with different concentration of Poly VinylAlcohol (PVA) and determine molar of PVA.
   b. Study the variation of viscosity with different concentration of sugar solutions.

3. **Solid State:**
   a. Indexing of a given powder diffraction pattern of a cubic crystalline system.

4**. pH metry**:
   a. Study the effect of addition of HCl/NaOH on pH to the solutions of acetic acid, sodium acetate and their mixtures.
   b. Preparation of buffer solutions of different pH values (i). Sodium acetate-acetic acid (ii).Ammonium chloride-ammonium hydroxide
   c. pH metric titration of (i) strong acid with strong base, (ii) weak acid with strong base.

Determination of dissociation constant of a weak acid.

Suggested Readings:

Text Books:

1. Khosla, B. D., Garg, V. C. & Gulati, A.(2011).*Senior Practical Physical Chemistry*. New Delhi :R. Chand &Co.

Reference Books:

1. Garland, C. W., Nibler, J. W. & Shoemaker, D. P. (2003). *Experiments in PhysicalChemistry*. 8th Ed.New York : McGraw-Hill.
2. Halpern, A. M. & McBane, G. C.(2003).*Experimental Physical Chemistry*. 3rd Ed. New York : W.H. Freeman & Co.

Semester-I

17CHU113 BASICS AND HYDROCARBONS - PRACTICAL4H 2C

Course objectives

To develop skills in

- To purify organic compounds by crystallisation.
- To calibrate the thermometer, determine the melting point, and to analyse the effect of
- impurities on the melting point.
- To determine the boiling point of a liquid by distillation method.
- To explain the principles of chromatography and to separate organic compounds by paper and thin layer chromatography.
- To detect the elements present in an organic compound.
- To prepare few organic compounds using standard organic reactions.

Course Outcomes (CO's)

The student will be able to

1. Purify organic compounds by crystallisation.
2. Characterisation of the compounds by elemental analysis, melting point, and effect of impurities on the melting point.
3. To separate organic compounds by paper chromatographic and TLC methods
4. To Preparation of organic compounds.
5. The lab will also provide hands-on opportunities to develop and apply this knowledge.
6. Understood the principles of chromatography and to separate organic compounds by paper and thin layer chromatography

Methodology

Laboratory experiments, Melting point apparatus, paper chromatography, Heating mantles

1. Checking the calibration of the thermometer
2. Purification of organic compounds by crystallization using the following solvents:
   a.Water, b.Alcohol, c.Alcohol-Water
3. Determination of the melting points of unknown organic compounds.
4. Effect of impurities on the melting point – mixed melting point of two unknown organic Compounds
5. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation)
6. Chromatography
   a. Separation of a mixture of two amino acids by ascending paperchromatography
   b. Separation of a mixture of two sugars by ascending paper chromatography
   c. Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC)
7. Detection of extra elements
8. Organic Preparations
   (i) Bromination of acetanilide / aniline / phenol
   (ii) Nitration of nitrobenzene / toluene.

SuggestedReadings:

Text Books:

1. Mann, F.G. & Saunders, B.C.(2009). *Practical Organic Chemistry*. Pearson Education.

Reference Books:

1. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell A.R. (2012). *Practical OrganicChemistry*. 5th Ed. Pearson.

பகுதி – I, தமிழ்பருவம் II 17LSU201 : தமிழ் இரண்டாம் தாள் 4-H,4-C

(இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு

1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I :பக்தி இலக்கியம் (10 மணிநேரம்)

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் ,வளர்ச்சி, வரலாறு.

1. **சைவம் -**பெரியபுராணம் - திருமூலநாயனார் புராணம்.
2. **வைணவம் -** பெரியாழ்வார் திருமொழி: 10 பாடல்கள்.

அலகு – II :சங்கஇலக்கியம் : (15 மணிநேரம்)

சங்க இலக்கியங்கள் அறிமுகம்

அ).எட்டுத்தொகை

நற்றிணை : பிரசம் கலந்த – பாலை -110

குறுந்தொகை : கருங்கட்டாக் கலை – குறிஞ்சி- 69

ஐங்குறுநூறு : நெய்தல்-தொண்டிப்பத்து:

திரைஇமிழ் இன்னிசை-171

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல் : பரிபாடல் திரட்டு-மதுரை நகர்ச்சிறப்பு –உலகம் ஒரு நிறையாத்தான்-6, மாயோன் கொப்பூழ்-7, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : சுடர்தொடீ கேளாய்: குறிஞ்சிக்கலி- 36

அகநானூறு : அன்னாய் வாழி வேண்டன்னை - குறிஞ்சி - 48

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

ஆ). பத்துப்பாட்டு

திருமுருகாற்றுப்படை - பழமுதிர்ச்சோலையின் சிறப்பு

முருகன் இருப்பிடங்கள் – 'சிறுதினை மலரொடு' என்பதிலிருந்துதொடங்கி, 'அறிந்தவாறே' என்பது வரையிலான தொடர்கள்: 218-249.

முருகன் அருள்புரிதல் – 'தெய்வம் சான்ற' என்பதிலிருந்து தொடங்கி, 'நல்குமதி' என்பது வரையிலான தொடர்கள்: 286-295.

அலகு - III :காப்பியம் **(6 மணிநேரம்)**

சிலப்பதிகாரம்:

மங்கல வாழ்த்துப் பாடல்: (21-29) – கண்ணகியின் சிறப்பு:

'நாகநீள் நகரொடு' என்பதிலிருந்து தொடங்கி, 'கண்ணகி என்பாண் மன்னோ' என்பது வரையிலான தொடர்கள்.

நடுகற்காதை: (207-234)- சேரன் செங்குட்டுவன் கண்ணகிக்குக் கோயில் எடுத்தல்: 'அருந்திறலரசர்' என்பதிலிருந்து தொடங்கி, 'மன்னவரேறென்' என்பது வரையிலான தொடர்கள்.

வாழ்த்துக்காதை: (482-485)- செங்குட்டுவனுக்குக் கண்ணகி காட்சியளித்தல்: 'என்னே' என்பதிலிருந்து தொடங்கி, 'விசும்பில் தோன்றுமால்' என்பது வரையிலான தொடர்கள்.

வழக்குரை காதை:பத்தினிப் பெண்டிர் எழுவர் கதை: 'நீர்வார் கண்ணை' என்பதிலிருந்து தொடங்கி, 'புகாரென் பதியே' என்பது வரையிலான தொடர்கள்.

வஞ்சினமாலை: 'வன்னி மரமும்' என்பதிலிருந்து தொடங்கி, 'பதிப்பிறந்தேன்' என்பது வரையிலான தொடர்கள்.

அலகு – IV :சிறுகதை **(10 மணிநேரம்)**

1. **குளத்தங்கரை அரசமரம் – வ.வே.சு.ஐயர்**
2. **காட்டில் ஒரு மான் - அம்பை**
3. **நாற்காலி – கி.ராஜநாராயணன்**

4. **நகரம் – சுஜாதா**

அலகு- V :மொழிப்பயிற்சி **(7 மணிநேரம்)**

படைப்பிலக்கியப் பயிற்சிகள் (கதை, கவிதை, கட்டுரை, உரைநடை)மொழிபெயர்ப்பு

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.கற்பகம்பல்கலைக்கழகத்தமிழ்த்துறை வெளியீடு.

17CHU201 PHYSICAL CHEMISTRY II: Chemical Thermodynamics and its applications 5H 5C **Semester-II**

Instruction Hours/week:L: 5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

- To provide the basics of chemical thermodynamics and the concept of first law of
- Thermodynamics.
- To provide the knowledge about the thermo chemistry and to explain about the 2nd law of
- Thermodynamics.
- To explain the concepts of third law of thermodynamics and systems of variable composition.
- To explain about the usage of chemical thermodynamics in chemical equilibrium.
- To provide a knowledge about solutions and colligative properties.
- To recognise the forces which drive the chemical reactions in forward direction and the concept of the interchange of energy in a system.

Course Outcomes

1. Students will explain and apply the concepts of thermodynamics to chemical and physical systems. Know to calculate Q, W, ΔU and ΔH for various process.
2. Students understood the concepts of thermochemistry and the concept of entropy.
3. Students know about the third law of thermodynamics, free energy functions and about the Systems of Variable Composition
4. Students will be able to derive essential mathematical relationships in thermodynamics, and chemical equlibria.
5. Know to list the colligative properties of solutions, explaining how and why each property is affected by an increase by the amount of solute
6. Recognise the forces which drive the chemical reactions in forward direction and the concept of the interchange of energy in a system.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Chemical Thermodynamics: Intensive and extensive variables; state and path functions;isolated, closed and open systems.

First law: Concept of heat, Q, work, W, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of Q, W, ΔU and ΔH for reversible, irreversible and free expansion of gases (ideal and Van der Waals) under isothermal and adiabatic conditions.

UNIT II

Thermochemistry: Heats of reactions: standard states; enthalpy of formation and enthalpy ofcombustion and its applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics. Calculation of entropy change for reversible and irreversible processes.

UNIT III

Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state.

Systems of Variable Composition: Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases.

UNIT IV

Chemical Equilibrium: Criteria of thermodynamic equilibrium, degree of advancement ofreaction, chemical equilibria in ideal gases. Thermodynamic derivation of relation betweenGibbs free energy of reaction and reaction quotient. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration (Le Chatelier Principle,Quantitatively). Free energy of mixing and spontaneity.equilibrium between ideal gases and a pure condensed phase.

UNIT V

Solutions and Colligative Properties: Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure,ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] andamount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

Suggested Readings

Text Books:

1. Peter, A. & Paula, J. de.(2011).*Physical Chemistry*. 9th Ed. Oxford University Press.
2. Castellan, G. W. (2004).*Physical Chemistry.* 4th Ed. Narosa.

Reference Books:

1. Engel, T. & Reid, P. (2012).*Physical Chemistry.* 3rd Ed. Prentice-Hall
2. McQuarrie, D. A. & Simon, J. D. (2004). New Delhi: Molecular Thermodynamics Viva Books Pvt. Ltd.
3. Assael, M. J., Goodwin, A. R. H., Stamatoudis, M., Wakeham, W. A. & Will, S. (2011).*Commonly Asked Questions in Thermodynamics*. NY : CRC Press.
4. Levine, I .N. (2010). *Physical Chemistry.* 6th Ed. Tata Mc Graw Hill. •
5. Metz, C.R.(2006). *2000 solved problems in chemistry*. Schaum Series

Semester-II

17CHU202 INORGANIC CHEMISTRY II: Metallurgy and S-Block and P-block elements 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

The student will recite knowledge on

- The general principles of metallurgy
- S-block elements Complexes of s-block elements
- Chemistry of p-block elements
- Chemistry Hydrides, oxides and oxacids
- Preparation, properties, structure and uses of some types of inorganic compounds.

Course Outcomes

It enabled the students have discuss

1. The basic principles and methods involved in the metallurgy
2. The basic properties of s-block elements and their compounds
3. The complex formation tendency of s-block elements and their structure
4. The basic properties of p-block elements and their compounds.
5. Chemistry Hydrides, oxides and oxacids
6. The preparation, properties, structure and uses of borazine, silicates, silicones, interhalogen compounds, phosphonitrilic and clathrates.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

General Principles of Metallurgy

Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy with reference to cyanide process for silver and gold. Methods of purification of metals: Electrolytic process, Van Arkel-de Boer process and Mond's process, Zone refining.

UNIT II

Chemistry of *s* Block Elements:

(i) General characteristics: melting point, flame colour, reducing nature, diagonal relationships and anomalous behavior of first member of each group.
(ii) Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen andwater.
(iii) Common features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, peroxides, superoxides, carbonates, nitrates, sulphates.

UNIT III

(i) Complex formation tendency of s-block elements; structure of the followingcomplexes:crown ethers and cryptates of Group I; basic beryllium acetate, berylliumnitrate, EDTA complexes of calcium and magnesium.
(ii) Solutions of alkali metals in liquid ammonia and their properties.

UNIT IV

Chemistry of *p* Block Elements:
Electronic configuration, atomic and ionic size, metallic/non-metallic character, melting point, ionization enthalpy, electron gain enthalpy, electronegativity, Allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and anomalous behaviour of first member of each group.

Structure, bonding and properties: acidic/basic nature, stability, ionic/covalent nature,oxidation/reduction, hydrolysis, action of heat of the following:

Hydrides : hydrides of Group 13 (only diborane), Group 14, Group 15 (EH_3 where E = N, P, As, Sb, Bi), Group 16 and Group 17.
Oxides : oxides of phosphorus, sulphur and chlorine
Oxoacids : oxoacids of phosphorus and chlorine; peroxy acids of sulphurHalides: halides of silicon and phosphorus

UNIT V

Preparation, properties, structure and uses of the following compounds:
- ✓ Borazine
- ✓ Silicates, silicones,
- ✓ Phosphonitrilic halides {$(PNCl_2)_n$where n = 3 and 4}
- ✓ Interhalogen and pseudohalogen compounds
- ✓ Clathrate compounds of noble gases, xenon fluorides (MO treatment of XeF_2).

Suggested Readings:

Text Books:

1. Lee, J.D. (2010). *Concise Inorganic Chemistry*. Pearson Education.
2. Douglas .B.E, Mc Daniel, D.H. &Alexander J.J. (1994). *Concepts & Models of Inorganic Chemistry*.3rdEd. N.Y. : John Wiley Sons.

Reference Books:

1. Greenwood, N.N. & Earnshaw. (2005). *Chemistry of the Elements*, Butterworth-Heinemann.
2. Cotton, F.A. & Wilkinson, G. (1999). *Advanced Inorganic Chemistry*. Wiley, VCH.
3. Miessler, G. L. & Donald, A. Tarr. (2011).*Inorganic Chemistry*.5thEd.(adapted).Pearson,
4. Shriver, D.F., Atkins P.W & Langford, C.H. (2010).*Inorganic Chemistry. 5th*Ed.Oxford University Press.

Semester-II

17CHU203 ORGANIC CHEMISTRY II:5H 5C Oxygen containing Functional Groups

Instruction Hours/week:L:5 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

To provide the students a knowledge on

- Chemistry of halogenated compounds alkyl
- The preparation, properties and relative reactivity of alcohols and phenols
- Preparation, properties and standard reactions of carbonyl compounds.
- Chemistry of Organometallic compounds, Ethers and Epoxides and Addition reactions
- Chemistry of carboxylic acids and their derivatives.
- Chemistry of aryl halidies and their uses

Course Outcomes (CO's)

The students will able to

1. Understand the chemistry of alkyl halides and aryl halides.
2. Understand the preparation, properties and relative reactivity of alcohols and phenols
3. Understand Preparation, properties and standard reactions of carbonyl compounds
4. Understand the preparations, reactions and applications of epoxides, ethers and organometallic compounds
5. Understand the preparations and properties of carboxylic acid and its derivatives.
6. Explain the chemistry of aryl halides.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Chemistry of Halogenated Hydrocarbons:

Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent; nucleophilic substitution vs. elimination.

Aryl halides: Preparation (including preparation from diazonium salts) and properties,nucleophilic aromatic substitution; SNAr, Benzyne mechanism.

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

UNIT II

Alcohols, Phenols:

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-BlancReduction; Oxidation of diols by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors affecting it, Ring substitutionreactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

UNIT III

Carbonyl Compounds:

Structure, reactivity, preparation and properties; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisan-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger oxidation, α – substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner,$LiAlH_4$, $NaBH_4$, MPV, PDC)

UNIT IV

Organometallic compounds, Ethers and Epoxides and Addition reactions

Organometallic compounds of Mg (Grignard reagent) – Use in synthesis of organic compounds.*Ethers and Epoxides:* Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$

Addition reactions of α, β- unsaturated carbonyl compounds: Michael addition.Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.

UNIT V

Acids and their Derivatives:

General methods of preparation, physical properties and reactions of monocarboxylic acids,effect of substituents on acidic strength. Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids.

Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilicsustitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters,Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann- bromamide degradation and Curtius rearrangement.

Suggested Readings:

Text Books:

1. Morrison, R. T. & Boyd, R. N. (1992). *Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Reference Books:

1. Finar, I. L. (2002). *Organic Chemistry.* Volume 1. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Graham Solomons, T.W. (2012).*Organic Chemistry*. John Wiley & Sons, Inc.

Semester-II

17CHU211 CHEMICAL THERMODYNAMICS AND ITS APPLICATIONS- PRACTICAL 2H 1C

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course Objectives

The Students have a present knowledge

- To measure the heat capacity of a calorimeter
- To determine the enthalpy of neutrilisation.
- To determine the ionisation of solution.
- To determine the enthalpy of hydration of salt.
- To measure the integral enthalpy of solution
- To determine the basicity of a diprotic acid

Course Outcomes (CO's)

It enables the students calculate

1. The heat capacity of a calorimeter
2. The enthalpy of neutrilisation,
3. Calculated the ionisation of solution.
4. Calculated the enthalpy of hydration of salt.
5. The integral enthalpy of solution
6. The basicity of a diprotic acid

Methodology

Calorimeters, thermometers,

Thermochemistry:

(a) Determination of heat capacity of a calorimeter for different volumes using (i) change ofenthalpy data of a known system (method of back calculation of heat capacity of calorimeterfrom known enthalpy of solution of sulphuric acid or enthalpy of neutralization), and (ii) heatgained equal to heat lost by cold water and hot water respectively

(b) Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

(c) Determination of the enthalpy of ionization of ethanoic acid.

(d) Determination of integral enthalpy (endothermic and exothermic) solution of salts.

(e) Determination of basicity of a diprotic acid by the thermochemical method in terms of thechanges of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.

(f) Determination of enthalpy of hydration of salt.

(g) Study of the solubility of benzoic acid in water and determination of ΔH.

SuggestedReadings:

Text Books:

1. Khosla, B. D.; Garg, V. C. & Gulati, A.(2011). *Senior Practical Physical Chemistry*. New Delhi: R. Chand & Co.

Reference Books:

2. Athawale, V. D. & Mathur, P. (2011). *Experimental Physical Chemistry*.New Delhi: New Age International.

Semester-II

17CHU212 S-BLOCK ANDP-BLOCK ELEMENTS - PRACTICAL4H 2C

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students have to be analyse

- The estimate the metal ions by iodimetric titrations
- The estimate the metal ions by complexemetric titrations using EDTA
- The carryout the preparations of inorganic metal complexes.
- Prepare cuprous chloride
- Prepare Manganese (III) phosphate
- Prepare potash alum and chrome alum.

Course Outcomes

The students have analyse

1. The iodometric titration methods.
2. The complexometric titration methods
3. The preparation the s and p-block metal complexes.
4. Preparation of cuprous chloride
5. Preparation of Manganese (III) phosphate
6. Preparation of potash alum and chrome alum.

Methodology

Iodimetric titrations, Complexometric titrations, Inorganic preperations.

(A) Iodo / Iodimetric Titrations

(i) Estimation of Cu(II) and $K_2Cr_2O_7$ using sodium thiosulphate solution (Iodometrically).

(ii) Estimation of antimony in tartar-emetic iodimetrically

(B) Complexometric titrations using disodium salt of EDTA

(i) Estimation of Mg^{2+}, Zn^{2+}

(ii) Estimation of $Ca^{2+}$by substitution method

(C) Inorganic preparations

(i) Cuprous Chloride, Cu_2Cl_2

(ii) Manganese (III) phosphate, $MnPO_4.H_2O$

(iii) Aluminium potassium sulphate $KAl(SO_4)_2.12H_2O$ (Potash alum) orChrome alum.

Suggested Readings

Text Books

1. Vogel, A.I. (1978). *A Textbook of Quantitative Inorganic Analysis*, ELBS.

Reference Books

2. Marr, G. and Rockett, R.W. (1972). *Practical Inorganic Chemistry,* Van Nostrand Reinhold.
3. Deepak Pant.P. (2010). *Inorganic Chemistry Practical*, BookRix.

Semester-II

17CHU 213 OXYGEN CONTAINING FUNCTIONAL GROUPS - PRACTICAL **2H 1C**

Instruction Hours/week:L: 0 T:0 P:2 Marks: Internal:40 External: 60 Total:100

Course Objectives

The Students have a present knowledge

- To analyse the organic functional groups like alcohols, phenols carbonyl and carboxylic acid groups
- To demonstrate the preparations of organic compounds by acylation reactions
- To demonstate the preparations of organic compounds by benzyloation reactions.
- To carry out the iodoform reactions and selective reductions.
- To prepare semicarbazone derivatives of ketones
- To prepare S-Benzylisothiouronium salt of aromatic acids.

Course Outcomes

The student know to classifying the

1. Identification the organic functional groups like alcohols, phenols carbonyl and carboxylic acid groups
2. Preparation organic compounds by acylation reactions
3. Preparation organic compounds by benzoylation reactions.
4. Iodoform reactions and selective reductions.
5. Preparations semicarbazone derivatives of ketones
6. Preparations S-Benzylisothiouronium salt of aromatic acids.

Methodology

Laboratory experiments, acylation, benzyolation

1. Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group.
2. Organic preparations:

i. Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidinesand o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any onemethod:
   a. Using conventional method.
   b. Using green approach

ii. Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-,p-anisidine) and one of the following phenols (β -naphthol, resorcinol, p- cresol)by Schotten-Baumann reaction.

iii. Oxidation of ethanol/ isopropanol (Iodoform reaction).
iv. Selective reduction of meta dinitrobenzene to m-nitroaniline.
v. Hydrolysis of amides and esters.

vi. Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone,cyclohexanone, benzaldehyde.
vii. S-Benzylisothiouronium salt of one each of water soluble and water insoluble acids(benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid).
viii. Aldol condensation using either conventional or green method.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solidsamples must be collected and may be used for recrystallization and melting point.

SuggestedReadings

Text Books:

1. Mann, F.G. & Saunders, B.C.(2009). *Practical Organic Chemistry*. Pearson Education.
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. (2012). *Practical Organic Chemistry*. 5th Ed., Pearson.

Reference Books:

1. Ahluwalia, V.K. &Aggarwal, R. (2000).*Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*. University Press.
2. Ahluwalia, V.K. &Dhingra, S. (2000). *Comprehensive Practical Organic Chemistry: Qualitative Analysis*. University Press.

Semester-II

17AEC201 ENVIRONMENTAL STUDIES4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

It enables the students to

- The fundamental terms and definitions of environment
- Recall the Renewable and Non-renewable Resources.
- Quote the Biodiversity and Its Conservation
- Outline about Environmental Pollution
- Discuss the disaster management
- Discuss the Social Issues and the Environment

Course outcomes (CO's)

The students know about the explanation of

1. Fundamental terms and definitions of environment
2. Renewable and Non-renewable Resources.
3. Biodiversity and Its Conservation
4. Environmental Pollution
5. Gained knowledge about disaster management
6. Social Issues and the Environment

UNIT-I

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem. Energy flow, Ecological succession Food chains and food webs.Classification of ecosystem.

UNIT II: Natural Resources

Renewable and Non-renewable Resources:

Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources: Use and over-utilization, exploitation. Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.Fire accidents and prevention.

UNIT III: Biodiversity and Its Conservation

Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels.India as a mega-diversity nation.Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV: Environmental Pollution

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Diaster management: Foods, earthquake, cyclone and landslides.

UNIT V: Social Issues and the Environment

From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions.Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation.Public awareness.Population growth, variation among nations.Population explosion—Family Welfare Programme. Environment and human health.Human rights.Value education.HIV/AIDS.Women and Child Welfare.Role of Information Technology in environment and human health.

Suggested Readings:

Text Books

1. Tripathy.S.N. & Sunakar Panda.(2004). *Fundamentals of Environmental Studies*.2nd Edition.New Delhi: Vrianda Publications Private Ltd.
2. Arvind Kumar .(2004). *A Textbook of Environmental Science*.New Delhi: APH Publishing Corporation.
3. VermaP.S.,&.Agarwal.V.K.(2001).*Environmental Biology :Principles of Ecology*. New Delhi: S.Chand and Company Ltd.

Reference Books

1. Anubha Kaushik, C.P.&Kaushik, (2004).*Perspectives in Environmental Studies*.New Delhi: New Age International Pvt. Ltd. Publications.
2. Singh, M.P., Singh, B.S. & Soma S. Dey, (2004). *Conservation of Biodiversity and Natural Resources*.Delhi: Daya Publishing House.
3. Daniel B.Botkin & Edward A.Keller.(1995). *Environmental Science*.NewYork:John Wiley and Sons, Inc.
4. Uberoi, N.K., (2005). *Environmental Studies*,New Delhi, India: Excel Books Publications.

Semester-III

17CHU301 PHYSICAL CHEMISTRY III:Phase equilibria and chemical kinetics 4H 4C

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students should be able

- To illustrate the phase equilibrium.
- Understand the Clacius-Clapeyron equation and its applications.
- To explain the theory behind three component systems
- To summarize about electrochemical cells and EMF measurements
- To discuss the applications of EMF measurements
- To contrast the fundamentals of surface chemistry

Course Outcomes

The students have gained knowledge to summarise

1. The concept of Phase equilibria and phase diagrams
2. Understood the Clacius-Clapeyron equation and its applications.
3. About three component systems and their characteristic properties
4. Different types of electrochemical cells and EMF measurements
5. Applictions of EMF measurements in determining thermodynamic properties
6. The basics of surface chemistry.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Phase Equilibria: Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems; Clausius-Clapeyron equation and itsapplications to solid-liquid, liquid-vapour and solid-vapour equilibria, phase diagram for onecomponent systems (H_2O and S), with applications. Phase diagrams for systems of solid-liquid equilibria involving eutectic, congruent and incongruent melting points.

UNIT II

Three component systems: triangular plots, water-chloroform-acetic acid system. Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications to fractional distillation of binary miscible liquids (ideal and non ideal), azeotropes, lever rule, partial miscibility of liquids, CST, miscible pairs, steam distillation. Nernst distribution law: its derivation and applications.

UNIT III

Electrochemical Cells: Rules of oxidation/reduction of ions based on half-cell potentials,applications of electrolysis in metallurgy and industry. Chemical cells, reversible and irreversible cells with examples.Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells.

UNIT IV

Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass and SbO/Sb_2O_3 electrodes. Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers.Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation).

UNIT V

Surface chemistry: Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich).nature of adsorbed state. Qualitative discussion of BET.

Suggested Readings:

Text Books:

1. Peter Atkins & Julio De Paula.(2010).*Physical Chemistry*. 9th Ed. Oxford University Press.
2. Castellan, G. W. (2004).*Physical Chemistry*. 4th Ed. Narosa
3. McQuarrie, D. A. & Simon, J. D. (2004).*Molecular Thermodynamics*. New Delhi : Viva Books Pvt. Ltd. • Engel, T. & Reid, P.(2012).*Physical Chemistry*. 3rd Ed. Prentice-Hall

Reference Books

1. Assael, M. J., Goodwin, A. R. H., Stamatoudis, M., Wakeham, W. A. & Will, S. (2011). *CommonlyAsked Questions in Thermodynamics*. NY : CRC Press.
2. Zundhal, S.S. (2011). *Chemistry concepts and applications*. Cengage India • Ball, D. W. (2012). *Physical Chemistry*. Cengage India.
3. Mortimer, R. G. (2009).*Physical Chemistry*. 3rd Ed. Elsevier: NOIDA, UP.
4. Levine, I. N. (2011).*Physical Chemistry*. 6th Ed. Tata McGraw-Hill.
5. Metz, C. R. (2009).*Physical Chemistry*. 2nd Ed. Tata McGraw-Hill.

Semester-III

17CHU302 INORGANIC CHEMISTRY III:
Coordination Chemistry 4H 4C

Instruction Hours/week:L:40 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The students should be able

- To discuss the key features of coordination compounds,
- Understand the nomenclature, isomerism and types in coordination compounds.
- To describe thevarious theories to explain the characteristics of coordination compounds.
- To contrast the nature of transition elements and their compounds.
- To contrast about the occurrence, preparation and properties of Lanthanides and actinides.
- To discuss about the fundamentals of Inorganic reaction mechanisms.

Course Outcomes

The students have gained knowledge to summarise

1. Recognise the role played by transition metal complexes play in Inorganic Chemistry.
2. Understood the nomenclature, isomerism and types in coordination compounds.
3. Describe the structure and bonding theories, electronic and magnetic properties of the transition metal complexes and their kinetic studies.
4. Explain the theories of bonding in coordination compounds and their experimental behaviour.
5. Recognise and explain the interaction of metal ions with biological ligands.
6. Explain the role of Inorganic "substances" in living systems and the use of metal ions in medicinal therapy and diagnosis

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Coordination Chemistry:

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

UNIT II

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

UNIT III

Transition Elements:

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the following compounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

UNIT IV

Lanthanoids and Actinoids:

Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

UNIT V

Inorganic Reaction Mechanism

Introduction to inorganic reaction mechanisms. Substitution reactions in square planarcomplexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

Suggested Readings

Text Books:

1. Purcell, K.F & Kotz, J.C. (1980).*An Introduction toInorganic Chemistry*.W.B. Saunders Co.
2. Huheey, J.E. (1993).*Inorganic Chemistry*.Prentice Hall.

Reference Books

1. Cotton, F.A. & Wilkinson, G. (1999).*Advanced Inorganic Chemistry*.Wiley-VCH.
2. Greenwood, N.N. & Earnshaw A. (2006).*Chemistry of the Elements*.Butterworth-Heinemann.
3. Miessler, G. L. &. Tarr, Donald A. (2009).*Inorganic Chemistry.* 3rd Ed.(adapted),Pearson.

Semester-III

17CHU303 ORGANIC CHEMISTRY III: 4H 4C

Nitrogen Containing Functional Groups, Heterocyclic chemistry and natural products

Instruction Hours/week:L: 4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

CourseObjectives

The students should be able

- To contrast the preparation and properties of compounds with nitrogen containing functional groups.
- Understand the preparation and properties of diazoniumsalts.
- Learn about polynuclear hydrocarbons,
- Know about five, six and fused membered heterocyclic compounds.
- To discuss the preparation and reactions of alkaloids
- To discuss the preparation and reactions of terpenes.

CourseOutcomes

The students have summarise

1. The preparation and properties of compounds with nitrogen containing functional groups.
2. Understood the preparation and properties of diazonium salts.
3. Learned about the polynuclear hydrocarbons.
4. Knowledge about five, six and fused membered heterocyclic compounds.
5. The preparation and reactions of alkaloids
6. The preparation and reactions of terpenes.

Methodology

Blackboard teaching, Power point presentation and group discussion.

UNIT I

Nitrogen Containing Functional Groups

Preparation and important reactions of nitro compounds, nitriles and isonitriles.

Amines: Preparation and properties: Effect of substituent and solvent on basicity; Gabrielphthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustivemethylation, Hofmann-elimination reaction; Distinction between 1°, 2° and 3° amines withHinsberg reagent and nitrous acid.

UNIT II

Diazonium Salts: Preparation and their synthetic applications.

Polynuclear Hydrocarbons

Aromaticity of polynuclear hydrocarbons, structure elucidation of naphthalene; Preparation and properties of naphthalene, phenanthrene and anthracene.

UNIT III

Heterocyclic Compounds

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered ringscontaining one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis),

UNIT IV

Indole(Fischer indole synthesis and Madelung synthesis), Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis, Bischler-Napieralski reaction, Pictet-Spengler reaction, Pomeranz-Fritsch reaction)

UNIT V

Alkaloids

Natural occurrence, General structural features, Isolation and their physiologicalaction, Hoffmann's exhaustive methylation, Emde's modification; Structure elucidation and synthesis of Nicotine.Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine.

Terpenes

Occurrence, classification, isoprene rule; Elucidation of stucture and synthesis of Citral.

SuggestedReadings

Text Books:

1. Morrison, R. T. & Boyd, R. N.(1992). *Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. (2002).*Organic Chemistry*. Volume 1. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Reference Books

1. Finar, I. L.(2002).*Organic Chemistry*: *Stereochemistry and the Chemistry of Natural Products*. Volume 2. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Acheson, R.M. (1976). *Introduction to the Chemistry of Heterocyclic compounds*. John Welly& Sons.
3. Graham Solomons, T.W.(2012).*Organic Chemistry*. John Wiley & Sons, Inc.
4. Kalsi, P. S.(2009).*Textbook of Organic Chemistry*. 1st Ed. New Age International (P) Ltd. Pub.
5. Clayden, J., Greeves, N., Warren, S. & Wothers, P.(2012).*Organic Chemistry*. Oxford University Press.
6. Singh, J.; Ali, S.M. & Singh, J. (2010).*Natural Product Chemistry*. PrajatiParakashan.

Semester-III

17CHU311 PHASE EQUILIBRIA AND CHEMICAL KINETICS-4H 2C PRACTICAL

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

It enables the students to Paraphrase the

- To Determine of critical solution temperature (CST) and
- To Determine of eutectic temperature
- To Determine distribution coefficients of two immisible solutions.
- To construct of the phase diagram using cooling curves or ignition tube method: a. simple eutectic and b. congruently melting systems.
- To apply their knowledge in Potentiometry to laboratory.
- To perform the potentiometric titrations.

Course Outcomes

The students able to determine,

1. Apply their knowledge in Phase equilibria
2. Determination of critical solution temperature (CST) and
3. Determination of eutectic temperature
4. Determination distribution coefficients of two immisible solutions.
5. Apply their knowledge in Potentiometry to laboratory.
6. Perform the titrations potentiometrically.

Methodology

Potentiometer, electrochemical experiments

Phase Equilibria:

I. Determination of critical solution temperature and composition at CST of the phenolwatersystem and to study the effect of impurities of sodium chloride and succinic acidon it.

II. Phase equilibria: Construction of the phase diagram using cooling curves or ignition tubeethod: a. simple eutectic and b. congruently melting systems.

III. Distribution of acetic/ benzoic acid between water and chloroform or cyclohexane.

IV. Study the equilibrium of at least one of the following reactions by the distribution method:

(i) $I_2(aq) + I^-(aq) \rightarrow I_3(aq)$

(ii) $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n^{2+}$

Potentiometry:

V. Perform the following potentiometric titrations: i. Strong acid vs. Strong base ii. Weakacid vs. Strong base iii. Dibasic acid vs. Strong base iv. Potassium dichromate vs. Mohr'ssalt

SuggestedReadings

Text Books:

1. Khosla, B. D., Garg, V. C. & Gulati, A. (2011). *Senior Practical Physical Chemistry*.25. New Delhi: R. Chand& Co.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. (2003).*Experiments in Physical Chemistry*. 8th Ed. McGraw-Hill: New York.

Reference Books

1. Halpern, A. M. & McBane, G. C. (2003). *Experimental Physical Chemistry*. 3rd Ed.New York :W.H.Freeman & Co.

Semester-III

17CHU312 COORDINATION CHEMISTRY - PRACTICAL 4H 2C

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

- Explain the principle of gravimetric analysis
- To estimate the amount of nickel present in the NiDMG
- Prepare coordination complexes
- To measure the 10Dq by spectrophotometrically.
- Justify the properties of coordination complexes
- To synthesise the ligand transfer reaction by substitution method.

Course outcomes

The students have to

1. Determine metals like Ni, Cu and Fe using the principle of gravimetric analysis
2. Estimate the amount of nickel present in the NiDMG
3. Prepare coordination complexes
4. Measurement of 10 Dq by spectrophotometric method
5. Justify the properties of coordination complexes
6. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g.bidentate ligands like acetylacetone, DMG, glycine) by substitution method.

Methodology

Precipitation and estimation, preparation of complexes, Measurement of properties

Gravimetric Analysis:

i. Estimation of nickel (II) using Dimethylglyoxime (DMG).
ii. Estimation of copper as CuSCN
iii. Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$.
iv. Estimation of Al(III) by precipitating with oxine and weighing as $Al(oxine)_3$(aluminium oxinate).

Inorganic Preparations:

i. Tetraamminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$
ii. Acetylacetonate complexes of Cu^{2+}/Fe^{3+}
iii. Tetraamminecarbonatocobalt (III) nitrate
iv. Potassium tri(oxalato)ferrate(III)

Properties of Complexes

i. Measurement of 10 Dq by spectrophotometric method
ii. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g.bidentate ligands like acetylacetone, DMG, glycine) by substitution method.

Suggested Readings

TextBook

1. Vogel, A.I. (2002).*A text book of Quantitative Analysis*.ELBS.

Reference Book

1. Marr, G. & Rockett, B.W.(1972).*Practical Inorganic Chemistry*. Van Nostrand Reinhold.

Semester-III

17CHU313 NITROGEN CONTAINING FUNCTIONAL GROUPS, 4H 2C
HETEROCYCLICCHEMISTRY AND NATURAL PRODUCTS - PRACTICAL

Instruction Hours/week:L: 0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objective

This course enables the student to

- Identify the presence of nitro
- Identify the presence of amine
- Identify the presence of amide groups
- Identify functional groups like alcohols.
- Identify functional groups of carboxylic acids.
- Identify the functional groups like phenols , carbonyl compounds and esters

Course Outcome

The students have analyse the

1. Functional group tests for nitrogen containing organic compounds
2. Identification of nitro group
3. Identification of amine group
4. Identification of amide
5. Tests used in the Identification of functional groups like alcohols, carboxylic acids
6. Identification of phenols , carbonyl compounds and esters

Methodology

Qualitative analysis of organic compounds

1. Functional group test for nitro, amine and amide groups.
2. Qualitative analysis of unknown organic compounds containing simple functional groups (alcohols, carboxylic acids, phenols, carbonyl compounds and esters)

SuggestedReadings

Text Books:

1. Mann, F.G. & Saunders, B.C.(2009). *Practical Organic Chemistry*. Pearson Education
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. (2012). *Practical Organic Chemistry*.5th Ed. Pearson.
3. Ahluwalia, V.K. &Aggarwal, R.(2000).*Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*. University Press

Reference Books

1. Ahluwalia, V.K. &Dhingra, S. (2000).*Comprehensive Practical Organic Chemistry: QualitativeAnalysis*. University Press.

Semester-III

17CHU304A PHARMACEUTICAL CHEMISTRY3H 3C

Instruction Hours/week:L:03 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Perform the drug discovery process.
- To utalize the software to predict the ADMET.
- Build the synthesis of analgesic, antipyretic, anti-inflammatory agents
- Build the synthetic process of Central Nervous System and cardiovascular drugs.
- Restate the fermentation process
- Modify to prepare antibiotics and related compounds.

Course Outcome

The students have knowledge to create about the

1. Drug discovery
2. Utalization of the software using prediction of ADMET
3. Procedures to prepare analgesic, antipyretic, anti-inflammatory agents
4. Synthesis of Central Nervous System and cardiovascular drugs.
5. Fermentation process and preparation of antibiotics.
6. Modified the preparation of antibiotics and related compounds

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT 1

Drug discovery, design and development; Basic Retrosynthetic approach.

UNIT II

Synthesis of therepresentative drugs of the following classes: analgesic agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, lbuprofen); antibiotics (Chloramphenicol);antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide,Trimethoprim); antiviral agents (Acyclovir),

UNIT III

Synthesis of therepresentative drugs of the following classes: Central Nervous System agents (Phenobarbital,Diazepam),Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS relateddrugs (AZT- Zidovudine).

Fermentation

UNIT IV

Aerobic and anaerobic fermentation. Production of Ethyl alcohol and citric acid,

UNIT V

Production of (i) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine,Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Suggested Readings

Text Books:

1. Patrick, G.L.(1995). *Introduction to Medicinal Chemistry*.65. UK: Oxford University Press
2. Hakishan, V.K. Kapoor,(1996). *Medicinal and Pharmaceutical Chemistry*, New Delhi: Vallabh Prakashan. Pitampura.

Reference Books

1. William O. Foye, Thomas L., Lemke & David A. William.(2008).*Principles of MedicinalChemistry*. New Delhi: B.I. Waverly Pvt. Ltd.

Semester-III

17CHU304B IT SKILLS FOR CHEMISTS3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course enables the student to gain knowledge in the mathematics and computer science to

- Interpret the Uncertainty in experimental techniques
- Statistical treatment
- Error analysis
- Summarise the types of algeberic operations
- Explain computer programming and to handle numeric data
- Illustrate the numerical modelling

Course Outcomes

1. Interpret the Uncertainty in experimental techniques and Statistical treatment
2. Under stood the knowledge of error analysis.
3. Formulate a set of calculations that can address a relevant research question;
4. 4. Use one or several computer programs and extract useful information;
5. 5. Write a research paper that describes methods, results, and interpretation;
6. 6. Assess the meaning and validity of calculations that appear in the chemical literature.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Mathematics

Fundamentals, mathematical functions, polynomial expressions, logarithms, the exponentialfunction, units of a measurement, interconversion of units, constants and variables, equationof a straight line, plotting graphs.Uncertainty in experimental techniques: Displaying uncertainties, measurements inchemistry, decimal places, significant figures, combining quantities.Uncertainty in measurement: types of uncertainties, combining uncertainties. Statisticaltreatment. Mean, standard deviation, relative error. Data reduction and the propagation oferrors.Graphical and numerical data reduction. Numerical curve fitting: the method of leastsquares (regression).

UNIT II

Algebraic operations on real scalar variables (e.g. manipulation of Van der Waals equation indifferent forms).Roots of quadratic equations analytically and iteratively (e.g. pH of a weakacid).Numerical methods of finding roots (Newton-Raphson, binary –bisection, e.g. pH of aweak acid not ignoring the ionization of water, volume of a vander Waals gas, equilibriumconstant expressions).Differential calculus: The tangent line and the derivative of a function, numericaldifferentiation (e.g., change in pressure for small change in volume of a Vander Waals gas,potentiometric titrations).Numerical integration (Trapezoidal and Simpson's rule, e.g. entropy/enthalpy change fromheat capacity data).

UNIT III

Computer programming:

Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchyof operations, inbuilt functions.Elements of the BASIC language.BASIC keywords andcommands.Logical and relative operators.Strings and graphics.Compiled versus interpretedlanguages.Debugging.Simple programs using these concepts.Matrix addition and multiplication.Statistical analysis.

UNIT IV

Introductory writing activities: Introduction to word processor and structure drawing(ChemSketch) software. Incorporating chemical structures, chemical equations, expressionsfrom chemistry (e.g. Maxwell-Boltzmann distribution law, Bragg's law, van der Waalsequation, etc.) into word processing documents.

Handling numeric data: Spreadsheet software (Excel), creating a spreadsheet, entering andformatting information, basic functions and formulae, creating charts, tables and graphs.Incorporating tables and graphs into word processing documents. Simple calculations,plotting graphs using a spreadsheet (Planck's distribution law, radial distribution curves forhydrogenic orbitals, gas kinetic theory- Maxwell-Boltzmann distribution curves as functionof temperature and molecular weight), spectral data, pressure-volume curves of van derWaals gas (vander Waals isotherms), data from phase equilibria studies. Graphical solutionof equations.

UNIT V

Numeric modelling: Simulation of pH metric titration curves. Excel functions LINEST andLeast Squares. Numerical curve fitting, linear regression (rate constants from concentrationtimedata, molar extinction coefficients from absorbance data), numerical differentiation

(e.g.handling data from potentiometric and pH metric titrations, pKa of weak acid), integration(e.g. entropy/enthalpy change from heat capacity data).

Statistical analysis: Gaussian distribution and Errors in measurements and their effect ondata sets. Descriptive statistics using Excel.

Suggested Readings

Text Books:

1. McQuarrie, D. A. (2008). *Mathematics for Physical Chemistry*.University Science Books
2. Mortimer, R.(2005).*Mathematics for Physical Chemistry*. 3rdEd. Elsevier
3. Steiner, E. (1996). *The Chemical Maths Book*.Oxford University Press.
4. Yates, P.(2007). *Chemicalcalculations*.2nd Ed. CRC Press.
5. Harris, D. C. (2007). *Quantitative Chemical Analysis*. 6th Ed. Freeman Chapters 3-5.

Reference Books

1. Levie, R. de. (2001). *How to use Excel in analytical chemistry and in general scientific data Analysis*. Cambridge Univ. Press 487 pages.
2. Noggle, J. H. (1985).*Physical chemistry on a Microcomputer*.Little Brown & Co.
3. Venit, S.M. (1996).*Programming in BASIC: Problem solving with structure and style*. Delhi :Jaico Publishing House.

Semester-III

17CHU314APHARMACEUTICAL CHEMISTRY - PRACTICAL 3H 1C

Instruction Hours/week:L:0 T:0 P:03 Marks: Internal:40 External: 60 Total:100

Course Objective

The course enables the student to

- Develop the synthesis of pharmaceutical drugs like aspirin
- Synthesis of magnesium bisilicate.
- Determine the melting point of aspirin
- Spectral characterization of aspirin
- Determine the melting point of antacid
- Spectral characterization of antacid

Course Outcome

The students restate the

1. Synthesis of pharmaceutical drugs like aspirin
2. Synthesis of magnesium bisilicate.
3. Determination of the melting point of aspirin
4. Spectral characterization of aspirin
5. Determine the melting point of antacid
6. Spectral characterization of antacid

Methodology

Practicals

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).

Suggested Readings

Text Books:

1. Patrick G.L. (1995): Introduction to *Medicinal Chemistry.* UK:Oxford UniversityPress.
2. Hakishan, V.K. Kapoor, (1996)*Medicinal and Pharmaceutical Chemistry*.New Delhi: VallabhPrakashan. Pitampura.

Reference Books

1. William O. Foye, Thomas L., Lemke ,& David A. William.(2008).*Principles of MedicinalChemistry*. New Delhi: B.I. Waverly Pvt. Ltd.

Semester-III

17CHU314B IT SKILLS FOR CHEMISTS- PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3Marks: Internal: 40 External: 60 Total:100

Course Objectives

The course enables the student to

- Describe the rules and the methods to be followed in the computer programming.
- Describe the basic programme of curve fitting
- Describe the numerical differentiation and intergration.
- Interpret Statistical analysis of the numeric data.
- Draw the chemical structure using software
- Understand the statistical significance testing.

Course Outcome

The students have to explained the

1. The rules and the methods to be followed in the computer programming.
2. the basic programme of curve fitting
3. The numerical differentiation and intergration.
4. Interpretion of Statistical analysis of the numeric data.
5. Draw the chemical structure using software
6. Under stood the statistical significance testing.

Methodology

Computer programming, Chem draw or related softwares.

BASIC programs for curve fitting, numerical differentiationand integration (Trapezoidalrule, Simpson's rule), finding roots (quadratic formula, iterative, Newton-Raphson method).Structure drawing software.

Statistical significance testing: The *t* test. The *F*test.

Presentation: Presentation graphics

SuggestedReadings

Text Books:

1. McQuarrie, D. A.(2008).*Mathematics for Physical Chemistry*.University Science Books
2. Mortimer, R. (2005).*Mathematics for Physical Chemistry*.3rdEd. Elsevier.
3. Steiner, E. (1996).*The Chemical Maths Book*.Oxford University Press.Yates, P.(2007)*Chemical calculations*.2ndEd. CRC Press.
4. Harris, D. C. (2007). *Quantitative Chemical Analysis*. 6th Ed. Freeman Chapters 3-5.

Reference Books

1. Levie, R. de. (2001). *How to use Excel in analytical chemistry and in general scientific dataanalysis*, Cambridge Univ. Press 487 pages.
2. Noggle, J. H.(1985).*Physical chemistry on a Microcomputer*.Little Brown & Co.
3. Venit, S.M. (1996).*Programming in BASIC: Problem solving with structure and style*. Delhi :Jaico Publishing House.

Semester-III

17CHU305 INTRODUCTION TO WATER MANAGEMENT 4C

Instruction Hours/week:L:0 T:0 P:0Marks: External: 100 Total:100

Course Objectives

The course enables the students to

- Understand the Importance of drinking water
- Understand the water pollution
- Understand the parameters to be checked during water analysis.
- Determine the water quality parameters.
- Control of Pollution
- Major water pollution episodes.

Course Outcomes

On the successful completion of the course , the students should able to

1. Understood the Importance of drinking water
2. Understood the water pollution
3. Understood the parameters to be checked during water analysis.
4. Determination the water quality parameters.
5. Control of Pollution
6. Major water pollution episodes.

Methodology

Self study.

UNIT 1

Water

Introduction, Sources of water - Importance and Availability of water - Molecular structure and physical properties - Hydrogen bonding - water as a solvent. WHO and ISO standards for raw water criteria.

UNIT II

Water Pollution

Impact of man on the Environment – an over view of Urbanization and Biodiversity. Environmental pollution – classification of pollution - Water pollution - Types of water pollution, ground water, surface water and Marine water pollution - Different types of water pollutants - sources and harmful effects on environment.

UNIT III

Determination of Water Quality parameters

Monitoring of some important parameters to determine the water quality - hardness, total solids, acidity, alkalinity, PH value, amount of free CO_2 , Fluoride content, chloride content, and their estimation. Biological oxygen demand (BOD) - CBOD and NBOD, Chemical Oxygen demand (COD), Chlorine demand and their determinations. Disadvantages of using hard water.

UNIT IV

Control of water pollution

Eutrophication - Causes, effects and control, Softening of water: Desalination, Clark's process, lime soda process, ion exchange process, Permutit process, Phosphate conditioning;- Demineralization of water- Treatment of water: Sterilization, flocculation, industrial treatment- treatment of wastes or effluents with organic and inorganic impurities, sewage and sewage treatment.

UNIT V

Major Water pollution Episodes- The Ganga Basin and Ganga Action plan.

Suggested Readings

Text Books:

1. P.C. Jain and Monica Jain, (1993), Engineering Chemistry, Dhanpat Rai and Sons.
2. R.K.Trivedy and P.K.Goel, (1986), Chemical and Biological methods for Water Pollution Studies, Environmental Publications.

Reference Books

1. Asim K.Das, (2010), Environmental chemistry with Green Chenmistry, Arunabha Sen, Books and Allied (P) Ltd, Kolkata-9.
2. Anubha Kaushik and CP. Kaushik, (2014). Perspectives in environmental studies, 4th Edition, New age International Pubhilishers P Ltd, New Delhi-2.

Semester-IV

17CHU401 PHYSICAL CHEMISTRY IV:Electrochemistry4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

The course enables the students to

- Explain the types of conductance measurements and the factors affecting it
- Describe the ionic mobilities and the applications of conductance measurements
- Discuss the order and molecularity of reactions and the integrated rate expressions for different types of first order reactions.
- To knowledge about chemical kinetics
- Summarize the fundamentals of catalysis
- Restate the fundamentals of photochemistry.

Course Outcome

The students have to restated

1. The types of conductance measurements and the factors affecting it.
2. The ionic mobilities and the applications of conductance measurements
3. The order and molecularity of reactions and the integrated rate expressions for different types of first order reactions.
4. Gained knowledge about chemical kinetics.
5. The fundamentals of catalysis
6. The fundamentals of photochemistry.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Conductance: Quantitative aspects of Faraday's laws of electrolysis Arrhenius theory ofelectrolytic dissociation. Conductivity, equivalent and molar conductivity and their variationwith dilution for weak and strong electrolytes. Molar conductivity at 29 infinite dilution.Kohlrausch law of independent migration of ions.Debye-Hückel-Onsager equation, Wien effect,Debye-Falkenhagen effect, Walden's rules.

UNIT II

Ionic velocities, mobilities and their determinations,transference numbers and their relation to ionic mobilities, determination of transferencenumbers using Hittorf and Moving Boundary methods. Applications of conductancemeasurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii)solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v)hydrolysis constants of salts.

UNIT III

Chemical Kinetics: Order and molecularity of a reaction, rate laws in terms of the advancementof a reaction, differential and integrated form of rate expressions up to second order reactions,experimental methods of the determination of rate laws, kinetics of complex reactions (integratedrate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions and (iii)consecutive reactions and their differential rate equations (steady-state approximation in reactionmechanisms) (iv) chain reactions.

Unit IV

Temperature dependence of reaction rates; Arrheniusequation; activation energy. Collision theory of reaction rates, Lindemann mechanism,qualitative treatment of the theory of absolute reaction rates.

Catalysis: Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions atsolid surfaces. Enzyme catalysis, Michaelis-Menten mechanism, acid-base catalysis.

Unit V

Photochemistry: Characteristics of electromagnetic radiation, Lambert-Beer's law and itslimitations, physical significance of absorption coefficients. Laws, of photochemistry, quantumyield, actinometry, examples of low and high quantum yields, photochemical equilibrium and thedifferential rate of photochemical reactions, photosensitised reactions, quenching. Role ofphotochemical 34 reactions in biochemical processes, photostationary states,chemiluminescence.

Suggested Readings

Text Books:

1. Atkins, P.W & Paula, J.D.(2011).*Physical Chemistry*. 9th Ed. Oxford University Press.
2. Castellan, G. W.(2004).*Physical Chemistry*. 4th Ed. Narosa.
3. Mortimer, R. G. (2009).*Physical Chemistry*. 3rd Ed. Elsevier: NOIDA, UP.
4. Barrow, G. M.(2006). *Physical Chemistry*. 5th Ed. New Delhi : Tata McGraw Hill.

Reference Books

1. Engel, T. & Reid, P. (2012). *Physical Chemistry*. 3rd Ed. Prentice-Hall.
2. Rogers, D. W. (2010).*Concise Physical Chemistry*. Wiley.
3. Silbey, R. J., Alberty, R. A. & Bawendi, M. G. (2005).*Physical Chemistry*. 4th Ed. John Wiley & Sons,Inc.

Semester-IV

17CHU402 INORGANIC CHEMISTRY IV: Organometallic Chemistry4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the student to discuss

- The Theoretical Principles in Qualitative Analysis to identify the cations and anions
- The classification of organometallic compounds based on bond type
- The few important metal complexes of commercial importance
- About 18 electron rule
- The catalytic property of organometallic compounds.
- The Metal ions present in biological systems

Course Outcome

The student have discussed

1. The Theoretical Principles in Qualitative Analysis to identify the cations and anions
2. The classification of organometallic compounds based on bond type
3. Few important metal complexes of commercial importance
4. About 18 electron rule
5. The catalytic property of organometallic compounds.
6. The Metal ions present in biological systems

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Theoretical Principles in Qualitative Analysis (H_2S Scheme)

Basic principles involved in analysis of cations and anions. Solubility products, common ioneffect.Principals involved in separation of cations into groups and choice of group reagents.Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after

Group II.

UNIT II

Organometallic Compounds

Definition and classification of organometallic compounds on the basis of bond type.Concept of hapticity of organic ligands. Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series.Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT.π-acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.

UNIT III

Zeise's salt: Preparation and structure, evidences of synergic effect and comparison of synergic effect with that in carbonyls. Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds. Ferrocene: Preparation and reactions (acetylation, alkylation, metallation, MannichCondensation). Structure and aromaticity. Comparison of aromaticity and reactivity with that of
benzene.

UNIT IV

Metal ions present in biological systems, classification of elements according to their action inbiological system. Geochemical effect on the distribution of metals.Sodium / K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug.Iron and its application in bio-systems, Haemoglobin, Myoglobin; Storage and transfer of iron.

UNIT V

Catalysis by Organometallic Compounds

Study of the following industrial processes and their mechanism:

1. Alkene hydrogenation (Wilkinson's Catalyst)
2. Synthetic gasoline (Fischer Tropsch reaction)
3. Polymerisation of ethene using Ziegler-Natta catalyst

Suggested Readings

Text Books:

1. Cotton, F.A., Wilkinson, G., & Gaus, P.L.(1993). *Basic Inorganic Chemistry*.3rd Ed. Wiley India.
2. Huheey, J. E., Keiter, E.A. & Keiter, R.L. (2006). *Inorganic Chemistry: Principles ofStructure and Reactivity.* 4th Ed.Harper Collins.Pearson.
3. Sharpe, A.G. (2005). *Inorganic Chemistry*, 4th Indian Reprint. Pearson Education.
4. Douglas, B. E.; McDaniel, D.H. & Alexander, J.J.(1994).*Concepts and Models in Inorganic Chemistry.* 3rdEd.NY:John Wiley and Sons.
5. Greenwood, N.N. & Earnshaw, A. (1997). *Chemistry of the Elements*.2nd Ed, Elsevier, (Ziegler Natta Catalyst and Equilibria in Grignard Solution).
6. Lee, J.D. (2008). *Concise Inorganic Chemistry*.5th Ed.John Wiley and sons.

Reference Books

1. Powell, P. (1988). *Principles of Organometallic Chemistry*, Chapman and Hall.
2. Shriver, D.D., Atkins, P. and Langford, C.H. (1994).*Inorganic Chemistry*.2nd Ed. OxfordUniversity Press.
3. Miessler, G. L. & Tarr, Donald A. (2010).*Inorganic Chemistr.* 4th Ed.Pearson.

4. Crabtree, Robert H. (2000). *The Organometallic Chemistry of the Transition Metals*. NY: John Wiley New York.
5. Spessard, Gary O., & Miessler, Gary L. (1996). *Organometallic Chemistry*. Upper SaddleRiver, NJ: Prentice-Hall.

Semester-IV

17CHU403 ORGANIC CHEMISTRY IV: Organic spectroscopy4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students to

- Discuss the principle and the theory behind the UV spectroscopy.
- Discuss the principle and the theory behind the IR spectroscopy.
- Explain the principle and the theory behind the NMR spectroscopy.
- Summarize about the occurrence, classification and their biological importance carbohydrates
- Justify about the classification of dyes.
- Justify about polymers and their types, prepartion and uses.

Course Outcome

The Student have gained knowledge about

1. The principle and the theory behind the UV spectroscopy.
2. The principle and the theory behind the IR spectroscopy.
3. The principle and the theory behind the NMR spectroscopy.
4. The occurrence, classification and their biological importance carbohydrates
5. The classification of dyes
6. Preparation ,types, properties and uses of polymers.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT 1

Organic Spectroscopy

General principles to absorption and emission spectroscopy.

UV Spectroscopy: Types of electronic transitions, λ_{max}, Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption; Application of Woodward Rules for calculation of λmax for the following systems: α,β-unsaturated aldehydes, ketones, carboxylic acids and esters; Conjugated dienes: alicyclic, homoannular and heteroannular; Extended conjugated systems (aldehydes, ketones and dienes); distinction between cis and trans isomers.

UNIT II

IR Spectroscopy: Fundamental and non-fundamental molecular vibrations; IR absorptionpositions of O, N and S containing functional groups; Effect of H-bonding, conjugation,resonance and ring size on IR absorptions; Fingerprint region and its significance; application in functional group analysis.

UNIT III

NMR Spectroscopy: Basic principles of Proton Magnetic Resonance, chemical shift and factorsinfluencing it; Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne,
aldehydes and aromatics, Interpetation of NMR spectra of simple compounds.
Applications of IR, UV and NMR for identification of simple organic molecules.

UNIT IV

Carbohydrates

Occurrence, classification and their biological importance.Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers andanomers, mutarotation, determination of ring size of glucose and fructose, Haworth projectionsand conformational structures; Interconversions of aldoses and ketoses; Killiani- Fischersynthesis and Ruff degradation;Disaccharides – Structure elucidation of maltose, lactose and sucrose.Polysaccharides – Elementary treatment of starch, cellulose and glycogen.

UNIT V

Dyes

Classification, Colour and constitution; Mordant and Vat Dyes; Chemistry of dyeing;Synthesis and applications of: Azo dyes – Methyl orange; Triphenyl methane dyes -Malachite green and Rosaniline ; Phthalein Dyes – Phenolphthalein; Natural dyes – structure elucidation and synthesis of Alizarin and Indigotin; Edible Dyes with examples.

Polymers

Introduction and classification including di-block, tri-block and amphiphilic polymers;Polymerisation reactions -Addition and condensation -Mechanism of cationic, anionic and free radical addition polymerization; Metallocene-based Ziegler-Natta polymerisation of alkenes;Preparation and applications of plastics – thermosetting (phenol-formaldehyde, Polyurethanes) and thermosoftening (PVC, polythene); Fabrics – natural and synthetic (acrylic, polyamido, polyester); Rubbers – natural and synthetic: Buna-S, Chloroprene and Neoprene; Vulcanization; Polymer additives; Introductionto; Biodegradable and conducting polymers with examples.

Suggested Readings

Text Book:

1. Kalsi, P. S.(2009).*Textbook of Organic Chemistry*. 1st Ed. New Age International (P) Ltd. Pub.
2. Morrison, R. T. & Boyd, R. N.(1992).*Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Billmeyer, F. W.(1984).*Textbook of Polymer Science*. John Wiley & Sons, Inc.
4. Gowariker, V. R., Viswanathan, N. V. &Sreedhar, J.(2003).*Polymer Science*. New Age International (P) Ltd. Pub.

Reference Books

1. Finar, I. L.(2002). *OrganicChemistry: Stereochemistry and the Chemistry of Natural Products.*Volume 2. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Clayden, J., Greeves, N., Warren, S. & Wothers, P.(2000).*Organic Chemistry*. Oxford University Press.
3. Singh, J.; Ali, S.M. & Singh, J. (2010).*Natural Product Chemistry*. PrajatiPrakashan.

Semester-IV

17CHU411 ELECTROCHEMISTRY- PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students to

- Perform in the conductance measurement,
- Determine of cell constant
- Determine the conductometric titrations
- Determine the kinetic aspects and rate measurements of different types of reactions.
- Determine the Acid hydrolysis of methyl acetate with hydrochloric acid.
- Determine the Saponification of ethyl acetate

Course Outcome

The Student have interpreted to

1. Measured the conductance
2. Determination of the cell constant
3. Determination of conductometric titrations
4. The kinetic aspects and rate measurements of different types of reactions.
5. Determination the Acid hydrolysis of methyl acetate with hydrochloric acid.
6. Determination of the Saponification of ethyl acetate

Methodology

Measurements with conductivity meters, reaction rate measurements

Conductometry:

I. Determination of cell constant

II. Determination of conductivity, molar conductivity, degree of dissociation anddissociation constant of a weak acid.

III. Perform the following conductometric titrations: i. Strong acid vs. strong base ii. Weakacid vs. strong base iii. Mixture of strong acid and weak acid vs. strong base iv. Strongacid vs. weak base

Chemical Kinetics:

IV. Study the kinetics of the following reactions.

1. Iodide-persulphate reaction (i) Initial rate method; (ii)Integrated rate method
2. Acid hydrolysis of methyl acetate with hydrochloric acid.
3. Saponification of ethyl acetate.
4. Comparison of the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate.

Suggested Readings

Text Books:

1. Khosla, B. D., Garg, V. C. & Gulati, A. (2011).*Senior Practical Physical Chemistry*.New Delhi: R. Chand & Co.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P.(2003).*Experiments in Physical Chemistry*.8th Ed. New York : McGraw-Hill

Reference Books

1. Halpern, A. M. & McBane, G. C. (2003).*Experimental Physical Chemistry*. 3rd Ed.New York: W.H. Freeman & Co.

Semester-IV

17CHU412 ORGANOMETALLIC CHEMISTRY- PRACTICAL4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course Objectives

This lab course enables the student to

- Identify the anions and the cations in a mixture by Qualitative semimicro analysis
- Understand the chemistry of different reactions
- Identify the interfering anion
- Outline the principles behind the spot tests
- chromatographic separations
- Paper chromatographic separation of nickel and cobalt, copper and cadmium

Course Outcome

The students have

1. Identified the anions and the cations in a mixture by Qualitative semi micro analysis
2. Understood the chemistry of different reactions.
3. Identified the interfering anion
4. Define the principles behind the spot tests and
5. Define the Principles of chromatographic separations
6. Paper chromatographic separation of nickel and cobalt, copper and cadmium

Methodology

Qualitative semimicro analysis

Qualitative semimicro analysis of mixtures containing 3 anions and 3 cations. Emphasis should be given to the understanding of the chemistry of different reactions. The following radicals are suggested:

CO_3^{2-}, NO^{2-}, S^{2-}, SO_3^{2-},$S_2O_3^{2-}$, CH_3COO^-, F^-,Cl^-, Br^-, I-, NO^{3-}, BO_3^{3-}, $C_2O_4^{2-}$, PO_4^{3-}, NH^{4+}, K^+, Pb^{2+}, Cu^{2+}, Cd^{2+}, Bi^{3+}, Sn^{2+}, Sb^{3+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}

Mixtures should preferably contain one interfering anion, **or** insoluble component ($BaSO_4$,$SrSO_4$, $PbSO_4$, CaF_2or Al_2O_3) **or** combination of anions e.g. $CO_3^{2-}$and SO_3^{2-}, NO_2-and NO_3^-,

Cl-and Br-Cl-and I-, Br-and I, $NO_3^-$and Br^-, $NO_3^-$and I^-

Spot tests should be done whenever possible.

Principles involved in chromatographic separations. Paper chromatographic separation offollowing metal ions:

i. Ni (II) and Co (II)
ii. Cu(II) and Cd(II)

Suggested Reading

1. Svehla,G. (1996)Vogel's*Qualitative Inorganic Analysis*, Longman, New York.

Semester-IV

17CHU413 ORGANIC SPECTROSCOPY - PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course objectives

The student will able to develop and identify the

- Extraction caffeine from tea leaves.
- Preparation urea formaldehyde resin
- Qualitative analysis of unknown organic compounds
- Simple organic compounds by IR spectroscopy
- Simple organic compounds by NMR spectroscopy
- Preparation of methyl orange

Course outcome

The students have to catagorize and demonstrate

1. About the Extraction of caffeine from tea leaves.
2. The Preparation of urea formaldehyde resin
3. The qualitative analysis of unknown organic compounds
4. Identify simple organic compounds by IR spectroscopy
5. Identify simple organic compounds by NMR spectroscopy
6. The Preparation of methyl orange

Methodology

Spectroscopic methods UV, IR and NMR

1. Extraction of caffeine from tea leaves.
2. Preparation of urea formaldehyde resin.
3. Qualitative analysis of unknown organic compounds containing monofunctional groups(carbohydrates, aryl halides, aromatic hydrocarbons, nitro compounds, amines and amides) andsimple bifunctional groups, e.g. salicylic acid, cinnamic acid, nitrophenols etc.
4. Identification of simple organic compounds by IR spectroscopy and NMR spectroscopy(Spectra to be provided).
5. Preparation of methyl orange.

Suggested Readings

Text Books:

1. Vogel, A.I. (2012).*Quantitative Organic Analysis*. Part 3. Pearson.
2. Mann, F.G. & Saunders, B.C. (2009). *Practical Organic Chemistry*. Pearson Education
3. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. &Tatchell, A.R. (2012). *Practical Organic Chemistry*. 5th Ed. Pearson.

Reference Books

1. Ahluwalia, V.K. &Aggarwal, R. (2000*). Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis.* University Press.
2. Ahluwalia, V.K. &Dhingra, S. (2000).*Comprehensive Practical Organic Chemistry: QualitativeAnalysis*. University Press.

Semester-IV

17CHU404A GREEN METHODS IN CHEMISTRY 3H 3C

Instruction Hours/week:L:3 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the students to

- Summarize the twelve principles of green chemistry
- To know the special emphasis of an atom economy.
- Explain the catalysis and alternate sources of energy.
- Describe the process involved in the real word cases likeSurfactants for CO_2
- Synthetic azo pigments to replace toxic organic and inorganicpigments.
- Determination of environmentally safe marine antifoulant and plastic (poly lactic acid) made from corn.

Course outcome

1. Recognise the impact of green chemistry on human health and the environment.
2. Knowledge about the special emphasis of an atom economy.
3. Demonstrate the knowledge of the twelve principles of Green Chemistrywhich they can apply to a range of work places for a safer, less toxic and heal thier environment.
4. Described the process involved in the real word cases likeSurfactants for CO_2
5. Synthetic azo pigments to replace toxic organic and inorganicpigments.
6. Determination of environmentally safe marine antifoulant and plastic (poly lactic acid) made from corn.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Theory and Hand-on Experiments

Introduction: Definitions of Green Chemistry. Brief introduction of twelve principles ofGreen Chemistry, with examples, special emphasis on atom economy, reducing toxicity,green solvents,

UNIT II

Green Chemistry and catalysis and alternative sources of energy, Greenenergy and ustainability

UNIT III

The following Real world Cases in Green Chemistry should be discussed:

Surfactants for carbon dioxide – Replacing smog producing and ozone depletingsolvents with CO_2 for precision cleaning and dry cleaning of garments.

UNIT IV

Designing of environmentally safe marine antifoulant.Rightfit pigment: Synthetic azo pigments to replace toxic organic and inorganicpigments.

UNIT V

An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from corn.

Suggested Readings

Text Books:

1. Anastas, P.T. & Warner, J.K. (2005).*Green Chemistry- Theory and Practical*. Oxford University Press.
2. Matlack, A.S. (2001).*Introduction to Green Chemistry*. Marcel Dekker.

Reference Books

1. Cann, M.C. & Connely, M.E. (2000). *Real-World cases in Green Chemistry*, American Chemical Society.Washington.

Semester-IV

17CHU404B ANALYTICAL CLINICAL BIOCHEMISTRY 3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

This course enables the student to

- Classify the basic structure of carbohydrates, and fermentation processes.
- Classification and biological importance of Proteins.
- Classification and biological importance of lipids.
- Properties, functions and biochemical functions of steroid hormones
- Know the about enzyme ,classification , mechanism and factors affectingenzyme activity.
- Identify the biochemistry of diseases.

Courseoutcome

The students have knowledge to categorize

1. The basic structure of carbohydrates.
2. Classification and biological importance of Proteins.
3. Classification and biological importance of lipids.
4. Properties, functions and biochemical functions of steroid hormones
5. Knowledge about enzyme, classification, mechanism and factors affectingenzyme activity.
6. The biochemistry of diseases.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Unit I

Carbohydrates: Biological importance of carbohydrates, Metabolism, Cellular currency ofenergy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle.Isolation and characterization of polysachharides.

Unit II

Proteins: Classification, biological importance; Primary and secondary and tertiary structuresof proteins: α-helix and β- pleated sheets, Isolation, characterization, denaturation of proteins.*Enzymes:* Nomenclature, Characteristics (mention of Ribozymes), Classification; Active site,Mechanism of enzyme action, Stereospecificity of enzymes, Coenzymes and cofactors,Enzyme inhibitors, Introduction to Biocatalysis: Importance in "Green Chemistry" andChemical Industry.

Unit III

Lipids: Classification. Biological importance of triglycerides and phosphoglycerides andcholesterol; Lipid membrane, Liposomes and their biological functions and underlyingapplications.Lipoproteins.

Unit IV

Properties, functions and biochemical functions of steroid hormones.Biochemistry of peptide hormones.

Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNAand RNA: Replication, Transcription and Translation, Introduction to Gene therapy.

Enzymes: Nomenclature, classification, effect of pH, temperature on enzyme activity, enzymeinhibition.

Unit V

Biochemistry of disease: A diagnostic approach by blood/ urine analysis.

Blood: Composition and functions of blood, blood coagulation. Blood collection andpreservation of samples.Anaemia, Regulation, estimation and interpretation of data for bloodsugar, urea, creatinine, cholesterol and bilirubin.

Urine: Collection and preservation of samples. 6. Formation of urine. Composition andestimation of constituents of normal and pathological urine.

Suggested Readings

Text Books:

[1] Cooper, T.G. (1977). *Tool of Biochemistry.* John Wiley and Sons.
[2] Keith Wilson & John Walker.(1994).*Practical Biochemistry*. Cambridge University Press.
[3] Alan H Gowenlock,(2005). Varley's.*Practical Clinical Biochemistry*.CBS Publisher.
[4] Thomas M. Devlin.(2009).*Textbook of Biochemistry*. Academic Internet Publishers.
[5] Berg, J.M., Tymoczko, J.L. & Stryer, L.(2002).*Biochemistry*. W.H. Freeman.

Reference Books

1. Nelson, D. L. & Cox, M. M.(2008).*Lehninger's Principles of Bioch*emistry. 7th Ed.W. H. Freeman.
2. Harwood. (1990). *Series on Analytical Chemistry*. John Wiley & Sons.

Semester-IV

17CHU414A GREEN METHODS IN CHEMISTRY –PRACTICAL 3H 1C

Instruction Hours/week:L:0 T:0 P:3 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student to

- Apply the principles and the practical aspects of green chemistry
- Prepare biodiesel from vegetable oil.
- Prepare phthalocyaninecomplex of Cu (II).
- Characterise the biodiesel.
- Mechano chemical solvent free synthesis of azomethine.
- Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II)

Course outcome

The students have to use

1. The basic principles and practical aspects like preparations and characterization in green approach.
2. Preparation and characterization of biodiesel from vegetable oil.
3. Characterization of biodiesel from vegetable oil.
4. Preparation of phthalocyaninecomplex of Cu(II).
5. Mechano chemical solvent free synthesis of azomethine.
6. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).

Methodology

Greener methods of preparation and characterisation

Practical's

1. Preparation and characterization of biodiesel from vegetable oil.
2. Extraction of D-limonene from orange peel using liquid CO2 prepared from dry ice.
3. Mechano chemical solvent free synthesis of azomethine.
4. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex ofcopper(II).

SuggestedReadings

Text Books:

1. Anastas, P.T. & Warner, J.K. (2005).*Green Chemistry- Theory and Practical*. OxfordUniversity Press.
2. Matlack, A.S. (2001). *Introduction to Green Chemistry*. Marcel Dekker
3. Cann, M.C. & Connely, M.E. (2000). *Real-World cases in Green Chemistry*, AmericanChemical Society. Washington.

Reference Books

1. Ryan, M.A. & Tinnesand, M. (2002).*Introduction to Green Chemistry*. AmericanChemical Society. Washington.
2. Lancaster, M.(2010).*Green Chemistry: An introductory text.* 2ndEdition.RSC publishing.

Semester-IV

17CHU414B ANALYTICAL CLINICAL BIOCHEMISTRY -PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3Marks: Internal: 40 External: 60 Total:100

Course outcome

The course enables the student to

- Identify and estimate carbohydrates.
- Identify and estimate lipids.
- Estimate the iodine number of oils
- Determine the saponification number of oils.
- Determine Cholesterol.
- Determine proteins

Course outcome

The students have to perform

1. The Identification and estimation of carbohydrates, iodine number and saponification number of oils
2. The Identification and estimation of lipids.
3. Estimation of the iodine number of oils
4. Determination the saponification number of oils.
5. Determination of Cholesterol
6. The determination of proteins

Methodology

Identification and estimation of the following:

1. Carbohydrates – qualitative and quantitative.
2. Lipids – qualitative.
3. Determination of the iodine number of oil.
4. Determination of the saponification number of oil.
5. Determination of cholesterol using Liebermann- Burchard reaction.
6. Proteins – qualitative.
7. Isolation of protein.
8. Determination of protein by the Biuret reaction.
9. Determination of nucleic acids

Suggested Readings

Text Books:

1. Cooper, T.G. (1977). *Tool of Biochemistry.* John Wiley and Sons.
2. Keith Wilson & John Walker.(1994).*Practical Biochemistry*. Cambridge University Press.
3. Alan H Gowenlock,(2005). Varley's.*Practical Clinical Biochemistry*.CBS Publisher.
4. Thomas M. Devlin.(2009).*Textbook of Biochemistry*. Academic Internet Publishers.
5. Berg, J.M., Tymoczko, J.L. & Stryer, L.(2002).*Biochemistry*. W.H. Freeman.

Reference Books

1. Nelson, D. L. & Cox, M. M.(2008).*Lehninger's Principles of Bioch*emistry. 7th Ed.W. H. Freeman.
2. Harwood. (1990). *Series on Analytical Chemistry*. John Wiley & Sons.

Semester-V

17CHU501 MATHEMATICS I4H 4C

Instruction Hours/week: L:4 T:0 P:0Marks: Internal:40 External: 60 Total:100

Course Objectives

This course enables the students to learn

- Mathematics is an important tool for the study of physics and Chemistry.
- The concepts of Matrices and their properties.
- Techniques of differentiation and integration.
- Basic mathematical tools like vector analysis of MatricesComplex variables and analyis etc.
- Differential Calculus
- Integral Calculus

Course Outcomes (COs)

On successful completion of this course, the students will be able to

1. Solve simultaneous equations with the help of matrices.
2. Mastery in the concepts of vector and scalar fields.
3. Gain the intellectual knowledge of complex functions and their applications.
4. Acquire fundamental knowledge in the techniques of differentiation.
5. Know the properties of definite integrals.
6. Learnt about differencial calculus and Integral calculuc.

UNIT I

Matrices: Different types of matrices – Inverse of a matrix – Solution of simultaneous equations by matrix method- Cayley-Hamilton theorem(Statement only)-Verification.

UNIT II

Vector calculus: Concepts of vector and scalar fields- Derivative of a vector - The Del operator, Gradient – Divergence of a vector – Curl of a vector- Directional derivative – Formula involving ∇ operator. Laplacian Operator.

UNIT III

Complex variables: Analytical function –Cauchy –Riemann equations – The necessary and sufficient condition for f(z) to be analytic – Polar form of C-R equation-Properties of analytic function – Construction of analytic functions – Milne Thomson method.

UNIT IV

Differential calculus: Differentiation- Curvature and radius of Curvature in Cartesian and Polar form – Evolutes – Involute.

UNIT V

Integral Calculus: Definite and Indefinite integrals – Methods of Integration – Integration by substitution – Integration by parts.

SUGGESTED READINGS

1. Venkataraman. M. K.,(1998). Engineering Mathematics, The National Publications& Co., Chennai.

2. Manickavasagam Pillai.T.K , and S. Narayanan, 2002.“Calculus”, Volume I, and Volume II S.V Printers & Publishers, Chennai (Unit IV, V)

3. Sastry .S.S,2009, Engineering mathematics, PHI learning Pvt. Ltd, New Delhi (Unit-III)

Semester-V

17CHU502 PHYSICS I 4H 4C

Instruction Hours/week: L:4 T:0 P:0Marks: Internal:40 External: 60 Total:100

Course Objectives:

- To understand basic theories and experiments in Physics.
- To understand the fundamentals of physics.
- To educate and motivate the students in the field of science
- To know about about thermal physics
- To learn about Lase and optics physics
- To learn about fundamentals of electronics

Course Outcomes:

1. Students will demonstrate proficiency in mathematics and the mathematical concepts to understand physics.
2. Students will design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes.
3. Students will demonstrate an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.
4. knowledge about about thermal physics
5. Learnt about Lase and optics physics
6. Learnt about fundamentals of electronics

UNIT-I

PROPERTIES OF MATTER: Elastic constants of an isotropic solid -Stress – Strain - Relations connecting them - Poisson's ratio - Bending of beams - Uniform and non-uniform bending - Bending moment of a bent beam - cantilever - Static and dynamic methods - Torsion in a wire - Rigidity modulus determination by Static and dynamic methods.

Surface tension and Surface energy- Pressure difference across a spherical surface- Pressure difference across a curved surface.

UNIT-II

MECHANICS: Motion of bodies in 2–D - Newton's laws - projectile motion – range- maximum height – projectile from space flight- Rotational motion – Rotation with constant angular acceleration –angular momentum of particles – rigid body – spinning top – conservation of angular momentum – Planetary motion – Kepler's laws – universal law of gravitation.

UNIT-III

THERMAL PHYSICS: Laws of thermodynamics – Reversible and irreversible process – Heat engine – Carnot's theorem.

Black body – Stefan's law – Newton's law of cooling – Newton's law of cooling from Stefan's law – Experimental determination of Stefan's constant – Wien's displacement law – Rayleigh – Jean's law – Planck's law.

UNIT-IV

OPTICS AND LASER PHYSICS: Reflection – Refraction – Snell's law – Total internal reflection – Interference – Diffraction – Polarization – Coherence

Stimulated emission and absorption – Einstein's theory of radiation - population inversion – optical pumping – meta stable state – conditions for laser actions – Ruby laser – Helium – neon laser – applications of lasers – Raman effect – Raman shift – stokes and anti-stokes lines.

UNIT-V

BASIC ELECTRONICS: Intrinsic and extrinsic semiconductor – PN Junction diode – Biasing of PN junction – V-I characteristics of junction diode – Rectifiers – Half wave – Full wave and bridge rectifiers – Zener diode – Characteristics of Zener diode – Voltage regulator – Transistor – Characteristics of transistor – CB, CE mode – Transistors as an amplifier.

SUGGESTED READINGS

1. Murugesan. R., Modern Physics, S.Chand & Co, New Delhi.
2. Brijlal and N. Subramanyam, 2004, Properties of matter, S. Chand & Company, New Delhi.
3. Aruldhas and P.Rajagopal, Modern Physics, Prentice Hall of India, New Delhi.
4. Mathur. D.S., 2003, Elements of properties of matter - Shyamlal Charitable Trust, New Delhi.
5. Principles of Electronics, V K Mehta and Rohit Mehta, S.Chand & Company Ltd. Revised Eleventh Edition 2008.
6. F. W. Sears and G. L. Salinger, Thermodynamics, Kinetic theory, and Statistical Thermodynamics, IIIrd ed., Narosa Publishing House (1998).
7. Ghatak and Thygarajan, Lasers, Theory and applications, Macmillan IndiaLtd., New Delhi, (1984)

Semester-V

17CHU503A POLYMER CHEMISTRY 4H 4C

Instruction Hours/week:L:4 T:0 P:0 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student to

- Recognize the history of polymeric materials, criteria, kinetics and characterization of polymerisation.
- Criteria for polymeric material formation.
- Learn Kinetics of polymerization.
- Understand Characterisation of polymerisation.
- To know the Structure property relationships of polymer
- Justify the properties of polymers

Course outcome

The students have list the knowledge like

1. History of polymeric materials.
2. Criteria for polymeric material formation.
3. Learned Kinetics of polymerization.
4. Understood Characterisation of polymerisation.
5. Kwoledge about Structure property relationships of polymer.
6. Properties of polymers.

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction and history of polymeric materials:

Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance:

Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization.Bifunctional systems, Poly-functional systems.

UNIT II

Kinetics of Polymerization:

Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

Crystallization and crystallinity:

Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

UNIT III

Nature and structure of polymers - Structure Property relationships.

Determination of molecular weight of polymers (*Mn*, *Mw*, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

UNIT IV

Glass transition temperature (Tg) and determination of Tg, Free volume theory, WLF equation, Factors affecting glass transition temperature (Tg).

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

UNIT V

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Suggested Readings

Text Books:

1. Seymour R.B., Charles E (2003). *Seymour's Polymer Chemistry: An Introduction.* Marcel Dekker, Inc.
2. G. Odian.(2004). *Principles of Polymerization*.John Wiley.
3. F.W. Billmeyer.(1972). *Text Book of Polymer Science*.John Wiley.
4. P. Ghosh. (2001). *Polymer Science & Technology*. Tata Mcgraw-Hill.

Reference Book

1. R.W. Lenz.(1968). *Organic Chemistry of Synthetic High Polymers*.John Wiley.

Semester-V

17CHU503BNOVEL INORGANIC SOLIDS4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course objectives

The course enables the students have to perform

- The Synthesis and modification of inorganic solids of technological importance
- Understand about the inorganic solids of technological importance
- The Synthesis and properties of nanomaterials
- The Synthesis of engineering materials used for mechanical construction
- The Synthesis and properties of composite materials
- The Synthesis and properties of speciality polymers

Course outcome

The student have identified

1. The Synthesis and modification of inorganic solids
2. Understood about inorganic solids of technological importance
3. The Synthesis and properties of nanomaterials
4. The Synthesis of engineering materials used for mechanical construction
5. The Synthesis and properties of composite materials
6. The Synthesis and properties of speciality polymers

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Synthesis and modification of inorganic solids:

Conventional heat and beat methods, Co-precipitation method, Sol-gel methods,Hydrothermal method, Ion-exchange and Intercalation methods.

Inorganic solids of technological importance:

Solid electrolytes – Cationic, anionic, mixed Inorganic pigments – coloured solids, white andblack pigments.Molecular material and fullerides, molecular materials & chemistry – one-dimensionalmetals, molecular magnets, inorganic liquid crystals.

UNIT II

Nanomaterials:

Overview of nanostructures and nanomaterials: classification.Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-controlof nanoarchitecture-onedimensional control.Carbon nanotubes and inorganic nanowires.Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials,bionano composites.

UNIT III

Introduction to engineering materials for mechanical construction:

Composition, mechanical and fabricating characteristics and applications of various types ofcast irons, plain carbon and alloy steels, copper, aluminium and their alloys like duralumin,brasses

and bronzes cutting tool materials, super alloys thermoplastics, thermosets andcomposite materials.

UNIT IV

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites,classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrixcomposites, fibre-reinforced composites, environmental effects on composites, applicationsof composites.

UNIT V

Speciality polymers:

Conducting polymers - Introduction, conduction mechanism, polyacetylene,polyparaphenylene and polypyrrole, applications of conducting polymers, Ion-exchangeresins and their applications. Ceramic & Refractory: Introduction, classification, properties,raw materials, manufacturing and applications.

SuggestedReadings

Text Books:

1. Shriver & Atkins. (2014). *Inorganic Chemistry*, Oxford University Press.
2. Peter Alkins, Tina Overton, Jonathan Rourke,Mark Weller and Fraser Armstrong. (2011-2012). 5th Edition. Oxford University Press.
3. Adam, D.M. (1974) *Inorganic Solids: An introduction to concepts in solid-state structuralchemistry*. John Wiley & Sons.

Reference Books

1. Poole, C.P. & Owens, F.J. (2003). *Introduction to Nanotechnology*. John Wiley & Sons.
2. Rodger, G.E. (2002). *Inorganic and Solid State Chemistry*. Cengage Learning India Edition.

Semester-V

17CHU511 MATHEMATICS-I - PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This course enables the students

- To develop skills for quantitative estimation using computer language.
- To code various differentiation and integration methods in a modern computer language.
- To plot the graphs of function
- Matrix addition.
- Matrix multiplication
- Inverse of a matrix.

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Solve complicated matrix related problems like matrix inverse and matrix multiplication.
2. Acquire problem-solving skills through computer programming.
3. Plot various functions and parametric curves.
4. Matrix addition.
5. Matrix multiplication
6. Inverse of a matrix.

List of Practical

1. Matrix addition.

2. Matrix multiplication.

3. Inverse of a matrix.

4. Transpose of a matrix

5. Plotting of graphs of function $e^{ax + b}$, log(ax + b), 1/(ax + b), sin(ax + b), cos(ax + b), |ax +b| and to illustrate the effect of a and b on the graph.
6. Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.

7. Sketching parametric curves. (Eg. Trochoid, cycloid, epicycloids, hypocycloid).

8. Obtaining surface of revolution of curves.

Semester-V

17CHU512 PHYSICS-II - PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objective

- To acquire basic understanding of laboratory technique and to educate and motivate the students in the field of Physics
- To allow the students to have a deep knowledge of fundamentals of optics.
- Young's Modulus-Non Uniform bending-Optic lever
- Determination of spring constant of the given spring.
- Determine the radius of capillary tube using microscope.
- Refractive Index of a solid prism (I-d) curve-Spectrometer

Course outcome

Students can able to

1. Perform basic experiments in mechanics and electricity and analyze the data.
2. Acquire engineering skills and Practical knowledge, which help the student in their everyday life.
3. know the physical Principles and applications of Electronics.
4. Young's Modulus-Non Uniform bending-Optic lever
5. Determination of spring constant of the given spring.
6. Determine the radius of capillary tube using microscope.
7. Refractive Index of a solid prism (I-d) curve-Spectrometer

ANY TEN EXPERIMENTS

Experiments

1. Young's Modulus-Non Uniform bending-Optic lever
2. Young's Modulus-Static cantilever
3. Acceleration due to gravity-Compound pendulum
4. Determination of spring constant of the given spring.
5. Determine the radius of capillary tube using microscope.
6. Refractive Index of a solid prism (I-d) curve-Spectrometer
7. Co-efficient of thermal conductivity-Lee's disc method
8. Wavelength of spectral lines -Grating-minimum deviation method-Spectrometer.
9. Characteristics of a Zener and Junction diode
10. μ of a lens-Newton's ring method
11. Thickness of a thin wire-Air wedge method
12. Determine the surface tension - Drop weight method
13. Determine the wavelength of He-Ne laser.
14. Determination of the Coefficient of Viscosity of a given liquid using Burette method
15. Construct a single stage amplifier using transistor

SUGGESTED READINGS:

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
1. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, Pragathi Prakashan, Meerut
2. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, Pragathi Prakashan, Meerut

Semester-V

17CHU513A POLYMER CHEMISTRY - PRACTICAL 4H 2C

Instruction Hours/week:L:0 T:0 P:4 Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student have to apply

- Have hands on experience to prepare different types of polymers by various methods
- To do the purification of polymers
- To characterise the polymers by chemical and instrumental methods.
- To prepare isopthaloyl chloride
- Determine hydroxyl number of a polymer using colorimetric method
- Analyse the polymers

Course outcome

The students have demonstrate and perform

1. The preparation of different types of polymers by various methods
2. The purification of polymers
3. The characterization the polymers by chemical and instrumental methods.
4. Preparation of isopthaloyl chloride
5. Determination of hydroxyl number of a polymer using colorimetric method
6. Analysis of the polymers

Polymer synthesis

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA).
   a. Purification of monomer
   b. Polymerization using benzoyl peroxide (BPO) / 2,2'-azo-bis-isobutylonitrile (AIBN)
2. Preparation of nylon 66/6
   1. Interfacial polymerization, preparation of polyester from isophthaloyl chloride (IPC) and phenolphthalein
   a. Preparation of IPC
   b. Purification of IPC
   c. Interfacial polymerization

3. Redox polymerization of acrylamide
4. Precipitation polymerization of acrylonitrile
5. Preparation of urea-formaldehyde resin
6. Preparations of novalac resin/resold resin.
7. Microscale Emulsion Polymerization of Poly(methylacrylate).

Polymer characterization

1. Determination of molecular weight by viscometry:
   (a) Polyacrylamide-aq.NaNO2 solution
   (b) (Poly vinyl proplylidine (PVP) in water
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of ―head-to-head‖ monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis: Polyethylene glycol (PEG) (OH group).
4. Testing of mechanical properties of polymers.
5. Determination of hydroxyl number of a polymer using colorimetric method.

Polymer analysis

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. Instrumental Techniques
3. IR studies of polymers
4. DSC analysis of polymers
5. Preparation of polyacrylamide and its electrophoresis
   *at least 7 experiments to be carried out.

SuggestedReadings

Text Books:

1. Malcohm P. Stevens(1999). *Polymer Chemistry: An Introduction*. 3rd Ed. Oxford University Press.
2. Harry R. Allcock, Frederick W. Lampe and James E. Mark, (2003*).Contemporary Polymer Chemistry*. 3rd ed. Prentice-Hall
3. Fred W. Billmeyer, (1984).*Textbook of Polymer Science*. 3rd ed. Wiley-Interscience
4. Joel R. Fried, (2003).*Polymer Science and Technology*.2nd ed. Prentice-Hall.
5. Petr Munk & Tejraj M. Aminabhavi, (2002).*Introduction to Macromolecular Science*. 2nd ed. John Wiley & Sons

Reference Books

1. L. H. Sperling,.(2005). *Introduction to Physical Polymer Science*.4th ed. John Wiley & Sons.
2. Malcolm P. Stevens, (2005).*Polymer Chemistry: An Introduction*. 3rd ed. Oxford University Press.
3. Charles E. Carraher,.(2013). *Seymour/ Carraher's Polymer Chemistry*. 9th ed. Jr.

Semester-V

17CHU513B NOVEL INORGANIC SOLIDS- PRACTICAL 4H 2C

Instruction Hours/week: L:0 T:0 P:04 Marks: Internal: 40 External: 60 Total:100

Course objectives

The course helps the student to

- Explain the ion exchange method
- Expalin the cation exchange method
- coprecipitation methods of novel inorganic solids
- Discuss the method for the preparation of nanoparticles
- Nano partical preparation using green method
- Prepare the hydrogel by coprecipitation method

Course outcome

The students have demonstrated

1. The cation exchange method
2. The ion exchange method
3. coprecipitation methods of novel inorganic solids
4. The method for the preparation of nanoparticles
5. Nano partical preparation using green method
6. Preparation of the hydrogel by coprecipitation method

1. Determination of cation exchange method
2. Determination of total difference of solids.
3. Synthesis of hydrogel by co-precipitation method.
4. Synthesis of metal nanoparticles.

Suggested Reading:

1. Fahlman, B.D. (2004).*Materials Chemistry,* Springer.

Semester-V

17CHU504A CHEMINFORMATICS 3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal:40 External: 60 Total:100

Course objectives

This course enables the student to

- Describe the principles of cheminformatics
- Explain the Representation of molecules and chemical reactions
- Predict the searching methods for chemical structures
- Predict the properties of molecules using computational methods
- QSAR studies
- Intepret the computer assisted structure elucidations.

Courseoutcome

The students have presented the knowledge about

1. The principles of cheminformatics
2. The Representation of molecules and chemical reactions
3. The searching methods for chemical structures
4. The prediction of the properties of molecules using computational methods
5. QSAR studies
6. The computer assisted structure elucidations

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Chemoinformatics: History and evolution of chemoinformatics, Use ofchemoinformatics, Prospects of chemoinformatics, Molecular Modelling and Structureelucidation.

UNIT II

Representation of molecules and chemical reactions: Nomenclature, Different types ofnotations, SMILES coding, Matrix representations, Structure of Molfiles and Sdfiles,Libraries and toolkits, Different electronic effects, Reaction classification.

UNIT III

Searching chemical structures: Full structure search, sub-structure search, basic ideas,similarity search, three dimensional search methods, basics of computation of physical andchemical data and structure descriptors, data visualization.

UNIT IV

Applications: Prediction of Properties of Compounds; Linear Free Energy Relations;Quantitative Structure-Property Relations; Descriptor Analysis; Model Building; ModellingToxicity; Structure-Spectra correlations; Prediction of NMR, IR and Mass spectra;

UNIT V

ComputerAssisted Structure elucidations; Computer Assisted Synthesis Design, Introduction to drugdesign; Target Identification and Validation; Lead Finding and Optimization; Analysis of HTS data; Virtual Screening; Design of Combinatorial Libraries; Ligand-Based and StructureBased Drug design; Application of Chemoinformatics in Drug Design.

Suggested Readings

Text Books:

1. Andrew R. Leach & Valerie, J. Gillet (2007). *An introduction to Chemoinformatics.* Springer: The Netherlands.
2. Gasteiger, J. & Engel, T. (2003).*Chemoinformatics: A text-book.* Wiley-VCH.

Reference Book

1. Gupta, S. P. (2011).*QSAR & Molecular Modeling.* New Delhi: Anamaya Pub.

Semester-V

17CHU504B CHEMISTRY OF COSMETICS & PERFUMES 3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

This skill enhancement course helps the student to

- Develop the preparation of hair dyes, hair spray and shampoos
- Develop the preparation of Hair spray
- Describe the preparation and uses of lotions,
- Describe the preparation and uses lipsticks
- Describe the preparation and uses talcum powder and Creams.
- Demonstrate the chemistry of essential oils

Course outcome

The students have formulate the knowledge about

1. The preparation of hair dyes, hair spray and shampoos
2. The preparation and uses of lotions,
3. The preparation and uses of lipsticks and
4. The preparation and uses of talcum powder
5. The preparation and uses of creams
6. The chemistry of essential oils

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Unit I

A general study including preparation and uses of the following: Hair dye, hair spray,Shampoo.

Unit II

Preparation and uses of suntan lotions, face powder, lipsticks, talcum powder, nail enamel,

Unit III

Preparation and uses of creams (cold,vanishing and shaving creams), antiperspirants and artificial flavours.

Unit IV

Essential oils and theirimportance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil

Unit V

Essential oils and theirimportance in cosmetic industries with reference to eucalyptus rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

Suggested Readings

Text Books:

1. E. Stocchi. (1990).*Industrial Chemistry*. Vol –I. UK : Ellis Horwood Ltd.
2. P.C. Jain, M. Jain (2004).*Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.

Reference Books

1. Sharma, B.K. & Gaur, H. (1996).*Industrial Chemistry.*Meerut : Goel Publishing House.

Semester-V

17CHU514A CHEMINFORMATICS- PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3Marks: Internal:40 External: 60 Total:100

Course objectives

The course helps the student to

- Apply the applications of chemiinformatics in drug design.
- Draw the chemical structure using chemdraw software.
- Molecular docking studies were carried using Autodock software.
- Predict ADME using swissadme software
- Learn Lipinski's rule of five using swissadme software.
- Predict drug likeness

Course outcome

The students know to perform the cheminformatics aspects in the drug designing process.

1. Applied the applications of chemiinformatics in drug design.
2. Draw the chemical structure using chemdraw software.
3. Molecular docking studies were carried using Autodock software.
4. Prediction ADME using swissadme software
5. Learned Lipinski's rule of five using swissadme software.
6. Prediction of drug likeness

Methodology

Computer software's

Hands-on Exercises

Application of Chemoinformatics in Drug Design

Suggested Readings

Text Books:

1. Andrew R. Leach & Valerie, J. Gillet. (2007). *An introduction to Chemoinformatics.* Springer: The Netherlands.
2. Gasteiger, J. & Engel, T. (2003).*Chemoinformatics: A text-book.* Wiley-VCH.

Reference Book

1. Gupta, S. P. (2011). *QSAR & Molecular Modeling.* New Delhi: Anamaya Pub.

Semester-V

17CHU514B CHEMISTRY OF COSMETICS & PERFUMES - PRACTICAL 3H 1C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

This course enables the student to

- Prepare of talcum powder.
- Prepare of shampoo.
- Prepare of enamels.
- Prepare of hair remover.
- Prepare of face cream.
- Prepare of nail polish and nail polish remover.

Course outcomes

Students have knowledge to compose about the

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.
5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover

Methodology

Preparations of cosmetics and perfumes

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.

5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover.

SuggestedReadings

Text Books:

1. E. Stocchi. (1990).*Industrial Chemistry*, Vol –I. UK: Ellis Horwood Ltd.
2. P.C. Jain, M. Jain(2004). *Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.

Reference Book

1. Sharma, B.K. & Gaur, H. (1996). *Industrial Chemistry.* Meerut: Goel Publishing House.

Semester-VI

17CHU601 MATHEMATICS II 4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This course enables the students to learn

- The Concept of Fourier analysis and solving boundary value problems.
- Techniques of Fourier transform
- To solve differential equations.
- Numerical techniques of differentiation and integration.
- To know about Laplacian transforms
- To solve diffential equation

Course Outcomes (COs)

On successful completion of this course, the students will be able to

1. Appreciate the physical significance of Fourier series
2. Understand the mathematical principles on transforms.
3. Apply mathematical foundation to formulate and solve problems arising in physics
4. Synthesize numerical techniques for practical problems
5. know about Laplacian transforms
6. solve diffential equation

UNIT I

Fourier series: Definition – Finding Fourier coefficients for a given periodic function with period 2π – Odd and Even functions – Half Range Series

UNIT II

Fourier Transforms: Definition of Fourier Transform-Properties of Fourier Transform- Inverse Fourier transform-Convolution theorem-Finite Fourier Sine &Cosine Transform –Parseval's theorem.

UNIT III

Laplace Transforms: Definition of Laplace Transform - Properties of Laplace Transform, Inverse Laplace Transform. Application of Laplace Transform.

UNIT IV

Differential Equations: Types of Linear differential equations with constant coefficients – Simultaneous differential equations with constant coefficient.

UNIT V

Numerical methods: Solving simultaneous equations–Gauss Elimination method, Gauss Jordan method, Gauss Jacobi Method, Gauss – Seidel method. Numerical Integration – Trapezoidal Rule, Simpson's Rule.

SUGGESTED READINGS

1. Venkataraman. M. K.,1998. Engineering Mathematics, The National Publications& Co., Chennai. (Unit I, II)
2. Manickavasagam Pillai.T.K , and S. Narayanan, 2002."Calculus", Volume I, and Volume II S.V Printers & Publishers, Chennai (Unit IV, V)
3. Sastry .S.S,2009, Engineering mathematics, PHI learning Pvt. Ltd, New Delhi (Unit-II

Semester-VI

17CHU602 PHYSICS II4H 4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal: 40 External: 60 Total:100

Course Objectives:

- To give the basic knowledge on material properties.
- To acquire knowledge on digital electronics.
- To educate and motivate the students in the field of science.
- To know about Electrostatics
- To know about atomic and nuclear physics.
- To acquire knowledge on magnetism

Course Outcomes:

Students can able to

- Explain how physics applies to phenomena in the world around them.
- Recognize how and when physics methods and principles can help address problems in their major and then apply those methods and principles to solve problems.
- principles can help address problems in their major
- Apply those methods and principles to solve problems.
- Gained knowledge about digital electronics and Electrostatics
- Gained knowledge about atomic and nuclear physics.
-

UNIT – I

Electrostatics: Coulombs law – electric field – Gauss's law and its applications – potential – potential due to various charge distribution. Parallel plate capacitors – dielectrics- current – galvanometer – voltmeter – ammeter- potentiometric measurements.

UNIT - II

Magnetism: Magnetic field – Biot Savart's law – B due to a solenoid – Amperes law – Faradays law of induction – Lenz's law. Magnetic properties of matter –Dia, para and ferro - Cycle of magnetization – Hysteresis – B-H curve – Applications of B-H curve.

UNIT - III

Modern Physics: Einstein's Photoelectric effect-characteristics of photoelectron –laws of photoelectric emission-Einstein's photo electric equations- Compton effect-matter waves-De-Broglie Hypothesis. Heisenberg's uncertainty principle-Schrödinger's equation- particle in a box.

UNIT-IV

Atomic and Nuclear Physics: Atom Models : Sommerfield's and Vector atom Models – Pauli's exclusion Principle – Various quantum numbers and quantization of orbits. X-rays : Continuous and Characteristic X-rays – Mosley's Law and importance – Bragg's Law.
Nuclear forces –characteristics - nuclear structure by liquid drop model – Binding energy – mass defect – particle accelerators – cyclotron and betatron – nuclear Fission and nuclear Fusion.

UNIT - V

Digital Electronics: Decimal – binary – octal and hexadecimal numbers– their representation, inter-conversion, addition and subtraction, negative numbers. Sum of products – product of sums – their conversion – Simplification of Boolean expressions - K-Map – min terms – max terms - (2, 3 and 4 variables). Basic logic gates – AND, OR, NOT, NAND, NOR and EXOR gates – NAND and NOR as universal building gates – Boolean Algebra – Laws of Boolean Algebra – De Morgan's Theorems – Their verifications using truth tables.

SUGGESTED READINGS

1. Narayanamurthi, Electricity and Magnetism, The National Publishing Co, First edition,1988.
2. J. B. Rajam, Atomic Physics., S. Chand & Company Limited, New Delhi, First edition, 1990.
3. B. N. Srivastava, Basic Nuclear Physic, Pragati Prakashan, Meerut, 2005.
4. Albert Paul Malvino, Digital principles and Applications, McGraw-Hill International Editions, New York, 2002.
5. Digital fundamentals – by Floyd 8th edition Pearson education 2006
6. R. S. Sedha, A text book of Digital Electronics, S. Chand & Co, New Delhi, First edition ,2004.

Semester-VI

17CHU603A MOLECULAR MODELLING AND DRUG DESIGN4H 4C

Instruction Hours/week: L:4 T:0 P:0Marks: Internal:40 External: 60 Total:100

Course objectives

The course enables the students to summarize

- The introductory concepts of molecular modelling
- The force fields involved with different types of interactions
- The Energy Minimization and Computer Simulation
- The Molecular Dynamics & Monte Carlo Simulation
- The Structure Prediction and Drug Design
- QSAR studies

Course outcomes

The students are contrast

1. The introductory concepts of molecular modelling
2. The force fields involved with different types of interactions
3. About the Energy Minimization and Computer Simulation
4. About the Molecular Dynamics & Monte Carlo Simulation
5. About the Structure Prediction and Drug Design
6. QSAR studies

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction to Molecular Modelling:

Introduction. Useful Concepts in Molecular Modelling: Coordinate Systems. PotentialEnergy Surfaces.Molecular Graphics.Surfaces.Computer Hardware and Software.TheMolecular Modelling Literature.

UNIT II

Force Fields:

Fields.Bond Stretching.Angle Bending.Introduction to nonbonded interactions.Electrostatic interactions.vander Waals Interactions. Hydrogen bonding in MolecularMechanics.Force Field Models for the Simulation of Liquid Water.

UNIT III

Energy Minimization and Computer Simulation:

Minimization and related methods for exploring the energy surface. Non-derivative method,First and second order minimization methods. Computer simulation methods.Simplethermodynamic properties and Phase Space.Boundaries. Analyzing the results of asimulation and estimating Errors.

UNIT IV

Molecular Dynamics & Monte Carlo Simulation:

Molecular Dynamics Simulation Methods.Molecular Dynamics using simple models.Molecular Dynamics with continuous potentials.Molecular Dynamics at constanttemperature and pressure.Metropolis method.Monte Carlo simulation of molecules. Modelsused in Monte Carlo simulations of polymers.

UNIT V

Structure Prediction and Drug Design:

Structure prediction - Introduction to comparative Modeling.Sequence alignment.Constructing and evaluating a comparative model. Predicting protein structures by'Threading', Molecular docking. Structure based de novo ligand design,Drug Discovery – Chemoinformatics – QSAR.

SuggestedReadings

Text Books:

1. Leach, A.R. (2001). *Molecular Modelling Principles and Application*, Longman.
2. Haile, J.M. (1997). *Molecular Dynamics Simulation Elementary Methods*, John Wiley and Sons.
3. Gupta, S.P. (2008).*QSAR and Molecular Modeling*. Springer. Anamaya Publishers.

Semester-VI

17CHU611 MATHEMATICS II- PRACTICAL4H 4C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objectives

This course enables the students to learn

- To solve simultaneous linear algebraic equations using various methods.
- To evaluate definite integrals using numerical techniques.
- Problem-solving through (computer language) programming.
- Solution of simultaneous linear algebraic equations – Gauss Jacobi method
- Solution of simultaneous linear algebraic equations – Gauss Seidal method
- Numerical Integration – Simpson's one third rule

Course Outcomes (COs)

On successful completion of this course, the student will be able to

1. Familiarize with the programming environment for numerical methods.
2. Develop proficiency in skills to solve the algebraic equations.
3. Evaluate the definite integrals using computer programming techniques
4. Solution of simultaneous linear algebraic equations – Gauss Jacobi method
5. Solution of simultaneous linear algebraic equations – Gauss Seidal method
6. Numerical Integration – Simpson's one third rule

List of Practical

1. Compute Fourier Coefficients.
2. Solution of simultaneous linear algebraic equations – Gauss Elimination method
3. Solution of simultaneous linear algebraic equations – Gauss Jordan method
4. Solution of simultaneous linear algebraic equations – Gauss Jacobi method
5. Solution of simultaneous linear algebraic equations – Gauss Seidal method
6. Numerical Integration – Simpson's one third rule
7. Numerical Integration – Simpson's three eighth rule
8. Numerical Integration – Trapezoidal rule

Semester-VI

17CHU612 PHYSICS II -PRACTICAL 4H 4C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal: 40 External: 60 Total:100

Course Objective

- To enhance the students to understand the concepts in integrated chips.
- To understand the optical and electronic properties of solids through experimentations
- Determine the magnetic dipole moment (*m*) of a bar magnet - Tan A &Tan B
- Verify of Basic logic gates using discrete components.
- Study of NOR& NAND gate as Universal building block.
- Study of logic gates using IC's.

Course Outcomes:

Students can able to

1. Perform basic experiments in mechanics, heat and electricity and analyze the data
2. Acquire engineering skills and Practical knowledge, which help the student in their everyday life.
3. know the physical Principles and applications of Electronics.
4. Gained knowledge about the physical Principles and applications of Electronics.
5. Determine the magnetic dipole moment (*m*) of a bar magnet - Tan A &Tan B
6. Verification of Basic logic gates using discrete components.
7. Studied the NOR& NAND gate as Universal building block.
8. Studied logic gates using IC's.

Any 8 Experiments

1. Determine the magnetic dipole moment (*m*) of a bar magnet - Tan A
2. Determine the magnetic dipole moment (*m*) of a bar magnet - Tan B
3. Field Intensity-Circular coil- Vibration magnetometer
4. Moment of a magnet-Circular coil-Deflection Magnetometer
5. Study of logic gates using IC's.
6. Study of NOR gate as Universal building block.
7. Study of NAND gate as Universal building block.
8. Verification of Basic logic gates using discrete components.
9. To study the variation in current and voltage in a series LCR circuit
10. To study the variation in current and voltage in a parallel LCR circuit
11. Transistor characteristics – CE &CB

SUGGESTED READINGS

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, Pragathi Prakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, Pragathi Prakashan, Meerut

Semester-VI

17CHU613A MOLECULAR MODELLING AND DRUG DESIGN-PRACTICAL 4H 2C

Instruction Hours/week: L:0 T:0 P:4Marks: Internal:40 External: 60 Total:100

Course objectives

The lab course enables the students to analyse

- Qualititative and qualitative calculations involved in the molecular modelling and its usefulness in drug design
- Compare the optimized C-C bond lengths in ethane, ethene, ethyne and benzene.Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzeneand pyridine π bonds.
- Perform a conformational analysis of butane. (b)
- Determine the enthalpy of isomerization of *cis* and *trans*2-butene.
- Relate the charge on the hydrogen atom in hydrogen halides with their acidcharacter.
- Compare the basicities of the nitrogen atoms in ammonia, methylamine,dimethylamine and trimethylamine.
- Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol,and 2-methyl-2-propanol.

Course outcomes

The students have analysed

1. The Qualititative and qualitative calculations involved in the molecular modelling and its usefulness in drug design
2. Comparision of the optimized C-C bond lengths in ethane, ethene, ethyne and benzene.Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzeneand pyridine π bonds.
3. Performed a conformational analysis of butane.
4. Determination of the enthalpy ofisomerization of *cis a*nd *trans2*-butene.
5. Relate the charge on the hydrogen atom in hydrogen halides with their acidcharacter.
6. Comparision of the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol, and 2-methyl-2-propanol.
7. Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol,and 2-methyl-2-propanol.

Methodology

Free Computer softwares

i. Compare the optimized C-C bond lengths in ethane, ethene, ethyne and benzene.Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzeneand pyridine π bonds.

ii. (a) Perform a conformational analysis of butane. (b) Determine the enthalpy ofisomerization of *cis* and *trans*2-butene.

iii. Visualize the electron density and electrostatic potential maps for LiH, HF, N_2, NOand CO and comment. Relate to the dipole moments. Animate the vibrations of thesemolecules.

iv. (a) Relate the charge on the hydrogen atom in hydrogen halides with their acidcharacter. (b) Compare the basicities of the nitrogen atoms in ammonia, methylamine,dimethylamine and trimethylamine.

v. (a) Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol,and 2-methyl-2-propanol. Note the dipole moment of each molecule. (b) Show howthe shapes affect the trend in boiling points: (118 ºC, 100 ºC, 108 ºC, 82 ºC,respectively).vi. Build and minimize organic compounds of your choice containing the followingfunctional groups. Note the dipole moment of each compound: (a) alkyl halide (b)aldehyde (c) ketone (d) amine (e) ether (f) nitrile (g) thiol (h) carboxylic acid (i) ester(j) amide.

vii. (a) Determine the heat of hydration of ethylene. (b) Compute the resonance energy ofbenzene by comparison of its enthalpy of hydrogenation with that of cyclohexene.

viii. Arrange 1-hexene, 2-methyl-2-pentene, (*E*)-3-methyl-2-pentene, (*Z*)-3-methyl-2-pentene, and 2,3-dimethyl-2-butene in order of increasing stability.

ix. (a) Compare the optimized bond angles H2O, H2S, H2Se. (b) Compare the HAH bondangles for the second row dihydrides and compare with the results from qualitativeMO theory.

Note: Software: ChemSketch, ArgusLab (www.planaria-software.com), TINKER 6.2 (dasher.wustl.edu/ffe), WebLab Viewer, Hyperchem, or any similar software.

Suggested Readings

Text Books:

1. Leach, A.R. (2001).*Molecular Modelling Principles and Application*. Longman.
2. Haile, J.M. (1997).*Molecular Dynamics Simulation Elementary Methods*, John Wiley and Sons.

Reference Book:

1. Gupta, S.P. (2008). *QSAR and Molecular Modeling*. Springer - Anamaya Publishers.

Semester-VI

17CHU691	**PROJECT WORK**	**8H 6C**

Instruction Hours/week: L:0 T:0 P:8Marks: Internal: 40 External: 60 Total:100

Semester-VI

17CHU604A BASIC ANALYTICAL CHEMISTRY 3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal:40 External: 60 Total:100

Course objectives

The course enables the students have to interpret

- The interdisciplinary nature of analytical chemistry
- The various methods involved in the analysis of soil ,
- Analyse water
- Analys food products
- Concepts of *p*H
- The various methods involved in the analysis of cosmetics

Course outcome

The course enables the students have to interpreted

1. The interdisciplinary nature of analytical chemistry
2. The various methods involved in the analysis of soil ,
3. Analysis water
4. Analysis of food products
5. Concepts of *p*H
6. The various methods involved in the analysis of cosmetics

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

UNIT I

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Conceptof sampling.Importance of accuracy, precision and sources of error in analyticalmeasurements.Presentation of experimental data and results, from the point of view ofsignificant figures.

UNIT II

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometrictitrations, Chelation, Chelating agents, use of indicators

a. Determination of pH of soil samples.
b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometrictitration.

UNIT III

Analysis of water: Definition of pure water, sources responsible for contaminating water,water sampling methods, water purification methods.

a. Determination of pH, acidity and alkalinity of a water sample.
b. Determination of dissolved oxygen (DO) of a water sample.

UNIT IV

Analysis of food products: Nutritional value of foods, idea about food processing and foodpreservations and adulteration.

a. Identification of adulterants in some common food items like coffee powder, asafoetida,chilli powder, turmeric powder, coriander powder and pulses, etc.
b. Analysis of preservatives and colouring matter.

Chromatography: Definition, general introduction on principles of chromatography, paperchromatography, TLC etc.

a. Paper chromatographic separation of mixture of metal ion (Fe3+ and Al3+).
b. To compare paint samples by TLC method.

Ion-exchange: Column, ion-exchange chromatography etc.Determination of ion exchange capacity of anion / cation exchange resin (using batchprocedure if use of column is not feasible).

UNIT V

Analysis of cosmetics: Major and minor constituents and their function

a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zincoxide and Calcium carbonate by complexometric titration.

SuggestedReading

Text Books:

1. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. (1988).*Instrumental Methods of Analysis*. 7th Ed. Belmont, California, USA : Wadsworth Publishing Co. Ltd.
2. Skoog, D.A. Holler F.J. & Nieman, T.A.(1998). *Principles of Instrumental Analysis*, Cengage Learning India Ed.
3. Skoog, D.A.; West, D.M. & Holler, F.J.(1992).*Fundamentals of Analytical Chemistry* 6thEd.Fort Worth :Saunders College Publishing.
4. Harris, D. C. (2006). *Quantitative Chemical Analysis*. W. H. Freeman and Company Ltd.,Dean, J. A. (1992). *Analytical Chemistry Notebook.* McGraw Hill.

Reference Books

1. Day, R. A. & Underwood, A. L. (1991). *Quantitative Analysis*. Prentice Hall of India.
2. Freifelder, D. (1982).*Physical Biochemistry*.2nd Ed.N.Y. USA: W.H. Freeman and Co.
3. Cooper, T.G. (1977).*The Tools of Biochemistry*.16.N.Y. USA: John Wiley and Sons.
4. Robinson, J.W.(1995).*Undergraduate Instrumental Analysis*.5th Ed.NewDelhi:MarcelDekker Inc.,

Semester-VI

17CHU604B PESTICIDE CHEMISTRY 3H 3C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

The course enables the students to design

- The synthesis and manufacture of many natural fertilizers
- The synthesis and manufacture of many synthetic fertilizers
- The synthesis and manufacture of organochlorines
- The synthesis and manufacture organophosphorous compounds
- The synthesis and manufacture of quinine pesticides
- The synthesis and manufacture of anilides

Course outcomes

The students have designed

1. The synthesis and manufacture of many natural fertilizers
2. The synthesis and manufacture of many synthetic fertilizers
3. The synthesis and manufacture of organochlorines
4. The synthesis and manufacture organophosphorous compounds
5. The synthesis and manufacture of quinine pesticides
6. The synthesis and manufacture of anilides

Methodology

Blackboard teaching, Powerpoint presentation and group discussion.

Unit I

General introduction to pesticides (natural and synthetic), benefits and adverse effects.

Unit II

Changing concepts of pesticides, structure activity relationship.

Unit III

Synthesis and technicalmanufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,)

Unit IV

Synthesis and technicalmanufacture and uses of Organophosphates (Malathion, Parathion); Carbamates (Carbofuranand carbaryl)

Unit V

Synthesis and technicalmanufacture and uses ofQuinones (Chloranil), Anilides (Alachlor and Butachlor).

Practicals

1. To calculate acidity/alkalinity in given sample of pesticide formulations as perBIS specifications.
2. Preparation of simple organophosphates, phosphonates and thiophosphates

Suggested Reading

1. Cremlyn, R. (1978). *Pesticides. Preparation and Modes of Action*. NewYork: John Wiley & Sons.

Semester-VI

17CHU614A BASIC ANALYTICAL CHEMISTRY -PRACTICAL3H 1C

Instruction Hours/week: L:0 T:0 P:3Marks: Internal:40 External: 60 Total:100

Course objectives

The course enables the students to design

- The synthesis and manufacture of many natural fertilizers
- The synthesis and manufacture of many synthetic fertilizers
- The synthesis and manufacture of organochlorines
- The synthesis and manufacture organophosphorous compounds
- The synthesis and manufacture of quinine pesticides
- The synthesis and manufacture of anilides

Course outcomes

The students have designed

1. The synthesis and manufacture of many natural fertilizers
2. The synthesis and manufacture of many synthetic fertilizers
3. The synthesis and manufacture of organochlorines
4. The synthesis and manufacture organophosphorous compounds
5. The synthesis and manufacture of quinine pesticides
6. The synthesis and manufacture of anilides

Methodology

Estimation of metal ion by flame photometry, Spectrophotemetric procedures

Applications (Any one):

a. To study the use of phenolphthalein in traps cases.
b. To analyze arson accelerants.
c. To carry out analysis of gasoline.

Instrumental demonstrations:

a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flamephotometry.
b. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.
c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.

SuggestedReading

Text Books:

1. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. (1988). *Instrumental Methods of Analysis*. 7th Ed. Belmont, California, USA : Wadsworth Publishing Co. Ltd.
2. Skoog, D.A. Holler F.J. & Nieman, T.A.(1998). *Principles of Instrumental Analysis*, Cengage Learning India Ed.

3. Skoog, D.A.; West, D.M. & Holler, F.J.(1992).*Fundamentals of Analytical Chemistry* 6th Ed.Fort Worth :Saunders College Publishing.
4. Harris, D. C. (2006). *Quantitative Chemical Analysis*. W. H. Freeman and Company Ltd.,
5. Dean, J. A. (1992). *Analytical Chemistry Notebook*. McGraw Hill.

Reference Books

1. Day, R. A. & Underwood, A. L. (1991). *Quantitative Analysis*. Prentice Hall of India.
2. Freifelder, D. (1982).*Physical Biochemistry*.2nd Ed.N.Y. USA: W.H. Freeman and Co.
3. Cooper, T.G. (1977).*The Tools of Biochemistry*.16.N.Y. USA: John Wiley and Sons.
4. Robinson, J.W.(1995). *Undergraduate Instrumental Analysis*.5th Ed.NewDelhi:Marcel Dekker Inc.,

Semester-VI

17CHU614B PESTICIDE CHEMISTRY-PRACTICAL3H 1C

Instruction Hours/week: L:3 T:0 P:0Marks: Internal: 40 External: 60 Total:100

Course objectives

The lab course enables the student to solve

- the calculation of acidity in given sample of pesticide formulation
- the calculation of alkalinity in given sample of pesticide formulation
- the synthesis of simple organophosphates,
- the synthesis of phosphonates
- the synthesis of thiophosphates
- Alayse organophosphates, phosphonates and thiophosphates

Course outcomes

The students have solved

1. the calculation of acidity in given sample of pesticide formulation
2. the calculation of alkalinity in given sample of pesticide formulation
3. the synthesis of simple organophosphates
4. the synthesis of phosphonates
5. the synthesis of thiophosphates
6. Alaysis of organophosphates, phosphonates and thiophosphates

Methodology

PH measurements, Fertilizer preparation

Practicals

1. To calculate acidity/alkalinity in given sample of pesticide formulations.
2. Preparation of simple organophosphates, phosphonates and thiophosphates

Suggested Reading:

1. Cremlyn, R.(1978).*Pesticides. Preparation and Modes of Action*. NewYork: John Wiley & Sons.