



Navagan Shikshan Sanstha, Rajuri(N)
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Kaku Arts, Science & Commerce College, Beed
NAAC Re-accredited 'A' Grade (3.15 CGPA) & ISO 21001-2018

Department of Chemistry

Program Specific Outcomes (PSOs) & Course Outcomes (COs)

Program Specific Outcomes (PSOs)

Programme Specific Outcomes (PSOs):

PSO1; Core competency: The chemistry graduates will know the fundamental concepts of chemistry and applied chemistry. These fundamental concepts would reflect the latest understanding of the field, and therefore, are dynamic in nature and require frequent and time-bound revisions.

PSO2; Communication skills: Chemistry graduates will possess minimum standards of communication skills expected of a Chemistry graduate in the country. They are expected to read and understand the documents with in-depth analyses and logical arguments. Graduates are expected to be well-versed in speaking and communicating their idea/finding/concepts to wider audience.

PSO3; Critical thinking: Chemistry graduates are expected to know basics of cognitive biases, mental models, logical fallacies, scientific methodology and constructing cogent scientific arguments.

PSO4; Psychological skills: Chemistry Graduates are expected to possess basic psychological skills required to face the world at large, as well as the skills to deal with individuals and students of various sociocultural, economic and educational levels. Psychological skills may include feedback loops, self-compassion, self-reflection, goal-setting, interpersonal relationships, and emotional management.

PSO5; Problem-solving: Chemistry Graduates will be equipped with problem-solving philosophical approaches that are pertinent across the disciplines.

PSO6; Analytical reasoning: Chemistry Graduates acquire formulate cogent arguments and spot logical flaws, inconsistencies, circular reasoning etc.

PSO7; Research-skills: Chemistry Graduates will be keenly observant about what is going on in the natural surroundings to awake their curiosity. Chemistry Graduates are expected to design a scientific experiment through statistical hypothesis testing and other *a priori* reasoning including logical deduction.

PSO8; Teamwork: Chemistry Graduates will be team players, with productive cooperations involving members from diverse socio-cultural backgrounds.

PSO9; Digital Literacy: Chemistry Graduates are expected to be digitally literate for them to enroll and increase their core competency via e-learning resources such as MOOC and other digital tools for lifelong learning. Chemistry Graduates should be able to spot data fabrication and fake news by applying rational skepticism and analytical reasoning.

PSO10; Moral and ethical awareness: Chemistry Graduates will be responsible citizen of India and be aware of moral and ethical baseline of the country and the world. They are expected to define their core ethical virtues good enough to distinguish what construes as illegal and crime in Indian constitution. Emphasis be given on academic and research ethics, including fair Benefit Sharing, Plagiarism, Scientific Misconduct and so on.

PSO11; Leadership readiness: Chemistry Graduates are expected to be familiar with decision making process and basic managerial skills to become a better leader. Skills may include defining objective vision and mission, how to become charismatic inspiring leader and so on.

Course Outcomes

B.Sc First Year Semester-

I & II

B.Sc First Year Semester-I & II

DSC-1 : (Title of Paper) FUNDAMENTALS OF CHEMISTRY-1

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Write the electronic configurations of the elements
- ii) Understand the changes in periodic properties in modern periodic table
- iii) Understand the different types of electron displacement in a molecule
- iv) Differentiate between inductive, electromeric, resonance, and mesomeric effects.
- v) Understand the methods of formation, structure and properties of the intermediate.
- vi) Understand the basic concepts and different laws of thermodynamics and thermochemistry
- vii) The concept of chemical equilibrium

DSC-2 : (Title of Paper) Lab Course -1

Total Credits : 02

Total Contact Hours : 60 Hrs

Maximum Marks : 50

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) To consistently follow established SOPs for various chemical experiments.
- ii) To prepare solution of desired concentration..
- iii) To maintain accurate and thorough records of experimental data, and analyze results to draw meaningful conclusions.
- iv) To apply critical thinking skills to identify and address challenges that may arise during experiments, showcasing the ability to troubleshoot and optimize procedures.
- v) To gain insights into how chemical lab practices are applied in professional research or industrial settings, preparing them for future careers in diverse scientific and industrial fields.
- vi) Students will demonstrate ethical conduct in all aspects of laboratory work, emphasizing integrity, responsibility, and professionalism

SEC-1 A : (TITLE OF PAPER) - Water Treatment and Analysis

Total Credits : 01 (Theory paper) Total Contact Hours : 15 Hrs

Maximum Marks : 50

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Resources and properties of water
- ii) Understand the different pollutants
- iii) Understand treatment of domestic and industrial water
- iv) Understand the sources of water pollution

**SEC-2 A : (TITLE OF PAPER) - Water Treatment and Analysis
(Practical paper)****Course Outcomes (COs) :**

After completion of the course, students will be able to -

- i) Resources and properties of water
- ii) Understand the different pollutants
- iii) Understand treatment of domestic and industrial water
- iv) Understand the sources of water pollution
- v) Carryout experiment for determination of water quality parameters

This course will be available for the students form other faculty**GE/ OE -1 : (TITLE OF PAPER) Herbal Chemistry - I****Course Outcomes (COs) :**

After completion of the course, students will be able to -

- CO1: acquainted with importance of herbal drugs,
- CO2: know the different sources of herbal medicine and their preparation
- CO3: acquire the knowledge of organic farming
- CO4: know about the Indian system of drugs ayurveda, Unani, siddha and homeopathy
- CO5: know health benefits and role of nutraceuticals

Semester-II

DSC-3 : (Title of Paper) FUNDAMENTALS OF CHEMISTRY-2

Total Credits : 02

Total Contact Hours : 30 Hrs

Maximum Marks : 50

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Identify the type bond.
- ii) Predict the shape and geometry and bond angle in a molecule.
- iii) Understand the factors affecting ionic bond formation.
- iv) Identify types of isomerism.
- v) Apply the CIP rules for nomenclature of stereoisomers.
- vi) Rate of reactions and factors affecting it.
- vii) Solve the numerical on order reactions.

DSC-4 : (Title of Paper) FUNDAMENTALS OF CHEMISTRY-2 (Lab course-2)

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Acquire skills in common techniques for the Volumetric estimations of inorganic compound
- ii) Acquire skills in common techniques preparation and purification of organic compounds.
- iii) Assess the effectiveness of purification techniques
- iv) Develop precision in measuring and recording physical constants
- v) Analyze the relationship between melting/boiling points and purity.
- vi) Develop skills in recording and reporting experimental procedures and results
- vii) Handle different apparatus like eudiometer viscometer, stalagmometer for determining physical properties

VSC-1 B : (TITLE OF PAPER) - Soap and detergents (Theory paper)

Course Outcomes (COs) :

After completion of the course, students will be able to -

CO1: Can gain the information about soaps, detergents and shampoos.

CO2: Can Acquire knowledge of basic concepts and techniques of soap and detergent industry.

CO3: Get hands training of analysis of soaps and detergents.

CO4: Aware about environmental aspects of detergents.

CO5: Development Skill for detergent, liquid soap and laundry soap making.

VSC-2 B : (TITLE OF PAPER) - Soap and detergents (Practical paper)

Course Outcomes (COs) :

After completion of the course, students will be able to -

CO1: Can gain the information about soaps, detergents and shampoos.

CO2: Can Acquire knowledge of basic concepts and techniques of soap and detergent industry.

CO3: Get hands training of analysis of soaps and detergents.

CO4: Aware about environmental aspects of detergents.

CO5: Development Skill for detergent, liquid soap and laundry soap making

This course will be available for the students form other faculty
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GE/OE-2 : (Title of Paper) Herbal Chemistry-II
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Course Outcomes (COs) :

After completion of the course, students will be able to -

CO1: acquainted with importance of herbal drugs,

CO2: know the different sources of herbal medicine and their preparation

CO3: acquire the knowledge of organic farming

CO4: know about the Indian system of drugs ayurveda, Unani, siddha and homeopathy

**B.Sc. II Year
Semester-III &
IV**

B.Sc. II year Sem-III
Minor Paper -Concept of Chemistry - I

Course Outcomes (COs):

1. Apply knowledge of carbohydrates, amino acids and proteins for dietary analysis
2. Understand that different name reactions are involved in organic chemistry.
3. Apply the mechanism of organic reaction mechanisms.
4. Understand preparations and reactions of alcohols, carboxylic acids, aldehydes and ketones.
5. Understand the nomenclature of organic compounds.

B.Sc. II year Sem-III
Major Paper – Organic Chemistry
Course Outcomes (COs):

1. Understand the structure of benzene and its derivatives.
2. Understand the aromatic and antiaromatic compounds.
3. Understand that different name reactions are involved in organic chemistry.
4. Apply the mechanism of organic reaction mechanisms.
5. Understand preparations and reactions of alcohols, carboxylic acids, aldehydes and ketones.
6. Understand the nomenclature of organic compounds.

SAC00022263P	
CHE/DSC/P/226:	Title of Paper: Organic Chemistry Lab Course:

Course Outcomes (COs):

After completion of the course, students will be able to:

1. Understand the stoichiometry.
2. Understand the isolation of organic compound.
3. Develop basic skills in organic synthesis.
4. Develop the skill of purification of compounds by using Thin Layer chromatography and crystallization.
5. Develop the separation technique skills of organic compounds.
6. Develop the skill for element detection and functional group detection in organic compounds.

Major Paper – Physical Chemistry- lab Course

Course Outcomes (COs):

1. Understand the chemical kinetics of reaction.
2. Select and apply method for determining viscosity and surface tension.
3. Calibrate and Use Ph meter.
4. Use conductometer and colorimeter.
5. Develop the skill in handling potentiometer.
6. Develop the skill for determination of heterogenous equilibria

SAC00022013T CHE/DSC/T/ 201	Title of Paper: Physical Chemistry
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Course Outcomes (COs):

After completion of the course, students will be able to:

1. Understand the phase equilibrium.
2. Understand and apply concept of conductance and conductometry.
3. Understand and apply laws of quantum theory.
4. Apply the mathematical equation for quantum chemistry.
5. Understand and apply photochemical concept and laws
6. Understand use the fluorescence, phosphoresce and chemiluminescence .

SCC00022013T

CHE/MN/T/201	Title of Paper: Concepts of Chemistry II
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Course Outcomes (COs):

After completion of the course, students will be able to:

1. Understand the principles of electrolytic conduction.
2. Apply the principles of electrolytic conduction.
3. Analyse the phenomenon related to atomic structure.
4. Remember the various laws of photochemistry.
5. Evaluate the photochemical processes.

SEC00022003T

(Title of Paper) FOOD ADULTERATION- Theory

Course Outcomes (COs) : After completion of the course, students will be able to -

- i) Get basic knowledge of various food adulterations.
- ii) Understand the adulteration of common foods and their adverse impact on health.
- iii) Comprehend certain skills of detecting adulteration of common foods.
- iv) Know the basic laws and procedures regarding food adulteration and consumer protection.
- v) Apply the knowledge of food adulteration to other kinds of adulteration.

SEC00022263P

CHE/VSC/P/226 : (Title of Paper) --- Lab Course – FOODADULTERATION
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Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Know the basic and procedures regarding food adulteration.
- ii) Comprehend certain skills of detecting adulteration of common foods.
- iii) Analyse the quality and adulteration of various food materials.
- iv) Perform practical's skilfully related to food adulteration.
- v) Detects skilfully adulterants in given sample by using chemical test.
- vi) Understand the exact chemical reaction involved in food adulteration chemical tests.

CHE/DSC/T/250 : (Inorganic Chemistry) : Theory Course
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Course Outcomes (COs) :

After completion of the course, students will be able to –

- i. To understand transition elements and its characteristic properties.
- ii. Understand the assumptions and Werner's coordination theory.
- iii. Understand the different types of isomerism.
- iv. Differentiate between VBT and CFT.
- v. Understand the formation of outer and inner orbital complexes.
- vi. Understand the basic concepts of volumetric analysis.

CHE/DSC/P/276 : (Inorganic Chemistry) Lab Course 7

Course Outcomes (COs) :

After completion of the course, students will be able to –

- i) Understand synthesis of coordination compounds and metal and ligand bonding.
- ii) Understand the principle of gravimetric analysis and able to estimate Ni, Cu, Fe, Al, Ba, Ca, Mn and Zn
- iii) Know how to prepare coordination complexes
- iv) Know how to calculation of Experiments.

CHE/DSC /T/251 : (Title of Paper) APPLIED CHEMISTRY

Course Outcomes (COs) :

After completion of the course, students will be able to -

- xi) Know the different analytical spectroscopic techniques.
- xii) Understand the phenomenon used in the UV-Visible Spectroscopy
- xiii) Understand the interaction of radiation with matter.
- xiv) Able to interpreting UV-Visible, IR spectra.
- xv) Understand the methods of formation, structure and properties of the intermediate.
- xvi) Understand the principle used in IR and Raman Spectroscopy

SAC00022774P

CHE/DSC/P/277: (Title of Paper) Lab Course -Applied chemistry

Course Outcomes (COs) :

After completion of the course, students will be able to -

- vii) To consistently follow established SOPs for various chemical analysis.
- viii) To know the handling of various sophisticated analytical instruments.
- ix) To maintain accurate and thorough records of experimental data, and analyze results to draw meaningful conclusions.
- x) To apply critical thinking skills to identify and address challenges that may arise during experiments, showcasing the ability to troubleshoot and optimize procedures.
- xi) To gain insights into how chemical lab practices are applied in professional research or industrial settings, preparing them for future careers in diverse scientific and industrial fields.
- xii) Students will exhibit ethical conduct in all features of laboratory work, highlighting integrity, accountability, and professionalism

SCC00022504T

CHEM/MN/T/250 : (Theory Course) Tital of the Paper (Concepts of Chemistry III)
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Course Outcomes (COs) :

After completion of the course, students will be able to –

- i. To understand transition elements and its characteristic properties.
- ii. Understand the assumptions and Werner's coordination theory.
- iii. Understand the different types of isomerism.
- iv. Differentiate between VBT and CFT.
- v. Understand the formation of outer and inner orbital complexes.
- vi. Understand the basic concepts of Lanthanides and Actinides.

SCC00022514T

CHE/MN/T/251	Title of the Paper: Concepts of Chemistry IV
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Course Outcomes:

After completion of the course, students will be able to

- 1) Understand the interaction of EMR and matter.
- 2) Get idea about relationship between Energy, wavelength, frequency and wavenumbers.
- 3) Understand energy transitions, absorption and emission spectral phenomenon.

SEC00022504T
CHE/SEC//T/250 : Lab Safety and Laboratory Practices (Theory)

Learning Course Outcomes: -

By the end of this course, student will be able to:

1. To consistently follow the established safety protocols.
2. To recognize hazards and implement safety measures.
3. To apply thinking skills to administer first aid for fire and chemical exposure.
4. To enhance workplace safety.
5. Able to disposed off hazardous chemicals/waste.

SEC00022764P

CHE/SEC/P//276 --Lab Safety and Laboratory Practices- (Practical Paper)

Course Outcomes (Cos)

1. Understand various safety symbols, chemical packaging information.
2. Understand the precautionary measures required when handling hazardous substances.
3. To perform first aid effectively for chemical accidents.
4. Understand best practices for the disposal of hazardous chemicals

B.Sc. Third Year-
Semester
V & VI

Course Outcomes (COs):

1. Develop a clear understanding of electronic structure and spectral behavior of transition metal complexes
2. Understand fundamental concepts of organometallic chemistry with emphasis on metal carbonyl chemistry.
3. Analyze bonding in transition metal carbonyls using molecular orbital theory and electron counting rules.
4. Predict structure and geometry of carbonyl complexes based on electron count and ligand behavior.
5. Explain the assumptions of Molecular Orbital Theory.
6. Construct and interpret molecular orbital diagrams for diatomic molecules.
7. Determine bond order, stability, and magnetic properties using MO theory.

CHE/DSC/P/326 Title:- Inorganic Chemistry
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Course Outcomes (COs):

After completion of the course, students will be able to:

1. Apply principles of qualitative inorganic analysis to identify unknown substances.
2. Demonstrate knowledge of analytical chemistry techniques for metal ion analysis.
3. Systematically separate and identify components of inorganic mixtures.
4. Apply appropriate methods for quantitative estimation of metal ions.
5. Perform quantitative analysis with acceptable experimental accuracy.
6. Calculate percentage yield and percentage purity of prepared compounds.

SAC00023015T		
CHE/DSC/T/ 301	(Theory)	Title of Paper: Spectral Analysis

Course Outcomes (COs): After completion of the course, students will be able to:

1. Demonstrate the ability to explain the theoretical foundations and operational principles of ^1H NMR, ^{13}C NMR and mass spectrometry.
2. Accurately interpret and analyse ^1H NMR, ^{13}C NMR, and mass spectra to identify molecular structure, functional groups and chemical environments.
3. Integrate spectral data from multiple techniques to propose and justify the structures of organic compounds.
4. Explore fragmentation pattern for various functional group and phenomena like the molecular ion peak and McLafferty rearrangement.
5. Solve structural elucidation problems using real or simulated NMR and mass spectrometry datasets, showcasing critical analysis and reasoning skills.

CHE/DSC/P/327:	Title of Paper:	Spectral Analysis Lab Course:
Course Outcomes (COs): After completion of the course, students will be able to:		

1. Analyse and interpret ^1H NMR spectra to determine the number and environment of hydrogen atoms in a molecule.
2. Analyse and interpret ^{13}C NMR spectra to identify different carbon environments in a molecule.
3. Interpret mass spectra to determine molecular mass, fragmentation patterns and possible molecular structures.
4. Use combined spectral data (^1H NMR, ^{13}C NMR, IR and mass spectrometry) to deduce complete molecular structures.
5. Accurately interpret and analyse ^1H NMR, ^{13}C NMR, IR and mass spectra to identify molecular structure, functional groups and chemical environments.
6. Integrate spectral data from multiple techniques to propose and justify the structures of organic compounds.

SBC00023015T		
DSC: SUB/DSE/T/301	Theory	Title of Paper: Organic Synthesis

Course Outcomes:

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

1. Classify and describe the functions of important oxidizing and reducing reagents used in organic synthesis.
2. Explain the mechanisms of key reagent-based transformations such as hydride reductions, DMSO-based oxidations, and Birch reduction.
3. Select appropriate reagents for specific functional group interconversions with proper justification.
4. Compare the selectivity, scope, and limitations of commonly used oxidizing and reducing systems.
5. Design simple multistep organic syntheses using suitable reagents and reaction conditions.
6. Analyze reaction outcomes and predict products in reagent-based synthetic problems.
7. Apply knowledge of safe handling and environmental aspects of important organic reagents.

SBC00023265P	
DSC: SUB/DSE/P/327	Title of Paper : Practical Based on Organic Synthesis

Course Outcomes

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

1. Execute selected organic syntheses using appropriate laboratory techniques and obtain products with acceptable yield and purity.
2. Apply green chemistry principles in designing and performing environmentally safer organic reactions.
3. Monitor reaction progress and assess completion using thin layer chromatography and interpret R_f values correctly.
4. Explain the reaction mechanisms and named reactions associated with the performed organic transformations.
5. Isolate, purify, and characterize organic compounds using standard laboratory methods.
6. Carry out quantitative estimation of selected organic functional groups with reasonable accuracy and precision.
7. Follow safe laboratory practices, maintain proper records, and manage chemical waste responsibly.

SCC00023005T	
CHE/MN/T/300	Title of Paper: Advanced Chemistry I

Course Outcomes (COs):

After completion of the course, students will be able to:

1. Develop a clear understanding of electronic structure and spectral behavior of transition metal complexes
2. Understand fundamental concepts of organometallic chemistry with emphasis on metal carbonyl chemistry.
3. Analyze bonding in transition metal carbonyls using molecular orbital theory and electron counting rules.
4. Predict structure and geometry of carbonyl complexes based on electron count and ligand behavior.
5. Explain the assumptions of Molecular Orbital Theory.
6. Construct and interpret molecular orbital diagrams for diatomic molecules.
7. Determine bond order, stability, and magnetic properties using MO theory.

SCC00023015T	
CHE/MN/T/301	Title of Paper: Advanced Chemistry II

Course Outcomes (COs):

After completion of the course, students will be able to:

1. Demonstrate the ability to explain the theoretical foundations and operational principles of ¹H NMR, ¹³C NMR and mass spectrometry.
2. Accurately interpret and analyse ¹H NMR, ¹³C NMR, and mass spectra to identify molecular structure, functional groups and chemical environments.
3. Integrate spectral data from multiple techniques to propose and justify the structures of organic compounds.
4. Explore fragmentation pattern for various functional group and phenomena like the molecular ion peak and McLafferty rearrangement.

SEC00023005T	
CHEM/VSC/T/300 : (Title of Paper) NATURAL AND SYNTHETIC DYES	

Course Outcomes (COs) :

After completion of the course, students will be able to -

- i) Get basic knowledge of various natural dyes and its applications.
- ii) Understand the various basic concepts which are related to dyes.
- iii) Comprehend skills of reactions interpretations related to synthetic dyes. .
- iv) Learn and apply the knowledge of color and constitutions in daily life.
- v) Know the various methods of synthesis and uses of various synthetic dyes.
- vi) Aware about adverse effects of dyes on ecosystem and its remedies.

1. Course Outcomes (COs) :

2. After completion of the course, students will be able to -
3. Demonstrate proficiency in the synthesis of azo dyes through diazotization and coupling reactions and explain the underlying reaction mechanisms.
4. Synthesize important organic dyes and indicators such as Methyl Orange, Methyl Red, Crystal Violet, Malachite Green, Phenolphthalein, and Fluorescein with appropriate purification and characterization techniques.
5. Apply principles of dye chemistry to dye cotton, wool, and silk fabrics using suitable classes of dyes and controlled dyeing conditions.
6. Evaluate the performance of dyed textiles by conducting washing, light, and heat fastness tests and interpreting the results.
7. Correlate molecular structure with colour, indicator behaviour, fluorescence, and dye–fiber interactions in practical applications.
8. Employ good laboratory practices, safety procedures, data analysis, and technical reporting skills in dye synthesis and textile dyeing experiments.

SAC00023506T**CHE/DSC/T/350****Theory Course****Total of paper- Organic Chemistry****Course Outcomes (COs):****After completion of the course, students will be able to –**

- 1.To understand classification of carbohydrates, structures of monosaccharides.
- 2.Differentiate between anomer, epimer and, reducing and non-reducing sugars
- 3.To understand Mutarotation, reactions of glucose and glycosidic bonds.
- 4.Able to understand classification of amino acids and reactions with various reagents with their significance, peptide bonds.
- 5.To understand the classification of proteins, structure of proteins.
- 6.To understand the nomenclature and classification of heterocyclic compounds
- 7.To understand aromaticity, synthesis and reactions of heterocyclic compounds with one hetero atom.
- 8.Able to understand condensed heterocycles.

CHE/DSC/P/ 376	(Organic Chemistry) Lab Course
Total Credits : 02	Total Contact Hours : 60 Hrs
University Assessment 30 Marks	Internal Assessment 20 Marks

Course Outcomes**At the end of the course, the student will be able to:**

1. Students can be able to identify carbohydrates and proteins qualitatively.
2. Students able to separate sugars and amino acids by chromatography.
3. Students able to do the quantitative analysis by estimations of sugars and amino acids.
4. Students get knowledge about preparation of some organic compounds.

CHE/DSC /T/351 :	Theory	(Title of Paper) PHYSICAL CHEMISTRY
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Course Outcomes (COs): After completion of the course, students will be able to:

- 1.Differentiate between strong and weak electrolyte and explain their molar conductivity variations
- 2.Explain the Debye –Huckel theory of conductance, including the specific impacts of the relaxation effect and electrophoretic effect on ionic mobility.
- 3.Derive and demonstrate the validity of Debye –Huckel – Onsagar equation for strong electrolyte.
- 4.Calculate critical electrochemical parameters including ionic strength, activity and activity coefficients of electrolytes.
- 5.Utilize the Debye-Huckel Limiting law to predict the behavior of ions in dilute solutions.

6. Solve complex numerical related to conductivity and ionic interactions.
7. Understand these properties depend solely on the number of solute particles rather than their chemical identity.
8. Learn the four primary colligative properties, relative lowering of vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure.
9. To utilize Rault's law and Vant Hoff's law to calculate the concentration magnitude.
10. To calculate unknown molecular mass or molar mass of a given solute.
11. Explain how electrolyte cause greater changes in colligative properties compared to nonelectrolytes, utilizing the Van't Hoff factor.
12. Understand the distinction between ideal and non-ideal solution based on Raoult's law.
13. Learn how intermolecular forces of attraction dilute solution behaviour.
14. Identify the changes in enthalpy and volume for ideal solution and how they differ for non ideal solutions.
15. Analyse positive and negative deviations from Raoult's law , including the formation of azeotropes.

CHE/DSC /T/351 : Lab-Cource (Title of Paper) PHYSICAL CHEMISTRY

Course Outcomes (COs)

- **CO 1 (Refractometry):** Determine the refractive index and specific refractivity of pure liquids and binary mixtures to find unknown compositions.
- **CO 2 (Colorimetry):** Apply Beer-Lambert's Law to calculate chemical equilibrium constants and quantify metal ion concentrations.
- **CO 3 (pH-metry):** Measure pH to determine dissociation constants (K_a) of mono/dibasic acids and proton-ligand stability constants.
- **CO 4 (Conductometry):** Perform conductometric titrations to analyze strong acids, weak acids, acid mixtures, and salt concentrations.
- **CO 5 (Potentiometry):** Utilize potentiometric titration curves to determine the neutralization points of single acids and complex acid mixtures.
- **CO 6 (Polarimetry):** Operate a polarimeter to measure optical rotation, calculate concentration, and monitor the kinetics of cane sugar inversion.

SAC00023526T

CHE/DSC /T/35

(Title of Paper) IKS2 Ancient Indian Chemistry

Course Outcomes (COs):

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

1. Know the Indian Knowledge systema and its significance in the protection of traditional knowledge.
2. Understand the need of Indian Knowledge system IKS and significance of the ancient Indian chemistry
3. Relate the various concepts of ancient chemistry with the concepts of modern chemistry the
4. Organize the contribution of made by the ancient Indians in the field of science and chemistry in particular and related concepts
5. Need of the contribution of Indian in the basics of organic farming
6. Outline the chemistry heritage of ancient and India.

SCC00023506T

CHE/MN/T/350 :

(Advanced Chemistry III) : Theory Course

Course Outcomes (COs):

After completion of the course, students will be able to –

1. To understand classification of carbohydrates, structures of monosaccharidesm.
2. Differentiate between anomer, epimer and, reducing and non-reducing sugars
3. To understand Mutarotation, reactions of glucose and glycosidic bonds.
4. Able to understand classification of amino acids and reactions with various reagents with their significance, peptide bonds.
5. To understand the classification of proteins, structure of proteins.
6. To understand the nomenclature and classification of heterocyclic compounds
7. To understand aromaticity, synthesis and reactions of heterocyclic compounds with one hetero atom.
8. Able to understand condensed heterocycles

Course Outcomes (COs): After completion of the course, students will be able to:

1. Differentiate between strong and weak electrolyte and explain their molar conductivity variations
2. Explain the Debye –Huckel theory of conductance, including the specific impacts of the relaxation effect and electrophoretic effect on ionic mobility.
3. Derive and demonstrate the validity of Debye –Huckel – Onsagar equation for strong electrolyte.
4. Calculate critical electrochemical parameters including ionic strength, activity and activity coefficients of electrolytes.
5. Utilize the Debye-Huckel Limiting law to predict the behavior of ions in dilute solutions.
6. Solve complex numerical related to conductivity and ionic interactions.
7. Understand these properties depend solely on the number of solute particles rather than their chemical identity.
8. Learn the four primary colligative properties, relative lowering of vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure.
9. To utilize Rault's law and Vant Hoff's law to calculate the concentration magnitude.
