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DEPARTMENT OF CHEMISTRY

Programme Outcomes & Programme Specific Outcomes

PROGRAMME OUTCOMES (PO) :

- PO-1: B.Sc. & M.Sc. Chemistry curriculum is so designed to provide the students a comprehensive understanding about the fundamentals of chemistry covering all the principles and perspectives.
- PO-2: The branches of Chemistry such as Organic Chemistry, Inorganic Chemistry, Physical Chemistry and Analytical Chemistry expose the diversified aspects of chemistry where the students experience a broader outlook of the subject.
- PO-3: The syllabi of the B.Sc. & M.Sc. Chemistry course are discretely classified to give stepwise advancement of the subject knowledge right through the three years of the term.
- PO-4: The practical exercises done in the laboratories impart the students the knowledge about various chemical reagents and reactions. Thereby, hone their skills of handling the corrosive, poisonous, explosive and carcinogenic chemicals making themselves employable in any kind of chemical industries. They are also trained about the adverse effects of the obnoxious chemicals and the first aid treatment.

Programme Specific Outcomes (PSO), B.Sc. Chemistry:

- PSO-1: The students will understand the existence of matter in the universe as solids, liquids, and gases which are composed of molecules, atoms and sub atomic particles.
- PSO-2: Students will learn to estimate inorganic salt mixtures and organic compounds both qualitatively and quantitatively using the classical methods of analysis in practical classes.
- PSO-3: Students will grasp the mechanisms of different types of reactions both organic and inorganic and will try to predict the products of unknown reactions.

- PSO-4: Students will learn to synthesize the chemical compounds by maneuvering the addition of reagents under optimum reaction conditions.

Programme Specific Outcomes (PSO), B.Sc. Honors Chemistry:

- PSO-1: Have sound knowledge about the fundamentals and applications of chemical and scientific theories.
- PSO-2: Every branch of Science and Technology is related to Chemistry.
- PSO-3: Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.
- PSO-4: Will become familiar with the different branches of chemistry like analytical, organic, inorganic, physical, environmental, polymer and biochemistry.
- PSO-5: Helps in understanding the causes of environmental pollution and can open up new methods for environmental pollution control.
- PSO-6: Develops analytical skills and problem solving skills requiring application of chemical principles.
- PSO-7: Acquires the ability to synthesize, separate and characterize compounds using laboratory and instrumentation techniques.

Programme Specific Outcomes (PSO), M.Sc. Chemistry:

- PSO-1: Demonstrate and apply the fundamental knowledge of the basic principles in various fields of Chemistry.
- PSO-2: Apply various aspects of chemistry in natural products isolations, pharmaceuticals, dyes, textiles, polymers, petroleum products, forensic etc. and also to develop interdisciplinary approach of the subject.
- PSO-3: collaborate effectively on team-oriented projects in the field of Chemistry or other related fields.
- PSO-4: Augment the recent developments in the field of green and eco-friendly reactions, pharmaceutical, Bioinorganic Chemistry and relevant fields of research and development.
- PSO-5: Enhance the scientific temper among the students so as to develop a research culture and implementation of the policies to tackle the burning issues at global and local level.

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Course objectives and Outcomes

Subject-Inorganic Chemistry **Class: B.Sc. 1st Sem.**

Course Objectives

1. To understand the shapes of different orbitals.
2. To understand different principles for filling electrons.
3. To understand how to draw energy diagrams.
4. To understand how to calculate bond order.
5. To understand how to calculate lattice energy through Born Haber Cycle.

Course Outcomes

1. Able to write electronic configuration of given atomic number.
2. Able to tell the name of orbitals by recognizing shapes of orbitals.
3. Able to calculate bond order of different molecules.
4. Able to draw MO digrams of different molecules.
5. Able to draw structures of different ionic solids.
6. Able to calculate effective nuclear charge using Slaters Rule.

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Course objectives and Outcomes

Subject: Physical Chemistry **Class: B.Sc. 1st Sem.**

Course Objective

1. Students will be able to describe the concept of pressure from a macroscopic and microscopic perspective.
2. Students will describe the relationship between partial pressures and total pressure as described in Dalton's Law of partial pressure.
3. Students will be able to explain the quantitative relationship between T,V,n& P as described by kinetic molecular theory.
4. The students will be able to compare and contrast the chemical behaviour and physical properties of common substances.
5. The students will be able to classify matter by its state and bonding behaviour using the periodic table as a reference.

Course Outcomes

1. Students should be able to describe the characteristic of the three states of matter.
2. Students should be able to describe the different physical properties of each state of matter.
3. Students should be able to determine the difference between solids, liquids and gases.
4. Students will be able to define what matter is and where you can find it.
5. Students will be able to give examples of solids, liquids and gases.

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Course objectives and Outcomes

Subject : Organic Chemistry **Class: B.Sc. 1st Sem.**

Course Objective

1. To understand the core concepts of organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.
2. To study about the isomerism and types of isomerism.
3. To understand optical isomerism, geometric isomerism and conformational isomerism.
4. To acquire basic knowledge of reactive intermediates and mechanism of organic reactions.
5. To study about nomenclature, synthesis, isomerism and physical properties of alkanes and cycloalkanes.

Course Outcomes

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

1. Recognize and draw constitutional isomers,stereoisomers, including enantiomers and diasteromers, racemic mixture and meso compounds .
2. Know the fundamental principles of organic chemistry and predict outcomes and derive mechanism of various types of organic reactions.
3. Understand various types of reactive intermediates and factors affecting their stability .
4. Understand the nomenclature, synthesis, isomerism and physical properties of alkanes and cycloalkanes

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Course objectives and Outcomes

Subject : Inorganic Chemistry **Class: B.Sc. 2nd Sem.**

Course Objective

1. The purpose of study semiconductor devices and materials is to familiarize students with P-N junction and transistors.
2. The students will be able to understand general trends in the chemistry behind p-block elements.
3. The students will be able to know the important compounds and important applications of compounds of boron and carbon.
4. The students will understand the biological significance of sodium ,potassium, magnesium and calcium.
5. The students will be able to explain large scale preparation and properties of industrially viz., cement, plaster of paris, sodium hydroxide, sodium carbonate and bicarbonate etc.
6. The students will be able to describe the salient features of alkali and alkaline earth metals.

Course Outcomes

1. The students will be able to design and carry out scientific experiments as well as accurately record and analyse the results of experiments.
2. Students will be able to explain why chemistry is an integral activity for addressing social, economic and environmental problems.
3. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
4. The students will be able to describe the periodic table as a list of elements arranged so as to demonstrate trends in their physical and chemical properties.
5. The students will able to state the principle resemblances of elements within each main group in particular alkali metals, alkaline earth metals , halogens and noble gases.

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Course objectives and Outcomes

Subject : Physical Chemistry **Class: B.Sc. 2nd Sem.**

Course Objective

1. To describe a reaction rate in terms of a change in concentration divided by a change in time (at constant volume) and a general form of a (differential) rate law.
2. To write a general form of the rate law for any chemical reaction and define the order of a chemical reaction.
3. To determine integrated rate expression for zero order, first order, second and third order reaction and their respective half life period expressions.
4. To study the various factors which affect the rate of a chemical reaction such as concentration ,temperature, solvent, catalyst etc. And theories of chemical kinectics.
5. acquire basic knowledge of electrode conduction.
6. determine the solubility of sparingly soluble salts.
7. explain the various methods for the determination of transport number.

Course Outcomes

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

1. State the basic principles electrochemistrys
2. Mention and explain various methods for the determination of transport number.
3. Explain the concepts of electrolytic conduction and dilution
4. Understand rate of reaction and factors affecting it.
5. Derive integrated rate expressions for zero order ,first order ,second order and third order reaction.
6. Understand theories of reaction kinetics and differentiate them.

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Course objectives and Outcomes

Subject-Organic Chemistry **Class: B.Sc. 2nd Sem.**

Course objectives

1. To identify addition reactions for alkenes and alkynes.
2. To understand the nature of double and triple bonds for addition reactions.
3. To identify the difference between dienes and alkenes.
4. To understand the mechanism of attack of electrophiles and nucleophiles.
5. To understand the preparation methods for alkenes, alkynes, alkyl halides.

Course outcomes

1. Recognize the basic practical skills for the synthesis of alkenes, alkynes, alkyl halides.
2. Able to predict the reactivity of organic compound from its structure.
3. Able to understand the rules for naming different organic compounds
4. Able to recognize mechanism for given chemical reaction.

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Course objectives and Outcomes

Subject: Inorganic chemistry **Class: B.Sc. 3rd Sem.**

Course Objective

1. In order to study transition metals to understand the trends in properties and reactivity of the d-block elements.
2. To explain the typical physical and chemical properties of the transition metals.
3. To identify simple compound classes for transition metals and describe their chemical properties.
4. To make the students understand that solutions which have water as a solvent are called aqueous solutions and those with solvent other than water are called non-aqueous solutions.
5. The students should know that that equivalent weight of an acid and base can be find out from their molecular weight and the acidity and basicity of that compound.
6. The student should understand that there are different methods of expressing concentration of a solution such as mass percent, ppm, normality, molarity, and molality.

Course Outcomes

1. The students will be able to explain the fundamental concepts in coordination chemistry of transition metals.
2. The Students should be familiar with the basic knowledge of the non-aqueous solutions and applications of non-aqueous solvents in analytical chemistry.
3. The students will develop the ability of effective solving practical problem of analytical chemistry of non-aqueous solutions.
4. Students will be able to describe different quantitative methods of analysis of organic and inorganic substances.
5. Students will be able to demonstrate methods of drugs analysis and pharmaceuticalcalculations.

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Course objectives and Outcomes

Subject : Physical chemistry **Class: B.Sc. 3rd Sem.**

Course Objective

1. To understand thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials.
2. To understand Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law
3. To understand the concept of equilibrium constant, free energy, chemical potential
4. To understand the Nernst distribution law – its thermodynamic derivation, modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law
5. To understand the determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride

Course Outcomes

After the completion of the course, Students will be able to

1. Recognize the basic terms of thermodynamic.
2. Able to predict the energy change in heat capacities at constant volume and pressure and their relationship.
3. Able to drive Joule's law and its application.
4. Able to derive relationship between modification of distribution law when solute undergoes dissociation
5. Able to recognize the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.

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Course objectives and Outcomes

Subject-Organic Chemistry **Class: B.Sc. 3rd Sem.**

Course Objectives

1. To understand the methods for preparation of alcohols.
2. To understand the different classes of alcohols.
3. To understand the structure of carboxylic acid and their derivatives.
4. To understand the reactivity of different carboxylic acid derivatives.
5. To understand the chemical reactions of phenols.
6. To understand chemical reactions and synthesis of Epoxides
7. To understand basic principle of UV-Visible spectroscopy

Course Outcomes

1. Able to recognize structures of acid halides, esters, amides, acid anhydrides.
2. Able to convert given name of alcohol to structure.
3. Able to write the order of reactivity of different carboxylic acid derivatives.
4. Able to describe different classes of alcohols.
5. Able to write down structure of phenol and phenoxide ion.
6. To find out value of wavelength of different dienes and unsaturated carbonyl compounds.

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Course objectives and Outcomes

Subject: Inorganic chemistry **Class: B.Sc. 4th Sem.**

Course Objective

1. The students will understand the importance of periodic table of the elements, how it came to be and its role in organizing chemical information.
2. The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.
3. The students will learn the laboratory skills needed to design, safely conduct and interpret chemical research.
4. The primary aim of a qualitative research is to provide a complete detailed description of the research topic.
5. Quantitative research focuses more in counting and classifying features and constructing statistical models and figures to explain what is observed.

Course Outcomes

1. By quantitative analysis courses, the students will be learn to understand, communicate and interpret quantitative information and mathematical ideas.
2. All should able to develop skills in the recognition of patterns, generalisation, abstraction to a formal system and application of the system to specific situations.
3. The students will be able to understand the various uses of lanthanides elements in flash light powders and in dying cotton.
4. The students will be able to understand about recently lanthanides have been used in lasers.
5. The students will be able to know about actinides elements are used as nuclear fuels for various purposes.

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Course objectives and Outcomes

Subject : Physical Chemistry **Class: B.Sc. 4th Sem.**

Course Objective

1. To understand the concepts of thermodynamics and its laws
2. To understand the entropy change in reversible and irreversible reaction
3. To understand the physical significance of third law of thermadynamics
4. To understand the concepts of electrochemistry
5. To understand the working and reaction of electrochemical cells

Course Outcomes

After the completion of the course, Students will be able to

1. Recognize the basic concepts of thermodynamics
2. Able to predict the reversible and irreversible reaction
3. Able to understand the physical significance of third law of thermadynamics
4. Able to recognize the reaction of electrochemical cells and types

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Course objectives and Outcomes

Subject-Organic Chemistry **Class: B.Sc. 4th Sem.**

Course objectives

1. To understand how to name different aldehydes and ketones.
2. To understand the reactivity of different carbonyl compounds towards nucleophilicaddition reaction.
3. To understand how to write the products of addition reaction to carbonyl compounds.
4. To understand to differentiate between primary, secondary and tertiary amines.
5. To determine the percentage composition of a liquid sample mixture by the application of Beers Law.
6. To determine the presence of functional groups in any organic compound
7. To understand the basic of nitro compounds.

Course outcomes

1. Students are able to recognize mechanism of different reactions related to carbonyl compounds.
2. Students are able to differentiate between given different amines.
3. Able to recognize different functional groups by given only graph of peaks.
4. Able to write mechanism of different condensation reaction.
5. Able to recognize the reactivity of substituted aromatic amines.

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Course objectives and Outcomes

Subject : Inorganic chemistry **Class: B.Sc. 5th Sem.**

Course Objective

1. To understand the concepts of metal ligand bonding in transition complex compounds.
2. To understand the thermodynamics and kinetic aspects of metal complexes.
3. To understand the nomenclature, classification, properties and preparations of coordination compounds.
4. To understand the chemistry of organometalic compounds, homogenous hydrogenation and carbonyls.
5. To understand the bioinorganic chemistry of hemoglobin, myoglobin etc.

Course Outcomes

After the completion of the course, Students will be able to

1. Recognize the bonding in transition compounds by VBT and CFST theories.
2. Able to predict the geometry of coordination compounds and type of hybridization.
3. Able to determine the properties and preparations of Li, Al, Hg, Sn, Ti etc. metal compounds.
4. Able to recognize the biological reaction alkali and alkaline earth metals, nitrogen fixation, hemoglobin and myoglobin.

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Course objectives and Outcomes

Subject- Physical Chemistry **Class: B.Sc. 5th Sem.**

Course Objectives

1. To understand the concept of black body radiations.
2. To understand the concept of wave functions.
3. To understand different properties of molecular structure.
4. To understand the basic features of spectroscopy.
5. To understand the Harmonic Osillator.

Course Outcomes

1. Able to recognize different regions for different spectroscopy.
2. Able to explain the concept of Electromagnetic Waves.
3. Able to explain the concept use in Black Body Radiation.
4. Able to calculate dipole moment in given molecules.
5. Able to use concept of polarizability.

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Course objectives and Outcomes

Subject: Organic chemistry **Class: B.Sc. 5th Sem.**

Course Objective

1. In order to study the NMR spectroscopy to understand the important role of nuclear magnetic resonance spectroscopy in the study of the structures of organic compounds.
2. To develop an understanding of the significance of the number,positions,intensitiesand splitting of signals in nuclear magnetic resonance spectra.
3. To be able to assign structures to simple molecules on the basis of nuclear magnetic resonance spectra.
4. In order to study carbohydrates will develop the skills to recognize and draw particular carbohydrate structures.
5. To know general structural elementsof cyclic monosaccharide and disaccharidesand their implications for structure and function.

Course outcomes

1. After study of course students have firm foundations in the fundamentals and application of current chemical and scientific theories.
2. Students are able to identify and solve chemical problems and explore new areas of research.
3. Students are skilled in problingsolving ,critical thinking and analytical reasoning.
4. After completion of course students should have the ability to identify organic compounds by analysis and interpretation of spectral data.
5. Students should have the ability to explain common terms in NMR spectroscopy such as chemical shift ,coupling constant and anisotropy and describe how they are affected by molecular structure.
6. Students are skilled to perform the most commonly used NMR experiments and to interpret and document their results.

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Course objectives and Outcomes

Subject-Inorganic Chemistry **Class: B.Sc. 6th Sem.**

Course objectives

1. To understand the role of metal ions in biological system.
2. To understand the role of metal ions in oxygen transport.
3. To understand the concept of acid and bases.
4. To understand the uses of inorganic polymers.
5. To understand the nature of bonding of different metals with carbon atom.

Course Outcomes

1. Students are able to describe role of different metal ions in biological system.
2. Students are able to recognize role of porphyrin ring in haeomoglobin.
3. Students are able to count total of electrons in organometallic compound.
4. Students come to know about uses of different inorganic polymers in making of tyres, toys, plastics bags.
5. Students are able to name different organometallic compounds.

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Course objectives and Outcomes

Subject : Physical chemistry **Class: B.Sc. 6th Sem.**

Course Objective

1. To understand the transitions through electronic spectroscopy
2. To understand the term symbols of diatomic molecules
3. To understand the different type of vapour pressure curves
4. To understand the ideal and non ideal solutions and their behaviour
5. To understand the thermodynamics of one and two component system.

Course Outcomes

After the completion of the course, Students will be able to

1. Recognize the basic rules of electronic spectroscopy.
2. Able to predict the term symbols of diatomic molecules
3. Able to understand the behavior of ideal and non ideal solutions
4. Able to recognize the thermodynamics of one and two component system
5. Recognize the basic rules of various component system

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Course objectives and Outcomes

Subject: Organic chemistry **Class: B.Sc. 6th Sem.**

Course objective

1. The main aim of Heterocyclic compounds study is to develop novel, efficient, convenient, selective and environmentally benign synthetic methods in organic chemistry.
2. The objective of the present study of heterocyclic compounds is to develop green methodologies for the synthesis of nitrogen containing heterocyclic.
3. The students will be aware about most of drugs in the present market are the compounds containing various heterocyclic moieties.
4. To enable students to acquire a specialised knowledge and understanding of selected aspects by means of lecture series and a research project.
5. The course aims to provide an advanced understanding of the core principles and topics of biochemistry and their experimental basis.

Course outcomes

1. The students should be able to demonstrate advanced knowledge and understanding in aspect of protein structure.
2. The students will be able to introduce about basic chemistry of the heterocyclic.
3. The students will get familiar with particular properties and reactions for the most important heterocyclic as well as different systems of nomenclature.
4. The students will develop fundamental theoretical understanding of heterocyclic chemistry.
5. The students will be able to fully comprehend the chemistry of many heterocyclic products, carbohydrate, amino acids, peptides, proteins and lipids in use such as drugs and food.

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject: Inorganic chemistry-I **Class: M.Sc. Chemistry 1st Sem.**

Course Objective

1. The students should be able to describe various types of isomerism which can occur in coordination complexes.
2. The students should be able to give the systematic names of simple coordination compounds.
3. The students should be able to explain what is meant by the Spectrochemical Series and list the approximate order of common ligands in the spectrochemical series.
4. The students should be able to explain the terms stepwise stability constant and overall stability constant.
5. The students should be able to give appropriate definitions of the terms inert and labile and state which d-electron configurations are associated with inertness.
6. The students should be able to explain the use of terms Hard and Soft in relation to metal ions and ligands and discuss the stability of complexes in terms of hard and soft interactions.

Course Outcomes

1. Students should be able to explain atomic structure based on quantum mechanics and explain periodic properties of the atoms.
2. Students should be able to explain selected crystal structures explain what kind of parameters that affect the crystal structure of a compound and perform calculations of the lattice enthalpy of ionic compounds.
3. Students should be able to explain the periodic properties of the different groups of compounds focusing on production methods and application of selected elements and compounds.
4. Students should be able to explain the band structure of solids and determine the electrical properties.
5. Students should be able to explaining the theory of the determination of the electron structure of d-metal complexes and explain the properties of these complexes.
6. Students should be able to explain the structure and bonding in molecules and predict the structure of molecules.

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject-Physical Chemistry **Class: M.Sc. Chemistry 1st Sem.**

Course Objective

1. To understand the concept of quantum mechanics.
2. To understand the concept of thermochemistry.
3. To understand the concept of different laws of thermodynamics.
4. To understand the Debye Huckel Theory of ion-ion interactions.
5. To understand the effect of temperature on reaction rates.
6. To understand the different theories of chemical kinetics.

Course outcomes

1. Able to solve the problems related to 1D box.
2. Able to explain role of operators in quantum.
3. Able to solve problems of Carnot cycle.
4. Able to solve questions basis on rates of different reactions.
5. Able to explain temperature and pressure effect on mountains.
6. Able to differentiate between different theories of kinetics.

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Course Objective & Outcome

Subject-Organic Chemistry **Class: M.Sc. Chemistry 1st Sem.**

Course Objective

1. To understand the difference between conformation and configurations.
2. To understand the principles used in asymmetric synthesis.
3. To understand the stereochemistry of sugar conformations.
4. To understand the mechanisms involved in aliphatic nucleophilic substitution reactions.
5. To understand the topicity of ligands.
6. To understand the concept of aromaticity.
7. To understand about different mechanism of nucleophilic substitution reaction with special reference to its stereochemistry.
8. To understand basic concepts of organic chemistry, nature of bonding and chemical reactions.

Course Outcomes

1. Able to recognize either molecule is aromatic,non-aromatic or antiaromatic.
2. Able to describe mechanism of different aliphatic nucleophilic substitution reactions.
3. Able to draw potential energy diagrams.
4. Able to assign R and S to given molecules.
5. Able to do interconversion of Fischer to Newmann,Newmann to Sawhorse and vice versa.
6. Able to identify the absolute conformation of different organic molecules.
7. able to write down mechanism of different aliphatic electrophilic substitution reactions.
8. To correlate the conformation and reactivity.

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Course Objective & Outcome

Subject-Statistical Technique & its Applications **Class: M.Sc. Chemistry 1st Sem.**

Course Objectives

1. Student will able to calculate and apply measures of location and measures of dispersion -- grouped and ungrouped data cases.
2. Student will able to apply discrete and continuous probability distributions to various business problems.
3. Student will able to Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.
4. Student will Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.
5. Student will able to Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test. Further, understand both the meaning and applicability of a dummy variable and the assumptions which underline a regression model.
6. Student will be able to perform a multiple regression using computer software

Course outcomes

1. Students are prepared for working with correlation and regression
2. Students are aware about the concept of hypothesis testing in research.
3. They knows about t-test , chi-square test etc. with various numerical.
4. They also describe the characteristics of population on the basis of sample.
5. Students aware about the concept of sampling method which are practical used.
6. Student will able to Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.

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Course Objective & Outcome

Subject: Communication Skills **Class: M.Sc. Chemistry 1st Sem.**

Course Objectives

1. Students will demonstrate competency in research skills related to the use of the field's professional literature and in systematic research design and implementation.
2. Students will demonstrate an understanding of multiple theoretical perspectives and diverse intellectual traditions in Communication.
3. Students will demonstrate competency in human relational interaction.
4. Students will demonstrate competency in the analysis and practice of ethical communication.
5. Students will demonstrate an understanding of the importance of free expression and the responsibilities it entails.
6. Students will demonstrate competency in effective communication with diverse others and an understanding of the impact of culture on communication

Course outcomes

After completion of the course Students will be able to

1. Demonstrate critical and innovative thinking
2. Display competence in oral, written, and visual communication.
3. Apply communication theories.
4. Show an understanding of opportunities in the field of communication.

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Course Objective & Outcome

Subject : Inorganic Chemistry-II **Class: M.Sc. Chemistry 2nd Sem.**

Course Objective

1. The objective of the course is to appraise the students about the organometallic Chemistry.
2. To learn about the 18 e rule and its violation.
3. To identify the basic concept, terms, and important events in the development of organometallic chemistry.
4. To learn methods, including spectroscopy techniques, used to determine the structure of organometallic complexes and to probe reaction mechanism.
5. To develop an appreciation for the scope, diversity, and application of organometallic chemistry.
6. To learn about the common organometallic reactions and to be able to draw reasonable reaction mechanisms.

Course Outcomes

After the completion of the course, Students will be able to

1. Have a good overview of the fundamental principles of organotransition-metal chemistry and know how chemical properties are affected by metals and ligands.
2. Be able to use knowledge about structure and bonding issues to understand the stability and reactivity of simple organometallic complexes.
3. Have insight into the use of modern methods to characterize organometallic compounds.
4. Understand fundamental reaction types and mechanisms and how to combine these to understand efficient catalytic processes
5. Know important applications of organometallic homogeneous catalysis in the production of large-scale (bulk) and smaller-scale (fine chemicals) production.

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject :Physical Chemistry **Class: M.Sc. Chemistry 2nd Sem.**

Course Objective

1. To learn about the concept of phase and derivation of phase rule.
2. To understand the Phase diagram for one component system and for two completely miscible component systems.
3. To study eutectic systems and calculation of eutectic point.
4. To understand ClausiusClapeyron equation and its applications.
5. To study kinetics of reaction in solution and influence of pressure, ionic strength, solvent on reaction rates.
6. To learn about kinetics of catalytic reactions i.e. acid-base catalysis, heterogeneous catalysis and enzyme catalysis.
7. To evaluate Michaelis's constant for enzyme-substrate binding by Lineweaver-Burk plot.
8. To understand the concept of distribution and thermodynamic probability.
9. To evaluate most probable distribution state for all type of statics i.e. for Maxwell-Boltzmann, Fermi dirac and Bose –Einstein statistics.
10. To understand the concept of partition function, its physical significance and calculation of molar and atomic partition function.
11. To study Angular momentum and space quantization.
12. To evaluate commutation relation between total orbital angular momentum operator and its components.
13. To study the concept of ladder operators and their application to an eigen function of Z-component of angular momentum.
14. To solve Schrodinger wave equation for Rigid rotor and Linear harmonic oscillator and calculate their respective energies.

Course Outcomes

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

1. Understand the concept of Phase and Gibb's Phase rule.
2. Study Phase diagram for one component and two component systems and calculate eutectic point, congruent and incongruent melting points.
3. Describe Kinetics of reaction in solution and in catalytic reactions.
4. Calculate Michaelis's constant for enzyme-substrate binding by Lineweaver-Burk plot.
5. Understand the concept of distribution and thermodynamic probability.
6. Evaluate most probable distribution state for all type of statics i.e. for Maxwell-Boltzmann, Fermi dirac and Bose –Einstein statistics.
7. Understand the concept of partition function, its physical significance and calculation of molar and atomic partition function.
8. Solve Schrodinger wave equation for Rigid rotor and Linear harmonic oscillator and calculate their respective energies.
9. Evaluate commutation relation between total orbital angular momentum operator and its components.
10. Study the concept of ladder operators and their application to an eigen function of Z-component of angular momentum.

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject: Organic Chemistry **Class: M.Sc. Chemistry 2nd Sem.**

Course Objective

1. To understand the main concept of aromatic electrophilic substitution reaction and activating and directing effects of substituent on ring.
2. To understand the mechanisms of different aromatic nucleophilic substitution reactions.
3. To understand the mechanism of elimination reactions.
4. To understand pyrolytic elimination reaction.
5. To understand the concept of addition reaction to multiple bonds.
6. To understand the addition of Grignard Reagent on carbonyl compounds.
7. To understand the mechanism of different types of rearrangements.

Course Outcomes

1. Able to recognize effect of different groups on ring.
2. Able to find out the mechanism of aromatic electrophilic substitution reaction.
3. Able to differentiate between all types of rearrangements.
4. Able to describe mechanism of different rearrangement reactions.
5. Able to practically found different groups present in different organic compounds.
6. Able to explain reactivity of different carbonyl compounds.
7. Able to recognize mechanism of given chemical reactions.

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject :Supramolecular& Photochemistry **Class: M.Sc. Chemistry 2nd Sem.**

Course Objective

1. To Study the principles of supramolecular chemistry and host-guest chemistry using "lock and key" analogy.
2. To determine the nature of supramolecular interactions, cation binding hosts, anion binding, ion pairs receptors, molecular guests in solution, self-assembly
3. To establish molecular recognition as the fundamental of supramolecular chemistry.
4. To study the synthesis and structure of various supramolecular system such as crown ethers, coronads,cryptands, spherands, rotaxanes etc.
5. To explain the cocept of photochemistry and study Beer-Lambert law.
6. To describe and explain photochemical and photophysical processes using Jablonski diagramand their quantum yield expressions.
7. To study the selection rules for electronic transitions and develop quantum mechanical formulation of Franck-Condon principle.

Course Outcomes

After the completion of the course, Students will be able to

1. Have a good overview of the core concepts in supramolecular chemistry and explain non covalent interactions,molecularrecoginition and self-assembly.
2. Be able to describe some of the applications of supramolecular chemistry including industrial applications and supramolecular catalysis.
3. Understand fundamentals of photochemistry and laws governing it such as Beer-Lambert law.
4. Describe and distinguish between radiative and non- radiative transitions with the help of Jablonski diagram.
5. Understand photophysical kinetics of unimolecular and bimolecular processes and Stern-Volmer

DEPARTMENT OF CHEMISTRY

Course Objective & Outcome

Subject : Group Theory & MolecularSpectroscopy Class: M.Sc. Chemistry 2nd Sem.

Course Objective

1. To learn about the selection rule for infrared-active transitions.
2. To Determine the vibrations for a triatomic molecule and identify whether they are infrared-active.
3. To Justify the difference in intensity between Stokes and anti-Stokes lines.
4. To learn about symmetry elements and symmetry operations.
5. To learn about the point groups and character table
6. To learn about the Application of group theory i.e. Hybridization .

Course Outcomes

1. Describe the selection rule for infrared-active transitions.
2. Determine the vibrations for a triatomic molecule and identify whether they are infrared-active.
3. Determine whether the molecular vibrations of a triatomic molecule are Raman active.
4. Explain the difference between Stokes and anti-Stokes lines in a Raman spectrum. 3. Justify the difference in intensity between Stokes and anti-Stokes lines.
5. Draw the Stokes and anti-Stokes lines in a Raman spectrum of a compound when given the energies of the different transitions.
6. Students will be able to analyse the hybridization of given compounds.
7. Students will be able to Draw character table and point groups. Students will be able to

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject :Inorganic chemistry-I **Class: M.Sc. Chemistry 3rd Sem.**

Course Objective

1. To determine the (most important) quantum states of a given material (atoms, small molecules) and can assign these states to energy Terms.
2. To determine which quantum state(s) belong(s) to the ground stat and which state belongs to the excited state.
3. To determine the structure of inorganic and organic compounds by using different types of spectroscopy technics.
4. To determinethemassesofatomsormoleculesinwhichanelectricalchargeisplacedonthemolecule andtheresultingionsareseparatedbytheirmasstochargeratio.
5. To determine the hyperfine parameters, recoil energy , quadrupole splitting and chemical shift / isomer shift by using mossbauer spectroscopy.

Course Outcomes

After the completion of the course, Students will be able to

1. Understanding the various ways organic chemical structures are depicted.
2. Drawing organic chemical structures from names (and vice-versa)
3. Naming Structures including stereoisomers and geometric isomers
4. Understand the concepts of equivalent and non-equivalent hydrogens.
5. Understand the effect of structure on chemical shift and coupling constants.
6. Construct splitting diagrams (“trees”) and be able to measure coupling constants an NMR spectrum, or predict coupling constants and trees from a structure.
7. Recongnize and know how to test for exchangeable hydrogens in a molecule.
8. Deduce unknown structures and fully assign an IR spectrum to the structure.
9. Apply mass spectroscopy (exact mass, and fragmentation patterns) to organic structural analysis.

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject :Inorganic chemistry-II **Class: M.Sc. Chemistry 3rd Sem.**

Course Objective

1. ObjectivesforNuclearChemistry.
2. Defineradioactivityanddistinguishbetweennaturalandartificial.
3. Explaintransmutation.
4. Radioactiveemissions:alpha,beta,gamma.
5. Describewhateachemissioniscomposedofandhowtheydifferfromeachotherwithrespecttomass, charge,penetratingpower,andionizingpower.
6. Tellwhathappenstoanelementthatundergoesalphadecay,betadecay,orgammadecay.
7. Discusstheprocessusedtoseparatethethreetypesofradioactiveemissions.
8. Defineandexplainmassdefect.
9. Definebindingenergy.
10. Explainthebasicdifferencebetweenafissionreactionandafusionreaction.
11. Explainhowachainreactionworks.
12. Discussthedifferencebetweenafissionreactioninanuclearbombandtheoneinanuclearfissionreactor.
13. Givethedetailsofafusionreaction.
14. Listthethreeplacesfusionoccurs:fusionreactors,thesun,hydrogenbomb.

Course Outcomes

After the completion of the course, Students will be able to

1. Identify and define various types of nuclear transmutation including fission, fusion and decay reactions.
2. Use proper isotopic notation to write down and balance a nuclear reaction.
3. State and compare the differences and similarities between a nuclear change and a chemical change.
4. Recall and properly use Einstein's theory of relativity equation, E = mc2, to calculate the amount of energy released upon a nuclear change.
5. Define binding energy and mass defect and be able to calculate each for a given nucleus.
6. Understand and explain the concept of ionizing radiation and distinguish between the three different types of radiation.
7. Understand and explain the concept of isotopic stability including the band of stability.
8. Be familiar with the units used to quantify nuclear decay
9. Understand the concept of rate of change and half life in the context of nuclear decay.
10. Understand the basics of nuclear chemistry applications: nuclear power, medical treatment, isotopic labelling, and carbon dating.

DEPARTMENT OF CHEMISTRY

Course Objective & Outcome

Subject: Organic Chemistry **Class: M.Sc. Chemistry 3rd Sem.**

Course Objectives

1. To understand the different classes of drugs.
2. To understand the role of metal ions in biological system.
3. Come to know about contribution of metal ion in enzymes.
4. To understand the structure of Hb.
5. To understand the role of carriers in muscle contraction.
6. To understand the essential and trace metals.

Course Outcomes

After the completion of the syllabus, students will be:

1. Able to understand the mechanism of oxygen transport in body.
2. Able to understand positive and negative impacts of drugs.
3. Able to understand various pumps in the body and their significance.
4. Able to know about the phenomenon of muscle contraction.

Able to draw the structure of myoglobin

DEPARTMENT OF CHEMISTRY

Course Objective & Outcome

Subject : Inorganic Chemistry-IV **Class: M.Sc. Chemistry 4th Sem.**

Course Objective

1. The objective of the course is to appraise the students about the organometallic Chemistry.
2. To learn about the 18 e rule and its violation.
3. To identify the basic concept, terms, and important events in the development of organometallic chemistry.
4. To learn methods, including spectroscopy techniques, used to determine the structure of organometallic complexes and to probe reaction mechanism.
5. To develop an appreciation for the scope, diversity, and application of organometallic chemistry.
6. To learn about the common organometallic reactions and to be able to draw reasonable reaction mechanisms.

Course Outcomes

After the completion of the course, Students will be able to

1. Have a good overview of the fundamental principles of organotransition-metal chemistry and know how chemical properties are affected by metals and ligands.
2. Be able to use knowledge about structure and bonding issues to understand the stability and reactivity of simple organometallic complexes.
3. Have insight into the use of modern methods to characterize organometallic compounds.
4. Understand fundamental reaction types and mechanisms and how to combine these to understand efficient catalytic processes
5. Know important applications of organometallic homogeneous catalysis in the production of large-scale (bulk) and smaller-scale (fine chemicals) production.

DEPARTMENT OF CHEMISTRY

Course Objective & Outcome

Subject : Inorganic Special -V **Class: M.Sc. Chemistry 4th Sem.**

Course Objective

1. To understand the basic concepts elecroanalytical chemistry
2. To understand the terms AC and DC Polarography
3. To understand the working of different types of electrodes
4. To understand the concepts of voltameteryamperometery
5. To understand the working and reaction of electrochemical cells

Course Outcomes

After the completion of the course, Students will be able to

1. Recognize the basic concepts of elecroanalytical chemistry
2. Able to predict the AC and DC Polarography
3. Able to understand the physical and chemical significance of electrodes
4. Able to detect the chemical compounds in various solutions
5. Able to predict the organic and inorganic compounds

DEPARTMENT OF CHEMISTRY
Course Objective & Outcome

Subject: Inorganic Special- VI **Class: M.Sc. Chemistry 4th Sem.**

Course Objective

1. To understand the roles of metals in the pathological basis for disease and medical treatments through the development of new systems and optimization of existing technologies.
2. To provide qualitative data suggesting that the key differentiating variable in satisfaction might be the strength and quality of therapeutic relationship.
3. The specific objective addressed using a mixture of quantititative and qualitative methods.
4. The aim of dietary nutrients intake by which we obtain the substances to fulfil our bodies need to grow and keep functioning properly.
5. The main aim to study dietary intake will be able to understand that different foods have different nutritional value and their deficiency causing various health problems.

Course Outcomes

1. The students will be able to predict a drug properties based on its structure.
2. The students will be able to describe the common methods of spectroscopic and chromatographic analysis, and discuss how they can be applied to pharmaceuticals.
3. To describe the factors that affect its absorption, distribution, metabolism and excretion and hence the considerations to be made in drug design.
4. To explain the relationship between drug's chemical structure and its therapeutic properties.
5. The students will be introduced to further chemical principles that are required to understand the action and behaviour of drug compounds .