

Pt. CLS Govt. College, Karnal

Department of Chemistry

2020-21 (Odd)

Learning objectives and Outcomes

B.Sc.-1st Semester

Subject-Inorganic Chemistry

Subject Code CH-101

Learning Objectives

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

Learning Outcomes

1. Able to write electronic configuration of given atomic number in different oxidation states.
2. Able to recognize the shapes of various orbitals.
3. Able to calculate bond order of different molecules like O₂ and N₂.
4. Able to draw MO diagrams of HOMO and HETERO molecules.
5. Able to draw structures of different ionic solids.
6. Able to calculate Z_{eff} using Slaters Rule.

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Department of Chemistry

2020-21 (Odd)

Learning Objective & Outcomes

B.Sc.- 1st Semester

Subject: Physical Chemistry

Subject Code: CH-102

Learning Objective

1. Students will understand the concept of pressure in different perspective.
2. Students will be able to describe the 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.

Learning Outcomes

1. Students will be able to describe the characteristic of the three states of matter.
2. Students will be able to describe the different physical properties of each state of matter.
3. Students will be able to determine the difference between solids, liquids and gases.
4. Students will be able to describe the matter and its properties.
5. Students will be able to give examples of solids, liquids and gases.

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Department of Chemistry

2020-21 (Even)

Learning Objective & Outcomes

B.Sc - 1st Semester

Subject : Organic Chemistry

Subject Code : CH-103

Learning Objective

1. To understand the core concepts of organic chemistry i.e. resonance, aromaticity, hyperconjugation, and inductive effect etc. and their application.
2. To study about the isomerism and types of stereoisomerism.
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 the nomenclature, synthesis, physical and chemical properties of alkanes and cycloalkanes.

Learning Outcomes

At the end of this course, the students will be able to

1. Recognize and draw constitutional isomers, stereoisomers, including enantiomers and diastereomers, racemic mixture and meso compounds.
2. Know the fundamental principles of organic chemistry 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, chemical and physical properties of alkanes and cycloalkanes

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Department of Chemistry

2020-21 (Even)

Learning Objective & Outcomes

B.Sc. - 2nd Semester

Subject : Inorganic Chemistry

Subject Code : CH-104

Learning 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 compounds and the 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.

Learning 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 be 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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Department of Chemistry
2020-21 (Even)

Learning Objective & Outcomes
B.Sc.(Chemistry) 2nd Semester

Subject : Physical Chemistry

Subject Code : CH-105

Learning Objective

1. To describe a reaction rate in terms of a change in concentration 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 order 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 kinetics.
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.

Learning Outcomes

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

1. State the basic principles electrochemistry.
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 by conceptual knowledge.

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2020-21(Even)

Learning objectives and Outcomes

B.Sc.-2nd Semester

Subject-Organic Chemistry

Subject Code: CH-106

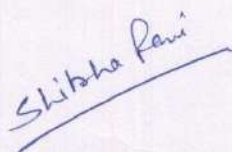
Learning objectives

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.

Learning 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 IUPAC nomenclature of different organic compounds
4. Able to recognize mechanism for the various chemical reaction.


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Department of Chemistry

2020-21

Learning objectives and Outcomes

B.Sc.-2nd Semester

Subject-Practical

Subject Code: CH-107

Learning objectives

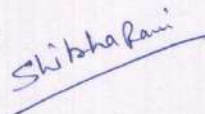
1. Experimental practice of quantitative volumetric analysis.
2. The objective of the titrations the determination of the concentration or the mass of the minimum formula from the titrated chemical material composing a pure liquid or a solution.
3. Synthesis of organic compounds.
4. The objective of physical experiment is to determine the viscosity, surface tension and refractive index of the given liquid sample.
5. The main objective of volumetric analysis is to determine the amount of a substance in a given sample.

Learning Outcomes

Upon successful completion students should be able to

1. Facilitate the learner to make the solutions of various molar concentration.
2. This may include the concepts of mole, converting moles to gram, converting grams to mole, defining concentration, dilution of solution, and making different molar concentrations.
3. Taking the boiling point of a given sample.
4. Learn how to determine the viscosity surface tension and refractive index of unknown sample.


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Department of Chemistry

2020-21 (Odd)

Learning Objective & Outcomes

B.Sc.- 3rd Semester

Subject: Inorganic chemistry

Subject Code: CH-201


Learning 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 explain the stability of variable oxidation state with the help of Latimer and Frost diagram.
4. The students should know the geometry and shapes of coordination complexes.
5. 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.

Learning 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 effectively solving practical problems of analytical chemistry of non-aqueous solutions.
4. Students will be able to describe different quantitative methods of analysis of organic and inorganic substances.


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Learning Objective & Outcomes

B.Sc. - 3rd Semester

Subject : Physical chemistry

Subject Code : CH-202

Learning Objective

1. To understand thermodynamic terms: system, surrounding etc. open and closed system, intensive and extensive properties. State and path functions and their differentials.
2. To understand the concept of work and 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. Applications of distribution law
5. To understand the determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride

Learning 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 derive 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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Learning objectives and Outcomes

B.Sc.-3rd Semester

Subject-Organic Chemistry

Subject Code: CH-203

Learning 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.

Learning 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.

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Department of Chemistry

2020-21(Even)

Learning Objective & Outcomes

B.Sc - 4th Semester

Subject: Inorganic chemistry

Subject Code : CH-204

Learning Objective

1. The students will understand the importance of periodic table of the elements, how it came to be and its role in organising 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.

Learning 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 dyeing 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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Learning Objective & Outcomes

B.Sc. - 4th Semester

Subject : Physical Chemistry

Subject Code : CH-205

Learning 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 thermodynamics
4. To understand the concepts of electrochemistry
5. To understand the working and reaction of electrochemical cells

Learning 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 thermodynamics
4. Able to recognize the reaction of electrochemical cells and types

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2020-21(Even)

Learning objectives and Outcomes

B.Sc.-4th Semester

Subject-Organic Chemistry

Subject Code CH-206

Learning objectives

1. To understand the naming of different aldehydes and ketones.
2. To understand the reactivity of different carbonyl compounds towards nucleophilic 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.

Learning 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 IR spectroscopy.
4. Able to write mechanism of different condensation reaction.
5. Able to recognize the reactivity of substituted aromatic amines.

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2020-21

Learning Objective & Outcomes

B.Sc.-4th Semester

Subject-Practical

Subject Code: CH-207

Learning objectives

1. Experimental practice of qualitative analysis of organic compounds.
2. The objective of the qualitative analysis is to determine the specific functional groups present in the compound.
3. Synthesis of inorganic salts.
4. The objective of gravimetric analysis is to determine purity of the given sample.

Learning Outcomes

Upon successful completion students should be able to

1. Facilitate the learner to make the solutions of various molar concentration.
2. Learn how to identify the given sample of unknown organic compound.
3. Determine the purity of given compound by using gravimetric analysis.
4. Learn how to determine the viscosity surface tension and refractive index of unknown sample.

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Department of Chemistry

2020-21 (Odd)

Learning Objective & Outcomes
B.Sc. - 5th Semester

Subject : Inorganic chemistry

Subject Code : CH-301

Learning 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 electronic spectra of transition metal complexes.
5. To understand the calculation of magnetic moment of transition metal complexes.

Learning 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 Magnetic properties of transition metals.
4. Able to calculate the term symbol of metals in different oxidation states.

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2020-21 (Odd)

Learning objectives and Outcomes

B.Sc.-5th Semester

Subject- Physical Chemistry

Subject Code: CH-302

Learning 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 concept of operators and particle in 1D box.

Learning 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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Learning Objective & Outcomes

B.Sc.-5th Semester

Subject: Organic chemistry

Subject Code: CH-303

Learning Objective

1. To study the NMR spectroscopy in order to understand the important role of nuclear magnetic resonance spectroscopy for the evaluation of structures of organic compounds.
2. To develop an understanding of the significance of the number, positions, intensities and 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 elements of cyclic monosaccharide and disaccharides and their implications for structure and function.

Learning 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 problem solving, 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.
6. Students are skilled to perform the most commonly used NMR experiments and to interpret and document their results.

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Department of Chemistry

2020-21(Even)

Learning objectives and Outcomes

B.Sc.-6th Semester

Subject-Inorganic Chemistry

Subject Code: CH -304

Learning 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.

Learning 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 haemoglobin.
3. Students are able to count total of electrons in organometallic compound.
4. Students come to know about uses of different inorganic polymers silicones and phosphazenes.
5. Students are able to name different organometallic compounds.


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Department of Chemistry

2020-21(Even)

Learning Objective & Outcomes

B.Sc. - 6th Semester

Subject : Physical chemistry

Subject Code : CH-305

Learning Objective

1. To understand the Born-Oppenheimer approximation.
2. To understand the various laws of photochemistry.
3. To understand the different type of colligative properties.
4. To understand the ideal and non-ideal solutions and their behaviour
5. To understand the thermodynamics of one and two component system.

Learning 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 terms used in Jablonski Diagram.
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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2020-21(Even)

Learning Objective & Outcomes

B.Sc-6th Semester

Subject: Organic chemistry

Subject Code : CH-306

Learning 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.

Learning 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.

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2020-21

Learning Objective & Outcomes

B.Sc.-5th Semester

Subject-Practical

Subject Code: CH-307

Learning objectives

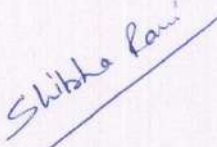
1. Experimental practice of qualitative analysis of inorganic salts.
2. The objective of the qualitative analysis is to determine the acidic radicals and basic radicals.
3. Synthesis of organic compounds like SBT, aspirin, m-nitro aniline.
4. Separation of coloured compounds by using TLC.
4. The objective of physical experiment is to determine the molecular weight by rast method, conductance and specific rotation by using polarimeter.

Learning Outcomes

Upon successful completion students should be able to

1. Facilitate the learner to make the solutions of various molar concentration to determine the conductometric analysis.
2. Learn how to identify the acidic and basic radicals of given sample of unknown inorganic salts .
3. Determination of molecular weight.
4. Learn to find out the dextro-rotatory or leavo-rotatory nature of the sample.


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