

Lecture 1 - Introduction of Organometallic Chemistry

Lecture 2 - Counting of Electrons

Lecture 3 - Ligand Substitution Reactions

Lecture 4 - Oxidative Addition [1. Concerted Mechanism]

Lecture 5 - Oxidative Addition [2. SN₂ Mechanism]

Lecture 6 - Oxidative Addition [3. Radical Mechanism]

Lecture 7 - Reductive Elimination

Lecture 8 - Migratory Insertion and Elimination Reactions

Lecture 9 - Migration and Insertion Reactions

Lecture 10 - Alpha-Migratory Insertion and alpha-Elimination Reactions

Lecture 11 - Beta-Migratory Insertion

Lecture 12 - Beta-Elimination Reaction

Lecture 13 - Alpha-Abstraction and beta-Abstraction

Lecture 14 - 4-Center Reactions; [2+2] Reactions

Lecture 15 - External Attack by a Ligand and Reductive Coupling

Lecture 16 - Hydrogenation Reaction

Lecture 17 - Hydrogenation Reaction [Dihydride Catalyst]

Lecture 18 - Stereoselective Hydrogenation Reaction

Lecture 19 - Carbonylation Reaction [1. Monsanto Acetic Acid Process 2. Hydroformylation 3. Hydrocarboxylation]

Lecture 20 - Carbonylation Reaction [1. Hydroformylation 2. Hydrocarboxylation 3. Hydrocyanation]

Lecture 1 - Fundamentals of Chemical thermodynamics

Lecture 2 - Work

Lecture 3 - Tutorial-1

Lecture 4 - First Law of Thermodynamics

Lecture 5 - Tutorial-2

Lecture 6 - Adiabatic processes

Lecture 7 - Entropy

Lecture 8 - Entropy and Second Law: Basics

Lecture 9 - Entropy and Second Law: Applications

Lecture 10 - Third Law of Thermodynamics

Lecture 11 - Discussion on Helmholtz energy

Lecture 12 - Discussion on Gibbs Energy

Lecture 13 - Maxwell relations, Properties of Gibbs energy

Lecture 14 - Further discussion on properties of Gibbs energy

Lecture 15 - Fugacity

Lecture 16 - Tutorial session

Lecture 17 - Tutorial session

Lecture 18 - Chemical potential of a substance in mixture

Lecture 19 - Chemical potential of Liquids, Raoult's Law, Henry's Law

Lecture 20 - Thermodynamics of mixing, Excess functions

Lecture 21 - Partial molar volume

Lecture 22 - Activities (Accounting for deviations from Ideal behaviour)

Lecture 23 - Tutorial on thermodynamics of mixing and deviations from ideality

Lecture 24 - Further discussion on relation between C_p and C_v

Lecture 25 - Chemical Equilibrium

Lecture 26 - Perfect gas equilibria

Lecture 27 - Equilibrium constant

Lecture 28 - Effect of pressure on equilibrium constant and equilibrium composition

Lecture 29 - Effect of temperature on equilibria

Lecture 30 - Biological standard states and pH

Lecture 31 - Tutorial 1 - Equilibrium constant

Lecture 32 - Tutorial 2 - Equilibrium constant

Lecture 33 - Acids and bases and Equilibrium concepts

Lecture 34 - pH Scale Strong and weak acids and bases

Lecture 35 - Strong and weak acids and bases

Lecture 36 - Acid-base titrations

Lecture 37 - pH curve for titration of weak acid with strong base Buffers and indicators

Lecture 38 - Thermodynamics in systems of biological interest

Lecture 39 - Calorimetry

Lecture 40 - Differential scanning calorimetry (DSC)

Lecture 41 - Further discussion on Differential Scanning Calorimetry (DSC)

Lecture 42 - Explaining Differential Scanning Calorimetric Profiles (DSC Profiles)

Lecture 43 - Applications of DSC in thermal unfolding of proteins and protein-solvent interactions

Lecture 44 - Further discussion on applications of DSC in thermal unfolding of proteins and protein-solvent interactions

Lecture 45 - Isothermal Titration calorimetry (ITC)

Lecture 46 - Further discussion on Isothermal Titration calorimetry (ITC)

Lecture 47 - ITC Experimental Design and Isothermal Titration Calorimetry (ITC) in Drug Design

Lecture 48 - Isothermal Titration Calorimetry (ITC) in Drug Design

Lecture 49 - Isothermal Titration Calorimetry (ITC) in Engineering Binding Affinity

Lecture 50 - Calorimetry in identifying partially folded states of proteins (Molten Globule State)

Lecture 51 - Thermodynamic Characterization of Partially Folded States of Proteins

Lecture 52 - Quantitative Thermodynamic Characterization of Partially Folded States of Proteins

Lecture 53 - ITC in Drug-Protein Interactions

Lecture 54 - Identifying sites for Drug-Protein Interactions by ITC

Lecture 55 - Identifying sites for Drug-Protein Interactions, DSC of Protein-Ligand Complexes. Enthalpy-Entropy Compensation

Lecture 56 - Estimation of Binding Constants in Strong to Ultratight Protein-Ligand, Interactions Using Differential Scanning Calorimetry

Lecture 57 - Continuation of discussion on... Estimation of Binding Constants in Strong to Ultratight Protein-Ligand Interactions Using Differential Scanning Calorimetry

Lecture 58 - Thermal unfolding of protein by non-calorimetric methods, Addressing thermodynamics of the process

Lecture 59 - Titration Calorimetry as a tool to determine thermodynamic and Kinetic parameters of enzymes

Lecture 60 - Summary of the course

Lecture 1 - Classification of Elements and Periodic Properties

Lecture 2 - Periodic Properties, Periodic Trends and Classification of Main Group Compounds

Lecture 3 - Classification of Main Group Compounds

Lecture 4 - Effective Nuclear Charge

Lecture 5 - Structure and Bonding Aspects: Lewis Structures and VSEPR Theory

Lecture 6 - Structure and Bonding Aspects: VSEPR Theory

Lecture 7 - Structure and Bonding Aspects: Valence Bond Theory

Lecture 8 - Structure and Bonding Aspects: Valence Bond Theory

Lecture 9 - Structure and Bonding Aspects: MO Theory

Lecture 10 - Structure and Bonding Aspects: MO Theory

Lecture 11 - Structure and Bonding Aspects: MO Theory

Lecture 12 - Structure and Bonding Aspects: MO Theory

Lecture 13 - Chemistry of Hydrogen

Lecture 14 - Chemistry of Hydrogen

Lecture 15 - Chemistry of Hydrogen, Hydrides and Hydrogen Bonding

Lecture 16 - Chemistry of Group 1 Elements

Lecture 17 - Chemistry of Group 1 Elements

Lecture 18 - Chemistry of Group 1 Elements

Lecture 19 - Chemistry of Group 1 Elements

Lecture 20 - Chemistry of Group 2 Elements

Lecture 21 - Chemistry of Group 2 Elements

Lecture 22 - Chemistry of Group 2 Elements

Lecture 23 - Chemistry of Group 2 Elements

Lecture 24 - Chemistry of Group 2 Elements

Lecture 25 - Chemistry of Group 13 Elements

Lecture 26 - Chemistry of Group 13 Elements

Lecture 27 - Chemistry of Group 13 Elements

Lecture 28 - Chemistry of Group 13 Elements

Lecture 29 - Chemistry of Group 13 Elements

Lecture 30 - Wades Rules

Lecture 31 - Chemistry of Group 13 Elements

[Lecture 32 - Chemistry of Group 14 Elements](#)

[Lecture 33 - Chemistry of Group 14 Elements](#)

[Lecture 34 - Chemistry of Group 14 Elements](#)

[Lecture 35 - Chemistry of Group 14 Elements](#)

[Lecture 36 - Chemistry of Group 14 Elements](#)

[Lecture 37 - Chemistry of Group 14 Elements](#)

[Lecture 38 - Chemistry of Group 14 Elements](#)

[Lecture 39 - Chemistry of Group 15 Elements](#)

[Lecture 40 - Chemistry of Group 15 Elements](#)

[Lecture 41 - Chemistry of Group 15 Elements](#)

[Lecture 42 - Chemistry of Group 15 Elements](#)

[Lecture 43 - Chemistry of Group 15 Elements](#)

[Lecture 44 - Chemistry of Group 15 Elements](#)

[Lecture 45 - Chemistry of Group 15 Elements](#)

[Lecture 46 - Chemistry of Group 15 Elements](#)

[Lecture 47 - Chemistry of Group 16 Elements](#)

[Lecture 48 - Chemistry of Group 16 Elements](#)

[Lecture 49 - Chemistry of Group 16 Elements](#)

[Lecture 50 - Chemistry of Group 16 Elements](#)

[Lecture 51 - Chemistry of Group 16 Elements](#)

[Lecture 52 - Chemistry of Group 17 Elements](#)

[Lecture 53 - Chemistry of Group 17 Elements](#)

[Lecture 54 - Chemistry of Group 18 Elements](#)

[Lecture 55 - Chemistry of Group 12 Elements](#)

[Lecture 56 - Organometallic Compounds of Main Group Elements](#)

[Lecture 57 - Organometallic Compounds of Main Group Elements](#)

[Lecture 58 - Organometallic Compounds of Main Group Elements](#)

[Lecture 59 - Organometallic Compounds of Main Group Elements](#)

[Lecture 60 - Overall Summary](#)

Lecture 1 - History of Organometallic Compounds

Lecture 2 - Polarity and Reactivity of $M-C$ bonds

Lecture 3 - Reactivity of Organometallic Compounds

Lecture 4 - Reactivity of Organometallic Compounds

Lecture 5 - 18 Valence Electron Rule and Classification

Lecture 6 - 18 Valence Electron Rule and Classification

Lecture 7 - Reactivity and types of Organometallic compounds

Lecture 8 - Sigma-Donor Ligands

Lecture 9 - Preparation of Sigma-Alkyl Compounds

Lecture 10 - Preparation and Properties of Sigma-Alkyl Compounds

Lecture 11 - Properties of Sigma-Alkyl Compounds

Lecture 12 - β -elimination in Sigma-Alkyl Compounds

Lecture 13 - β -elimination in Detail

Lecture 14 - TM Sigma-Alkyl Complexes and its Application

Lecture 15 - TM Sigma-Alkyl Complexes and its Application

Lecture 16 - $C-H$ Activation

Lecture 17 - $C-H$ Activation in Details

Lecture 18 - $C-H$ Activation in Details

Lecture 19 - Characterization of $C-H$ Activation

Lecture 20 - Bonding in $C-H$ Activation

Lecture 21 - $C-C$ Bond Activation

Lecture 22 - $C-C$ Bond Activation

Lecture 23 - $C-C$ Bond Activation in Details

Lecture 24 - Transition Metal Perfluoroalkyl (RF^TM) Complexes

Lecture 25 - Preparation of Transition Metal Perfluoroalkyl (RF^TM) Complexes

Lecture 26 - $C-F$ Activation

Lecture 27 - Transition Metal Alkenyl/Aryl Complexes

Lecture 28 - Transition Metal Aryl Complexes

Lecture 29 - Transition Metal Aryl/Alkyne Complexes

Lecture 30 - Transition Metal Alkyne/Carbene Complexes

Lecture 31 - Transition Metal Carbene Complexes: Preparations

- Lecture 32 - Transition Metal Carbene Complexes: Properties
- Lecture 33 - Transition Metal Carbene Complexes: Reactivities
- Lecture 34 - Transition Metal Carbene Complexes: Reactivities
- Lecture 35 - Transition Metal Carbene Complexes: Reactivities
- Lecture 36 - Transition Metal Carbene Complexes: Reactivities
- Lecture 37 - Reactivity of Schrock type Carbene Complexes and Transition Metal Carbynes
- Lecture 38 - Transition Metal Carbynes: Preparation
- Lecture 39 - Transition Metal Carbynes: Properties
- Lecture 40 - Transition Metal Carbynes: Properties
- Lecture 41 - Properties of Transition Metal Carbynes And Transition Metal Carbonyls
- Lecture 42 - Transition Metal Carbonyls
- Lecture 43 - Transition Metal Carbonyls
- Lecture 44 - Transition Metal Carbonyls: Bonding Properties
- Lecture 45 - Transition Metal Carbonyls: Bonding properties
- Lecture 46 - Transition Metal Carbonyls: Reactivities
- Lecture 47 - Transition Metal Carbonyls: Reactivity and Carbonyl Metallates
- Lecture 48 - Transition Metal Carbonyl Hydrides
- Lecture 49 - Application of Carbonyl Metallates and Metal Halides
- Lecture 50 - Application of Metal Halides and Metal Alkenes
- Lecture 51 - Transition Metal Olefin Complexes
- Lecture 52 - Transition Metal Olefin Complexes
- Lecture 53 - Transition Metal Olefin Complexes: Reactivity
- Lecture 54 - Bonding Properties in Olefin Complexes
- Lecture 55 - Transition Metal Diolefin Complexes
- Lecture 56 - Transition Metal Diolefin and Alkyne Complexes
- Lecture 57 - Transition Metal Alkyne Complexes
- Lecture 58 - Transition Metal Alkyne Complexes: Reactivity
- Lecture 59 - Transition Metal Alkyne Complexes: Reactivity
- Lecture 60 - Summary: Transition Metal Organometallic Chemistry: Principles to Applications

Lecture 1 - Assymmetric Hydrogenation

Lecture 2 - Transition Metal Carbenes Fischer and Schrock Carbenes

Lecture 3 - Olefin Metathesis

Lecture 4 - Alkyne Metathesis

Lecture 5 - Cyclopropanation Reaction

Lecture 6 - Catalytic Cyclopropanation Reaction and Introduction to Cross Coupling Reaction

Lecture 7 - Kumada Coupling Reaction

Lecture 8 - Suzuki Coupling Reaction

Lecture 9 - Stille Coupling Reaction

Lecture 10 - Assymmetric Suzuki Coupling Reaction

Lecture 11 - Sonogashira Coupling Reaction

Lecture 12 - Heck Coupling Reaction

Lecture 13 - Assymmetric Heck Reaction Introduction to Buchwald-Hartwig Coupling Reaction

Lecture 14 - Buchwald-Hartwig Coupling Reaction

Lecture 15 - Role of Ligands its Influence in Buchwald-Hartwig Coupling Reaction

Lecture 16 - Oxidative Cyclization Process

Lecture 17 - Application of Oxidative Cyclization in Natural Product Synthesis

Lecture 18 - Synthesis of Reactive Metallacycle Intermediate Via-Beta-Abstraction and their Applications

Lecture 19 - Kulinkovich Reaction and its Mechanism

Lecture 20 - Pauson's Khand Reaction

Lecture 1 - Overview of inorganic chemistry of life

Lecture 2 - Elements in biology and or life

Lecture 3 - Selection and criteria for elements

Lecture 4 - Biomolecules

Lecture 5 - Coordination in enzymes

Lecture 6 - Amino acids, peptides and proteins - An introduction

Lecture 7 - Nucleoside, nucleotide and nucleic acids and DNA: An introduction

Lecture 8 - General introduction of metalloproteins

Lecture 9 - Coordination chemistry aspects - An introduction

Lecture 10 - Stability and lability

Lecture 11 - Techniques used inorganic chemistry life

Lecture 12 - Techniques used inorganic chemistry life (Continued...)

Lecture 13 - Techniques used inorganic chemistry life (Continued...)

Lecture 14 - Techniques used inorganic chemistry life (Continued...)

Lecture 15 - Recap on metalloenzymes

Lecture 16 - Role of Alkali, Alkaline earth elements in life

Lecture 17 - Role of Alkali, Alkaline earth elements in life (Continued...)

Lecture 18 - Role of Alkali, Alkaline earth elements in life (Continued...) Ion transport and ionophores

Lecture 19 - Role of Alkali, Alkaline earth elements in life (Continued...) Ion transport and ionophores

Lecture 20 - Functioning of ATPases and nucleases [Na,K]ATPase

Lecture 21 - Role of vanadium in life - General perspectives

Lecture 22 - Role of vanadium in life - Haloperoxidases

Lecture 23 - Enzymes based on manganese in life

Lecture 24 - Role of Iron in life - General perspectives

Lecture 25 - Role of Iron in life - Transport systems

Lecture 26 - Role of Iron in life - Transport and Storage systems

Lecture 27 - Role of Iron in life - Electron transfer

Lecture 28 - Role of Iron in life - Perspectives of electron transfer proteins

Lecture 29 - Role of Iron in life - Monooxygenases: Cytochrome P450

Lecture 30 - Role of Iron in life - Mono-and di-oxygenases

Lecture 31 - Role of Iron in life - Reductases

- Lecture 32 - Role of Iron in life - Reductases and Phosphatases
- Lecture 33 - Role of Iron in life - Reductases and Phosphatases (Continued...)
- Lecture 34 - Role of Cobalt in life
- Lecture 35 - Role of Nickel in life - General perspectives
- Lecture 36 - Role of Nickel in life - Hydrolase, hydrogenase and SOD
- Lecture 37 - Role of Nickel in life - Carbonmonoxide dehydrogenase (CODH)
- Lecture 38 - Role of Copper in life - General perspectives
- Lecture 39 - Role of Copper in life - Type I and Type 2 copper enzymes
- Lecture 40 - Role of Copper in life - Multicenter copper oxidases and SOD
- Lecture 41 - Role of Zinc in life - General perspectives including oxidoreductases and hydrolases
- Lecture 42 - Role of Zinc in life - Carbonic anhydrase and carboxypeptidase
- Lecture 43 - Role of Zinc in life - Transferases, ligases and isomerases
- Lecture 44 - Role of Molybdenum in life - Introductory aspects
- Lecture 45 - Role of Molybdenum in life - Nitrogenase
- Lecture 46 - Role of Molybdenum in life - Oxidoreductases
- Lecture 47 - Role of Mercury in the environment - Mercury reductase
- Lecture 48 - Role of Selenium in life - Glutathione peroxidase
- Lecture 49 - Inorganics in medicine - Introductory aspects and cis-platin
- Lecture 50 - Inorganics in medicine - Apoptosis
- Lecture 51 - Inorganics in medicine - PDT, MRI and Barium tests
- Lecture 52 - Inorganics in medicine - Titanium in biomedical
- Lecture 53 - Highlights of the course - Part I
- Lecture 54 - Highlights of the course - Part II
- Lecture 55 - Highlights of the course - Part III
- Lecture 56 - Highlights of the course - Part IV
- Lecture 57 - Tutorials - Part I
- Lecture 58 - Tutorials - Part II
- Lecture 59 - Tutorials - Part III
- Lecture 60 - Tutorials - Part IV and overall

Lecture 1 - Symmetry point group: Introduction

Lecture 2 - Symmetry point group: Examples - Part I

Lecture 3 - Symmetry point group: Examples - Part II

Lecture 4 - Symmetry point group: Examples - Part III

Lecture 5 - Symmetry point group: Examples - Part IV

Lecture 6 - Transformation matrices and Matrix representation

Lecture 7 - More on Matrix representation: Cartesian coordinates in C_{2v} point group

Lecture 8 - Matrix representation: the way ahead

Lecture 9 - Introduction to Group Theory

Lecture 10 - Group Multiplication Tables

Lecture 11 - Groups and subgroups

Lecture 12 - Classes, Similarity transformations

Lecture 13 - Introduction to Matrices

Lecture 14 - Application of matrices in solution of simultaneous equations

Lecture 15 - Matrix eigenvalue equation

Lecture 16 - Matrix eigenvalue equation: an example

Lecture 17 - Similarity Transformations

Lecture 18 - Back to transformation matrices

Lecture 19 - Matrix representation revisited

Lecture 20 - Function space and Transformation Operators

Lecture 21 - Transformation Operators form the same group as transformation matrices

Lecture 22 - Transformation Operators form a unitary representation for orthonormal basis

Lecture 23 - Transformation Operators: Switching Bases

Lecture 24 - Equivalent representations

Lecture 25 - Unitary Transformation

Lecture 26 - Unitary Transformations (Continued...)

Lecture 27 - Reducible and Irreducible Representations

Lecture 28 - Irreducible Representations and Great Orthogonality Theorem

Lecture 29 - Character Tables: C_{2v}

Lecture 30 - Character Tables: C_{2v} and C_{3v}

Lecture 31 - Practice Session: Review of Some Questions and Solutions

- Lecture 32 - Reducible to Irreducible Representations
- Lecture 33 - Character Tables of Cyclic Groups
- Lecture 34 - Symmetry of Normal Modes: D_{3h}
- Lecture 35 - Symmetry of Normal Modes: D_{3h} (Continued...)
- Lecture 36 - Symmetry of Normal Modes: a shortcut
- Lecture 37 - Recap: Reducible Representation for Normal Modes
- Lecture 38 - Contribution of internal motion to normal modes
- Lecture 39 - Normal mode analysis: some examples
- Lecture 40 - Infrared and Raman spectroscopy
- Lecture 41 - IR and Raman activity
- Lecture 42 - IR and Raman activity: examples
- Lecture 43 - Symmetry Adapted Linear Combinations (SALC)
- Lecture 44 - SALC:BeH₂
- Lecture 45 - SALC:CH₄ Introduction
- Lecture 46 - SALC:CH₄
- Lecture 47 - Projection Operators
- Lecture 48 - Projection Operators (Continued...)
- Lecture 49 - Generating SALCs using Projection Operators
- Lecture 50 - Generating SALCs using Projection Operators (Continued...)
- Lecture 51 - Oh complex and Group-subgroup relation
- Lecture 52 - Group-Subgroup Relation
- Lecture 53 - SALCs as Pi-MO and Cyclopropenyl group
- Lecture 54 - SALCs as Pi-MO, Cyclopropenyl group
- Lecture 55 - SALCs as Pi-MO, Benzene
- Lecture 56 - LCAO Huckel approximation
- Lecture 57 - Huckel approximation: Naphthalene
- Lecture 58 - Stationary states, Multiplicity, Ethylene
- Lecture 59 - Napthalene - I
- Lecture 60 - Napthalene - II
- Lecture 61 - Napthalene - III
- Lecture 62 - Transition Metal Complexes: CFT and LFT
- Lecture 63 - Jahn-Teller Theorem, Tetragonal Distortion MOT:ML₆, Sigma and Pi Bonds
- Lecture 64 - MOT approach of bonding,H₂O,Ferrocene

[Lecture 65 - MOT approach of bonding,H2O,Ferrocene](#)

[Lecture 66 - Derivation: Great Orthogonality Theorem - I \(Schurrs Lemma 1\)](#)

[Lecture 67 - Derivation: Great Orthogonality Theorem - II \(Schurrs Lemma 2\)](#)

[Lecture 68 - Derivation: Great Orthogonality Theorem - III](#)

- Lecture 1 - Introduction to Computational Chemistry
- Lecture 2 - Writing Simple Programs: Compilation and Execution
- Lecture 3 - Programming Techniques 1 - Evaluating the sine function
- Lecture 4 - Programming Techniques 2 - Do loops and if statements
- Lecture 5 - Programming Techniques 3 - Roots of a quadratic equation and arrays
- Lecture 6 - Programming Techniques 4 - Arrays and matrices
- Lecture 7 - Practical Session of Programming 1
- Lecture 8 - Programming Techniques 5 - Formats, Functions and Subroutines
- Lecture 9 - Programming Techniques 6 - Functions and Subroutines, arranging numbers in as ascending order
- Lecture 10 - Programming Techniques 7 - Functions and Subroutines, and the common statement
- Lecture 11 - Numerical Methods. Analysis of errors
- Lecture 12 - Practical Session on Programming 2 - The exponential function
- Lecture 13 - Practical Session on Programming 3 - Functions and Subroutines
- Lecture 14 - Interpolation Methods-1
- Lecture 15 - Interpolation Methods-2: Newton's and Lagrange Interpolation
- Lecture 16 - Errors in interpolation, Matrix operations
- Lecture 17 - Gauss elimination method for matrix inversion
- Lecture 18 - Matrix diagonalization, Similarity transformations
- Lecture 19 - Matrix inversion, Matrix diagonalization
- Lecture 20 - Curve fitting, Newton Raphson method
- Lecture 21 - Random numbers, Numerical integration using Simpson's rule
- Lecture 22 - Numerical Integration and Differential Equations
- Lecture 23 - Practical Session on Programming 3: Random numbers, Simpson's rule; Introduction to Scilab
- Lecture 24 - Scilab-2: Matrix equations and Roots of Polynomials
- Lecture 25 - Scilab-3: Functions, Integrals, Differential Equations and graphs
- Lecture 26 - Scilab-4: Curve Fitting and Execution of Scilab programs
- Lecture 27 - Scilab-5: Legendre polynomials, Multiple plots and Curve fitting
- Lecture 28 - Scilab-6: Integral Transforms; Introduction to Molecular Dynamics (MD)
- Lecture 29 - Classical Molecular Dynamics-2, Force Fields and Equations of Motion
- Lecture 30 - Classical Molecular Dynamics-3, Force Fields and MD Algorithms
- Lecture 31 - Classical MD-4 Thermodynamic Properties and Distribution Functions.

[Lecture 32 - Classical MD-5, Execution of programs on liquid argon](#)

[Lecture 33 - Molecular Dynamics using Gromacs-1](#)

[Lecture 34 - Molecular Dynamics using Gromacs-2: Simulating Liquid Argon](#)

[Lecture 35 - Molecular Dynamics using Gromacs-3: Installing Gromacs](#)

[Lecture 36 - Molecular Dynamics using Gromacs-4: Liquid Water: Input Files](#)

[Lecture 37 - Molecular Dynamics using Gromacs-5: Liquid Water: Analysis of Results](#)

[Lecture 38 - Molecular Dynamics using Gromacs-6: Mixture of Water and Methanol](#)

[Lecture 39 - Molecular Dynamics using Gromacs-7: Gromacs Installation](#)

[Lecture 40 - Molecular Dynamics using Gromacs-8: Simulation of s-peptide](#)

[Lecture 41 - Molecular Dynamics using Gromacs-9: Free Energy of Solvation of Methane, Concluding remarks](#)

- Lecture 1 - Frequency Domain Spectroscopy: An Introduction
- Lecture 2 - Schematics of Instrumentation for FD Spectroscopy
- Lecture 3 - Sensitivity Light Collection and Signal to Noise Ratio
- Lecture 4 - Time Domain Spectroscopy
- Lecture 5 - Frequency Modulation for Fourier Transform Spectroscopy
- Lecture 6 - Rigid Rotor Model for Diatomic Molecules
- Lecture 7 - Recapitulation of Quantum Mechanics
- Lecture 8 - Conditions for Microwave Activity - I
- Lecture 9 - Conditions for Microwave Activity - II
- Lecture 10 - Microwave Spectra: Diatomic Molecules
- Lecture 11 - Simple Harmonic Oscillator
- Lecture 12 - Selection Rule
- Lecture 13 - High Resolution IR Spectra
- Lecture 14 - Anharmonic Oscillator and Raman Effect
- Lecture 15 - Semi Classical Treatment: Radiation-Matter
- Lecture 16 - Time Dependent Perturbation Theory
- Lecture 17 - Transition Moment Integral
- Lecture 18 - Transition Probability and Natural Linewidth
- Lecture 19 - Einstein Treatment
- Lecture 20 - Relationship Between Theoretical and Experimental Quantities
- Lecture 21 - Level System: Concluding Remark - I
- Lecture 22 - Level System: Concluding Remark - II
- Lecture 23 - Laser Basic
- Lecture 24 - Applications of Laser in Spectroscopy
- Lecture 25 - Laser in Spectroscopy : Ultrafast Dynamics
- Lecture 26 - Snapshot of Bond Breaking
- Lecture 27 - Raman Effect
- Lecture 28 - Raman Spectroscopy: Quantum Theory of Raman Effect
- Lecture 29 - Raman Spectroscopy and Beyond Dipole Approximation
- Lecture 30 - Symmetry in Chemistry : An Introduction
- Lecture 31 - Symmetry Operations : Transformation Matrices

- Lecture 32 - Representations Reducible and Irreducible
- Lecture 33 - Matrix Representation of Symmetry Point Group
- Lecture 34 - Group Theory : Character Table
- Lecture 35 - Character Table : Compendium of Irreducible Representations
- Lecture 36 - Mulliken Nomenclature, 2D Irreducible Representations and Bases
- Lecture 37 - Character Tables for Different Symmetry Point Groups
- Lecture 38 - Wave Functions as Basis
- Lecture 39 - Symmetry of Atomic and Molecular Orbitals
- Lecture 40 - Polyatomic Molecules : Normal Modes of Vibration
- Lecture 41 - Determination of Symmetries of Normal Modes of Vibration - I
- Lecture 42 - Determination of Symmetries of Normal Modes of Vibration - II
- Lecture 43 - A Shortcut to Symmetry of Normal Modes
- Lecture 44 - Normal Modes : Internal Motion IR and Raman Activity
- Lecture 45 - IR and Raman Activity - I
- Lecture 46 - IR and Raman Activity - II
- Lecture 47 - Electronic Spectroscopy : Introduction
- Lecture 48 - Electronic Spectra
- Lecture 49 - Rotational Fine Structure
- Lecture 50 - Symmetry of Electronic States
- Lecture 51 - Electronic States of Oxygen
- Lecture 52 - Electronic States and Transitions of Benzene
- Lecture 53 - Vibronic Coupling
- Lecture 54 - Electronic Spectrum of Benzene
- Lecture 55 - Basics of NMR Spectroscopy - I
- Lecture 56 - Basics of NMR Spectroscopy - II
- Lecture 57 - Spin Spin Coupling- AX systems
- Lecture 58 - Coupling in A2 systems
- Lecture 59 - Coupling in A2 systems (Continued...)
- Lecture 60 - NMR: Spectra and Measurement, FT NMR 900 Pulses
- Lecture 61 - FT NMR 1800 Pulses and Relaxation Phenomenon
- Lecture 62 - Relaxation Phenomenon: Inversion Recovery

Lecture 1 - Transition Metal Allyl and Enyl Complexes

Lecture 2 - Transition Metal Allyl and Enyl complexes: Preparation

Lecture 3 - Transition Metal Allyl and Enyl complexes: Preparation

Lecture 4 - Transition Metal Allyl and Enyl Complexes: Reactivity and Transition Metal Sandwich Complexes

Lecture 5 - Types of Transition Metal Sandwich Complexes

Lecture 6 - Transition Metal Cyclobutadiene Complexes

Lecture 7 - Transition Metal Cyclobutadiene Complexes: Preparations

Lecture 8 - Transition Metal Cyclobutadiene Complexes: Reactivity

Lecture 9 - Transition Metal Cyclopentadiene Complexes

Lecture 10 - Transition Metal Cyclopentadiene Complexes: Preparation and Properties

Lecture 11 - Transition Metal Cyclopentadiene Complexes: Bonding Properties

Lecture 12 - Transition Metal Cyclopentadiene Complexes: Molecular Orbital Diagram

Lecture 13 - Transition Metal Cyclopentadiene Complexes: Reactivity of Metallocene

Lecture 14 - Transition Metal Cyclopentadiene Complexes: Reactivity of Ferrocene

Lecture 15 - Transition Metal Cyclopentadienyl Carbonyl Complexes: Preparation

Lecture 16 - Transition Metal Cyclopentadienyl Carbonyl Complexes: Reactivity

Lecture 17 - Transition Metal Cyclopentadienyl Nitrosyl Complexes

Lecture 18 - Transition Metal Cyclopentadienyl Hydride Complexes

Lecture 19 - Transition Metal Cyclopentadienyl Hydride and Halide Complexes

Lecture 20 - Transition Metal Cyclopentadienyl Halide Complexes

Lecture 21 - Transition Metal Cyclopentadienyl Halide and Transition Metal Arene Complexes

Lecture 22 - Transition Metal Arene Complexes: Preparation, Structure and Bonding

Lecture 23 - Transition Metal Arene Complexes: Structure and Bonding

Lecture 24 - Transition Metal Arene Complexes: Reactivity

Lecture 25 - Transition Metal Arene Complexes: Reactivity

Lecture 26 - Transition Metal Arene Carbonyl Complexes: Reactivity

Lecture 27 - Transition Metal Arene Carbonyl Complexes: Reactivity

Lecture 28 - Transition Metal Arene Cyclopentadienyl Complexes

Lecture 29 - Transition Metal Arene Cyclopentadienyl and C_7H_7 Complexes

Lecture 30 - Transition Metal C_7H_7 Complexes: Preparation

Lecture 31 - Transition Metal C_7H_7 Complexes: Reactivity

- Lecture 32 - Transition Metal C₈H₈ and C₇H₇ Complexes
- Lecture 33 - Transition Metal C₈H₈ Complexes: Properties
- Lecture 34 - Transition Metal π - complexes of heterocycles
- Lecture 35 - C α -C Cross Coupling Reactions
- Lecture 36 - C α -C Cross Coupling Reactions: Allylic Alkylation
- Lecture 37 - C α -C Cross Coupling Reactions: Heck Reaction
- Lecture 38 - C α -C Cross Coupling Reactions: Suzuki Reaction
- Lecture 39 - C α -C Cross Coupling Reactions: Suzuki Reaction
- Lecture 40 - C α -C Cross Coupling Reactions: Stille Reaction
- Lecture 41 - C α -C Cross Coupling Reactions: Stille Coupling
- Lecture 42 - C α -C Cross Coupling Reactions: Sonogashira Coupling
- Lecture 43 - Hydrocyanation Reactions
- Lecture 44 - C α -heteroatom Coupling
- Lecture 45 - C α -heteroatom Coupling: Arylamination
- Lecture 46 - C α -Heteroatom Coupling: Hydroamination
- Lecture 47 - C α -Heteroatom Coupling: Hydroboration
- Lecture 48 - C α -Heteroatom Coupling: Hydrosilation
- Lecture 49 - Organometallic Catalysis Reactions: Olefin oxidation
- Lecture 50 - Organometallic Catalysis Reactions: Olefin oxidation
- Lecture 51 - Organometallic Catalysis Reactions: Enantioselective Sharpless Epoxidation
- Lecture 52 - Organometallic Catalysis Reactions: Water Gas Shift Reaction
- Lecture 53 - Organometallic Catalysis Reactions: Fisher Tropsch Synthesis
- Lecture 54 - Organometallic Catalysis Reactions: Fisher Tropsch Mechanism
- Lecture 55 - Organometallic Catalysis Reactions: Carbonylation of alcohols
- Lecture 56 - Organometallic Catalysis Reactions: Hydrogenation of Alkenes
- Lecture 57 - Organometallic Catalysis Reactions: Asymmetric Hydrogenation of Alkenes
- Lecture 58 - Organometallic Catalysis Reactions: Asymmetric Hydrogenation of Alkenes
- Lecture 59 - Organometallic Catalysis Reactions: Hydroformylation
- Lecture 60 - Summary of Advanced Transition Metal Organometallic Chemistry

Lecture 1 - Introduction to Reaction Mechanisms

Lecture 2 - Writing Reaction Mechanisms: Arrow pushing

Lecture 3 - Types of Polar Reactions

Lecture 4 - The Radical Reactions

Lecture 5 - Reaction Co-ordinate Diagrams

Lecture 6 - The Hammond Postulate

Lecture 7 - Kinetic versus Thermodynamic Control

Lecture 8 - Curtin-Hammett Principle

Lecture 9 - An Introduction to Reaction Kinetics

Lecture 10 - Deriving the Rate Laws

Lecture 11 - Distinguishing Reaction Mechanisms Using Rate Laws

Lecture 12 - Methods to Monitor a Reaction

Lecture 13 - The Hammett Equation

Lecture 14 - Linear Free Energy Relationships (LFER)

Lecture 15 - Hammett Plots for Electronic Effects

Lecture 16 - Scales used in Hammett Plots

Lecture 17 - Deviation from Linear Free Energy Relationships

Lecture 18 - LFER for Sterics: The Taft Parameters

Lecture 19 - Solvent Effects - Part A

Lecture 20 - Solvent Effects - Part B

Lecture 21 - Kinetic Isotope Effect

Lecture 22 - Primary Kinetic Isotope Effect

Lecture 23 - Secondary Kinetic Isotope Effect - Part A

Lecture 24 - Secondary Kinetic Isotope Effect - Part B

Lecture 25 - Heavy Atom Isotope Effects

Lecture 26 - Equilibrium Isotope Effects

Lecture 27 - Isotope Labelling

Lecture 28 - Trapping Intermediates - Part A

Lecture 29 - Trapping Intermediates - Part B

Lecture 30 - Trapping Intermediates - Part C

Lecture 31 - Checking for Common Intermediates

[Lecture 32 - Catalysis - Part A](#)

[Lecture 33 - Catalysis - Part B](#)

[Lecture 34 - Specific Catalysis](#)

[Lecture 35 - General Catalysis - Part A](#)

[Lecture 36 - General Catalysis - Part B](#)

[Lecture 37 - Enzyme Catalysis](#)

[Lecture 38 - Electrophilic Catalysis](#)

[Lecture 39 - Other Types of Catalysis](#)

[Lecture 40 - Course Summary](#)

Lecture 1 - Importance of metals in biology

Lecture 2 - Choice, uptake and assembly of metal ions in cells

Lecture 3 - Control and use of metal ions concentration in biological systems

Lecture 4 - Metal mediated folding of biopolymers

Lecture 5 - Study of binding mode of calcium and zinc in proteins

Lecture 6 - Electron transfer (ET) in living systems

Lecture 7 - Oxygen transport and activation

Lecture 8 - Hydrolytic Enzymes - Part I - Carbonic anhydrase and Liver alcohol dehydrogenase

Lecture 9 - Hydrolytic Enzymes - Part II - Carbopeptidase

Lecture 10 - Hydrolytic Enzymes - Part III - Arginase and Urease

Lecture 11 - Hemerythrin and azidomethemerythrin

Lecture 12 - Dioxygen reactivity in copper

Lecture 13 - Cu-O₂ intermediates

Lecture 14 - Copper-Oxygen chemistry - Part I - Mononuclear copper-oxygen

Lecture 15 - Copper-Oxygen chemistry - Part II - Cu-O₂ complexes

Lecture 16 - Copper-Oxygen chemistry - Part III - Reactivity summary

Lecture 17 - Iron Catalyzed oxidation of unactivated sp³ C-H bonds - Part I

Lecture 18 - Iron catalyzed oxidation of unactivated sp³ C-H bonds - Part II

Lecture 19 - Iron catalyzed oxidation of unactivated sp³ C-H bonds - Part III

Lecture 20 - Nitrous oxide reductase and its model complex

Lecture 21 - Cytochrome C-oxidase

Lecture 22 - Systematic variations in O-O stretch in Iron-oxo-copper ligand complex

Lecture 23 - Mononuclear nonheme iron (NHI) enzymes

Lecture 24 - Alpha-Keto Glutarate dependent Halogenases

Lecture 25 - Cytochrome P450 - Part I - Introduction

Lecture 26 - Cytochrome P450 - Part II - Reactions

Lecture 27 - Cytochrome P450 - Part III - Mechanism

Lecture 28 - Cytochrome P450 - Part IV - Role of Cystine ligand and distal charge relay

Lecture 29 - Methane monooxygenase

Lecture 30 - Dinuclear Iron active sites for CH₄ to CH₄OH conversion and its Mechanism

Lecture 31 - Concerted Vs radical pathway for CH₄ to CH₄OH conversion

[Lecture 32 - Photosynthesis - Part I](#)

[Lecture 33 - Photosynthesis - Part II](#)

[Lecture 34 - Pumps and channels](#)

[Lecture 35 - Quick summary on O₂ transport](#)

[Lecture 36 - Summary of Dioxygen reactivity in copper](#)

[Lecture 37 - Summary of Dioxygen reactivity in iron](#)

[Lecture 38 - Summary of Fe-O₂ chemistry](#)

Lecture 1 - Basic concepts

Lecture 2 - Resonance absorption

Lecture 3 - Bloch Equations

Lecture 4 - Relaxation

Lecture 5 - Introduction to Chemical Shift

Lecture 6 - Factors affecting Isotropic Chemical Shifts

Lecture 7 - Spin-Spin Coupling

Lecture 8 - Interpretation of multiplet structure using first order analysis

Lecture 9 - Analysis of NMR spectra of molecules

Lecture 10 - Quantum Mechanical Analysis - Part I

Lecture 11 - Quantum Mechanical Analysis - Part II

Lecture 12 - Dynamic effects in the NMR Spectra

Lecture 13 - Fourier Transform NMR

Lecture 14 - Theorems on Fourier Transform

Lecture 15 - Practical aspects of Fourier Transform NMR spectra

Lecture 16 - Data Processing in Fourier Transform NMR

Lecture 17 - Dynamic range in Fourier Transform NMR

Lecture 18 - Spin Echo and Solvent Suppression

Lecture 19 - Spin Decoupling in FT NMR and Relaxation Measurements

Lecture 20 - Polarization Transfer

Lecture 21 - Nuclear Overhauser Effect

Lecture 22 - Steady state NOE and Transient NOE

Lecture 23 - Distance and NOE

Lecture 24 - Selective Population Inversion

Lecture 25 - INEPT and Sensitivity Enhancement

Lecture 26 - Rotating Frame Experiments

Lecture 27 - Density matrix description of NMR - I

Lecture 28 - Density matrix description of NMR - II

Lecture 29 - Density matrix description of NMR - III

Lecture 30 - Time evolution of density operator

Lecture 31 - Density matrix description of NMR - IV

- Lecture 32 - Evolution of density operator in the presence of RF
- Lecture 33 - Product operator formalism
- Lecture 34 - Product operator formalism (Continued...)
- Lecture 35 - Product operator formalism (Continued...)
- Lecture 36 - Time evolution of basis operators
- Lecture 37 - Observable and Non-observable basis operators, Spin echo
- Lecture 38 - Spin echo (Continued...)
- Lecture 39 - INEPT
- Lecture 40 - Multidimensional NMR Spectroscopy
- Lecture 41 - Two Dimensional NMR - Part I
- Lecture 42 - Two Dimensional NMR - Part II
- Lecture 43 - Types of 2D NMR Spectra
- Lecture 44 - Two Dimensional Separation of Interaction in NMR
- Lecture 45 - Two Dimensional Correlation Experiments - I
- Lecture 46 - Two Dimensional Correlation Experiments - II
- Lecture 47 - Two Dimensional Correlation Experiments - III
- Lecture 48 - Double Quantum Filtered COSY (DQF-COSY)
- Lecture 49 - Two Dimensional Nuclear Overhauser Effect Spectroscopy (2D- NOESY)
- Lecture 50 - Constant-time COSY
- Lecture 51 - Scaling in 2D NMR
- Lecture 52 - Total Correlation Spectroscopy
- Lecture 53 - 2D Heteronuclear Experiment - I
- Lecture 54 - 2D Heteronuclear Experiment - II
- Lecture 55 - Multidimensional NMR
- Lecture 56 - Structure Determination of Peptides by NMR - I
- Lecture 57 - Structure Determination of Peptides by NMR - II
- Lecture 58 - Protein-Ligand Interaction - I
- Lecture 59 - Protein-Ligand Interaction - II
- Lecture 60 - Diffusion Ordered Spectroscopy

Lecture 1 - Concept of Effective Nuclear Charge

Lecture 2 - Electronic Configuration of Elements

Lecture 3 - Properties of Elements (Size, IE, EA and EN)

Lecture 4 - Extraction of Metals

Lecture 5 - Ellingham Diagram

Lecture 6 - Thermit Process and Zone Refining

Lecture 7 - Coordination Chemistry: 18 electron rule and VBT

Lecture 8 - Crystal Field Theory: Octahedral Complex

Lecture 9 - Crystal Field Theory: Tetrahedral Complex

Lecture 10 - Crystal Field Theory: Octahedral vs. Tetrahedral Complex

Lecture 11 - Application of CFSE: Spinel and J-T Distortion

Lecture 12 - Introduction to Molecular Magnetism

Lecture 13 - Problem Solving Approach

Lecture 14 - Magnetism

Lecture 15 - Spectroscopic Term Symbol

Lecture 16 - Magnetic States of Matter: Paramagnetic, Ferro and Antiferromagnetic

Lecture 17 - Introduction to Bio-Inorganic Chemistry

Lecture 18 - Metalloprotein (Hb, Mb, Transferrin) and Metalloenzyme (Plastocyanin)

Lecture 19 - Oxygen Transportation Mechanism

Lecture 1 - Introduction

Lecture 2 - Steady State Spectra

Lecture 3 - Spectro Photometer

Lecture 4 - How to record Absorption and Emission Spectra

Lecture 5 - Excited state processes

Lecture 6 - TCSPC for picosecond- Nanosecond Time Domain

Lecture 7 - TCSPC for picosecond- Nanosecond Time Domain (Continued...)

Lecture 8 - TCSPC Lab

Lecture 9 - Data Fitting 1

Lecture 10 - Data Fitting 2

Lecture 11 - Femtosecond Fluorescence Upconversion - 1

Lecture 12 - Femtosecond Fluorescence Upconversion - 2

Lecture 13 - Femtosecond Fluorescence Upconversion - 3

Lecture 14 - FOG Lab

Lecture 15 - Gate Detectors and Streak Camera - Part 1

Lecture 16 - Gate Detectors and Streak Camera - Part 2

Lecture 17 - Stimulated Emission

Lecture 18 - Two Level System

Lecture 19 - 3 and 4 level system

Lecture 20 - From CW to Pulsed Laser

Lecture 21 - Longitudinal modes

Lecture 22 - Modelocking for short pulses

Lecture 23 - Modelocking for short pulses (Continued...)

Lecture 24 - Kerr lens Modelocking for femtosecond pulses

Lecture 25 - Titanium Sapphire lasers

Lecture 26 - Active and Passive Modelocking

Lecture 27 - Modelocking and cavity damping

Lecture 28 - Ti:Sapphire laser (Lab visit)

Lecture 29 - Cavity Dumping

Lecture 30 - Cavity dumping (Continued...)

Lecture 31 - Q switching

- Lecture 32 - Stretching and compressing ultrafast laser pulses
- Lecture 33 - Pulse stretcher/Compressor: Single Grating
- Lecture 34 - Chirped pulsed amplification
- Lecture 35 - Oscillators and Amplifier: Design and materials
- Lecture 36 - Alexandrite and fibril lasers
- Lecture 37 - Regenerative amplifier in our lab
- Lecture 38 - Brief overview of nonlinear optical phenomena
- Lecture 39 - Brief overview of nonlinear optical phenomena (Continued...)
- Lecture 40 - Brief overview of nonlinear optical phenomena (Continued...)
- Lecture 41 - SFG and SHG with ultrafast pulses
- Lecture 42 - SFG and SHG with ultrafast pulses (Continued...)
- Lecture 43 - Optical parametric generation and amplification
- Lecture 44 - OPA in our lab TOPAS C - Part 1
- Lecture 45 - OPA in our lab TOPAS C - Part 2
- Lecture 46 - OPA in our lab TOPAS C - Part 3
- Lecture 47 - Snapshots of bond breaking
- Lecture 48 - Twisted Intramolecular Charge Transfer - Part 1
- Lecture 49 - Twisted Intramolecular Charge Transfer - Part 2
- Lecture 50 - Solvation dynamics - Part 1
- Lecture 51 - Solvation dynamics - Part 2
- Lecture 52 - Vibrational energy transfer in water
- Lecture 53 - Excited state proton transfer: Introduction
- Lecture 54 - Excited state double proton transfer of 7-Azaindole dimer - 1
- Lecture 55 - Excited state double proton transfer of 7-Azaindole dimer - 2
- Lecture 56 - Excited state double proton transfer of 7-Azaindole dimer - 3
- Lecture 57 - Plasmonic nanoparticles - 1
- Lecture 58 - Plasmonic nanoparticles - 2
- Lecture 59 - Nanoclusters
- Lecture 60 - Semiconductor Nanocrystals - Part 1
- Lecture 61 - Semiconductor nanocrystals - Part 2
- Lecture 62 - Radiative and Nonradiative Relaxation Pathways in CdSe Nanocrystals - Part 1
- Lecture 63 - Radiative and Nonradiative Relaxation Pathways in CdSe Nanocrystals - Part 2
- Lecture 64 - Multiexciton in semiconductor nanocrystals - Part 1

[Lecture 65 - Multiexciton in semiconductor nanocrystals - Part 2](#)

[Lecture 66 - Two dimensional Infrared spectroscopy: Introduction](#)

[Lecture 67 - 2DIR: Techniques](#)

Lecture 1 - Introduction

Lecture 2 - Reppe Synthesis (Introduction)

Lecture 3 - Reppe Reactions - Part 1

Lecture 4 - Reppe Reactions - Part 2

Lecture 5 - Reppe Reactions - Part 3

Lecture 6 - Metallative and Conventional Reppeand Metathesis Reaction (Introduction)

Lecture 7 - Origin of Olefin Metathesis

Lecture 8 - Mechanistic approaches of Metathesis Reaction - Part 1

Lecture 9 - Mechanistic approaches of Metathesis Reaction - Part 2

Lecture 10 - Mechanistic approaches of Metathesis Reaction - Part 3

Lecture 11 - Mechanistic approaches of Metathesis Reaction - Part 4

Lecture 12 - Types of Carbenes

Lecture 13 - Types of Metathesis Reactions

Lecture 14 - Alkyne Metathesis

Lecture 15 - Catalysis Development Aspect of Olefin Metathesis - Part 1

Lecture 16 - Catalysis Development Aspect of Olefin Metathesis - Part 2

Lecture 17 - Catalysis Development Aspect of Olefin Metathesis - Part 3

Lecture 18 - Catalysis Development Aspect of Olefin Metathesis - Part 4

Lecture 19 - Cross Metathesis - Part 1

Lecture 20 - Cross Metathesis - Part 2

Lecture 21 - Cross Metathesis - Part 3

Lecture 22 - Ring Opening Metathesis - Part 1

Lecture 23 - Ring Opening Metathesis - Part 2

Lecture 24 - Ring Opening Metathesis - Part 3

Lecture 25 - Ring Closing Metathesis - Part 1

Lecture 26 - Ring Closing Metathesis - Part 2

Lecture 27 - Ring Closing Metathesis - Part 3

Lecture 28 - Alkyne Metathesis

Lecture 29 - Alkene Alkyne Metathesis - Part 1

Lecture 30 - Alkene Alkyne Metathesis - Part 2

Lecture 31 - Alkene Alkyne Metathesis - Part 3

[Lecture 32 - Ring Closing Eneyne Metathesis \(RCEYM\) - Part 1](#)

[Lecture 33 - Ring Closing Eneyne Metathesis \(RCEYM\) - Part 2](#)

[Lecture 34 - Ring Closing Eneyne Metathesis \(RCEYM\) and Alkenes and Alkynes oligomerization reactions](#)

[Lecture 35 - Oligomerization of alkenes and alkynes - Part 1](#)

[Lecture 36 - Oligomerization of alkenes and alkynes - Part 2](#)

[Lecture 37 - Oligomerization of alkenes and alkynes - Part 3](#)

[Lecture 38 - Oligomerization of alkenes and alkynes - Part 4](#)

[Lecture 39 - Alkene oligomerization and Polymerization.](#)

[Lecture 40 - Olefin Polymerization - Part 1](#)

[Lecture 41 - Olefin Polymerization - Part 2](#)

[Lecture 42 - Olefin Polymerization - Part 3](#)

[Lecture 43 - Olefin Polymerization - Part 4](#)

[Lecture 44 - Olefin Polymerization - Part 5](#)

[Lecture 45 - Olefin Polymerization - Part 6](#)

[Lecture 46 - Olefin Polymerization - Part 7](#)

[Lecture 47 - Olefin Polymerization - Part 8](#)

[Lecture 48 - Olefin Polymerization - Part 9](#)

[Lecture 49 - Olefin Polymerization - Part 10](#)

[Lecture 50 - Olefin Polymerization - Part 11](#)

[Lecture 51 - Olefin Polymerization - Part 12](#)

[Lecture 52 - Olefin Polymerization - Part 13](#)

[Lecture 53 - Olefin Polymerization - Part 14](#)

[Lecture 54 - Olefin Polymerization - Part 15](#)

[Lecture 55 - Olefin Polymerization - Part 16](#)

[Lecture 56 - Homo and Copolymerization; Functionalized olefins, Cycloolefins and Diolefins](#)

[Lecture 57 - Non- Group IV Metal based olefin polymerization catalysts](#)

[Lecture 58 - Non- Group IV Metal based olefin polymerization catalysts](#)

[Lecture 59 - Bioorganometallic Chemistry](#)

[Lecture 60 - Overall summary of Transition metal organometallics in catalysis and biology](#)

[Lecture 1 - Basic Introduction](#)

[Lecture 2 - Bohr Model and Beyond](#)

[Lecture 3 - The wave nature of matter](#)

[Lecture 4 - Ground Rules: Postulates of Quantum mechanics - Part I](#)

[Lecture 5 - Ground Rules: Postulates of Quantum mechanics - Part II](#)

[Lecture 6 - Particle in a box - Part I](#)

[Lecture 7 - Particle in a box - Part II](#)

[Lecture 8 - Particle in a box - Part III](#)

[Lecture 9 - Particle in a box - Uncertainty Principle](#)

[Lecture 10 - Particle in a box - Uncertainty Principle \(Continued...\)](#)

[Lecture 11 - Quantum Mechanical Tunneling](#)

[Lecture 12 - Harmonic Oscillator - Part 1](#)

[Lecture 13 - Harmonic Oscillator - Part 2](#)

[Lecture 14 - Harmonic Oscillator - Part 3](#)

[Lecture 15 - Harmonic Oscillators - Wave Functions and Recursion formulae](#)

[Lecture 16 - Harmonic Oscillators - Wave Functions and Recursion formulae \(Continued...\)](#)

[Lecture 17 - Harmonic Oscillators: Conclusions](#)

[Lecture 18 - Rigid Rotor - Part 1](#)

[Lecture 19 - Rigid Rotor - Part 2](#)

[Lecture 20 - Rigid Rotor - Part 3](#)

[Lecture 21 - Polar Plots of Spherical Harmonics](#)

[Lecture 22 - Angular Momentum](#)

[Lecture 23 - Angular Momentum \(Continued...\)](#)

[Lecture 24 - Hydrogen Atom: Schrodinger Equation](#)

[Lecture 25 - Hydrogen Atom: Schrodinger Equation \(Continued...\)](#)

[Lecture 26 - Hydrogen atom: Quantum numbers](#)

[Lecture 27 - Radial Probability distribution functions](#)

[Lecture 28 - Hydrogen atom wavefunctions: s orbitals](#)

[Lecture 29 - 2s orbital](#)

[Lecture 30 - 2p orbitals](#)

[Lecture 31 - 3pz and 3d orbitals](#)

Lecture 32 - Atomic orbitals and orbital approximation

Lecture 33 - Multi electron atoms

Lecture 34 - He atom wavefunction

Lecture 35 - Excited states of many electron atoms

Lecture 36 - Introduction to Perturbation theory

Lecture 37 - Scope of Perturbation theory

Lecture 38 - Application of Perturbation theory: Anharmonic oscillator

Lecture 39 - Higher order perturbations

Lecture 40 - Perturbation theory for non-degenerate states

Lecture 41 - Perturbation Theory for degenerate states

Lecture 42 - Application of Perturbation Theory for degenerate States

Lecture 43 - Variation Method

Lecture 44 - Variational Method (Continued...)

Lecture 45 - Variational calculations for Harmonic Oscillator and Particle in a Box

Lecture 46 - Secular equations in Variational calculations

Lecture 47 - Secular equations for particle in a box

Lecture 48 - Variational calculation for particle in a box (Continued...)

Lecture 49 - Perturbation theory for many electron atoms

Lecture 50 - Variational method for many electron atoms

Lecture 51 - Hartree-Fock Equations and Self Consistent Fields

Lecture 52 - Hartree-Fock Equations for He - Part 1

Lecture 53 - Hartree-Fock Equations for He - Part 2

Lecture 54 - Electronic Wavefunctions of He atom

Lecture 55 - Valance Bond Theory and homonuclear diatomics - Part 1

Lecture 56 - Valance Bond Theory and homonuclear diatomics - Part 2

Lecture 57 - Molecular shape and hybrid orbitals

Lecture 58 - sp² hybridization

Lecture 59 - sp³ hybridization

Lecture 60 - Non-equivalent hybrid orbitals

Lecture 61 - Molecular Orbital Theory for H₂⁺

Lecture 62 - Molecular orbital theory for homonuclear diatomic molecules

Lecture 63 - Beyond Homonuclear diatomic molecules

Lecture 64 - MOT for polyatomic molecules

[Lecture 65 - Huckel MOT-1](#)

[Lecture 66 - Huckel MOT-2](#)

[Lecture 67 - The last word](#)

Lecture 1 - Why Study Statistical Mechanics?

Lecture 2 - Thermodynamics

Lecture 3 - Probability Theory - Part 1

Lecture 4 - Probability Theory - Part 2

Lecture 5 - Fundamental concepts and Postulates of Statistical Mechanics - Part 1

Lecture 6 - Fundamental concepts and Postulates of Statistical Mechanics - Part 2

Lecture 7 - From Postulates to Formulation

Lecture 8 - Microcanonical Ensemble

Lecture 9 - Relation with Thermodynamics in Microcanonical Ensemble - Part 1

Lecture 10 - Relation with Thermodynamics in Microcanonical Ensemble - Part 2

Lecture 11 - Canonical Ensemble - Part 1

Lecture 12 - Canonical Ensemble - Part 2

Lecture 13 - Thermodynamic Potential for Canonical ensemble

Lecture 14 - Grand Canonical Ensemble

Lecture 15 - Thermodynamic Potentials for Grand Canonical and Isothermal-Isobaric ensembles

Lecture 16 - Fluctuations and Response Function - Part 1

Lecture 17 - Fluctuations and Response Function - Part 2

Lecture 18 - Ideal Monatomic Gas: Microscopic Expression of Translational Entropy - Part 1

Lecture 19 - Ideal Monatomic Gas: Microscopic Expression of Translational Entropy - Part 2

Lecture 20 - Ideal Monatomic Gas: Microscopic Expression of Translational Entropy - Part 3

Lecture 21 - Ideal Monatomic Gas: Microscopic Expression of Translational Entropy - Part 4

Lecture 22 - Ideal Monatomic Gas: Microscopic Expression of Translational Entropy - Part 5

Lecture 23 - Ideal Gas of Diatomic Molecules: Microscopic Expression for Rotational and Vibrational Entropy and Specific Heat - Part 1

Lecture 24 - Ideal Gas of Diatomic Molecules: Microscopic Expression for Rotational and Vibrational Entropy and Specific Heat - Part 2

Lecture 25 - Ideal Gas of Diatomic Molecules: Microscopic Expression for Rotational and Vibrational Entropy and Specific Heat - Part 3

Lecture 26 - Ideal Gas of Diatomic Molecules: Microscopic Expression for Rotational and Vibrational Entropy and Specific Heat - Part 4

Lecture 27 - Ideal Gas of Polyatomic molecules

Lecture 28 - Cluster Expansion and Mayer's Theory of Condensation - Part 1

Lecture 29 - Cluster Expansion and Mayer's Theory of Condensation - Part 2

Lecture 30 - Cluster Expansion and Mayer's Theory of Condensation - Part 3

Lecture 31 - Cluster Expansion and Mayer's Theory of Condensation - Part 4

[Lecture 32 - Cluster Expansion and Mayer's Theory of Condensation - Part 5](#)

[Lecture 33 - Cluster Expansion and Mayer's Theory of Condensation - Part 6](#)

[Lecture 34 - Phase Transition and Landau Theory - Part 1](#)

[Lecture 35 - Phase Transition and Landau Theory - Part 2](#)

[Lecture 36 - Phase Transition and Landau Theory - Part 3](#)

[Lecture 37 - Comments on some important Concepts of Statistical Mechanics](#)

[Lecture 38 - Nucleation Part 1: Introduction, Thermodynamics of Nucleation](#)

[Lecture 39 - Nucleation Part 2: Kinetics of Nucleation](#)

[Lecture 40 - Nucleation Part 3: Kinetics of Nucleation, Classical Nucleation Theory, Heterogeneous Nucleation](#)

[Lecture 41 - Nucleation Part 4: Ostwald Step Rule](#)

[Lecture 42 - Spinodal Decomposition and Pattern Formation: Evolution of Structure through Dynamics - Part 1](#)

[Lecture 43 - Spinodal Decomposition and Pattern Formation: Evolution of Structure through Dynamics - Part 2](#)

[Lecture 44 - Ising Model and Other Lattice Models - Part 1](#)

[Lecture 45 - Ising Model and Other Lattice Models - Part 2](#)

[Lecture 46 - Ising Model and Other Lattice Models - Part 3](#)

[Lecture 47 - Ising Model and Other Lattice Models - Part 4](#)

[Lecture 48 - Ising Model and Other Lattice Models - Part 5](#)

[Lecture 49 - Binary Mixtures: Towards Understanding Non-Ideality and Osmotic Pressure - Part 1](#)

[Lecture 50 - Binary Mixtures: Towards Understanding Non-Ideality and Osmotic Pressure - Part 2](#)

[Lecture 51 - Theory of Liquids - Part 1](#)

[Lecture 52 - Theory of Liquids - Part 2](#)

[Lecture 53 - Theory of Liquids - Part 3](#)

[Lecture 54 - Theory of Liquids - Part 4](#)

[Lecture 55 - Polymers in Solution and Polymer Collapse - Part 1](#)

[Lecture 56 - Polymers in Solution and Polymer Collapse - Part 2](#)

[Lecture 57 - Polymers in Solution and Polymer Collapse - Part 3](#)

[Lecture 58 - Polymers in Solution and Polymer Collapse - Part 4](#)

[Lecture 59 - Computer Simulation Methods in Statistical Mechanics - Part 1](#)

[Lecture 60 - Computer Simulation Methods in Statistical Mechanics - Part 2](#)

[Lecture 61 - Conclusion](#)

- Lecture 1 - Introduction to quantum Mechanics - Part 1
- Lecture 2 - Introduction to quantum Mechanics - Part 2
- Lecture 3 - Introduction to quantum Mechanics - Part 3
- Lecture 4 - Time Dependant Perturbation Theory of Two states - Part 1
- Lecture 5 - Time Dependent Perturbation Theory of Two States - Part 2
- Lecture 6 - Time Dependent Perturbation Theory of Two States - Part 3
- Lecture 7 - Time Dependent Perturbation Theory of Many States - Part 1
- Lecture 8 - Time Dependent Perturbation Theory of Many States - Part 2
- Lecture 9 - First-Order Correction to Time- Dependent Perturbation Theory
- Lecture 10 - Properties of Light (Classical Treatment)
- Lecture 11 - Interaction Hamiltonian - Part 1
- Lecture 12 - Interaction Hamiltonian - Part 2
- Lecture 13 - Interaction Hamiltonian - Part 3
- Lecture 14 - Transition Moment Integral
- Lecture 15 - Absorption Probability - Part 1
- Lecture 16 - Absorption Probability - Part 2
- Lecture 17 - Transition to Continuum States: Fermi's Golden Rule
- Lecture 18 - Einstein's Coefficient - Part 1
- Lecture 19 - Einstein's Coefficient - Part 2
- Lecture 20 - Einstein's Coefficient - Part 3
- Lecture 21 - Spontaneous Emission Lifetime
- Lecture 22 - Relationship between Transition Dipole and Extinction Coefficient
- Lecture 23 - Spectral Lineshapes
- Lecture 24 - Selection Rules
- Lecture 25 - Molecular Rotations - Part 1
- Lecture 26 - Molecular Rotations - Part 2
- Lecture 27 - Molecular Rotations - Part 3
- Lecture 28 - Rotational Selection Rules
- Lecture 29 - Rotational Spectrum
- Lecture 30 - Molecular Vibrations - Part 1
- Lecture 31 - Molecular Vibrations - Part 2

[Lecture 32 - Vibrational Selection rules](#)

[Lecture 33 - Electronic Transition](#)

[Lecture 34 - Rotations of Polyatomic Molecules - Part 1](#)

[Lecture 35 - Rotations of Polyatomic Molecules - Part 2](#)

[Lecture 36 - Selection Rules for particle in a box](#)

[Lecture 37 - Interpretation of Rotational Spectra](#)

[Lecture 38 - Features of vibrational and electronic spectroscopy](#)

NPTEL : NOC:Essentials of Oxidation, Reduction and C-C Bond Formation. Application in Organic Synthesis (Chemistry and Biochemistry)

Co-ordinators : Prof. Yashwant D Vankar

Lecture 1 - Introduction to organic synthesis-Importance of selectivity, stereochemistry and Mechanism

Lecture 2 - Sulfur based oxidations of alcohols

Lecture 3 - Sulfur based oxidations and Pummerer rearrangement

Lecture 4 - Further aspects of sulfur and selenium based oxidations

Lecture 5 - Organoselenium chemistry and SeO₂ based oxidations

Lecture 6 - SeO₂ based oxidation of ketones and Sulfoxide- Sulfenate rearrangement (Mislow-Evans rearrangement)

Lecture 7 - Mechanistic and stereochemical aspects of Mislow-Evans rearrangement and synthetic applications

Lecture 8 - Further synthetic applications of Mislow-Evans rearrangement and Saegusa-Ito oxidation

Lecture 9 - 1,2-Ketone transpositions, Shapiro reaction and Dauben-Michno rearrangement (a case of 1,3-enone transposition)

Lecture 10 - Dess-Martin periodinane oxidation

Lecture 11 - Iodoxybenzoic acid (IBX) based oxidations

Lecture 12 - Silver based oxidations: Prevost reaction and use of Fetizon's reagent

Lecture 13 - Further aspects of oxidations using Fetizon's reagent: Mechanism and Stereochemistry

Lecture 14 - Ruthenium tetroxide (and RuCl₃/NaIO₄) mediated oxidations

Lecture 15 - Tetra-n-propylammonium perruthenate (TPAP) based oxidations, and Tamao-Fleming oxidation

Lecture 16 - Further synthetic and mechanistic aspects of Tamao-Fleming oxidations

Lecture 17 - Oxidations with dimethyl dioxirane (DMDO)

Lecture 18 - Mechanistic aspects of DMDO based oxidations and oxaziridine mediated alpha-hydroxylations of ketones

Lecture 19 - Asymmetric alpha-hydroxylations using oxaziridine based reactions

Lecture 20 - Barton and related reactions (oxidation at unfunctionalised carbons) and synthetic applications

Lecture 21 - beta-Cleavage in Barton and related reactions and miscellaneous oxidations such as TEMPO based oxidations, Pinnick oxidation and pseudomonas putida mediated oxidations

Lecture 22 - Reductions in organic chemistry: Metal hydride (NaBH₄ and LiAlH₄) mediated reduction

Lecture 23 - Reductions using diisobutylaluminum hydride (DIBAL-H)

Lecture 24 - Further aspects of DIBAL-H based reductions and comparison with mixed chloride hydrides

Lecture 25 - Reductions with Red-Al, and Luche Reductions

Lecture 26 - Further aspects of Luche reduction, stereochemistry in reductions and reduction with LiBH₄

Lecture 27 - Reductions with Zn(BH₄)₂, LiBHEt₃ (superhydride) and L and K-selectrides

Lecture 28 - Reductions with LS/KS selectrides and NaCNBH₃

Lecture 29 - Dissolving metal reductions (Na, K, Mg) and McMurry coupling using Ti(0)

Lecture 30 - Stereochemistry and mechanistic aspects of McMurry coupling and metal mediated reductions of alpha, beta-unsaturated

ketones

Lecture 31 - Silanes [R₃SiH, including polymethylhydrosiloxanes (PMHS)] as reducing agents

Lecture 32 - Further aspects of silanes as reducing agents and Barton-McCombie deoxygenation

Lecture 33 - Tributyltinhydride (n-Bu₃SnH) based radical based reductions and C-C bond formations

Lecture 34 - Asymmetric synthesis: An introduction

Lecture 35 - Sharpless asymmetric epoxidation: Mechanism, stereochemistry and kinetic resolution

Lecture 36 - Synthetic utility of chiral 2,3-epoxy alcohols obtained from Sharpless epoxidation

Lecture 37 - Katsuki-Jacobsen epoxidation: Mechanism and stereochemistry

Lecture 38 - Further aspects of Katsuki-Jacobsen epoxidation, and Introduction to Sharpless Asymmetric Dihydroxylation

Lecture 39 - Mechanism, stereochemical aspects and synthetic applications of Sharpless Asymmetric Dihydroxylation

Lecture 40 - Asymmetric hydrogenations and reductions using rhodium and ruthenium derived chiral catalysts

Lecture 41 - Asymmetric reduction with oxazaborolidines

Lecture 42 - C-C bond formations: Introduction to enolate, enamine and enol silyl ether based chemistry

Lecture 43 - C-C bond formations using enol silyl ether and imine based chemistry including SAMP and RAMP based asymmetric alkylations

Lecture 44 - Asymmetric C-C bond formations using Oppolzer's camphorsultams and introduction to directed Aldol reactions

Lecture 45 - Further aspects of Aldol chemistry including the use of boron and silicon enolates

Lecture 46 - C-C bond formations using Evans' oxazolidinone based chemistry

Lecture 47 - Ireland-Claisen rearrangement: Emphasis of enolate geometry on the stereochemical outcome, and Claisen rearrangements

Lecture 48 - Aromatic Claisen rearrangement, Johnson-Claisen rearrangement and Eschenmoser-Claisen rearrangement and synthetic

Lecture 49 - Bellus-Claisen rearrangement, Aza-Claisen rearrangement, Thia-Claisen rearrangement, Chen-Mapp rearrangement and their synthetic applications

Lecture 50 - Zwitterionic-Claisen rearrangement, Overmann rearrangement, Bamford-Stevens and Shapiro reactions and synthetic applications

Lecture 51 - Introduction to allyl metal additions for C-C bond formation

Lecture 52 - Allylindium chemistry: Mechanism, stereochemistry and synthetic applications

Lecture 53 - Allyltin chemistry: Mechanism, stereochemistry and synthetic applications

Lecture 54 - Chemistry of allylsilanes: Mechanism, stereochemistry and synthetic applications - Part 1

Lecture 55 - Further synthetic aspects of the chemistry of allylsilanes - Part 2

Lecture 56 - Further synthetic aspects of the chemistry of allylsilanes - Part 3

Lecture 57 - Chemistry of Vinylsilanes: Mechanism, Stereochemistry and Synthetic Applications

Lecture 58 - Peterson olefination and further synthetic aspects of vinylsilane chemistry

Lecture 59 - Simmons Smith cyclopropanation: Mechanism, stereochemistry and synthetic applications

Lecture 60 - Course Summary and Conclusion

Lecture 1 - Rate: the reaction velocity

Lecture 2 - Its elementary - rate law equations

Lecture 3 - Arrhenius equation: what's the fuss about?

Lecture 4 - Dance of atoms: from Newton to Hamilton

Lecture 5 - Boltzmann distribution: a story of Hamilton, Liouville and Boltzmann

Lecture 6 - Maxwell Boltzmann distribution: how fast are molecules moving?

Lecture 7 - Kinetic theory of collisions: initial estimate

Lecture 8 - Boltzmann distribution and kinetic theory of collisions

Lecture 9 - Kinetic theory of collisions: a discussion

Lecture 10 - Kinetic theory of collisions: reactive cross section

Lecture 11 - Problem solving session - 1

Lecture 12 - Problem solving session - 2

Lecture 13 - Kinetic theory of collision and equilibrium constant

Lecture 14 - Critique of kinetic theory of collisions

Lecture 15 - Transition state theory and partition functions

Lecture 16 - Partitioning the partition function

Lecture 17 - Translating, rotating and vibrating quantum mechanically

Lecture 18 - Partition function and equilibrium constant

Lecture 19 - What is a transition state?

Lecture 20 - A puzzle: cars on highway

Lecture 21 - Transition state theory: derivation 1

Lecture 22 - Practical calculation of TST rate

Lecture 23 - Calculating TST rate for the reaction $H+HBr$

Lecture 24 - Collision theory as a special case of TST

Lecture 25 - TST: an intuitive proof in one dimension

Lecture 26 - Rate as a flux across a dividing surface

Lecture 27 - Transition state theory: derivation 2 from dynamical perspective

Lecture 28 - Discussion of the assumptions of TST

Lecture 29 - Thermodynamic formulation of TST

Lecture 30 - Problem solving session - 3

Lecture 31 - Problem solving session - 4

- Lecture 32 - Hills and valleys of potential energy surfaces
- Lecture 33 - Molecular dynamics: rolling spheres on potential energy surfaces
- Lecture 34 - Predictions from potential energy surfaces - rotational vs vibrational energies
- Lecture 35 - Free energy and potential of mean force
- Lecture 36 - Transmission coefficient and molecular dynamics
- Lecture 37 - Problem solving session - 5
- Lecture 38 - Microcanonical rate constant: putting balls in jars
- Lecture 39 - Microcanonical rate constant: RRK model
- Lecture 40 - Microcanonical rate constant: magic of Marcus - RRKM model
- Lecture 41 - Canonical TST from microcanonical RRKM model
- Lecture 42 - Sum and density of states
- Lecture 43 - Unimolecular decay - revisited
- Lecture 44 - Unimolecular decay: RRK's approach
- Lecture 45 - Unimolecular decay: RRKM's approach
- Lecture 46 - Problem solving session - 6

Lecture 1 - Introduction to quantum theory

Lecture 2 - Schrodinger's theory

Lecture 3 - Laws of quantum mechanics

Lecture 4 - Wave functions

Lecture 5 - Quantum mechanics of a free particle

Lecture 6 - Particle in 1D box

Lecture 7 - Particle in 2D box

Lecture 8 - Spherical polar coordinates and angular momentum

Lecture 9 - Developing Hydrogen atom orbitals - 1

Lecture 10 - Developing Hydrogen atom orbitals - 2

Lecture 11 - Developing Hydrogen atom orbitals - 3

Lecture 12 - Visualizing molecular orbitals

Lecture 13 - Molecular orbital theory 1: Introduction

Lecture 14 - Molecular orbital theory 2: Diatomic molecules

Lecture 15 - Molecular orbital theory 3: Homo-diatomc molecules - I

Lecture 16 - Molecular orbital theory 4: Homo-diatomc molecules - II

Lecture 17 - Molecular orbital theory 5: Hetero-diatomc molecules

Lecture 18 - Molecular orbital theory 6: Polyatomic molecules

Lecture 19 - Molecular orbital theory 7: Ethylene (Introduction to Huckel's theory) - I

Lecture 20 - Molecular orbital theory 8: Ethylene (Introduction to Huckel's theory) - II

Lecture 21 - Molecular orbital theory 9: Butadiene - I

Lecture 22 - Molecular orbital theory 9: Butadiene - II

Lecture 23 - Concept of effective nuclear charge

Lecture 24 - Electronic configuration of elements

Lecture 25 - Properties of Elements (Size, IE, EA and EN)

Lecture 26 - Polarizability

Lecture 27 - Hard soft acid base

Lecture 28 - Predicting molecular structures: VSEPR theory

Lecture 29 - Coordination Chemistry: 18 electron rule and VBT

Lecture 30 - Crystal Field Theory: Octahedral Complex

Lecture 31 - Crystal Field Theory: Tetrahedral Complex

- Lecture 32 - Crystal Field Theory: Octahedral vs. Tetrahedral Complex
- Lecture 33 - Application of CFSE: Spinel and J-T Distortion
- Lecture 34 - Introduction to Molecular Magnetism
- Lecture 35 - Problem Solving Approach
- Lecture 36 - Magnetism
- Lecture 37 - Spectroscopic Term Symbol
- Lecture 38 - Magnetic States of Matter: Paramagnetic, Ferro and Antiferromagnetic
- Lecture 39 - Band structures of solid materials
- Lecture 40 - Density of states and doping in semiconductors
- Lecture 41 - Introduction to molecular spectroscopy
- Lecture 42 - Rotational spectroscopy
- Lecture 43 - Vibrational spectroscopy
- Lecture 44 - Electronic Spectroscopy - I
- Lecture 45 - Electronic Spectroscopy - II
- Lecture 46 - Electronic Spectroscopy - III
- Lecture 47 - Fluorescence Spectroscopy
- Lecture 48 - Fundamentals of NMR spectroscopy and MRI
- Lecture 49 - Surface characterization techniques
- Lecture 50 - Introduction to thermodynamics: Work, heat and energy
- Lecture 51 - First law of thermodynamics: Diathermic and adiabatic systems, exothermic and endothermic processes
- Lecture 52 - Enthalpy, Hess's law
- Lecture 53 - Second law of thermodynamics: Entropy and third law of thermodynamics
- Lecture 54 - Helmholtz and Gibbs free energies, Concept of spontaneity
- Lecture 55 - Electrochemical equilibrium, Nernst equation
- Lecture 56 - Acid base and solubility equilibria
- Lecture 57 - Corrosion
- Lecture 58 - Extraction of metals
- Lecture 59 - Ellingham Diagram
- Lecture 60 - Problems From Thermodynamics
- Lecture 61 - Intermolecular forces: Electrostatic and Ion-Dipole Interaction
- Lecture 62 - Intermolecular forces: Dipole-dipole, hydrogen bonding
- Lecture 63 - Real gases - Part 1
- Lecture 64 - Real gases - Part 2

[Lecture 65 - Introduction to Potential Energy Surfaces](#)

[Lecture 66 - Potential energy surface of H₃ system](#)

[Lecture 67 - Salient features of H₃ potential energy surface](#)

[Lecture 68 - Potential Energy Surfaces of HCN and H₂F system](#)

[Lecture 69 - Representation of three dimensional structures](#)

[Lecture 70 - Structural isomers and stereoisomers](#)

[Lecture 71 - Configurations, Symmetry and Chirality](#)

[Lecture 72 - Enantiomers and Diastereomers](#)

[Lecture 73 - Optical activity, Conformational analysis, and absolute configuration](#)

[Lecture 74 - Substitution reactions](#)

[Lecture 75 - Elimination reactions](#)

[Lecture 76 - Addition, Oxidation and Reduction reactions](#)

[Lecture 77 - Synthesis of a drug molecule](#)

Lecture 1 - Overview - 1

Lecture 2 - Overview - 2

Lecture 3 - Overview - 3

Lecture 4 - Illudin M (Kinder) Illudin C (Funk)

Lecture 5 - Total Synthesis of FR900848 (Barrett)

Lecture 6 - Total Synthesis of Cubane

Lecture 7 - Total Synthesis of Endiandric acids

Lecture 8 - Total Synthesis of Penicilin

Lecture 9 - Total Synthesis of Thienamycin

Lecture 10 - Total Synthesis of Prostaglandin (Corey)

Lecture 11 - Total Synthesis of Prostaglandin (Johnson and Stork)

Lecture 12 - Total Synthesis of Biotin and Lactacystin (i) Corey, (ii) Baldwin

Lecture 13 - Total Synthesis of Triquinanes: Isocomene 1) M. Pirrung 2) Fitjer

Lecture 14 - Total Synthesis of Triquinanes: Isocomene and Silphipherfol-6-en-5-one (Rawal)

Lecture 15 - Total synthesis of Triquinanes by radical cyclisation - I (Curran)

Lecture 16 - Total synthesis of Triquinanes by radical cyclisation - II

Lecture 17 - Total synthesis of Triquinanes by photochemical reaction - I

Lecture 18 - Total synthesis of Triquinanes by photochemical reaction - II

Lecture 19 - Total synthesis of Triquinanes by Thermal Metathesis (Mehta)

Lecture 20 - Total synthesis of Triquinanes by other reactions

Lecture 21 - Total synthesis of Longifolene (Corey and Oppolzer)

Lecture 22 - Total synthesis of Carpanone (Chapman)

Lecture 23 - Total synthesis of Mevinolin (Clive)

Lecture 24 - Total synthesis of Gibberellic Acid (Corey)

Lecture 25 - Total synthesis of Gibberellic Acid (Yamada)

Lecture 26 - Total synthesis of Perhydrohistrionicotoxin (Corey)

Lecture 27 - Total synthesis of Strychnine (Woodward)

Lecture 28 - Total synthesis of Strychnine (Rawal and Overman)

Lecture 29 - Total synthesis of Strychnine (Kuehne)

Lecture 30 - Total synthesis of Reserpine (Woodward)

Lecture 31 - Total synthesis of Yohimbine (Tamelen and Momose)

- Lecture 32 - Total synthesis of Quinine (Woodward and Stork)
- Lecture 33 - Total synthesis of Dendrobine (Livinghouse)
- Lecture 34 - Total synthesis of Morphine (Gates and Overman)
- Lecture 35 - Total synthesis of Morphine (Parker and White)
- Lecture 36 - Total synthesis of Methylhomosecodaphniphyllate (Heathcock)
- Lecture 37 - Total synthesis of Lysergic acid (Woodward and Oppolzer)
- Lecture 38 - Total synthesis of Galanthamine (Barton and Kirby)
- Lecture 39 - Total synthesis of Epibatidine (Trost and Evans)
- Lecture 40 - Total synthesis of Swainsonine (Hashimoto)
- Lecture 41 - Total synthesis of Staurosporine (Danishefsky and Wood)
- Lecture 42 - Total synthesis of Manzamine A (Winkler)
- Lecture 43 - Total synthesis of Progesterone (Johnson)
- Lecture 44 - Total synthesis of Progesterone from Diosgenin (Marker)
- Lecture 45 - Total synthesis of Estrone (Torgov)
- Lecture 46 - Total synthesis of Taxol (Nicolaou)
- Lecture 47 - Total synthesis of Taxol (Holton)
- Lecture 48 - Total synthesis of Taxol (Danishefsky)
- Lecture 49 - Total synthesis of Taxol (Wender)
- Lecture 50 - Total synthesis of Eleutherobin (Nicolaou)
- Lecture 51 - Total synthesis of Eleutherobin (Danishefsky)
- Lecture 52 - Total synthesis of Phorbol (Wender)
- Lecture 53 - Total synthesis of Periplanone (Still and Schreiber)
- Lecture 54 - Total synthesis of Discodermolide (Schreiber)
- Lecture 55 - Total synthesis of Epothilones I (Nicolaou)
- Lecture 56 - Total synthesis of Epothilones II (Schinzer and Danishefsky)
- Lecture 57 - Total synthesis of Vineomycinone B2 (Tius and Danishefsky)
- Lecture 58 - Total synthesis of Zaragozic acid C (Carreira)

Lecture 1 - CD Spectroscopy: Introduction

Lecture 2 - Symmetry and Molecular properties

Lecture 3 - Symmetry elements - I

Lecture 4 - Symmetry elements - II

Lecture 5 - Symmetry and point groups - I

Lecture 6 - Symmetry and point groups - II

Lecture 7 - Point group determination tutorial

Lecture 8 - Chirality and point group - I

Lecture 9 - Chirality and point group - II

Lecture 10 - Chirality and point group - III tutorial

Lecture 11 - Chirality and biology - I

Lecture 12 - Chirality and biology - II

Lecture 13 - Chirality and biology - III

Lecture 14 - Chirality and biology - IV

Lecture 15 - Chirality and biology - V

Lecture 16 - Origin of chirality

Lecture 17 - The physical background of chiral response - I

Lecture 18 - The physical background of chiral response - II

Lecture 19 - The physical background of chiral response - III

Lecture 20 - The physical background of chiral response - IV

Lecture 21 - The physical background of chiral response - IV

Lecture 22 - The physical background of chiral response - V

Lecture 23 - The physical background of chiral response - VI

Lecture 24 - Circular Dichroism Spectra

Lecture 25 - Examples of Circular Dichroism - I

Lecture 26 - Examples of Circular Dichroism - II

Lecture 27 - Examples of Circular Dichroism - III

Lecture 28 - Examples of Circular Dichroism - IV

Lecture 29 - Applications of CD spectroscopy - I

Lecture 30 - Applications of CD spectroscopy - II

Lecture 31 - Applications of CD spectroscopy - III

- Lecture 32 - Applications of CD spectroscopy - IV
- Lecture 33 - Applications of CD spectroscopy - V
- Lecture 34 - Applications of CD spectroscopy - VI
- Lecture 35 - CD spectroscopy: Conclusion
- Lecture 36 - Mössbauer Spectroscopy: Introduction
- Lecture 37 - Mössbauer Spectroscopy Fundamentals - I
- Lecture 38 - Mössbauer Spectroscopy
- Lecture 39 - Mössbauer Spectroscopy Fundamentals - II
- Lecture 40 - Mössbauer Spectroscopy Fundamentals - III
- Lecture 41 - Mössbauer Spectroscopy Fundamentals - IV
- Lecture 42 - Mössbauer Spectroscopy: Isomer shift - I
- Lecture 43 - Mössbauer Spectroscopy: Isomer shift - II
- Lecture 44 - Mössbauer Spectroscopy: Isomer shift - III
- Lecture 45 - Mössbauer Spectroscopy: Quadrupolar splitting - I
- Lecture 46 - Mössbauer Spectroscopy: Quadrupolar splitting - II
- Lecture 47 - Mössbauer Spectroscopy: Applications - I
- Lecture 48 - Mössbauer Spectroscopy: Applications - II
- Lecture 49 - Mössbauer Spectroscopy: Applications - III
- Lecture 50 - Mössbauer Spectroscopy: Data measurement
- Lecture 51 - Mössbauer Spectroscopy: Applications - IV
- Lecture 52 - Mössbauer Spectroscopy: Effect of ligands - I
- Lecture 53 - Mössbauer Spectroscopy: Effect of ligands - II
- Lecture 54 - Mössbauer Spectroscopy: Applications - V
- Lecture 55 - Mössbauer Spectroscopy: Probing ferrocenes - I
- Lecture 56 - Mössbauer Spectroscopy: Probing ferrocenes - II
- Lecture 57 - Mössbauer Spectroscopy: Probing ferrocenes - III
- Lecture 58 - Mössbauer Spectroscopy: Mixed valent complexes - I
- Lecture 59 - Mössbauer Spectroscopy: Mixed valent complexes - II
- Lecture 60 - Mössbauer Spectroscopy: Mixed valent complexes - III
- Lecture 61 - Conclusion section: CD spectroscopy
- Lecture 62 - Conclusion section: Mössbauer Spectroscopy

Lecture 1 - NMR Basic Concepts - I

Lecture 2 - NMR Basic Concepts - II

Lecture 3 - NMR Basic Concepts - III

Lecture 4 - NMR Basic Concepts - IV

Lecture 5 - NMR Spectra of Molecules

Lecture 6 - Chemical Shifts and Coupling constant

Lecture 7 - Fine Structures in NMR Spectra

Lecture 8 - Pulse Excitation and FT-NMR

Lecture 9 - Practical Aspects of FT-NMR - 1

Lecture 10 - Practical Aspects of FT-NMR - 2

Lecture 11 - Practical Aspects of FT-NMR - 3

Lecture 12 - Practical Aspects of FT-NMR - 4

Lecture 13 - Polarization Transfer Technique - 1

Lecture 14 - Polarization Transfer Technique - 2

Lecture 15 - General Concept of Multidimensional NMR - 1

Lecture 16 - General Concept of Multidimensional NMR - 2

Lecture 17 - 2-D NMR or 2-D Co-relation spectroscopy : General concept - 1

Lecture 18 - 2-D NMR or 2-D Co-relation spectroscopy : General concept - 2

Lecture 19 - 2-D NMR or 2-D Co-relation spectroscopy : General concept - 3

Lecture 20 - Introduction to NOESY and HSQC - 1

Lecture 21 - Introduction to NOESY and HSQC - 2

Lecture 22 - Introduction to NOESY and HSQC - 3

Lecture 23 - Introduction to NOESY and HSQC - 4

Lecture 24 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 1

Lecture 25 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 2

Lecture 26 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 3

Lecture 27 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 4

Lecture 28 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 5

Lecture 29 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 6

Lecture 30 - Application of NMR in the area of structural Biology: Structure of DNA and RNA - 7

Lecture 31 - Determination of Structure and Dynamics of Proteins - 1

- Lecture 32 - Determination of Structure and Dynamics of Proteins - 2
- Lecture 33 - Determination of Structure and Dynamics of Proteins - 3
- Lecture 34 - Determination of Structure and Dynamics of Proteins - 4
- Lecture 35 - Determination of Structure and Dynamics of Proteins - 5
- Lecture 36 - Determination of Structure and Dynamics of Proteins - 6
- Lecture 37 - NMR Analysis of Protein Dynamics - I
- Lecture 38 - NMR Analysis of Protein Dynamics - II
- Lecture 39 - NMR Analysis of Protein Dynamics - III
- Lecture 40 - NMR Analysis of Protein Dynamics - IV
- Lecture 41 - Protein-Ligand and Protein-Protein Interaction
- Lecture 42 - NMR Analysis of Ligand specific parameters in a Protein-Ligand Interaction - I
- Lecture 43 - NMR Analysis of Ligand specific parameters in a Protein-Ligand Interaction - II
- Lecture 44 - NMR Analysis of Protein Specific Parameters in a Protein-Ligand Interaction - I
- Lecture 45 - NMR Analysis of Protein Specific Parameters in a Protein-Ligand Interaction - II
- Lecture 46 - NMR in Drug Design
- Lecture 47 - NMR in Drug Discovery
- Lecture 48 - NMR in Drug metabolism - I
- Lecture 49 - NMR in Drug metabolism - II
- Lecture 50 - NMR in Drug metabolism - III
- Lecture 51 - Probing Protein Dynamics by NMR Spectroscopy - I
- Lecture 52 - Probing Protein Dynamics by NMR Spectroscopy - II
- Lecture 53 - Probing Protein Dynamics by NMR Spectroscopy - III
- Lecture 54 - Probing Protein Dynamics by NMR Spectroscopy - IV
- Lecture 55 - Probing Protein Dynamics by NMR Spectroscopy - V
- Lecture 56 - Basics of solid state NMR spectroscopy - I
- Lecture 57 - Basics of solid state NMR spectroscopy - II
- Lecture 58 - Basics of solid state NMR spectroscopy - III
- Lecture 59 - Basics of solid state NMR spectroscopy - IV
- Lecture 60 - Basics of solid state NMR spectroscopy - V

Lecture 1 - History of Periodic Table - 1

Lecture 2 - History of Periodic Table - 2

Lecture 3 - History of Periodic Table - 3

Lecture 4 - Introduction to Transition elements - 1

Lecture 5 - Introduction to Transition elements - 2

Lecture 6 - Introduction to Transition elements - 3

Lecture 7 - Introduction to Transition elements - 4

Lecture 8 - Coordination Theory

Lecture 9 - Werner's Coordination Theory

Lecture 10 - Early Bonding Concepts

Lecture 11 - Valence Bond Theory (VBT) - 1

Lecture 12 - Valence Bond Theory (VBT) - 2

Lecture 13 - Background To Crystal Field Theory (CFT)

Lecture 14 - Crystal Field Theory (CFT) Jahn-Teller Theorem

Lecture 15 - Crystal Field Theory (CFT) - 1

Lecture 16 - Crystal Field Theory (CFT) - 2

Lecture 17 - Ligand Field Theory (LFT) - 1

Lecture 18 - Ligand Field Theory (LFT) - 2

Lecture 19 - Ligand Field Theory (LFT) - 3

Lecture 20 - Ligand Field Theory (LFT) - 4

Lecture 21 - 18 Electron Rule

Lecture 22 - 18 Electron Rule

Lecture 23 - Metal-Metal Multiple Bonds

Lecture 24 - Metal-Metal Multiple Bonds [Quadruple and Quintuple Bonding]

Lecture 25 - Preparation of metal Complexes

Lecture 26 - Preparation of metal Complexes

Lecture 27 - Classification of ligands by donor atoms

Lecture 28 - Classification of ligands by donor atoms - Hydrogen

Lecture 29 - Classification of ligands by donor atoms - Carbon - 1

Lecture 30 - Classification of ligands by donor atoms - Carbon - 2

Lecture 31 - Classification of ligands by donor atoms - Carbon - 3

- Lecture 32 - Classification of ligands by donor atoms - Carbon - 4
- Lecture 33 - Classification of ligands by donor atoms - Nitrogen - 1
- Lecture 34 - Classification of ligands by donor atoms - Nitrogen - 2
- Lecture 35 - Classification of ligands by donor atoms - Nitrogen - 3
- Lecture 36 - Classification of ligands by donor atoms - Oxygen, Phosphorus
- Lecture 37 - Classification of ligands by donor atoms - Phosphorus - 1
- Lecture 38 - Classification of ligands by donor atoms - Phosphorus - 2
- Lecture 39 - Classification of ligands by donor atoms - Phosphorus - 3
- Lecture 40 - Classification of ligands by donor atoms - Halogens
- Lecture 41 - Oxidative addition and reductive elimination reactions - 1
- Lecture 42 - Oxidative addition and reductive elimination reactions - 2
- Lecture 43 - Oxidative addition and reductive elimination reactions - 3
- Lecture 44 - Oxidative addition and reductive elimination reactions - 4
- Lecture 45 - Inorganic Reaction Mechanisms
- Lecture 46 - Inorganic Reaction Mechanisms Square planar complexes
- Lecture 47 - Trans-Effect
- Lecture 48 - Substitution Reactions in Square Planar Complexes, Trans-Effect
- Lecture 49 - Substitution Reactions in Octahedral Complexes
- Lecture 50 - Substitution Reactions in Octahedral Complexes; Stereochemistry of Products
- Lecture 51 - Electron-Transfer Processes
- Lecture 52 - Electron-Transfer Processes
- Lecture 53 - Methods of Characterization UV-Visible Spectroscopy
- Lecture 54 - Methods of Characterization UV-Visible Spectroscopy
- Lecture 55 - UV-Visible Spectroscopy
- Lecture 56 - UV-Visible Spectroscopy
- Lecture 57 - NMR Spectroscopy
- Lecture 58 - NMR Spectroscopy
- Lecture 59 - NMR and IR Spectroscopy
- Lecture 60 - Summary and Conclusion

Lecture 1 - Radioactivity

Lecture 2 - Radioactive decay

Lecture 3 - Radioactive decay chain

Lecture 4 - Radioactive equilibria

Lecture 5 - Nuclear structure and stability

Lecture 6 - Nuclear force and nuclear properties

Lecture 7 - Liquid drop model

Lecture 8 - Applications of Liquid drop model

Lecture 9 - Nuclear Shell model

Lecture 10

Lecture 11 - Alpha decay

Lecture 12 - Beta decay

Lecture 13 - Gamma decay

Lecture 14 - Interaction of radiations with matter

Lecture 15 - Interaction of fast electrons with matter

Lecture 16 - Interaction of electromagnetic radiations with matter

Lecture 17 - Principles of radiation detectors

Lecture 18 - Gas filled detectors

Lecture 19 - Scintillator detectors

Lecture 20 - Semiconductor detectors

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26 - Compound nucleus reactions

Lecture 27 - Nuclear fission

Lecture 28 - Nuclear fusion

Lecture 29 - Production of radioisotopes using neutrons

Lecture 30 - Radioisotope production using charged particles

Lecture 31 - Radiochemical practices

[Lecture 32 - Radioanalytical techniques and applications](#)

[Lecture 33 - Nuclear analytical techniques](#)

[Lecture 34 - Applications of neutron activation analysis](#)

[Lecture 35 - Ion beam analysis](#)

[Lecture 36 - Nuclear reaction analysis and particle induced gamma emission](#)

[Lecture 37 - Nuclear Probes: Positron annihilation spectroscopy](#)

[Lecture 38 - Perturbed angular correlation](#)

[Lecture 39 - Radioisotope applications in healthcare](#)

[Lecture 40 - Radioisotope applications in Industry, agriculture and food technology](#)

[Lecture 41 - History of actinides](#)

[Lecture 42 - Actinide concept](#)

[Lecture 43 - Actinide ionic species in water](#)

[Lecture 44 - Actinide hydration and Hydrolysis](#)

[Lecture 45 - pH-pE concept](#)

[Lecture 46 - Ln/An absorption spectroscopy - I](#)

[Lecture 47 - Ln/An absorption spectroscopy - II](#)

[Lecture 48 - Ln/An emission spectroscopy - I](#)

[Lecture 49 - Ln/An emission spectroscopy - II](#)

[Lecture 50 - Solution chemistry Actinides](#)

[Lecture 51 - Complexation of actinides - I](#)

[Lecture 52 - Complexation of actinides - II](#)

[Lecture 53 - Solvent extraction of actinides - I](#)

[Lecture 54 - Solvent extraction of actinides - II](#)

[Lecture 55 - Actinide partitioning](#)

[Lecture 56 - Analytical chemistry of actinides](#)

[Lecture 57 - Transactinides](#)

[Lecture 58 - Fast radiochemical separations](#)

[Lecture 59 - Actinides in the environment](#)

[Lecture 60 - Actinides sorption and migration](#)

Lecture 1 - General introduction to Statistical Thermodynamics

Lecture 2 - Configuration and Weights

Lecture 3 - Configuration and Weights (Continued...)

Lecture 4 - Boltzmann Distribution

Lecture 5 - The Molecular Partition Function

Lecture 6 - The Molecular Partition Function of a uniform ladder of energy levels

Lecture 7 - The partition function for a particle of mass m free to move in a 1D container

Lecture 8 - The partition function for a particle of mass m free to move in a 3D container

Lecture 9 - Numerical Problems Set-I (based on partition function)

Lecture 10 - Numerical Problems Set-II

Lecture 11 - The Internal Energy

Lecture 12 - Obtaining expression for beta

Lecture 13 - The Statistical Entropy

Lecture 14 - Connecting partition function with entropy

Lecture 15 - Solving numerical problems based on Internal energy and Entropy

Lecture 16 - Solving numerical problems based on Internal energy and Entropy

Lecture 17 - Negative Temperature

Lecture 18 - Further discussion on q (Partition function), U (Internal energy) and S (Entropy)

Lecture 19 - The Canonical Partition Function

Lecture 20 - Relating Canonical Partition Function Internal Energy and Entropy

Lecture 21 - Recovering molecular partition function q from canonical partition function Q

Lecture 22 - Entropy of a monatomic gas

Lecture 23 - Further discussion on entropy of a monatomic gas - I

Lecture 24 - Further discussion on entropy of a monatomic gas - II

Lecture 25 - The Thermodynamic Functions (Pressure)

Lecture 26 - The Thermodynamic Functions (Enthalpy)

Lecture 27 - The Thermodynamic Functions (The Gibbs Energy)

Lecture 28 - The Thermodynamic Functions (The Molecular Partition Function)

Lecture 29 - The Rotational Contribution to Molecular Partition Function

Lecture 30 - The Rotational Contribution to Molecular Partition Function (Nonlinear Rotor)

Lecture 31 - The Rotational Contribution to Molecular Partition Function

[Lecture 32 - Rotational Partition Function](#)

[Lecture 33 - Vibrational Partition Function - I](#)

[Lecture 34 - Vibrational Partition Function - II](#)

[Lecture 35 - Vibrational Partition Function - Applications](#)

[Lecture 36 - Electronic Partition Function](#)

[Lecture 37 - Mean Energies](#)

[Lecture 38 - Mean Energies \(Continued...\)](#)

[Lecture 39 - Heat Capacity](#)

[Lecture 40 - Heat Capacity \(Continued...\)](#)

[Lecture 41 - Mean Energies \(Applications\)](#)

[Lecture 42 - Problem Solving](#)

[Lecture 43 - Residual Entropy](#)

[Lecture 44 - Residual Entropy \(Continued...\)](#)

[Lecture 45 - Relation between equilibrium constant \$K\$ and partition function \$q\$](#)

[Lecture 46 - Relation between equilibrium constant \$K\$ and partition function \$q\$ \(Continued...\)](#)

[Lecture 47 - Relation between equilibrium constant \$K\$ and partition function \$q\$ \(Applications-1\)](#)

[Lecture 48 - Relation between equilibrium constant \$K\$ and partition function \$q\$ \(Applications-2\)](#)

[Lecture 49 - Contributions to equilibrium constant](#)

[Lecture 50 - Contributions to equilibrium constant \(Continued...\)](#)

[Lecture 51 - Contributions to equilibrium constant \(Continued...\) and Problems Solving](#)

[Lecture 52 - Problem Solving](#)

[Lecture 53 - Problem Solving \(Continued...\)](#)

[Lecture 54 - Equations of state](#)

[Lecture 55 - Bose-Einstein Statistics](#)

[Lecture 56 - Problem Solving](#)

[Lecture 57 - FERMI-DIRAC Statistics](#)

[Lecture 58 - Radial Distribution Function](#)

[Lecture 59 - Recap - 1](#)

[Lecture 60 - Recap - 2](#)

Lecture 1 - A Course on Bio-physical Chemistry

Lecture 2 - Protein Structure

Lecture 3 - Secondary Structure of Proteins

Lecture 4 - Secondary Structure of Proteins (Continued...)

Lecture 5 - Tertiary Structure

Lecture 6 - Forces in Protein Folding

Lecture 7 - Forces in Protein Folding (Continued...)

Lecture 8 - Electrostatics (Continued...)

Lecture 9 - Intermolecular Interactions

Lecture 10 - Dipole-Dipole Interaction

Lecture 11 - Electrostatics (Continued...)

Lecture 12 - Hydrophobic Effect

Lecture 13 - Hydrophobic Effect (Continued...)

Lecture 14 - Hydrogen Bonding

Lecture 15 - Protein Stability Curves

Lecture 16 - Thermodynamics of Protein Unfolding

Lecture 17 - Thermodynamics of Protein Unfolding (Continued...)

Lecture 18 - Mechanism of Chemical Denaturation

Lecture 19 - Pressure Induced Denaturation (The P-T Diagram)

Lecture 20 - Protein Folding Pathways and Energy Landscapes

Lecture 21 - Diffusion

Lecture 22 - Diffusion (Continued...)

Lecture 23 - Diffusion (Continued...)

Lecture 24 - Langevin Equation and Brownian Motion

Lecture 25 - Langevin Equation and Brownian Motion (Continued...)

Lecture 26 - Langevin Equation and Brownian Motion (Continued...)

Lecture 27 - Protein Folding : Mechanisms and Kinetics

Lecture 28 - Protein Folding : Mechanisms and Kinetics (Continued...)

Lecture 29 - Protein Folding : Mechanisms and Kinetics (Continued...)

Lecture 30 - Protein Folding : The Chevron-Plot

Lecture 31 - Protein Folding Kinetics : Rapid Mixing and Relaxation Techniques

[Lecture 32 - Protein Folding Kinetics : Rapid Mixing and Relaxation Techniques \(Continued...\)](#)

[Lecture 33 - Protein Folding Kinetics : Rapid Mixing and Relaxation Techniques \(Continued...\)](#)

[Lecture 34 - Protein Folding Kinetics : Rapid Mixing and Relaxation Techniques \(Continued...\)](#)

[Lecture 35 - Experimental Tools](#)

[Lecture 36 - Spectroscopy : The Franck Condon Principle](#)

[Lecture 37 - Spectroscopy : The Franck Condon Principle \(Continued...\)](#)

[Lecture 38 - Electronic Spectroscopy Absorption and Fluorescence](#)

[Lecture 39 - Fluorescence](#)

[Lecture 40 - Fluorescence Quenching](#)

[Lecture 41 - Infrared Spectroscopy of Proteins](#)

[Lecture 42 - Infrared Spectroscopy of Proteins \(Continued...\)](#)

Lecture 1 - Introduction to Spectroscopy - I

Lecture 2 - Introduction to Spectroscopy - II

Lecture 3 - Introduction to Spectroscopy - III

Lecture 4 - Introduction to Spectroscopy - IV

Lecture 5 - Introduction to Spectroscopy - V

Lecture 6 - Introduction to Spectroscopy - VI

Lecture 7 - Rotational, rotational Raman Spectroscopy theory and Application - I

Lecture 8 - Rotational, rotational Raman Spectroscopy theory and Application - II

Lecture 9 - Vibrational Spectroscopy Theory and Application - I

Lecture 10 - Vibrational, Rotational-Vibrational, Raman Spectroscopy - II

Lecture 11 - Vibrational, Rotational-Vibrational, Raman Spectroscopy - III

Lecture 12 - Problems on Rotational, Vibrational and Raman Spectroscopy

Lecture 13 - Atomic Spectroscopy - I

Lecture 14 - Atomic Spectroscopy - II

Lecture 15 - Atomic Spectroscopy - III

Lecture 16 - Atomic Spectroscopy - IV

Lecture 17 - Atomic and Molecular Spectroscopy

Lecture 18 - Electronic Spectra of Diatomic Molecules and UV-Vis Spectroscopy

Lecture 19 - UV-Visible Spectroscopy of Conjugated Molecules

Lecture 20 - UV-Vis Spectroscopy and its Applications - I

Lecture 21 - UV-Vis Spectroscopy and its Applications - II

Lecture 22 - UV-Vis and Fluorescence Spectroscopy

Lecture 23 - Fluorescence Spectroscopy (Continued...)

Lecture 24 - Application of Fluorescence Spectroscopy

Lecture 25 - Application of Steady-State Fluorescence

Lecture 26 - Time- resolved Fluorescence Spectroscopy

Lecture 27 - Microscopy

Lecture 28 - Contrast in Microscopy, Fluorescence Microscopy

Lecture 29 - Fluorescence Microscopy and Application

Lecture 30 - Principle of NMR

Lecture 31 - NMR data processing and Chemical shift

[Lecture 32 - Structure Informations from NMR](#)

[Lecture 33 - Structure Calculation and 2D-NMR Spectroscopy](#)

[Lecture 34 - Mass Spectroscopy](#)

Lecture 1 - Introduction, Stability, Phase Space and Invariant Sets - 1

Lecture 2 - Introduction, Stability, Phase Space and Invariant Sets - 2

Lecture 3 - Introduction, Stability, Phase Space and Invariant Sets - 3

Lecture 4 - Maps and Flows. Simple Examples of Dynamics Systems - 1

Lecture 5 - Maps and Flows. Simple Examples of Dynamics Systems - 2

Lecture 6 - Logistic map. Simple Examples of Bifurcations

Lecture 7 - Bifurcation Diagrams. Period 3 Implies Chaos. Characterizing Chaos

Lecture 8 - Characterizing The Period-Doubling Route to Chaos

Lecture 9 - Lyapunov Exponents; Invariant measures

Lecture 10 - Intermittency. Crises

Lecture 11 - Fractals

Lecture 12 - Chaos in Flows. The Lorenz and Rossler Systems

Lecture 13 - The Baker and Horseshoe Maps

Lecture 14 - Hamiltonian Chaos - 1

Lecture 15 - Hamiltonian Chaos - 2

Lecture 1 - Aldol Reaction

Lecture 2 - Perkin, Claisen and Thorpe Reactions

Lecture 3 - Reaction of Enolates

Lecture 4 - Mannich Reaction

Lecture 5 - Reaction of Alkenes and Carbonyl Compounds

Lecture 6 - Friedel-Crafts and Prins Reactions

Lecture 7 - Grignard Reagents

Lecture 8 - Organolithium Reagents

Lecture 9 - Organocopper, Organozinc and Organomercury Reagents

Lecture 10 - Ritter Reaction and Gabriel Synthesis

Lecture 11 - Reactions of imines and enamines, synthesis of alkaloids and amino acids

Lecture 12 - Reactions of electrophilic and nucleophilic nitrogens, synthesis of amino acids and peptides

Lecture 13 - Principles, effect of substituents and carbon-carbon bond formation

Lecture 14 - Formylation/acylation and related reactions

Lecture 15 - Nitration, Sulfonation and other reactions

Lecture 16 - Principle, Substitution mechanism and reactions of Benzyne

Lecture 17 - Schiemann Reaction, Ullmann reaction and Stephens-Castro coupling

Lecture 18 - Ziegler Alkylation, Chichibabin Reaction, Von Richter Rearrangement, Smiles Rearrangement, Bamberger Rearrangement and Bucherer Reaction

Lecture 19 - Preparation, properties and reactions

Lecture 20 - Coupling reactions, Japp-Klingemann reaction and Tiffeneau-Demjanov rearrangement

Lecture 21 - Applications of diazonium salts

Lecture 22 - Wagner-Meerwein rearrangement, Pinacol rearrangement, Benzilic acid rearrangement and Arndt-Eistert synthesis

Lecture 23 - Rearrangement of halogen, oxygen, sulfur and nitrogen containing centre

Lecture 24 - Rearrangement to electron-Rich carbon

Lecture 25 - Reactivity and several reactions

Lecture 26 - Reactions of sulfur and silicon containing reagents

Lecture 27 - Preparation and reactions of organoborane and organotin reagents

Lecture 28 - Formation of carbon-carbon and carbon-halogen bonds

Lecture 29 - Cu, Mn, Sm, and Sn Based Reactions, Acyloin Condensation

Lecture 30 - C-N, C-O bond formation and decarboxylation

- Lecture 1 - Chromium Based Reagents for Oxidation
- Lecture 2 - Non-metal based Reagents for Oxidation
- Lecture 3 - Organic Peroxides
- Lecture 4 - Oxidation Mediated by DDQ, CAN and SeO₂
- Lecture 5 - Oxidation Mediated by Mn and Ag
- Lecture 6 - Oxidation by Ru, Hypervalent Iodine, Al and Na based Reagents
- Lecture 7 - Na and Li Metal based Reduction
- Lecture 8 - Hydride based Reduction
- Lecture 9 - Hydrogenation
- Lecture 10 - Al, Zn and Li Based Reagents for Reduction
- Lecture 11 - Reduction With Boranes, Diimide and Trialkylsilanes
- Lecture 12 - Li Based Reagents in Organic Synthesis
- Lecture 13 - Mg and Na Based Reagents in Organic Synthesis
- Lecture 14 - B Based Reagents in Organic Synthesis
- Lecture 15 - B and Al Based Reagents in Organic Synthesis
- Lecture 16 - S Based Reagents in Organic Synthesis
- Lecture 17 - P Based Reagents in Organic Synthesis
- Lecture 18 - Si and Pb Based Reagents in Organic Synthesis
- Lecture 19 - Sn and Bi Based Reagents in Organic Synthesis
- Lecture 20 - Ti Based Reagents in Organic Synthesis
- Lecture 21 - Ru Based Reagents in Organic Synthesis
- Lecture 22 - Pd Based Reagents in Organic Synthesis
- Lecture 23 - Cu Based Reagents in Organic Synthesis
- Lecture 24 - Cr and Mn Based Reagents in Organic Synthesis
- Lecture 25 - Zn and Hg Based Reagents in Organic Synthesis
- Lecture 26 - Au Based Reagents in Organic Synthesis
- Lecture 27 - Fe and Co Based Reagents in Organic Synthesis
- Lecture 28 - Ag and Rh Based Reagents in Organic Synthesis
- Lecture 29 - Ni, Pt and Ir Based Reagents in Organic Synthesis
- Lecture 30 - Introduction to Lanthanides and Sm Based Reagents
- Lecture 31 - Samarium(II) Iodide Based Reagents in Organic Synthesis

Lecture 32 - Sm and Yb Based Reagents in Organic Synthesis

- Lecture 1 - Concepts of heat and work; First Law of Thermodynamics
- Lecture 2 - Concepts of enthalpy and heat capacity
- Lecture 3 - Introduction to entropy
- Lecture 4 - Calculation of entropy for various processes
- Lecture 5 - Gibbs and Helmholtz free energy
- Lecture 6 - Introduction to chemical potential
- Lecture 7 - Clapeyron equation and phase transition; concept of fugacity
- Lecture 8 - Calculation of fugacity; free energy of mixing
- Lecture 9 - Partial molar quantities; excess thermodynamic quantities
- Lecture 10 - Concept of activity and activity coefficients; Debye-Huckel limiting law
- Lecture 11 - Phase Diagram of one component systems
- Lecture 12 - Phase Diagram of two component systems
- Lecture 13 - Phase Diagram of three component system; one dimensional random walk
- Lecture 14 - Macroscopic and microscopic states; Boltzmann distribution; Canonical partition function
- Lecture 15 - Calculation of different thermodynamical quantities using canonical partition function
- Lecture 16 - Introduction to molecular partition function
- Lecture 17 - Translational, electronic and nuclear partition function
- Lecture 18 - Rotational partition function
- Lecture 19 - Vibrational partition function; Introduction to grand canonical ensemble
- Lecture 20 - Grand canonical distribution; Introduction to microcanonical ensemble
- Lecture 21 - Problems on classical thermodynamics - 1
- Lecture 22 - Problems on classical thermodynamics - 2
- Lecture 23 - Problems on statistical thermodynamics - 1
- Lecture 24 - Problems on statistical thermodynamics - 2
- Lecture 25 - Problems on statistical thermodynamics - 3
- Lecture 26 - Fermi-Dirac and Bose-Einstein statistics
- Lecture 27 - Ideal Fermi gas
- Lecture 28 - Ideal Bose gas; Introduction to Bose-Einstein condensation
- Lecture 29 - Bose-Einstein condensations
- Lecture 30 - Nuclear spin statistics; Ortho- and para-hydrogens
- Lecture 31 - Specific Heats of solids

[Lecture 32 - Problems on statistical thermodynamics - 4](#)

[Lecture 33 - Advance problems - 1](#)

[Lecture 34 - Advance Problems - 2](#)

[Lecture 35 - Advance Problems - 3](#)

[Lecture 36 - Advance Problems - 4](#)

[Lecture 37 - Advance Problems - 5](#)

Lecture 1 - Importance of Biomolecules

Lecture 2 - DNA double helix: Chemical parameters

Lecture 3 - DNA and Proteins

Lecture 4 - Amino acids and Proteins

Lecture 5 - Protein 3D structures, folding and denaturation

Lecture 6 - Chemical synthesis pyrimidine nucleobases

Lecture 7 - Chemical synthesis purine nucleobases, Prebiotic chemistry

Lecture 8 - Synthesis of nucleosides

Lecture 9 - Solid phase DNA synthesis

Lecture 10 - Chemistry and Biology of DNA Replication

Lecture 11 - Chemistry of Polymerase Chain Reaction

Lecture 12 - Major components and steps involved in Polymerase chain reaction

Lecture 13 - DNA sequencing: Sanger's di-deoxy method

Lecture 14 - DNA sequencing: Maxam- Gilbert method

Lecture 15 - Numerical Problem-1

Lecture 16 - Sugar Chemistry

Lecture 17 - Chemistry behind DNA damage and mutation

Lecture 18 - Chemistry behind DNA damage and mutation

Lecture 19 - DNA repair

Lecture 20 - Transcription - The transfer of genetic information from DNA to mRNA

Lecture 21 - Translation - The transfer of genetic information from mRNA to protein I

Lecture 22 - Translation - The transfer of genetic information from mRNA to protein II

Lecture 23 - Role of Ribosome in protein synthesis and the concept of codon

Lecture 24 - Protein sequencing using Sanger's and Edman's degradation methods

Lecture 25 - Mass spectroscopy and other sequencing methods for large proteins

Lecture 26 - Solution phase peptide synthesis: mechanism and end protection

Lecture 27 - Peptide coupling agents, Solid phase synthesis, peptide based therapeutics

Lecture 28 - Spectroscopic techniques

Lecture 29 - Spectroscopic techniques - II and Purification technique-I of biomolecules

Lecture 30 - Purification techniques - II and Characteriation techniques of biomolecules

Lecture 31 - Molecular probes: PNA and LNA-I

[Lecture 32 - Molecular Probes: PNA and LNA-II](#)

[Lecture 33 - Carbohydrate chemistry - I: Introduction and Synthesis](#)

[Lecture 34 - Carbohydrate chemistry - II: Polysaccharides and its nanoparticles](#)

[Lecture 35 - Carbohydrate chemistry - III: Synthesis of nanoparticles; Recap of all modules](#)

Lecture 1 - Introduction to Materials Chemistry

Lecture 2 - Preparative routes: Conventional - Precursor technique - I

Lecture 3 - Preparative routes: Conventional - Precursor technique - II

Lecture 4 - Preparative routes: Un Conventional - Sonochemistry technique - II

Lecture 5 - Preparative routes: Un Conventional - Sonochemistry technique - II

Lecture 6 - Preparative routes: Un Conventional - Combustion technique

Lecture 7 - Preparative routes: Un Conventional - Microwave technique

Lecture 8 - Preparative routes: High Pressure - Hydrothermal Technique

Lecture 9 - Preparative routes: Conventional Solid State Technique

Lecture 10 - Molecular Beam Epitaxy: Monolayers to Multilayers

Lecture 11 - Pulsed Laser Deposition: Oxide thin films

Lecture 12 - Pulsed Electron Deposition: From oxides to polymeric films and devices

Lecture 13 - Sputtering deposited thin films and applications

Lecture 14 - Crystal growth-Single crystals.

Lecture 15 - Applications of X-ray diffraction

Lecture 16 - Applications of X-ray Photoelectron spectroscopy

Lecture 17 - Applications of X-ray Absorption spectroscopy

Lecture 18 - Applications of Thermal analysis techniques

Lecture 19 - Applications of Scanning Tunneling microscopy

Lecture 20 - Applications of Electron Microscopy

Lecture 21 - Case Study of ZnO

Lecture 22 - Magnetic materials - I

Lecture 23 - Magnetic Materials - II

Lecture 24 - Magnetic Materials - III & Related Phenomena

Lecture 25 - Shape Memory Materials

Lecture 26 - Spintronic Materials - I Colossal Magnetoresistive Oxides

Lecture 27 - Spintronic Materials - II Giant Magnetoresistive Materials

Lecture 28 - Spintronic Materials - III Tunneling Magnetoresistive Materials

Lecture 29 - Spintronic Materials - IV Dilute Magnetic Semiconductors

Lecture 30 - High T_c Superconductors

Lecture 31 - The New Carbon family - I - Fullerenes and Nanotubes

[Lecture 32 - The New Carbon family - II - Graphene](#)

[Lecture 33 - Optoelectronic Materials - I - OLEDs](#)

[Lecture 34 - Optoelectronic Materials - II - OLEDs](#)

[Lecture 35 - Inorganic Phosphors - I](#)

[Lecture 36 - Inorganic Phosphors - II](#)

[Lecture 37 - Phosphor Materials](#)

[Lecture 38 - Solar Cells](#)

[Lecture 39 - Interview with C N R Rao and Interview with E C Subba Rao](#)

[Lecture 40 - Perceptions & Projections](#)

[Lecture 1 - Mathematics for Chemistry](#)

[Lecture 2 - Mathematics for Chemistry](#)

[Lecture 3 - Mathematics for Chemistry](#)

[Lecture 4 - Mathematics for Chemistry](#)

[Lecture 5 - Mathematics for Chemistry](#)

[Lecture 6 - Mathematics for Chemistry](#)

[Lecture 7 - Mathematics for Chemistry](#)

[Lecture 8 - Mathematics for Chemistry](#)

[Lecture 9 - Mathematics for Chemistry](#)

[Lecture 10 - Mathematics for Chemistry](#)

[Lecture 11 - Mathematics for Chemistry](#)

[Lecture 12 - Mathematics for Chemistry](#)

[Lecture 13 - Mathematics for Chemistry](#)

[Lecture 14 - Mathematics for Chemistry](#)

[Lecture 15 - Mathematics for Chemistry](#)

[Lecture 16 - Mathematics for Chemistry](#)

[Lecture 17 - Mathematics for Chemistry](#)

[Lecture 18 - Mathematics for Chemistry](#)

[Lecture 19 - Mathematics for Chemistry](#)

[Lecture 20 - Mathematics for Chemistry](#)

[Lecture 21 - Mathematics for Chemistry](#)

[Lecture 22 - Mathematics for Chemistry](#)

[Lecture 23 - Mathematics for Chemistry](#)

[Lecture 24 - Mathematics for Chemistry](#)

[Lecture 25 - Mathematics for Chemistry](#)

[Lecture 26 - Mathematics for Chemistry](#)

[Lecture 27 - Mathematics for Chemistry](#)

[Lecture 28 - Mathematics for Chemistry](#)

[Lecture 29 - Mathematics for Chemistry](#)

[Lecture 30 - Mathematics for Chemistry](#)

[Lecture 31 - Mathematics for Chemistry](#)

[Lecture 32 - Mathematics for Chemistry](#)

[Lecture 33 - Mathematics for Chemistry](#)

[Lecture 34 - Mathematics for Chemistry](#)

[Lecture 35 - Mathematics for Chemistry](#)

[Lecture 36 - Mathematics for Chemistry](#)

[Lecture 37 - Mathematics for Chemistry](#)

[Lecture 38 - Mathematics for Chemistry](#)

[Lecture 39 - Mathematics for Chemistry](#)

[Lecture 40 - Mathematics for Chemistry](#)

[Lecture 1 - Advance Analytical Course](#)

[Lecture 2 - Advance Analytical Course](#)

[Lecture 3 - Advance Analytical Course](#)

[Lecture 4 - Advance Analytical Course](#)

[Lecture 5 - Advance Analytical Course](#)

[Lecture 6 - Advance Analytical Course](#)

[Lecture 7 - Advance Analytical Course](#)

[Lecture 8 - Advance Analytical Course](#)

[Lecture 9 - Advance Analytical Course](#)

[Lecture 10 - Advance Analytical Course](#)

[Lecture 11 - Advance Analytical Course](#)

[Lecture 12 - Advance Analytical Course](#)

[Lecture 13 - Advance Analytical Course](#)

[Lecture 14 - Advance Analytical Course](#)

[Lecture 15 - Advance Analytical Course](#)

[Lecture 16 - Advance Analytical Course](#)

[Lecture 17 - Advance Analytical Course](#)

[Lecture 18 - Advance Analytical Course](#)

[Lecture 19 - Advance Analytical Course](#)

[Lecture 20 - Advance Analytical Course](#)

[Lecture 21 - Advance Analytical Course](#)

[Lecture 22 - Advance Analytical Course](#)

[Lecture 23 - Advance Analytical Course](#)

[Lecture 24 - Advance Analytical Course](#)

[Lecture 25 - Advance Analytical Course](#)

[Lecture 26 - Advance Analytical Course](#)

[Lecture 27 - Advance Analytical Course](#)

[Lecture 28 - Advance Analytical Course](#)

[Lecture 29 - Advance Analytical Course](#)

[Lecture 30 - Advance Analytical Course](#)

[Lecture 31 - Advance Analytical Course](#)

[Lecture 32 - Advance Analytical Course](#)

[Lecture 33 - Advance Analytical Course](#)

[Lecture 34 - Advance Analytical Course](#)

[Lecture 35 - Advance Analytical Course](#)

[Lecture 36 - Advance Analytical Course](#)

[Lecture 37 - Advance Analytical Course](#)

[Lecture 38 - Advance Analytical Course](#)

[Lecture 39 - Advance Analytical Course](#)

[Lecture 40 - Advance Analytical Course](#)

[Lecture 1](#)

[Lecture 2](#)

[Lecture 3](#)

[Lecture 4](#)

[Lecture 5](#)

[Lecture 6](#)

[Lecture 7](#)

[Lecture 8](#)

[Lecture 9](#)

[Lecture 10](#)

[Lecture 11](#)

[Lecture 12](#)

[Lecture 13](#)

[Lecture 14](#)

[Lecture 15](#)

[Lecture 16](#)

[Lecture 17](#)

[Lecture 18](#)

[Lecture 19](#)

[Lecture 20](#)

[Lecture 21](#)

[Lecture 22](#)

[Lecture 23](#)

[Lecture 24](#)

[Lecture 25](#)

[Lecture 26](#)

[Lecture 27](#)

[Lecture 28](#)

[Lecture 29](#)

[Lecture 30](#)

[Lecture 31](#)

[Lecture 32](#)

[Lecture 33](#)

[Lecture 34](#)

[Lecture 35](#)

[Lecture 36](#)

[Lecture 37](#)

[Lecture 38](#)

[Lecture 39](#)

[Lecture 40](#)

Lecture 1 - Errors, precision and accuracy

Lecture 2 - Probability and distributions

Lecture 3 - Gaussian distribution and integrals

Lecture 4 - Gaussian distribution, integrals, averages

Lecture 5 - Practice problems 1

Lecture 6 - Vectors and Vector Spaces

Lecture 7 - Linear Independence

Lecture 8 - Scalar and vector fields

Lecture 9 - Gradient, divergence and curl

Lecture 10 - Practice problems 2

Lecture 11 - Line integrals, Potential Theory

Lecture 12 - Surface and Volume Integrals

Lecture 13 - Matrices

Lecture 14 - Linear Systems, Cramer's Rule

Lecture 15 - Practice Problems 3

Lecture 16 - Rank and Inverse of a Matrix

Lecture 17 - Eigenvalues and Eigenvectors

Lecture 18 - Special matrices

Lecture 19 - Spectral decomposition and Normal modes

Lecture 20 - Practice Problems 4

Lecture 21 - Differential equations, Order

Lecture 22 - Exact and Inexact differentials

Lecture 23 - Integrating Factors

Lecture 24 - System of 1st order ODEs, matrix methods

Lecture 25 - Practice Problems 5

Lecture 26 - Types of 2nd order ODEs, nature of solutions

Lecture 27 - Homogeneous 2nd order ODEs

Lecture 28 - Homogeneous and nonhomogeneous equations

Lecture 29 - Nonhomogeneous equations \hat{A} – Variation of parameters

Lecture 30 - Practice Problems 6

Lecture 31 - Power series method for solving Legendre DE

[Lecture 32 - Properties of Legendre Polynomials](#)

[Lecture 33 - Associated Legendre Polynomials, Spherical Harmonics](#)

[Lecture 34 - Hermite Polynomials, Solution of Quantum Harmonic Oscillator](#)

[Lecture 35 - Practice Problems 7](#)

[Lecture 36 - Conditions for power series solution](#)

[Lecture 37 - Frobenius Method, Bessel Functions](#)

[Lecture 38 - Properties of Bessel Functions, circular boundary problems](#)

[Lecture 39 - Legendre Polynomials, solution to radial part of H-atom](#)

[Lecture 40 - Practice Problems 8](#)

- Lecture 1 - Introduction - Motivation and Overview
- Lecture 2 - Introduction - Technical Details
- Lecture 3 - Introduction - Basic tools
- Lecture 4 - Computational Tools
- Lecture 5 - Quantum Measurement and Teleportation
- Lecture 6 - Quantum Teleportation and Cryptography
- Lecture 7 - DJ Algorithm and Implementation Aspects
- Lecture 8 - Grover's Algorithm
- Lecture 9 - Basics of Shor's Algorithm
- Lecture 10 - Shor's Algorithm and Quantum Fourier Transform (QFT)
- Lecture 11 - Basics of Quantum Mechanics
- Lecture 12 - Modern look at Quantum Mechanics
- Lecture 13 - Basics of NMR
- Lecture 14 - Concepts in NMR Quantum Computing
- Lecture 15 - Laser Basics
- Lecture 16 - Continuous Wave Lasers
- Lecture 17 - Pulsed Lasers
- Lecture 18 : Optical Implementation 'Linear Approach
- Lecture 19 : Various Aspects of Linear Optical Quantum Computing
- Lecture 20 : Laser Experimental Implementation for Grover's Algorithm
- Lecture 21 - Optical Implementation
- Lecture 22 - Solutions to problem set - 1
- Lecture 23 - Basics of Ion Traps
- Lecture 24 - Applications of Ion Traps in QIQC
- Lecture 25 - Reviewing Concepts and clarifying problems - 1
- Lecture 26 - Reviewing Concepts and clarifying problems - 2
- Lecture 27 - Qubits used in Commercial Quantum Computing
- Lecture 28 - Spintronics Quantum Computing
- Lecture 29 - Back to Basics - I
- Lecture 30 - Back to Basics - II
- Lecture 31 - Understanding Implementation Issues from the Basics - I

[Lecture 32 - Understanding Implementation Issues from the Basics - II](#)

[Lecture 33 - Implementation with Solid-State Super conducting Qubits](#)

[Lecture 34 - Concept of Density Matrix for Quantum Computing](#)

[Lecture 35 - Understanding the ensemble of Qubits from Density Matrix](#)

[Lecture 36 - Understanding Quantum Measurement, Entanglement etc. in Quantum Computing using Density Matrix](#)

[Lecture 37 - Principles: Quantum Mechanics and Computers](#)

[Lecture 38 - Measurements: Single vs Ensemble Averaged](#)

[Lecture 39 - Working of Quantum Computers: NMR QC](#)

[Lecture 40 - Academic Development in Quantum Computing - I](#)

[Lecture 41 - Academic Development in Quantum Computing - II](#)

[Lecture 42 - Commercial Development in Quantum Computing Implementation](#)

[Lecture 43 - Use of Atomic Qubits in Quantum Computing](#)

[Lecture 44 - Futuristic Aspects in Implementing Quantum Computing - I](#)

[Lecture 45 - Futuristic Aspects in Implementing Quantum Computing - II](#)

[Lecture 1](#)

[Lecture 2](#)

[Lecture 3](#)

[Lecture 4](#)

[Lecture 5](#)

[Lecture 6](#)

[Lecture 7](#)

[Lecture 8](#)

[Lecture 9](#)

[Lecture 10](#)

[Lecture 11](#)

[Lecture 12](#)

[Lecture 13](#)

[Lecture 14](#)

[Lecture 15](#)

[Lecture 16](#)

[Lecture 17](#)

[Lecture 18](#)

[Lecture 19](#)

[Lecture 20](#)

[Lecture 21](#)

[Lecture 22](#)

[Lecture 23](#)

[Lecture 24](#)

[Lecture 25](#)

[Lecture 26](#)

[Lecture 27](#)

[Lecture 28](#)

[Lecture 29](#)

[Lecture 30](#)

[Lecture 31](#)

[Lecture 32](#)

[Lecture 33](#)

[Lecture 34](#)

[Lecture 35](#)

[Lecture 36](#)

[Lecture 37](#)

[Lecture 38](#)

[Lecture 39](#)

[Lecture 40](#)

- Lecture 1 - Unique properties of LASERs and their applications
- Lecture 2 - LASER and its history
- Lecture 3 - Interaction of Light with matter
- Lecture 4 - Einsteins Concept of stimulated emission
- Lecture 5 - Calculation of Einsteins coefficient
- Lecture 6 - Population inversion, 2-level system and 3-level system
- Lecture 7 - 3-level System and 4-level system
- Lecture 8 - Components of LASERs
- Lecture 9 - Modes of LASER cavity and standing waves
- Lecture 10 - Transverse Modes of LASER cavity
- Lecture 11 - Threshold Condition
- Lecture 12 - Properties of Laser: Directionality and Intensity
- Lecture 13 - Properties of Laser: Coherence and Monochromaticity
- Lecture 14 - Continuous and Pulsed Lasers
- Lecture 15 - Some Numerical problem
- Lecture 16 - Cavity Dumping
- Lecture 17 - Q-switching
- Lecture 18 - Q-switching and Pockels effect
- Lecture 19 - Passive Q-switching, Mode-Locking
- Lecture 20 - Mode Locking
- Lecture 21 - Mode - locking
- Lecture 22 - Mode - locking (Continued...)
- Lecture 23 - Passive Mode - locking and Types of LASERs
- Lecture 24 - Solid state LASERs
- Lecture 25 - Semiconductor LASERs and Gas LASERs
- Lecture 26 - Gas LASERs
- Lecture 27 - Chemical and Dye LASERs
- Lecture 28 - Introduction to Non Linear Optics
- Lecture 29 - Non Linear Optics
- Lecture 30 - 2nd order Nonlinear optics
- Lecture 31 - Non-linear optical processes

[Lecture 32 - Aspects of SHG and Application of non-linear optics](#)

[Lecture 33 - Application of LASER: LIDAR](#)

[Lecture 34 - Application of Laser: Laser Spectroscopy](#)

[Lecture 35 - Application of Laser: Enrichment of Isotope](#)

[Lecture 36 - Laser Induced Chemistry](#)

[Lecture 37 - Laser Induced Chemistry and Ultrafast chemical Dynamics](#)

[Lecture 38 - Lasers in Medical Sciences](#)

[Lecture 39 - Lasers in Material sciences and engineering and Optical Communications](#)

[Lecture 40 - Laser safety and summary](#)

Lecture 1 - Vectors, Vector Operations and Linear Independence

Lecture 2 - Vector Operations, Generalization of Vectors

Lecture 3 - Vector Differentiation, Vector Transformations

Lecture 4 - Vector Integration, Line, Surface and Volume Integrals

Lecture 5 - Practice Problems

Lecture 6 - Matrix as a vector transformation, linear system

Lecture 7 - Special Matrices: Symmetric, Orthogonal, Complex

Lecture 8 - Rotational Matrices, Eigenvalues and Eigenvectors

Lecture 9 - Determinants, Matrix Inverse

Lecture 10 - Practice Problems

Lecture 11 - Step Function, Delta Function

Lecture 12 - Gamma Function, Error Function

Lecture 13 - Spherical Polar Coordinates

Lecture 14 - Cylindrical Polar Coordinates, Integrals

Lecture 15 - Recap of Module 3, Practice Problems

Lecture 16 - ODEs and PDEs, First order ODEs, system of 1st order ODEs

Lecture 17 - First order ODEs, exact integrals, integrating factors

Lecture 18 - System of first order ODEs, Linear first order ODEs

Lecture 19 - General solution of a system of linear first order ODEs with constant coefficients

Lecture 20 - Recap of Module 4, Practice problems

Lecture 21 - Homogeneous 2nd Order ODE, Basis Functions

Lecture 22 - Nonhomogeneous 2nd Order ODE

Lecture 23 - Power Series Method of Solving ODEs

Lecture 24 - Frobenius Method / Power Series Method

Lecture 25 - Time-independent Schrodinger Equation for H-atom

Lecture 26 - Maxima and Minima, Taylor Series

Lecture 27 - Taylor Series for functions of several variables

Lecture 28 - Critical Points of Functions

Lecture 29 - Lagranges Method of Undetermined Multipliers

Lecture 30 - Recap of Module 6, Practice Problems

Lecture 31 - Nonlinear Differential Equations

[Lecture 32 - Phase Plane of A Pendulum](#)

[Lecture 33 - Stability of Critical Points](#)

[Lecture 34 - Population Dynamics Models](#)

[Lecture 35 - Recap of Module 7, Practice Problems](#)

[Lecture 36 - Fourier Series, Fourier Expansion of Periodic Functions](#)

[Lecture 37 - \(Part A\): Fourier Expansions and Differential Equations](#)

[Lecture 38 - \(Part B\): Fourier Expansions and Differential Equations](#)

[Lecture 39 - Orthogonal Eigenfunctions, Sturm-Liouville Theory](#)

[Lecture 40 - Recap of Module 8, Practice Problems](#)

[Lecture 41 - Fourier Transforms](#)

[Lecture 42 - Properties of Fourier Transforms](#)

[Lecture 43 - Fourier Transforms and Partial Differential Equations](#)

[Lecture 44 - Laplace Transforms](#)

[Lecture 45 - Recap of Module 9, Practice Problems](#)

[Lecture 46 - Partial Differential Equations, Boundary Conditions](#)

[Lecture 47 - Separation of Variables](#)

[Lecture 48 - \(Part A\): Two-dimensional Wave Equation, Bessel Functions](#)

[Lecture 49 - \(Part B\): Two-dimensional Wave Equation, Bessel Functions](#)

[Lecture 50 - Recap of Module 10, Practice Problems](#)

[Lecture 51 - Discrete and Continuous Random Variables](#)

[Lecture 52 - Probability Distribution Functions](#)

[Lecture 53 - Poisson Distribution, Gaussain Distribution](#)

[Lecture 54 - Error Estimates, Least Square Fit, Correlation Functions](#)

[Lecture 55 - Recap of Module 11, Practice Problems](#)

Lecture 1 - Nature of solid state and the solid state materials

Lecture 2 - Thermodynamics of solids

Lecture 3 - Crystallisation Kinetics

Lecture 4 - Synthetic Strategy

Lecture 5 - Review of week 1 and Practice problems

Lecture 6 - Unit Cells

Lecture 7 - Conventional Unit Cell and Primitive Unit Cell

Lecture 8 - Bravais Lattices

Lecture 9 - Bravais Lattices, Basis and crystal

Lecture 10 - Summary of week 2 and Practices Problems

Lecture 11 - Symmetry In Crystals, Point Symmetries

Lecture 12 - Reflections, Inversions and Rotoinversions

Lecture 13 - Schonflies and Hermann-Mauguin Conventions

Lecture 14 - Fractional Coordinates, Planer Visualization

Lecture 15 - Review of week 3 And Practice Problems

Lecture 16 - Combining symmetry operations, translational symmetries

Lecture 17 - Screw Axis

Lecture 18 - Glide Planes

Lecture 19 - Symmetry and Symmetry Notations

Lecture 20 - Summary of week 4 and Practice Problems

Lecture 21 - Crystal Systems

Lecture 22 - Crystal Systems and Unit Cells

Lecture 23 - Point Groups

Lecture 24 - Space Groups

Lecture 25 - Week 5 Summary and Practice Problems

Lecture 26 - 32 Crystal Classes Based on Symmetry

Lecture 27 - Notation for 32 Crystal Classes

Lecture 28 - Short Form of Hermann-Mauguin Notations

Lecture 29 - Hermann - Mauguin notation for Space Groups

Lecture 30 - Summary and Practice Problems

Lecture 31 - Coordination number, Voids

- Lecture 32 - Lattice Imperfections and Crystals
- Lecture 33 - Line Planner and Bulk defects and crystals
- Lecture 34 - Thermodynamics of defects in crystals
- Lecture 35 - Review of Week 7, Practice Problems
- Lecture 36 - Miller Planes, Miller Indices
- Lecture 37 - Miller Indices for Hexagonal Systems, Distance between Planes
- Lecture 38 - X-ray diffraction, Bragg's Law, Reciprocal Lattice
- Lecture 39 - Reciprocal Lattice, XRD instrumentation
- Lecture 40 - Review of week 8, Practice Problems
- Lecture 41 - XRD - Analysis of Pattern
- Lecture 42 - Geometric Structure Factor - Missing Peaks
- Lecture 43 - X-Ray Crystallography
- Lecture 44 - Electron Microscopy
- Lecture 45 - Review of Week 9. Practice Problems
- Lecture 46 - Closed - Packed Structures and Voids
- Lecture 47 - Crystal Structures of Binary Compounds
- Lecture 48 - Perovskites and Spinals
- Lecture 49 - Space filling Polyhedra, Alloys
- Lecture 50 - Summary of Week 10 and Practice Problems
- Lecture 51 - Free electron Models
- Lecture 52 - Bloch Theorem
- Lecture 53 - Band Theory of Solids
- Lecture 54 - Bands in Higher Dimensions
- Lecture 55 - Summary of Week 11 and Practice Problems
- Lecture 56 - More about Band Theory, Crystal Momentum
- Lecture 57 - Density of States
- Lecture 58 - Metals, Insulators and Semiconductors
- Lecture 59 - Band Gap and Optical Properties
- Lecture 60 - Summary of Week 12 and Practice Problems

Lecture 1 - General Introduction and Prospects

Lecture 2 - Metals in Biology: Nature's Selection of Elements in Life

Lecture 3 - Metals in Biology: Control, Use and Enzymatic Action

Lecture 4 - Metals in Biology: Choice of Redox Active Metal Ions

Lecture 5 - Metals in Biology: Importance of Cobalt in Coenzyme-B12

Lecture 6 - Design Principles Used in Chemical Biology: Some Noteworthy Examples!

Lecture 7 - Design Principles Used in Chemical Biology: Role of Proteins in Controlling Reactivity!

Lecture 8 - Design Principles Used in Chemical Biology: Blue-Copper Proteins

Lecture 9 - Design Principles Used in Chemical Biology: Fixation of Nitrogen from Air

Lecture 10 - Life with Oxygen: Molecular and Chemical Properties of O₂

Lecture 11 - Life with Oxygen: Cytochrome c oxidase

Lecture 12 - Life with Oxygen: Superoxide Dismutase Activity

Lecture 13 - Life with Oxygen: Catalase and Peroxidase Activities

Lecture 14 - Life with Oxygen: Oxygenase Activity

Lecture 15 - Life with Oxygen: O₂-Carrying Proteins Hemocyanin and Hemerythrin

Lecture 16 - Life with Oxygen: O₂-Carrying Proteins Hemoglobin and Myoglobin

Lecture 17 - Life with Oxygen: Reversible O₂-binding and Transport

Lecture 18 - Life with Oxygen: Heme Oxygenase Activity

Lecture 19 - Metals in Medicine: Introduction to Medicinal Inorganic Chemistry

Lecture 20 - Metals in Medicine: Platinum-based Anti-Cancer Drugs

- Lecture 1 - Intro-Chemistry and Physics of Surfaces and Interfaces
- Lecture 2 - Historic perspective to surface science
- Lecture 3 - Creating surfaces from bulk lattices
- Lecture 4 - Reconstruction of surfaces
- Lecture 5 - Hexagonal lattice and miller bravais indices
- Lecture 6 - Introduction to ultra-high Vacuum and Preparation of Clean Surfaces
- Lecture 7 - Adsorption and the Energetic of Adsorption
- Lecture 8 - Nomenclature and types of Adlayers
- Lecture 9 - Thermal Desorption Spectroscopy
- Lecture 10 - Different types of Preparation methods for Thin Films
- Lecture 11 - Examples of PVD and CVD
- Lecture 12 - Moire Pattern at Solid-Solid Interface
- Lecture 13 - Growth Modes of Adlayers
- Lecture 14 - Energies that Control the Growth of Adlayers
- Lecture 15 - Kinetic and Thermodynamic Control in Adlayer Growth
- Lecture 16 - Molecular Adsorbates: Preparation
- Lecture 17 - Molecular Adsorbates: Factors Controlling Molecular Adlayer Formation - I
- Lecture 18 - Molecular Adsorbates: Factors Controlling Molecular Adlayer Formation - II
- Lecture 19 - Molecular Adsorbates: Factors Controlling Molecular Adlayer Formation - III
- Lecture 20 - Scanning Tunneling Microscopy
- Lecture 21 - Tip-vacuum Tunneling Junction
- Lecture 22 - Scanning Tunneling Spectroscopy - I
- Lecture 23 - Scanning Tunneling Spectroscopy - II
- Lecture 24 - Scanning Tunneling Spectroscopy: Applications - I
- Lecture 25 - Scanning Tunneling Spectroscopy: Applications - II
- Lecture 26 - Imaging Molecules and Atom Manipulation on Surfaces
- Lecture 27 - Single Molecule Manipulation on Surfaces
- Lecture 28 - Inelastic Tunneling Spectroscopy
- Lecture 29 - Ultra-violet Photo-electron Spectroscopy (UPS)
- Lecture 30 - Ultra-violet Photo-electron Spectroscopy (UPS): Applications
- Lecture 31 - X-ray Photo-electron Spectroscopy (XPS)

[Lecture 32 - X-Ray Photo-electron Spectroscopy \(XPS\): Applications - 1](#)

[Lecture 33 - X-Ray Photo-electron Spectroscopy \(XPS\): Applications - 2](#)

[Lecture 34 - 2D Molecular Materials on Surface - 1](#)

[Lecture 35 - 2D Molecular Materials on Surface - 2](#)

[Lecture 36 - Atomic Force Microscopy \(AFM\) - I](#)

[Lecture 37 - Atomic Force Microscopy \(AFM\) - II](#)

[Lecture 38 - Atomic Force Microscopy \(AFM\) - III](#)

[Lecture 39 - Dynamics of Atoms on Surfaces](#)

[Lecture 40 - Summary](#)

Lecture 1 - Introduction

Lecture 2 - Iron Storage and Transport - I

Lecture 3 - Iron Storage and Transport - II

Lecture 4 - Iron Storage and Transport - III

Lecture 5 - Electron Transport Proteins - I

Lecture 6 - Electron transport Proteins - II

Lecture 7 - Electron Transport Proteins - III

Lecture 8 - Electron Transport Proteins - IV

Lecture 9 - Electron Transport Proteins - V

Lecture 10 - Electron Transport Proteins - VI

Lecture 11 - Electron Transport Proteins - VII

Lecture 12 - Electron Transport Proteins - VIII

Lecture 13 - Electron Transport Proteins - IX

Lecture 14 - Electron Transfer in Photosynthesis - I

Lecture 15 - Electron Transfer in Photosynthesis - II

Lecture 16 - Manganese Enzymes

Lecture 17 - Nickel Enzymes - I

Lecture 18 - Nickel Enzymes - II

Lecture 19 - Nickel Enzymes - III

Lecture 20 - Nickel Enzymes - IV

Lecture 21 - Nickel Enzymes - V

Lecture 22 - Molybdenum Enzymes - I

Lecture 23 - Molybdenum Enzymes - II

Lecture 24 - Molybdenum Enzymes - III

Lecture 25 - Molybdenum Enzymes - IV

Lecture 26 - Molybdenum Enzymes - V

Lecture 27 - Molybdenum Enzymes - VI

Lecture 28 - Molybdenum and Tungsten in Biology

Lecture 29 - Tungsten Enzymes - I

Lecture 30 - Tungsten Enzymes - II

Lecture 31 - Tungsten Enzymes - III

[Lecture 32 - Tungsten Enzymes - IV](#)

[Lecture 33 - Vanadium Enzymes - I](#)

[Lecture 34 - Vanadium Enzymes - II](#)

[Lecture 35 - Vanadium Enzymes - III](#)

[Lecture 36 - Vanadium Enzymes - IV](#)

[Lecture 37 - Non-metals in Biology - I](#)

[Lecture 38 - Non-metals in Biology - II](#)

[Lecture 39 - Non-metals in Biology - III](#)

[Lecture 40 - Non-metals in Biology - IV](#)

Lecture 1 - Introduction

Lecture 2 - Definition

Lecture 3 - Classification of Ligands - I

Lecture 4 - Classification of Ligands - II

Lecture 5 - Ligands - III and Nomenclature - I

Lecture 6 - Nomenclature - II

Lecture 7 - Coordination Number - I

Lecture 8 - Coordination Number - II

Lecture 9 - Coordination Number - III

Lecture 10 - Coordination Number - IV

Lecture 11 - Isomerism - I

Lecture 12 - Isomerism - II

Lecture 13 - Coordination Equilibria - I

Lecture 14 - Coordination Equilibria - II

Lecture 15 - Bonding in Complexes - I

Lecture 16 - Bonding in Complexes - II

Lecture 17 - Bonding in Complexes - III

Lecture 18 - Bonding in Complexes - IV

Lecture 19 - Jahn-Teller Effect

Lecture 20 - Spin Crossover and Colour

Lecture 21 - Optical Spectra

Lecture 22 - d-d Transitions

Lecture 23 - Charge Transfer

Lecture 24 - Orgel Diagram

Lecture 25 - Tanabe Sugano Diagram

Lecture 26 - MLCT Transitions

Lecture 27 - Application of CFT

Lecture 28 - Spinels

Lecture 29 - Magnetochemistry

Lecture 30 - Magnetic Properties

Lecture 31 - Magnetic Measurements

[Lecture 32 - Ligand Field Theory](#)

[Lecture 33 - Sigma Orbitals](#)

[Lecture 34 - Pi Orbitals](#)

[Lecture 35 - Reaction Mechanism - I](#)

[Lecture 36 - Reaction Mechanism - II](#)

[Lecture 37 - Reaction Mechanism - III](#)

[Lecture 38 - Reaction Mechanism - IV](#)

[Lecture 39 - Reaction Mechanism - V](#)

[Lecture 40 - Biological Inorganic Chemistry](#)

Lecture 1 - Definition and Scope

Lecture 2 - Single - Step Methods for IVPs

Lecture 3 - Systematic Nomenclature

Lecture 4 - Nomenclature (Continued...) and Important Names

Lecture 5 - Overview of Structure Determination in Heterocyclic Chemistry

Lecture 6 - ¹⁵N NMR in Heterocyclic Chemistry

Lecture 7 - Effects of Ring Nitrogen - A

Lecture 8 - Effects of Ring Nitrogen - B

Lecture 9 - Effects of Ring Nitrogen - C

Lecture 10 - Oxidation in Heterocyclic Chemistry

Lecture 11 - Oxidation in Heterocyclic Chemistry (Continued...)

Lecture 12 - Reduction in Heterocyclic Chemistry

Lecture 13 - Radicals in Heterocyclic Chemistry - I

Lecture 14 - Radicals in Heterocyclic Chemistry - II

Lecture 15 - Lithiation for 5-membered heterocycles

Lecture 16 - Lithiation for 5-membered heterocycles (Continued...)

Lecture 17 - Lithiation of 6-membered heterocycle and non-aromatic heterocycles

Lecture 18 - Magnetiatio and Zincation in Heterocyclic Chemistry

Lecture 19 - Transition metal catalyzed cross coupling

Lecture 20 - Transition metal catalyzed cross coupling (Continued...)

Lecture 21 - Dehydrogenative (Oxidative) cross coupling

Lecture 22 - Tert-amino effect in heterocycle synthesis

Lecture 23 - [4 plus 2] cycloaddition in heterocyclic chemistry

Lecture 24 - [4 plus 2] cycloaddition in heterocyclic chemistry (Continued...)

Lecture 25 - [3 plus 2] Cycloaddition in heterocyclic chemistry

Lecture 26 - Cycloaddition : Revisited

Lecture 27 - [4 plus 3] Cycloaddition

Lecture 28 - [5 plus 2] Cycloaddition

Lecture 29 - [2 plus 2 plus 2] Cycloaddition

Lecture 30 - Pyrrole Synthesis - I

Lecture 31 - Pyrrole Synthesis - II

[Lecture 32 - Indole Synthesis - I](#)

[Lecture 33 - Indole Synthesis - II](#)

[Lecture 34 - Furan Synthesis](#)

[Lecture 35 - Thiophene Synthesis](#)

[Lecture 36 - Oxazole, Imidazole and Thiazole Synthesis](#)

[Lecture 37 - Pyridine Synthesis](#)

[Lecture 38 - Synthesis of Quinolines and Isoquinolines](#)

[Lecture 39 - Bicyclic Polyheteroatomic Heterocycles](#)

[Lecture 40 - Heterocyclic Rearrangements](#)

- Lecture 1 - Introduction to Organic Photochemistry
- Lecture 2 - Introduction to Organic Photochemistry (Continued...)
- Lecture 3 - Reactivity of $n\text{-}\pi^*$
- Lecture 4 - $\hat{I}\pm$ - cleavage - I
- Lecture 5 - $\hat{I}\pm$ - cleavage - II
- Lecture 6 - $\hat{I}\pm$ - cleavage - III
- Lecture 7 - \hat{I}^2 - cleavage
- Lecture 8 - Intramolecular Hydrogen Abstraction - I
- Lecture 9 - Intramolecular Hydrogen Abstraction - II
- Lecture 10 - Intramolecular Hydrogen Abstraction - III
- Lecture 11 - Intramolecular Hydrogen Abstraction
- Lecture 12 - Addition to \hat{I} - System
- Lecture 13 - Intramolecular Paterno-Buchi Reaction
- Lecture 14 - Energy of Electron Transfer Reaction
- Lecture 15 - Reactivity of $\hat{I} - \hat{I}^*$
- Lecture 16 - Addition Reaction of $\hat{I} - \hat{I}^*$
- Lecture 17 - Addition Reaction of $\hat{I} - \hat{I}^*$ (Continued...)
- Lecture 18 - Di-Pi Methane Rearrangement
- Lecture 19 - Photochemistry of Cyclohexanone
- Lecture 20 - Singlet Oxygen Chemistry
- Lecture 21 - Carbenes and Nitrenes
- Lecture 22 - Remote Functionalisation
- Lecture 23 - Introduction to Pericyclic Reaction
- Lecture 24 - Sigmatropic Reactions - I
- Lecture 25 - Sigmatropic Reactions - II
- Lecture 26 - Sigmatropic Reactions - III
- Lecture 27 - Cycloaddition Reactions - I
- Lecture 28 - Cycloaddition Reactions - II
- Lecture 29 - Cycloaddition - Diels-Alder Reactions
- Lecture 30 - Cycloaddition - Diels-Alder Reactions (Continued...)
- Lecture 31 - Cycloaddition - Ene Reactions

[Lecture 32 - 1,3 Dipolar Cycloaddition - I](#)

[Lecture 33 - 1,3 Dipolar Cycloaddition - II](#)

[Lecture 34 - Electrocyclic Reaction - I](#)

[Lecture 35 - Electrocyclic Reaction - II](#)

[Lecture 36 - Practice Problems in Pericyclic Reaction - I](#)

[Lecture 37 - Practice Problems in Pericyclic Reaction - II](#)

[Lecture 38 - Practice Problems in Pericyclic Reaction - III](#)

[Lecture 39 - Chelotropic Reaction](#)

[Lecture 40 - Application of Photochemistry](#)

[Lecture 1 - Introduction to Polymers](#)

[Lecture 2 - Introduction to Polymers \(Continued...\)](#)

[Lecture 3 - Introduction to Polymers \(Continued...\)](#)

[Lecture 4 - Step - growth Polymerization](#)

[Lecture 5 - Step - growth Polymerization \(Continued...\)](#)

[Lecture 6 - Step - growth Polymerization \(Continued...\)](#)

[Lecture 7 - Step - growth Polymerization \(Continued...\)](#)

[Lecture 8 - Step - growth Polymerization \(Continued...\)](#)

[Lecture 9 - Radical Chain Polymerization](#)

[Lecture 10 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 11 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 12 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 13 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 14 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 15 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 16 - Radical Chain Polymerization \(Continued...\)](#)

[Lecture 17 - Ionic Chain Polymerization](#)

[Lecture 18 - Ionic Chain Polymerization \(Continued...\)](#)

[Lecture 19 - Ionic Chain Polymerization \(Continued...\) and Chain Copolymerization](#)

[Lecture 20 - Chain Copolymerization \(Continued...\)](#)

[Lecture 21 - Chain Copolymerization \(Continued...\)](#)

[Lecture 22 - Chain Copolymerization \(Continued...\) and Ring Opening Polymerization](#)

[Lecture 23 - Polymer Stereochemistry and Coordination Polymerization](#)

[Lecture 24 - Polymer Stereochemistry and Coordination Polymerization \(Continued...\)](#)

[Lecture 25 - Polymer Solutions](#)

[Lecture 26 - Polymer Solutions \(Continued...\)](#)

[Lecture 27 - Polymer Solutions \(Continued...\)](#)

[Lecture 28 - Polymer Solutions \(Continued...\) and Chain Dimensions](#)

[Lecture 29 - Chain Dimensions \(Continued...\) and Frictional Properties of Solution](#)

[Lecture 30 - Frictional Properties of Solutions \(Continued...\) and Determination of Molecular Weight](#)

[Lecture 31 - Determination of Molecular Weight of Polymers \(Continued...\)](#)

[Lecture 32 - Determination of Molecular Weight of Polymers \(Continued...\)](#)

[Lecture 33 - Determination of Molecular Weight of Polymers \(Continued...\)](#)

[Lecture 34 - Structural Analysis of Polymers by Spectroscopic Methods](#)

[Lecture 35 - Amorphous and Crystalline State : Tg and Tm](#)

[Lecture 36 - Amorphous and Crystalline State : Tg and Tm \(Continued...\)](#)

[Lecture 37 - Polymer Properties and Evaluation : Mechanical Properties](#)

[Lecture 38 - Polymer Properties and Evaluation : Mechanical Properties \(Continued...\) and Other Properties](#)

[Lecture 39 - Other Properties \(Continued...\) and Polymer Additives](#)

[Lecture 40 - Polymer Additives \(Continued...\)](#)

[Lecture 41 - Polymer Additives \(Continued...\), Blends, Concluding Remarks](#)

[Lecture 1 - Rate Processes](#)

[Lecture 2 - Reaction Rates and Rate Laws](#)

[Lecture 3 - Effect of Temperature on Reaction Rate](#)

[Lecture 4 - Effect of Temperature on Reaction Rate \(Continued...\)](#)

[Lecture 5 - Complex Reaction](#)

[Lecture 6 - Complex Reaction \(Continued...\)](#)

[Lecture 7 - Complex Reaction \(Continued...\)](#)

[Lecture 8 - Complex Reaction \(Continued...\)](#)

[Lecture 9 - Theories of Reaction Rate](#)

[Lecture 10 - Theories of Reaction Rate \(Continued...\)](#)

[Lecture 11 - Theories of Reaction Rate \(Continued...\)](#)

[Lecture 12 - Theories of Reaction Rate \(Continued...\)](#)

[Lecture 13 - Theories of Reaction Rate \(Continued...\)](#)

[Lecture 14 - Kinetics of Some Specific Reactions](#)

[Lecture 15 - Kinetics of Some Specific Reactions \(Continued...\)](#)

[Lecture 16 - Enzyme Inhibition](#)

[Lecture 17 - Oscillatory Reactions](#)

[Lecture 18 - Acid Base Catalysis](#)

[Lecture 19 - Acid Base Catalysis \(Continued...\)](#)

[Lecture 20 - Kinetic Isotope Effects](#)

[Lecture 21 - Fast Reactions](#)

[Lecture 22 - Fast Reactions \(Continued...\)](#)

[Lecture 23 - Magneto Kinetics](#)

[Lecture 24 - Reactions in Solutions](#)

[Lecture 25 - Reactions in Solutions \(Continued...\)](#)

[Lecture 26 - Kinetics at Electrodes](#)

[Lecture 27 - Kinetics at Electrodes \(Continued...\)](#)

[Lecture 28 - Ultrafast Process](#)

[Lecture 29 - Ultrafast Process \(Continued...\)](#)

[Lecture 30 - Ultrafast Process \(Continued...\)](#)

[Lecture 31 - Reaction Dynamics](#)

[Lecture 32 - Reaction Dynamics \(Continued...\)](#)

[Lecture 33 - Reaction Dynamics \(Continued...\)](#)

[Lecture 34 - Reaction Dynamics : Scattering](#)

[Lecture 35 - Reaction Dynamics : Scattering \(Continued...\)](#)

[Lecture 36 - Reaction Dynamics : Controlling Reagents etc](#)

[Lecture 37 - Reaction Dynamics : Controlling Reagents etc \(Continued...\)](#)

[Lecture 38 - Reaction Dynamics : Controlling Reagents etc \(Continued...\)](#)

[Lecture 39 - Reaction Dynamics : Concluding](#)

[Lecture 40 - Concluding Remarks](#)

Lecture 1 - Amino Acid - I

Lecture 2 - Amino Acid - II

Lecture 3 - Protein Structure - I

Lecture 4 - Protein Structure - II

Lecture 5 - Protein Structure - III

Lecture 6 - Protein Structure - IV

Lecture 7 - Enzymes - I

Lecture 8 - Enzymes - II

Lecture 9 - Enzymes - III

Lecture 10 - Enzyme Mechanisms - I

Lecture 11 - Enzyme Mechanisms - II

Lecture 12 - Myoglobin and Hemoglobin

Lecture 13 - Lipids and Membranes - I

Lecture 14 - Lipids and Membranes - II

Lecture 15 - Membrane Transport

Lecture 16 - Nucleic Acids - I

Lecture 17 - Nucleic Acids - II

Lecture 18 - Nucleic Acids - III

Lecture 19 - Vitamins and Coenzymes - I

Lecture 20 - Vitamins and Coenzymes - II

Lecture 21 - Carbohydrates - I

Lecture 22 - Carbohydrates - II

Lecture 23 - Bioenergetics - I

Lecture 24 - Bioenergetics - II

Lecture 25 - Metabolism - I

Lecture 26 - Metabolism - II

Lecture 27 - Metabolism - III

Lecture 1 - Chemicals and Materials Analysis

Lecture 2 - Methods

Lecture 3 - Methods (Continued...)

Lecture 4 - Methods (Continued...)

Lecture 5 - Methods (Continued...)

Lecture 6 - Role of Analytical Chemistry

Lecture 7 - Techniques, Wet Ashing

Lecture 8 - Apparatus and Weighing

Lecture 9 - Filtration, Ignition

Lecture 10 - Crucibles, Filter Papers and their Uses

Lecture 11 - Chemical Equilibria

Lecture 12 - Chemical Equilibria (Continued...)

Lecture 13 - Chemical Equilibria (Continued...)

Lecture 14 - Chemical Equilibria (Continued...)

Lecture 15 - Chemical Equilibria (Continued...)

Lecture 16 - Spectrochemical Methods - I

Lecture 17 - Spectrochemical Methods - I (Continued...)

Lecture 18 - Spectrochemical Methods - I (Continued...)

Lecture 19 - Spectrochemical Methods - I (Continued...)

Lecture 20 - Spectrochemical Methods - I (Continued...)

Lecture 21 - Spectrochemical Methods - II

Lecture 22 - Spectrochemical Methods - II (Continued...)

Lecture 23 - Spectrochemical Methods - III (Continued...)

Lecture 24 - Spectrochemical Methods - IV (Continued...)

Lecture 25 - Spectrochemical Methods - V (Continued...)

Lecture 26 - Spectrochemical Methods - III

Lecture 27 - Spectrochemical Methods - III (Continued...)

Lecture 28 - Spectrochemical Methods - III (Continued...)

Lecture 29 - Spectrochemical Methods - III (Continued...)

Lecture 30 - Spectrochemical Methods - III (Continued...)

Lecture 31 - Thermal Methods of Analysis - I

[Lecture 32 - Thermal Methods of Analysis - I \(Continued...\)](#)

[Lecture 33 - Thermal Methods of Analysis - I \(Continued...\)](#)

[Lecture 34 - Thermal Methods of Analysis - I \(Continued...\)](#)

[Lecture 35 - Thermal Methods of Analysis - I \(Continued...\)](#)

[Lecture 36 - Thermal Methods of Analysis - II](#)

[Lecture 37 - Thermal Methods of Analysis - II \(Continued...\)](#)

[Lecture 38 - Thermal Methods of Analysis - II \(Continued...\)](#)

[Lecture 39 - Thermal Methods of Analysis - II \(Continued...\)](#)

[Lecture 40 - Thermal Methods of Analysis - II \(Continued...\)](#)

[Lecture 41 - Electrochemical Methods - I](#)

[Lecture 42 - Electrochemical Methods - I \(Continued...\)](#)

[Lecture 43 - Electrochemical Methods - I \(Continued...\)](#)

[Lecture 44 - Electrochemical Methods - I \(Continued...\)](#)

[Lecture 45 - Electrochemical Methods - I \(Continued...\):](#)

[Lecture 46 - Electrochemical Methods - II](#)

[Lecture 47 - Electrochemical Methods - II \(Continued...\)](#)

[Lecture 48 - Electrochemical Methods - II \(Continued...\)](#)

[Lecture 49 - Electrochemical Methods - II \(Continued...\)](#)

[Lecture 50 - Electrochemical Methods - II \(Continued...\)](#)

[Lecture 51 - Electrochemical Methods - III](#)

[Lecture 52 - Electrochemical Methods - III \(Continued...\)](#)

[Lecture 53 - Electrochemical Methods - III \(Continued...\)](#)

[Lecture 54 - Electrochemical Methods - III \(Continued...\)](#)

[Lecture 55 - Electrochemical Methods - III \(Continued...\)](#)

[Lecture 56 - Applications](#)

[Lecture 57 - Applications \(Continued...\)](#)

[Lecture 58 - Applications \(Continued...\)](#)

[Lecture 59 - Applications \(Continued...\)](#)

[Lecture 60 - Applications \(Continued...\)](#)

Lecture 1 - Constitution and Configuration

Lecture 2 - Chirality, Symmetry Elements

Lecture 3 - Project Ion Formulae Rules for Drawing

Lecture 4 - Project Ion Formulae Rules for Drawing

Lecture 5 - Newmann Projection, Saw Horse Projection, Wedge Formula

Lecture 6 - Chirotopicity and Stereogenicity

Lecture 7 - Absolute Configuration

Lecture 8 - Absolute Configuration (Continued...)

Lecture 9 - Problems on the above topics

Lecture 10 - Topicity

Lecture 11 - Axial Chirality in Allenes, Biphenyls

Lecture 12 - Relative Configuration, Prochiral Faces and Prochiral Centres

Lecture 13 - Chirality in Heteroatom Systems

Lecture 14 - Conformations and Conformers

Lecture 15 - Conformational Analysis of Acyclic Molecules

Lecture 16 - Conformational Analysis of Acyclic Molecules (Continued...)

Lecture 17 - Conformations of Acyclic Molecules Containing Heteroatoms

Lecture 18 - Conformations of Cyclic Systems

Lecture 19 - Conformations of Cyclic Systems (Continued...)

Lecture 20 - Conformation of Cyclobutane and Cyclopentane

Lecture 21 - Conformation of Cyclohexane

Lecture 22 - Energy Changes During Flipping

Lecture 23 - Energy Comparison between Chair and Boat Conformations

Lecture 24 - Conformational Analysis of Substituted Cyclohexanes

Lecture 25 - Conformational Analysis of Substituted Cyclohexanes (Continued...)

Lecture 26 - Conformational Analysis of Substituted Cyclohexanes (Continued...)

Lecture 27 - Conformational Analysis of Substituted Cyclohexanes (Continued...)

Lecture 28 - Conformational Analysis of Systems with Preference for Axial Groups

Lecture 29 - Conformation and Reactivity

Lecture 30 - Conformation and Reactivity (Continued...)

Lecture 31 - Conformation and Reactivity (Continued...)

[Lecture 32 - Stereoelectronic Effects](#)

[Lecture 33 - Stereoelectronic Effects \(Continued...\)](#)

[Lecture 34 - Substitution and Elimination in Cyclohexane Systems](#)

[Lecture 35 - Stereospecific and Stereoselective Reactions and Asymmetric Synthesis \(Elementary Idea\)](#)

[Lecture 36 - Asymmetric Induction: Nucleophilic Addition to Chiral Carbonyl Compounds](#)

[Lecture 37 - Asymmetric Induction: Nucleophilic Addition to Chiral Carbonyl Compounds \(Continued...\)](#)

[Lecture 38 - Asymmetric Induction \(Continued...\)](#)

[Lecture 39 - Facial Selectivity and Examples of Asymmetric Synthesis](#)

[Lecture 40 - Revisiting the Contents Covered](#)

Lecture 1 - Introductory Remarks

Lecture 2 - Introductory remarks (Continued...)

Lecture 3 - Introductory remarks and some rapid fire quiz

Lecture 4 - Retro Quiz based on simple Transformation

Lecture 5 - Transformation based strategy for a given target

Lecture 6 - Tf/Fg/SM based strategy and its exploratiin

Lecture 7 - Tf/SM/Fg based approaches to solve some basic problems

Lecture 8 - Tf/SM/Fg based strategy and its exploration

Lecture 9 - Tf/SM/Fg based strategy and its exploration for some simple target molecules

Lecture 10 - Tf/SM/Fg based strategy and its exploration

Lecture 11 - Tf/SM/Fg based strategies and its exploration

Lecture 12 - Tf/Fg/SM based strategies and its exploration

Lecture 13 - Tf/Fg/SM based approaches and its exploration

Lecture 14 - Tf/Fg/SM based strategies and its exploration

Lecture 15 - Multiple Tf based strategy for small molecule disconnection

Lecture 16 - Multiple Tf based strategies

Lecture 17 - Specific Tf such as Barton's nitrile ester photolysis

Lecture 18 - Specific transformation

Lecture 19 - Selective transformations

Lecture 20 - Functional Group (Fg) based strategies

Lecture 21 - Functional group based strategy

Lecture 22 - Fg based strategy

Lecture 23 - Fg based strategy

Lecture 24 - Fg based strategy based on protecting groups

Lecture 25 - Fg based strategy

Lecture 26 - Protecting group based strategic disconnection

Lecture 27 - Fg group based strategy

Lecture 28 - Fg based strategy

Lecture 29 - Fg based strategies

Lecture 30 - Fg based strategy

Lecture 31 - Fg based strategy

Lecture 32 - Fg based strategy

Lecture 33 - Starting material (SM) based strategy

Lecture 34 - Fg/Tf/SM based strategies

Lecture 35 - Fg/Tf/SM based strategies

Lecture 36 - Fg/Tf/SM based strategies

Lecture 37 - Fg based strategies

Lecture 38 - Fg based strategies in combination with SM and Tf

Lecture 39 - Fg/SM/Tf based combined strategies

Lecture 40 - Fg/SM/Tf based combined strategies

Lecture 41 - Fg based strategies

Lecture 42 - Fg based strategies

Lecture 43 - Symmetry based strategy

Lecture 44 - Symmetry based strategies

Lecture 45 - Symmetry based strategies

Lecture 46 - Symmetry based strategy

Lecture 47 - Symmetry based strategies

Lecture 48 - Symmetry based strategies

Lecture 49 - Topological based strategies

Lecture 50 - Topological strategies

Lecture 51 - Topological strategies

Lecture 52 - Stereochemical strategies

Lecture 53 - Stereochemical strategies

Lecture 54 - Stereochemical strategies

Lecture 55 - Stereochemical Strategies

Lecture 56 - Stereochemical strategies

Lecture 57 - Stereochemical strategies

Lecture 58 - Stereochemical strategies

Lecture 59 - Synthons concept revisited

Lecture 60 - Concluding remarks

[Lecture 1 - Review of Classical Thermodynamics - Part I](#)

[Lecture 2 - Review of Classical Thermodynamics - Part II](#)

[Lecture 3 - Thermodynamic potentials - Part 1](#)

[Lecture 4 - Thermodynamic potentials - Part 2](#)

[Lecture 5 - Microstates of a system](#)

[Lecture 6 - Microstates of a System \(Continued...\)](#)

[Lecture 7 - Microstates of a system \(Continued...\)](#)

[Lecture 8 - Microstates of a system \(Continued...\)](#)

[Lecture 9 - Microstates of a system](#)

[Lecture 10 - Microstates of a system](#)

[Lecture 11 - Microstates of a system \(Continued...\)](#)

[Lecture 12 - Microstates of a system \(Continued...\)](#)

[Lecture 13 - Microstates of a System \(Continued...\)](#)

[Lecture 14 - Fundamentals of Statistical Mechanics](#)

[Lecture 15 - Statistical Ensembles](#)

[Lecture 16 - Microstates of a system](#)

[Lecture 17 - Canonical ensemble - Part I](#)

[Lecture 18 - Canonical Ensemble - Part I \(Continued...\)](#)

[Lecture 19 - Canonical Ensemble - Part II](#)

[Lecture 20 - Canonical Ensemble - Part III](#)

[Lecture 21 - Ideal gas](#)

[Lecture 22 - Ideal gases \(Continued...\)](#)

[Lecture 23 - Ideal gases \(Continued...\)](#)

[Lecture 24 - Ideal gases \(Continued...\)](#)

[Lecture 25 - Statistical thermodynamics of ideal gases \(Continued...\)](#)

[Lecture 26 - Statistical Thermodynamics of ideal gases \(Continued...\)](#)

[Lecture 27 - Statistical thermodynamics of ideal gases \(Continued...\)](#)

[Lecture 28 - Statistical thermodynamics of ideal gases \(Continued...\)](#)

[Lecture 29 - Statistical thermodynamics of ideal gases \(Continued...\)](#)

[Lecture 30 - Statistical thermodynamics of diatomic ideal gases](#)

[Lecture 31 - Statistical thermodynamics of ideal gas](#)

[Lecture 32 - Chemical reaction equilibrium](#)

[Lecture 33 - Specific heat of solids](#)

[Lecture 34 - Application of Molecular Thermodynamics](#)

[Lecture 35 - Introduction to classical statistical mechanics](#)

[Lecture 36 - Introduction to classical statistical mechanics \(Continued...\)](#)

[Lecture 37 - Classical Statistical Mechanics](#)

[Lecture 38 - Classical Statistical Mechanics](#)

[Lecture 39 - Classical Statistical Mechanics](#)

[Lecture 40 - Rate of Chemical Reaction](#)

[Lecture 1 - Kinetic theory of gases](#)

[Lecture 2 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 3 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 4 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 5 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 6 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 7 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 8 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 9 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 10 - Kinetic theory of gases \(Continued...\)](#)

[Lecture 11 - Transport properties](#)

[Lecture 12 - Transport properties \(Continued...\)](#)

[Lecture 13 - Transport properties of gases](#)

[Lecture 14 - Molecular motion in Liquids](#)

[Lecture 15 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 16 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 17 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 18 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 19 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 20 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 21 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 22 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 23 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 24 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 25 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 26 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 27 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 28 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 29 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 30 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 31 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 32 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 33 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 34 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 35 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 36 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 37 - Molecular motion in Liquids \(Continued...\)](#)

[Lecture 38 - Molecular motion in gases](#)

[Lecture 39 - Molecular motion in gases](#)

[Lecture 40 - Molecular motion in gases](#)

Lecture 1 - Introduction

Lecture 2 - Buffers

Lecture 3 - Introduction to Biochemistry Laboratory Equipments and Safety Measures

Lecture 4 - Practical Aspects of Making Buffer

Lecture 5 - Making Tris Buffer (pH=8.2)

Lecture 6 - Making Phosphate Buffer (100mM)

Lecture 7 - Amino Acids and Their Properties

Lecture 8 - Amino Acid Titrations

Lecture 9 - pI Determination of Glycine

Lecture 10 - pI Determination of Lysine

Lecture 11 - Summary

Lecture 12 - UV and Visible Spectroscopy

Lecture 13 - Fluorescence Spectroscopy

Lecture 14 - UV/Visible Spectra of Amino Acids and Proteins

Lecture 15 - Fluorescence Spectra of Amino Acids and proteins

Lecture 16 - Spectroscopic Techniques Summary

Lecture 17 - Protein Folding and Denaturation - I

Lecture 18 - Protein Folding and Denaturation - II

Lecture 19 - Urea denaturation of HSA studied by UV/Vis absorbance

Lecture 20 - Temperature denaturation of HSA studied by UV/Vis absorbance

Lecture 21 - Denaturation of HSA by GdnHCl studied by Trp fluorescence

Lecture 22 - Protein Folding and Denaturation Summary

Lecture 23 - Chromatographic Techniques - I

Lecture 24 - Chromatographic Techniques - II

Lecture 25 - Protein Purification by Size Exclusion Chromatography (SEC)

Lecture 26 - Protein Purification by Affinity Chromatography

Lecture 27 - Gel Electrophoresis of DNA and Proteins - Part I

Lecture 28 - Gel Electrophoresis of DNA and Proteins - Part II

Lecture 29 - Gel Electrophoresis of DNA and Proteins - Part II

Lecture 30 - Isolation and Characterization of Proteins Part - I

Lecture 31 - Isolation and Characterization of Proteins Part - II

[Lecture 32 - Isolation and Purification of Proteins](#)

[Lecture 33 - Quality and Quantity of the Isolated Protein](#)

[Lecture 34 - Enzyme Kinetics - I](#)

[Lecture 35 - Enzyme Kinetics - II](#)

[Lecture 36 - Enzyme Kinetics \(by using enzyme from apple juice\)](#)

[Lecture 37 - Enzyme Kinetics \(by using enzyme from apple juice\) \(Continued...\)](#)

[Lecture 38 - Isolation and Characterization of DNA Part - I](#)

[Lecture 39 - Isolation and Characterization of DNA Part - II](#)

[Lecture 40 - Bacterial Culture for Plasmid DNA Isolation](#)

[Lecture 41 - Isolation of Plasmid DNA](#)

[Lecture 42 - Isolation and Characterization of DNA Summary](#)

[Lecture 43 - Basics of rDNA Technology Part - I](#)

[Lecture 44 - Basics of rDNA Technology Part - II](#)

[Lecture 45 - Cloning : Polymerase Chain Reaction, Restriction Enzyme Digestion and Ligation](#)

[Lecture 46 - DNA Transformation](#)

[Lecture 47 - Protein-Ligand Interaction](#)

[Lecture 48 - Protein-Ligand Interaction \(Continued...\)](#)

[Lecture 49 - Interaction study of HSA protein with Curcumin and Gallic acid using UV-Vis spectroscopy](#)

[Lecture 50 - Interaction study of HSA protein with Curcumin and Gallic acid using UV-Vis spectroscopy \(Continued...\)](#)

[Lecture 51 - Analysis of the Structure of Protein ligand complex](#)

[Lecture 52 - Immunoassay Techniques](#)

[Lecture 53 - Western Blotting Technique](#)

Lecture 1 - Introduction

Lecture 2 - Importance of chemical industry, chemicals from materials

Lecture 3 - Bulk and commodity chemicals

Lecture 4 - Fine and speciality chemicals

Lecture 5 - Water

Lecture 6 - Hydrogen

Lecture 7 - Inorganic peroxide compounds

Lecture 8 - Nitrogen compounds

Lecture 9 - Chloramine and Hydroxylamine

Lecture 10 - Nitric acid, Ostwald process and uses

Lecture 11 - Phosphorus and its components

Lecture 12 - Phosphoric acid salts

Lecture 13 - Tetrapotassium diphosphate preparation

Lecture 14 - Hydroxy apatite

Lecture 15 - P₄S₁₀ and phosphide preparation

Lecture 16 - Sulfur and copper (I) phosphide

Lecture 17 - Sulfur compounds and sulfur from H₂S and SO₂

Lecture 18 - Sulfuric acid, catalyst and S₂Cl₂, applications

Lecture 19 - Sulfur dichloride, thionyl chloride

Lecture 20 - Thiosulfates and dithionite

Lecture 21 - Sodium hydroxyl methanesulfinate and hydrogen sulfide

Lecture 22 - Halogen and halogen compounds

Lecture 23 - Fluorine and inorganic fluorides

Lecture 24 - Hydrogen fluoride and aluminum fluoride

Lecture 25 - Cryolite and other industrially important fluoride salts

Lecture 26 - Electrochemical fluorination, sulfonyl fluorides

Lecture 27 - Chloralkali electrolysis

Lecture 28 - Ion conduction membrane in electrolysis

Lecture 29 - Hydrochloric acid manufacture

Lecture 30 - Bromine and bromine compounds

Lecture 31 - Hydrogen bromide and alkali bromates

Lecture 32 - Iodine and iodine compounds

Lecture 33 - Mineral fertilizers

Lecture 34 - Nitrogen fertilizer and Urea

Lecture 35 - Potassium fertilizer

Lecture 36 - Metals and their compounds: Lithium

Lecture 37 - Sodium and its compounds

Lecture 38 - Potassium and its compounds

Lecture 39 - Magnesium and its compounds

Lecture 40 - Calcium and its compounds

Lecture 41 - Barium and its compounds

Lecture 42 - Chromium and its compounds

Lecture 43 - Manganese and its industrially important compounds

Lecture 44 - Silicon and its compounds

Lecture 45 - Organosilicon compounds, organoalkoxysilanes

Lecture 46 - Organomercapto silanes and silicones

Lecture 47 - Silicone rubber

Lecture 48 - Inorganic solids: glass

Lecture 49 - Zeolites

Lecture 50 - Inorganic Fibres: asbestos, textile glass and optical fibres

Lecture 51 - Glass fibre production and construction materials

Lecture 52 - Ceramics and its manufacturing processes

Lecture 53 - Specialty ceramic products

Lecture 54 - Ferrites and porcelain enamel

Lecture 55 - Layers of enamelling

Lecture 56 - Carbon modifications: Glassy carbon, foamed carbon, carbon black

Lecture 57 - Activated carbon

Lecture 58 - Metallic hard materials: Carbides, borides, silicides

Lecture 59 - Fillers and inorganic pigments

Lecture 60 - Oxide pigments, luminescent pigments, corrosion protection pigments, magnetic pigments

[Lecture 1 - Introduction](#)

[Lecture 2 - Structure and Geometry of Carbenes](#)

[Lecture 3 - Structure and Geometry of Carbenes \(Continued...\)](#)

[Lecture 4 - Generation of Carbene](#)

[Lecture 5 - Generation of Carbene \(Continued...\)](#)

[Lecture 6 - Generation of Carbene \(Continued...\)](#)

[Lecture 7 - Reaction of Carbene](#)

[Lecture 8 - Reaction of Carbene \(Continued...\)](#)

[Lecture 9 - Reaction of Carbene \(Continued...\)](#)

[Lecture 10 - Reaction of Carbene \(Continued...\)](#)

[Lecture 11 - Reaction of Carbene \(Continued...\)](#)

[Lecture 12 - Reaction of Carbene \(Continued...\)](#)

[Lecture 13 - Reaction of Carbene \(Continued...\)](#)

[Lecture 14 - Reaction of Carbene \(Continued...\)](#)

[Lecture 15 - Reaction of Carbene \(Continued...\)](#)

[Lecture 16 - Nitrene](#)

[Lecture 17 - Nitrene \(Continued...\)](#)

[Lecture 18 - Reaction of Nitrene](#)

[Lecture 19 - Reaction of Nitrene \(Continued...\)](#)

[Lecture 20 - Reaction of Nitrene \(Continued...\)](#)

Lecture 1 - A brief introduction to Molecules of Life: Structure of Amino acids and their various charged forms

Lecture 2 - Biological Macromolecules and Small molecules: Importance and functions

Lecture 3 - Amino Acids: The building block of proteins

Lecture 4 - Amino acids: separation and detection, Electrophoresis and Ninhydrin reaction

Lecture 5 - Method of determination of Amino acid sequence: primary structure of polypeptide/protein

Lecture 6 - Selective peptide bond cleavage: Enzymatic and Non-enzymatic methods

Lecture 7 - Peptide synthesis: Protecting groups for amine and carboxyl functionality

Lecture 8 - Peptide synthesis (Continued...) Protection, coupling and deprotection method

Lecture 9 - Recent development of coupling agents; Merrifield's method of solid phase peptide synthesis

Lecture 10 - Hierarchical structure of proteins: Secondary, tertiary and quaternary structure

Lecture 11 - Ramachandran plot and protein purification techniques

Lecture 12 - Protein purification techniques (Continued...)

Lecture 13 - Introduction to Enzymes and its kinetics

Lecture 14 - Enzyme catalysed reactions and introduction to catalytic activity of proteases

Lecture 15 - Enzyme Kinetics (Continued...)

Lecture 16 - Concept of Enzyme Inhibition

Lecture 17 - Concept of Enzyme Inhibition (Continued...)

Lecture 18 - Problems on Enzyme Kinetics and Enzyme Inhibition

Lecture 19 - Synthetic Biology

Lecture 20 - Synthetic Biology (Continued...)

Lecture 21 - Synthetic Biology (Continued...)

Lecture 22 - Nucleic Acid

Lecture 23 - Nucleic Acid (Continued...)

Lecture 24 - DNA sequencing method

Lecture 25 - DNA sequencing method (Continued...)

Lecture 26 - DNA sequencing method (Continued...)

Lecture 27 - Synthesis of oligonucleotide

Lecture 28 - Central dogma: DNA replication, transcription and translation

Lecture 29 - Central dogma: DNA replication, transcription and translation (Continued...)

Lecture 30 - Central dogma: DNA replication, transcription and translation (Continued...)

Lecture 31 - Central dogma: DNA replication, transcription and translation (Continued...)

[Lecture 32 - Central dogma: DNA replication, transcription and translation \(Continued...\)](#)

[Lecture 33 - Molecular Biology](#)

[Lecture 34 - Molecular Biology \(Continued...\)](#)

[Lecture 35 - Chemistry of cofactors/coenzymes](#)

[Lecture 36 - Chemistry of cofactors/coenzymes \(Continued...\)](#)

[Lecture 37 - Chemistry of cofactors/coenzymes \(Continued...\)](#)

[Lecture 38 - Chemistry of cofactors/coenzymes \(Continued...\)](#)

[Lecture 39 - Chemistry of cofactors/coenzymes \(Continued...\)](#)

[Lecture 40 - Chemistry of cofactors/coenzymes \(Continued...\)](#)

[Lecture 41 - Introduction to Drug Discovery Process](#)

[Lecture 42 - Fundamental Principles of Drug Development Process](#)

[Lecture 43 - Combinatorial chemistry](#)

[Lecture 44 - Neurotransmitters](#)

[Lecture 45 - Catechol amine based and GABA neurotransmitters](#)

[Lecture 46 - Hypertension: humoral mechanism and renin/angiotensin system](#)

[Lecture 47 - Inhibitor design of angiotensin converting enzyme](#)

[Lecture 48 - Antimicrobial drugs](#)

[Lecture 49 - Chemistry of penicillins](#)

[Lecture 50 - Resistance to beta-lactam antibiotics](#)

[Lecture 51 - Mechanistic studies of beta-lactamase](#)

[Lecture 52 - Non beta-lactam antibiotics](#)

[Lecture 53 - Mechanistic enzymology of Isopenicillin N synthase](#)

[Lecture 54 - Polyketide Biosynthesis](#)

[Lecture 55 - Biosynthesis of macrolide polyketides and introduction to virus](#)

[Lecture 56 - Anti-viral drugs](#)

[Lecture 57 - Cancer and Chemotherapy](#)

[Lecture 58 - Anti-cancer drugs \(Continued...\)](#)

[Lecture 59 - Aromatase inhibition and Anti-ulcer drugs](#)

[Lecture 60 - Cholesterol lowering agents](#)

[Lecture 61 - Cholesterol Biosynthesis](#)

[Lecture 62 - Pharmacokinetics and pharmacodynamics](#)

[Lecture 63 - QSAR principles](#)

Lecture 1 - Importance of Polymer Science and Brief Historical background

Lecture 2 - Definitions/Terminologies, Classifications

Lecture 3 - Classifications, Nomenclature

Lecture 4 - Classification by Polymerization Mechanism, Nomenclature

Lecture 5 - Molecular Weight, Big Picture of Polymer Science, Common Polymers

Lecture 6 - Examples of Step Polymers, Linear Step Polymerization

Lecture 7 - Linear Step Polymerization: MW Control, MW Distribution, Kinetics

Lecture 8 - Linear Step Polymerization: Kinetics (Continued...), Equilibrium Consideration, General Requirements for Achieving High MW; Non-linear Step Polymerization

Lecture 9 - Linear Step Polymerization: Summary - General Requirement, Non-Linear Step Polymerization

Lecture 10 - Types of Chain polymerization, Mechanism and Kinetics of Radical Chain Polymerization

Lecture 11 - Kinetics of Radical Chain Polymerization (Continued...), Various Types of Initiators

Lecture 12 - Thermal Initiation (Continued...), Molecular Weight and Kinetic Chain Length, Other Types of Radical Initiators, Transfer Reactions

Lecture 13 - Transfer Reactions, Effect of Temperature on Rate and MW, MW Distribution, ceiling Temperature

Lecture 14 - Energetics and Thermodynamics of Chain Polymerization, MW Distribution, Common Polymers

Lecture 15 - Thermodynamics of Chain Polymerization, MW Distribution, Common Polymers

Lecture 16 - Process Conditions, Emulsion Polymerization

Lecture 17 - Emulsion Polymerization (Continued...), Common Polymers by Radical Chain Polymerization, RDRP

Lecture 18 - Reversible - Deactivation Radical Polymerizations (RDRP)

Lecture 19 - RAFT Polymerization (Continued...), Ionic Polymerization

Lecture 20 - Polymer Stereochemistry and Zeigler - Natta Coordination Polymerization

Lecture 21 - Ring Opening Polymerization, Copolymers

Lecture 22 - Copolymerization (Continued...)

Lecture 23 - Polymers in Solution : Flory - Huggins Theory

Lecture 24 - Polymers in Solution : Application of Flory - Huggins Theory

Lecture 25 - Polymers in Solution : Solubility Parameter, Polymer Phase Separation and Fractionation

Lecture 26 - Polymers Chain Dimensions

Lecture 27 - Frictional Properties of Polymer Molecules in Dilute Solution, Determination of Polymer MW (Overview)

Lecture 28 - Membrane Osmometry, End Group Analysis, Dilute Solution Viscometry

Lecture 29 - Dilute Solution Viscometry, Light Scattering Techniques for MW

Lecture 30 - Gel Permeation Chromatography

[Lecture 31 - Light Scattering Techniques for MW and Size Measurements \(Continued...\)](#)

[Lecture 32 - Mass Spectroscopy of Polymers](#)

[Lecture 33 - Polymer Processing](#)

[Lecture 34 - Mechanical Properties, Amorphous State](#)

[Lecture 35 - Thermal Properties: Amorphous State](#)

[Lecture 36 - Thermal Properties: Crystalline State](#)

[Lecture 37 - Thermal Properties: Factors Influencing \$T_m\$, Determination of \$T_g\$ and \$T_m\$, Other Thermal Properties](#)

[Lecture 38 - Thermomechanical Properties, Viscoelasticity](#)

[Lecture 39 - Thermomechanical Properties, Viscoelasticity \(Continued...\)](#)

[Lecture 40 - Optical, Electrical, Barrier Properties; Chemical Resistance and Weathering of Polymers](#)

[Lecture 41 - Polymer Additives](#)

[Lecture 42 - Polymer Blends, Concluding Remarks](#)

NPTEL : NOC:Structure, Stereochemistry and Reactivity of Organic Compounds and Intermediates: A Problem Solving Approach (Chemistry and Biochemistry)

Co-ordinators : Prof. A. Basak

Lecture 1 - Introduction to structure and stereochemistry of organic molecules: salient features of symmetry elements; Role of principal axis, sigma plane, centre of symmetry, and alternating axis of symmetry in deciding chirality

Lecture 2 - Introduction to point group notation, classification, symmetry number and order

Lecture 3 - Examples of various point group notations, chiral and achiral point groups, examples of various point groups

Lecture 4 - Solving problems on point groups (C_n , C_{nv} , C_{nh} , D_{nd})

Lecture 5 - Conformational Analysis of Perhydrophenanthrene

Lecture 6 - Concept Clearing Session on Achiral Point Groups

Lecture 7 - Axial, Planar and Helical Chirality, assignment of absolute configuration to such molecules

Lecture 8 - Concept of pseudoasymmetry; Reflection variance/invariance problem; methods of nomenclature system

Lecture 9 - Conformational analysis of bicyclic systems: the Decalins

Lecture 10 - Conformational analysis of Perhydrophenanthrene

Lecture 11 - Conformational analysis of Perhydroanthracene

Lecture 12 - Revisiting conformational analysis of Perhydrophenanthrene

Lecture 13 - Revisiting conformational analysis of Perhydroanthracene

Lecture 14 - Introduction to Linear Polarized light and interaction with chiral materials; Circular Birefringence, Circular Dichroism

Lecture 15 - ORD, CD and Cotton Effect (CE); Empirical rule to determine the sign of CE, 2-axial haloketone rule

Lecture 16 - Octant rule: application to substituted cyclohexanone and decalone system

Lecture 17 - Application of Octant rule to tricyclic system; drawing of octant projection

Lecture 18 - Application of Octant rule to steroidal ketones; drawing of octant projection

Lecture 19 - Stereoelectronic effects on conformation and reactivity

Lecture 20 - Examples of anomeric effect and Stereoelectronic effect

Lecture 21 - Baldwin rules

Lecture 22 - Cyclization in enolic systems

Lecture 23 - Problem solving on Baldwin rules

Lecture 24 - Reactive Functionalities: Chemistry of Alkynes

Lecture 25 - Reactive Functionalities: Chemistry of Alkynes (Continued...), arynes and enediynes

Lecture 26 - Reactive Functionalities: Ene-diynes (Continued...), allenes and Ketenes

Lecture 27 - Beta - Lactam Synthesis

Lecture 28 - Chemistry of radicals

Lecture 29 - Reactivity of radicals: Frontier orbital approach.

Lecture 30 - Radical mediated C-C bond formation

[Lecture 31 - Radical mediated C-C bond formation \(Continued...\)](#).

[Lecture 32 - Radical mediated decarboxylation and deoxygenation](#)

[Lecture 33 - Dynamic Stereochemistry: Conformationally rigid and mobile systems](#)

[Lecture 34 - Dynamic Stereochemistry: Conformational analysis of elimination and addition](#)

[Lecture 35 - Dynamic Stereochemistry: Stereoselectivity in carbonyl reduction](#)

[Lecture 36 - Dynamic Stereochemistry: Reactivity of unsaturated carbonyl and enolate systems](#)

[Lecture 37 - Dynamic Stereochemistry: Enolate as nucleophile](#)

[Lecture 38 - Dynamic Stereochemistry: stereochemical issues in cyclohexenone reduction and alpha-electrophilic substitution in carbonyls](#)

[Lecture 39 - Dynamic Stereochemistry: Asymmetric aldol reactions](#)

[Lecture 40 - Dynamic Stereochemistry: Asymmetric aldol reaction \(Continued...\)](#)

Lecture 1 - Review of Quantum Chemistry

Lecture 2 - Postulates of Quantum Mechanics - I

Lecture 3 - Postulates of Quantum Mechanics - II

Lecture 4 - Exactly Solvable Models - I

Lecture 5 - Exactly Solvable Models - II

Lecture 6 - Exactly Solvable Models - II (Continued...)

Lecture 7 - Variational Principle - I

Lecture 8 - Variational Principle - II

Lecture 9 - Variational Method: Applications - I

Lecture 10 - Linear Variational Method

Lecture 11 - Applications of Linear Variational Method

Lecture 12 - Variational Method in Chemical Bonding - I

Lecture 13 - Variational Method in Chemical Bonding - II

Lecture 14 - Variational Method in Chemical Bonding - III

Lecture 15 - Molecular Orbital Treatment of Polyatomics

Lecture 16 - Molecular Orbital Treatment of Polyatomics

Lecture 17 - Perturbation Theory

Lecture 18 - Examples of Perturbation Theory - I

Lecture 19 - Examples of Perturbation Theory - II

Lecture 20 - Molecular Response to Electric Field - I

Lecture 21 - Molecular Response to Electric Field - II

Lecture 22 - Degenerate Perturbation Theory

Lecture 23 - Excited States of He Atom - I

Lecture 24 - Excited States of He Atom - II

Lecture 25 - Slater Determinants - I

Lecture 26 - Slater Determinants - II

Lecture 27 - Energy Expectation Value with Slater Determinants - I

Lecture 28 - Energy Expectation Value with Slater Determinants - II

Lecture 29 - Self-Consistent Field Method

Lecture 30 - Canonical HF Equations

Lecture 31 - Hartree-Fock Energy

[Lecture 32 - Hartree-Fock-Roothan Equations](#)

[Lecture 33 - The Density Matrix](#)

[Lecture 34 - Evaluation of Molecular Properties](#)

[Lecture 35 - Basis Sets - I](#)

[Lecture 36 - Basis Sets - II](#)

[Lecture 37 - Electron Correlation and Post HF Methods](#)

[Lecture 38 - Time-Dependent Perturbation Theory - I](#)

[Lecture 39 - Time-Dependent Perturbation Theory - II](#)

[Lecture 40 - Slowly Switched Constant Perturbation](#)

[Lecture 41 - Oscillating Perturbation](#)

[Lecture 42 - Einstein's Coefficients](#)

Lecture 1 - Metal Ions In Biological Systems

Lecture 2 - Metallobiosite structures

Lecture 3 - Biomolecular structure and molecular biology component

Lecture 4 - Structures of nucleic acids

Lecture 5 - Coordination Chemistry in action

Lecture 6 - Coordination of peptide building blocks

Lecture 7 - Occurrence and availability

Lecture 8 - Potential ligands of different types

Lecture 9 - Metal ion insertion

Lecture 10 - Organic cofactors and siderophores

Lecture 11 - Introduction

Lecture 12 - CD and Raman spectroscopy

Lecture 13 - EPR

Lecture 14 - NMR and X-ray

Lecture 15 - Electrochemical methods

Lecture 16 - Metal ion assimilation

Lecture 17 - Transport of metal ions in bacteria and plants

Lecture 18 - Transport of metal ions in fungi and mammals

Lecture 19 - Homeostasis in bacteria and plants

Lecture 20 - Homeostasis in fungi and mammals

Lecture 21 - Transport across membranes

Lecture 22 - Ion channels and ion pumps

Lecture 23 - (K⁺) channels

Lecture 24 - (Na⁺) channels

Lecture 25 - (Na⁺)-(K⁺) ATPase

Lecture 26 - (Mg²⁺) dependent enzymes and kinases

Lecture 27 - Phosphatases and enolases

Lecture 28 - Photoreception and enzymes

Lecture 29 - (Ca²⁺) transporting, binding and sensor proteins

Lecture 30 - Cell signaling by (Ca²⁺) binding and sensing

Lecture 31 - Functions of iron ions and iron ion proteins

- Lecture 32 - Heme proteins for (O₂) transport and storage
- Lecture 33 - Activators of (O₂) and electron transport proteins
- Lecture 34 - Iron-sulfur proteins
- Lecture 35 - Mononuclear and dinuclear non-heme enzymes
- Lecture 36 - Oxygen transport and SOD activity
- Lecture 37 - Type 1 blue copper proteins
- Lecture 38 - Type 2 non-blue copper proteins
- Lecture 39 - Type 3 dinuclear copper proteins
- Lecture 40 - Multicopper and mixed-copper enzymes
- Lecture 41 - Coordination chemistry and function of zinc ions
- Lecture 42 - Carbonic anhydrase and lyases
- Lecture 43 - Carboxypeptidase and metalloproteinases
- Lecture 44 - Alcohol dehydrogenase and Beta-lactamase
- Lecture 45 - Redox catalysis by manganese ions
- Lecture 46 - Redox catalysis by manganese ions
- Lecture 47 - Catalysis by manganese and cobalt ions
- Lecture 48 - Cobalt ion dependent proteins and enzymes
- Lecture 49 - Nickel proteins and enzymes
- Lecture 50 - More nickel ion bearing enzymes
- Lecture 51 - Carbon, hydrogen and oxygen
- Lecture 52 - Nitrogen and Silicon
- Lecture 53 - Phosphorus
- Lecture 54 - Sulfur and Selenium
- Lecture 55 - Chlorine and Iodine
- Lecture 56 - Brain and blood-brain barrier (BBB)
- Lecture 57 - Zinc and copper ions
- Lecture 58 - Iron ions
- Lecture 59 - Metal ion based drugs and metallotherapeutics
- Lecture 60 - Chemotherapy, radiotherapy and contrast agents

- Lecture 1 - Enolate generation, structure of enolates and related topic - I
- Lecture 2 - Enolate generation, structure of enolates and related topic - II
- Lecture 3 - Enolate generation, structure of enolates and related topic - III
- Lecture 4 - Different mode of asymmetric induction in enolate alkylation
- Lecture 5 - Revisit again, Different mode of asymmetric induction in enolate alkylation
- Lecture 6 - Substrate directed stereocontrol in acyclic and cyclic system
- Lecture 7 - Substrate directed enolate alkylation in bicyclic system
- Lecture 8 - Seebach's SRS principle and related systems - I
- Lecture 9 - Seebach's SRS principle and related systems - II
- Lecture 10 - Seebach's SRS principle and related systems - III
- Lecture 11 - Evans oxazolidinone and related systems - I
- Lecture 12 - Evans oxazolidinone and related systems - II
- Lecture 13 - Evans oxazolidinone and related systems - III
- Lecture 14 - Evans oxazolidinone and related systems - IV
- Lecture 15 - Evans oxazolidinone and related systems - V
- Lecture 16 - Helmchen's auxiliary, Oppolzer's sultam based auxiliary
- Lecture 17 - Camphor based N-acyloxazolidinones as chiral auxiliary
- Lecture 18 - Myer's ephedrine, Chiral Weinreb amide equivalents and related systems
- Lecture 19 - Myer's ephedrine and related systems
- Lecture 20 - Chiral Weinreb amide equivalents and related systems
- Lecture 21 - Meyer's oxazoline based alkylation - I
- Lecture 22 - Meyer's oxazoline based alkylation - II
- Lecture 23 - Meyer's bicyclic lactam based enolate alkylation
- Lecture 24 - Meyer's bicyclic lactam based alkylation
- Lecture 25 - Meyer's bicyclic lactams, Gleason's bicyclic thioglycolate lactam based systems
- Lecture 26 - Few problem solving from Meyer's oxazoline/bicyclic lactam based alkylation
- Lecture 27 - Schollkopf's bis-lactim ether and related systems; Auxiliary induced chiral relay
- Lecture 28 - Chiral relay systems in amino acid derived enolate alkylation
- Lecture 29 - Williams oxazinone, Yamada's chiral glycine enolate and related system
- Lecture 30 - Tricycloiminolactone as chiral glycine equivalents
- Lecture 31 - Najera's auxiliary, Davies diketopiperazine and related system

Lecture 32 - Ender's RAMP/SAMP, Coltart's cyclic carbamate hydrazone, Ellman's sulfinamide and related

Lecture 33 - Ender's RAMP/SAMP based systems

Lecture 34 - Ender's RAMP/SAMP based systems

Lecture 35 - Ender's RAMP/SAMP, Coltart's cyclic carbamate hydrazone, Ellman's sulfinamide

Lecture 36 - Coltart's cyclic carbamate hydrazone and its exploration

Lecture 37 - Memory of chirality in enolate alkylation

Lecture 38 - Organocatalytic methods for enolate alkylation (SOMO activation)

Lecture 39 - Enantioselective alkylation with chiral PTC

Lecture 40 - Overall analysis of the entire discussion

Lecture 1 - Bioenergetics: Understanding the significance in Biological Systems

Lecture 2 - Regulation of Enzyme Activity

Lecture 3 - Digestion and Absorption of Carbohydrates

Lecture 4 - Glycolysis, alcohol and lactic acid fermentation

Lecture 5 - Biochemistry of TCA Cycle (I)

Lecture 6 - TCA Cycle (II) - Regulation and special characteristics

Lecture 7 - Neoglucogenesis

Lecture 8 - Regulation of Glycolysis and Neoglucogenesis - I

Lecture 9 - Regulation of Glycolysis and Neoglucogenesis - II Cori Cycle, Rapoport Leubering

Lecture 10 - Hexose Monophosphate Shunt : Steps and Phases

Lecture 11 - Hexose Monophosphate Shunt : Regulation and Significance

Lecture 12 - Glycogen Metabolism - I

Lecture 13 - Glycogen Metabolism - II

Lecture 14 - Glycogen Metabolism - III

Lecture 15 - Glycogen Metabolism - IV

Lecture 16 - Galactose Metabolism and Associated Disorders

Lecture 17 - Fructose Metabolism and Associated Disorders

Lecture 18 - Regulation of Blood Glucose

Lecture 19 - Diabetes Mellitus and Metabolic Alterations

Lecture 20 - Digestion and absorption of Lipid

Lecture 21 - Lipoprotein Metabolism - I

Lecture 22 - Lipoprotein Metabolism - II

Lecture 23 - Lipoprotein metabolism - III

Lecture 24 - Fatty acid catabolism (Oxidation of Fatty acids) - I

Lecture 25 - Fatty acid catabolism (Oxidation of Fatty acids) - II

Lecture 26 - Fatty acid catabolism (Oxidation of Fatty acids) - III

Lecture 27 - Metabolism of Ketone Bodies

Lecture 28 - Biosynthesis of Fatty acid and its regulation

Lecture 29 - Biosynthesis of triacylglycerol, phosphoglycerides and sphingolipids

Lecture 30 - Cholesterol Metabolism

Lecture 31 - Digestion and absorption of Protein

Lecture 32 - Transformation of Amino acids

Lecture 33 - Metabolism of Ammonia and ammonia toxicity

Lecture 34 - Urea cycle - Steps, Significance and Energetics

Lecture 35 - Urea Cycle - Regulation and Enzyme Deficiency Disorders

Lecture 36 - Metabolism of Phenylalanine and Associated Disorders

Lecture 37 - Tyrosine Metabolism - I

Lecture 38 - Tyrosine Metabolism - II (Catecholamines)

Lecture 39 - Tyrosine Metabolism - III

Lecture 40 - Tryptophan Metabolism

Lecture 41 - Metabolism of Sulphur containing Amino acids (Methionine and Cysteine)

Lecture 42 - Metabolism of Glycine and its disorders

Lecture 43 - Metabolism of Serine, Threonine and Alanine

Lecture 44 - Branched chain amino acid metabolism and their disorders

Lecture 45 - Metabolism of Histidine, Proline, Arginine and Lysine

Lecture 46 - Heme Metabolism - I (Heme Synthesis and Regulation)

Lecture 47 - Heme Metabolism - II (Disorders of Heme Synthesis - Porphyrrias)

Lecture 48 - Heme Metabolism - III (Heme Degradation, Transport and Bilirubin Metabolism)

Lecture 49 - Disorders of Bilirubin Metabolism

Lecture 50 - Nucleotide Metabolism - I (Purine Metabolism)

Lecture 51 - Nucleotide Metabolism - II (Disorders of Purine Metabolism)

Lecture 52 - Nucleotide Metabolism - III (Pyrimidine Metabolism and Disorders)

Lecture 53 - Inborn errors of Metabolism

Lecture 54 - Integration of Metabolism - I (Cellular and Organ level integration)

Lecture 55 - Integration of Metabolism - II (Starve feed cycle)

Lecture 56 - Integration of Metabolism - III (Metabolic Control Analysis)

Lecture 57 - Obesity, Metabolic Syndrome and Role of Adipokines

Lecture 58 - Fatty Liver and alcohol metabolism

Lecture 59 - Energy metabolism and Nutritional disorders, Protein Energy Malnutrition and Dietary

Lecture 60 - Metabolism in Cancer Cells

Lecture 1 - Remembering the Masters: From Zeeman to Zavoisky

Lecture 2 - Introduction to EPR spectroscopy

Lecture 3 - Electron-Nuclear Hyperfine Interaction - I

Lecture 4 - Electron-Nuclear Hyperfine Interaction - II

Lecture 5 - Magnetic Moment in Magnetic Field - I

Lecture 6 - Magnetic Moment in Magnetic Field - II

Lecture 7 - EPR Instrumentations - I

Lecture 8 - EPR Instrumentations - II

Lecture 9 - EPR Instrumentations - III

Lecture 10 - EPR Instrumentations - IV

Lecture 11 - Quantum Mechanical Description of EPR - I

Lecture 12 - Quantum Mechanical Description of EPR - II

Lecture 13 - Introduction to Spin Relaxation

Lecture 14 - Theory of First-order EPR Spectra - I

Lecture 15 - Theory of First-order EPR Spectra - II

Lecture 16 - How to Analyse First-order EPR Spectra

Lecture 17 - How to Record EPR Spectra

Lecture 18 - Second-order Effects on EPR Spectra

Lecture 19 - Photochemistry and EPR Spectroscopy

Lecture 20 - Electron Spin Polarisation - I

Lecture 21 - Electron Spin Polarisation - II

Lecture 22 - Anisotropic Interactions in EPR Spectroscopy

Lecture 23 - Theoretical Basis of isotropic Hyperfine Coupling

Lecture 24 - Spin Relaxation and Bloch Equations - I

Lecture 25 - Spin Relaxation and Bloch Equations - II

[Lecture 1](#)

[Lecture 2](#)

[Lecture 3 - Part I](#)

[Lecture 3 - Part II](#)

[Lecture 4 - Part I](#)

[Lecture 4 - Part II](#)

[Lecture 4 - Part III](#)

[Lecture 5 - Part I](#)

[Lecture 5 - Part II](#)

[Lecture 5 - Part III](#)

[Lecture 5 - Part IV](#)

[Lecture 5 - Part V](#)

[Lecture 6 - Part I](#)

[Lecture 6 - Part II](#)

[Lecture 6 - Part III](#)

[Lecture 6 - Part IV](#)

[Lecture 7 - Part I](#)

[Lecture 7 - Part II](#)

[Lecture 8 - Part I](#)

[Lecture 8 - Part II](#)

[Lecture 8 - Part III](#)

[Lecture 9 - Part I](#)

[Lecture 9 - Part II](#)

[Lecture 9 - Part III](#)

[Lecture 10](#)

- Lecture 1 - Electromagnetic radiation
- Lecture 2 - Interaction of radiation with matter
- Lecture 3 - Introduction to chemical applications
- Lecture 4 - Analysis of spectra
- Lecture 5 - Radiation densities and Einstein's semi classical model
- Lecture 6 - Introduction to quantum mechanics - I
- Lecture 7 - Introduction to quantum mechanics - II
- Lecture 8 - Born-Oppenheimer approximation
- Lecture 9 - Beer-Lambert law
- Lecture 10 - Diatomic Vibration Spectra Hermonic Model
- Lecture 11 - Diatomic Vibration Morse Oscillator Model
- Lecture 12 - Normal Vibrational modes Triatomic molecules
- Lecture 13 - Normal Vibrational modes Polyatomic molecules
- Lecture 14 - Vibrational Polyatomic Infrared Spectroscopy Local Modes and Group Frequencies
- Lecture 15 - Microwave spectra of di-atomic molecules
- Lecture 16 - Diatomic Molecules Microwave Energies and Transitions
- Lecture 17 - Methodology of solving problems
- Lecture 18 - Rotational and Vibrational Line Intensities
- Lecture 19 - Microwave Spectra of Polyatomic molecules (Symmetric tops)
- Lecture 20 - Video Tutorial 2 : Part - I
- Lecture 21 - Video Tutorial 2 : Part - II
- Lecture 22 - Introduction to Tensors
- Lecture 23 - Polarizability Tensor
- Lecture 24 - Introduction to Rotational Raman Spectra.
- Lecture 25 - Review of basic concepts in Molecular Spectroscopy
- Lecture 26 - Review of Microwave Spectroscopy
- Lecture 27 - Review of Elementary Vibrational Spectroscopy

[Module 1](#)

[Module 2](#)

[Module 3](#)

[Module 4](#)

[Module 5](#)

[Module 6](#)

[Module 7](#)

[Module 8](#)

[Module 9](#)

[Module 10](#)

[Module 11](#)

[Module 12](#)

[Module 13](#)

[Module 14](#)

[Module 15](#)

[Module 16](#)

[Module 17](#)

[Module 18](#)

[Module 19](#)

[Module 20](#)

[Module 21](#)

[Module 22](#)

[Module 23](#)

[Module 24](#)

[Module 25](#)

[Module 26](#)

[Module 27](#)

[Module 28](#)

[Module 29](#)

[Module 30](#)

[Module 31](#)

[Module 32](#)

[Module 33](#)

[Module 34](#)

[Module 35](#)

[Module 36](#)

Lecture 1 - Activation of chemical reactions. Thermal and photochemical methods

Lecture 2 - MOs of polyene and their symmetry properties and methods of analyzing pericyclic reactions

Lecture 3 - Introduction to electrocyclic reactions and Woodward Hoffmann rules

Lecture 4 - Electrocyclic reactions \hat{A} – examples of 3, 4 and 5 membered ring systems (2e and 4e systems)

Lecture 5 - Electrocyclic reactions \hat{A} – examples of 6 and larger ring systems (6e and more)

Lecture 6 - Tutorial session 1

Lecture 7 - Cycloaddition reactions - Introduction and Woodward Hoffmann rules - [2+2] cycloadditions

Lecture 8 - Cycloaddition reactions \hat{A} – ketene cycloadditions

Lecture 9 - Cycloaddition reactions \hat{A} – Diels-Alder reaction - Woodward Hoffmann rule - Regiochemistry and Stereochemistry aspects

Lecture 10 - Diels Alder reaction - synthetic applications

Lecture 11 - Diels Alder reaction continued - Hetero diene and dienophile - Lewis acid mediated - asymmetric

Lecture 12 - 1,3-Dipolar cycloaddition reactions

Lecture 13 - 1,3-Dipolar cycloaddition reactions (Continued...)

Lecture 14 - [4pi+4pi], [4pi+6pi] and higher order cycloaddition reactions

Lecture 15 - Tutorial session 2 on cycloaddition reactions

Lecture 16 - Pericyclic reactions \hat{A} – Sigmatropic rearrangements \hat{A} – Introduction and [1,3] migrations

Lecture 17 - Pericyclic reactions \hat{A} – Sigmatropic rearrangements (Continued...) [1,5] H and C migrations and Cope rearrangement

Lecture 18 - Pericyclic reactions \hat{A} – Sigmatropic rearrangements (Continued...) oxy Cope and Claisen Rearrangement

Lecture 19 - Pericyclic reactions \hat{A} – Sigmatropic rearrangements (Continued...)

Lecture 20 - Pericyclic reactions \hat{A} – Sigmatropic rearrangements (Continued...) [2,3] sigmatropic shifts and higher order rearrangements Completed

Lecture 21 - Pericyclic reactions \hat{A} – Sigmatropic rearrangements (Continued...) Wittig rearrangement and higher order Sigmatropic shifts

Lecture 22 - Pericyclic reactions \hat{A} – Chelotropic reactions - introduction, SO₂ extrusion reactions

Lecture 23 - Pericyclic reactions \hat{A} – Tutorial session 3 - Problems on sigmatropic reactions

Lecture 24 - Chelotropic reactions 2

Lecture 25 - The Ene Reaction

Lecture 26 - Tutorial session - 4

Lecture 27 - Introduction to organic photochemistry

Lecture 28 - Photochemistry of alkenes cis-trans isomerization

Lecture 29 - Photochemistry of alkenes (Continued...)

Lecture 30 - Photochemistry of carbonyl compounds, Norrish type1 and 2 reactions

[Lecture 31 - Photochemistry of carbonyl compounds, enone and dienone photochemistry](#)

[Lecture 32 - Photochemistry of Nitrogen compounds](#)

[Lecture 33 - Photochemistry of aromatic compounds](#)

[Lecture 34 - Photoinduced electron transfer reactions](#)

Lecture 1 - Lecture 1 - Historical context and experiments: Introducing the Schrödinger equation

Lecture 2 - Lecture 2 - Bohr's atom, De Broglie Matter Waves and Schrodinger equation

Lecture 3 - Lecture 3 - Electromagnetic Radiation

Lecture 4 - Lecture 4 - Interaction of Radiation with Matter

Lecture 5 - Lecture 5 - Molecular Spectroscopy

Lecture 6 - Lecture 6 - Elementary Mathematical Functions 1

Lecture 7 - Lecture 7 - Review of Properties of Elementary Functions II

Lecture 8 - Lecture 8 - Time Dependent Schrödinger Equation & Time Independent Schrödinger Equation

Lecture 9 - Lecture 9 - Schrödinger Equation Particle in a One-dimensional Box : Part I

Lecture 10 - Lecture 10 - Schrödinger Equation Particle in a One-dimensional Box : Part II

Lecture 11 - Lecture 11 - Schrödinger Equation Particle in Two-dimensional Box : Part I

Lecture 12 - Lecture 12 - Particle in Two-dimensional Box : Part II Uncertainty Principle

Lecture 13 - Lecture 13 - Particle in Two-dimensional Box : Part III Expectation Values

Lecture 14 - Lecture 14 - The Quantum Mechanics of Hydrogen Atom - Part I

Lecture 15 - Lecture 15 - The Quantum Mechanics of Hydrogen Atom - Part II

Lecture 16 - Lecture 16 - The Quantum Mechanics of Hydrogen Atom - Part III

Lecture 17 - Lecture 17 - The Quantum Mechanics of Hydrogen Atom - Part IV

Lecture 18 - Lecture 18 - The Quantum Mechanics of Hydrogen Atom - Part V

Lecture 19 - Lecture 19A - Assignment 1 Solution/Hints

Lecture 20 - Lecture 19B - Assignment 1 Solution/Hints

Lecture 21 - Lecture 19C - Assignment 1 Solution/Hints

Lecture 22 - Lecture 19D - Assignment 1 Solution/Hints

Lecture 23 - Lecture 19E - Assignment 1 Solution/Hints

Lecture 24 - Lecture 20 - Harmonic Oscillator Model - Part I

Lecture 25 - Lecture 21 - Harmonic Oscillator Model - Part II

Lecture 26 - Lecture 22 - Harmonic Oscillator Model - Part III

Lecture 27 - Lecture 23 - Harmonic Oscillator Model - Part IV

Lecture 28 - Lecture 24 - Particle on a Ring - Part I

Lecture 29 - Lecture 25 - Particle on a Ring - Part II

Lecture 30 - Lecture 26 - Heisenberg's Uncertainty Relation

Lecture 31 - Lecture 27A - Operators, Commutators, Eigenvalues and Eigenvectors

[Lecture 32 - Lecture 27B - Operators, Commutators, Eigenvalues and Eigenvectors](#)

[Lecture 33 - Lecture 28 - Introduction to Chemical Applications](#)

[Lecture 34 - Lecture 29 - Radiation Densities and Einstein's Semiclassical model](#)

[Lecture 35 - Lecture 30 - Born Oppenheimer Approximation](#)

[Lecture 36 - Lecture 31 - Beer Lambert Law](#)

[Lecture 37 - Lecture 32 - Diatomic Vibrational Spectra Harmonic Model](#)

[Lecture 38 - Lecture 33 - Diatomic Vibration Morse Oscillator Model](#)

[Lecture 39 - Lecture 34 - Molecular Vibrations in Polyatomic Molecules - Qualitative Account](#)

[Lecture 40 - Lecture 35 - Polyatomic Vibrations - Illustrative examples of normal vibrations](#)

Lecture 1 - Introduction to Chemical Thermodynamics and Kinetics

Lecture 2 - Properties of gases - Part 1

Lecture 3 - Properties of gases - Part 2

Lecture 4 - Introduction - Part 1

Lecture 5 - Introduction - Part 2

Lecture 6 - First law - Part 1

Lecture 7 - First law - Part 2

Lecture 8 - First law - Part 3

Lecture 9 - First law - Part 4

Lecture 10 - First law - Part 5

Lecture 11 - Second law - Part 1

Lecture 12 - Second law - Part 2

Lecture 13 - Spontaneity and equilibrium - Part 1

Lecture 14 - Spontaneity and equilibrium - Part 2

Lecture 15 - Spontaneity and equilibrium - Part 3

Lecture 16 - Phase equilibrium - Part 1

Lecture 17 - Phase equilibrium - Part 2

Lecture 18 - Phase equilibrium - Part 3

Lecture 19 - Phase equilibrium - Part 4

Lecture 20 - Phase equilibrium - Part 5

Lecture 21 - Phase equilibrium - Part 6

Lecture 22 - Phase equilibrium - Part 7

Lecture 23 - Mixtures - Part 1

Lecture 24 - Mixtures - Part 2

Lecture 25 - Mixtures - Part 3

Lecture 26 - Mixtures - Part 4

Lecture 27 - Mixtures - Part 5

Lecture 28 - Chemical Equilibrium - Part 1

Lecture 29 - Chemical Equilibrium - Part 2

Lecture 30 - Chemical Equilibrium - Part 3

Lecture 31 - Chemical Equilibrium - Part 4

[Lecture 32 - Chemical Equilibrium - Part 5](#)

[Lecture 33 - Chemical equilibrium - Part 2B](#)

[Lecture 34 - Chemical equilibrium - Part 2C](#)

[Lecture 35 - Electrochemistry - Part 1](#)

[Lecture 36 - Electrochemistry - Part 2](#)

[Lecture 37 - Electrochemistry - Part 3](#)

[Lecture 38 - Surfaces and interfaces](#)

[Lecture 39 - Chemical Kinetics: Rate laws - Part 1](#)

[Lecture 40 - Chemical Kinetics: Rate laws - Part 2](#)

[Lecture 41 - Chemical Kinetics: Rate laws - Part 3](#)

[Lecture 42 - Chemical Kinetics: Rate laws - Part 4](#)

[Lecture 43 - Chemical Kinetics: Mechanisms - Part 1](#)

[Lecture 44 - Chemical Kinetics: Mechanisms - Part 2](#)

[Lecture 45 - Chemical Kinetics: Mechanisms - Part 3](#)

[Lecture 46 - Chemical Kinetics: Mechanisms - Part 4](#)

[Lecture 47 - Chemical Kinetics: Mechanisms - Part 5](#)

[Lecture 48 - Chemical Kinetics: Mechanisms - Part 6](#)

[Lecture 49 - Reaction dynamics - Part 1](#)

[Lecture 50 - Reaction dynamics - Part 2](#)

[Lecture 51 - Reaction dynamics - Part 3](#)

[Lecture 52 - Reaction dynamics - Part 4](#)

[Lecture 53 - Reaction dynamics - Part 5](#)

[Lecture 54 - Reaction dynamics - Part 6](#)

[Lecture 55 - Reaction dynamics - Part 7](#)

Lecture 1 - Introduction to X-Ray Crystallography

Lecture 2 - Sources of X-Rays, Crystal Systems and Bravais lattices

Lecture 3 - Crystallographic Symmetries

Lecture 4 - Equivalent Points and 1D Lattices

Lecture 5 - 5 Fold Symmetry and 2D Lattices

Lecture 6 - 2D Space Lattices

Lecture 7 - Crystallographic Point Groups

Lecture 8 - Stereographic Projections of Point Groups

Lecture 9 - Understanding of Crystallographic Space Groups

Lecture 10 - 2D Projection of Space Groups

Lecture 11 - Tutorial - 01

Lecture 12 - 3D Space Groups and Equivalent Points

Lecture 13 - Obtaining Equivalent Points by Shifting of Origin

Lecture 14 - Representation of Orthorhombic and Tetragonal Space Groups

Lecture 15 - Miller Indices for Crystallographic Directions and Planes

Lecture 16 - Miller Indices and Planar Densities

Lecture 17 - Tutorial - 02

Lecture 18 - Cubic Structures and atomic packing factors

Lecture 19 - Ceramic Structures

Lecture 20 - Theory of X-Ray Diffraction

Lecture 21 - Tutorial - 03

Lecture 22 - Origin of Reciprocal Lattice

Lecture 23 - Bragg's Law in Reciprocal Lattice and Origin of Systematic Absences

Lecture 24 - Systematic Absences and Crystallisation Methods

Lecture 25 - Special Method of Crystallisation

Lecture 26 - Tutorial

Lecture 27 - Single Crystal X-Ray Diffraction Data Collection

Lecture 28 - Diffractometers

Lecture 29 - Diffractometers and Detectors

Lecture 30 - Laue's and Bragg's Analysis

Lecture 31 - Experimental Methods and Theoretical Understanding of X-Ray Diffraction

[Lecture 32 - Derivation of Friedel's Law from Structure Factor by Vector Space Diagram](#)

[Lecture 33 - Structure Factor and Electron Density](#)

[Lecture 34 - Systematic Absence Conditions from Special Structure Factor Expression](#)

[Lecture 35 - Structure Refinement](#)

[Lecture 36 - Single Crystal X-Ray Diffractometer](#)

[Lecture 37 - Understanding the X-Ray Data](#)

[Lecture 38 - Data Handling \(Solution and Refinement\) using Various Crystallographic Packages](#)

[Lecture 39 - Structure Solution using Apex II \(Bruker Diffractometer\)](#)

[Lecture 40 - Direct Methods - Part 1](#)

[Lecture 41 - Direct Methods - Part 2](#)

[Lecture 42 - Disorder Treatment using Olex 2](#)

[Lecture 43 - Cambridge Structure Database and its Application](#)

[Lecture 44 - Data Reduction - Absorption Correction](#)

[Lecture 45 - Data Reduction - Lorentz and Polarization Correction](#)

[Lecture 46 - Data Reduction - Scale and Temperature Factor](#)

[Lecture 47 - Identification from Intensity Statistics the Correct Crystal System and Presence of Inversion Center](#)

[Lecture 48 - Identification from Intensity Statistics the presence of 2 fold axis in Lattice](#)

[Lecture 49 - Phase Problem](#)

[Lecture 50 - Direct Methods - Part 1](#)

[Lecture 51 - Direct Methods - Part 2](#)

[Lecture 52 - Sigma 1 and Triplet Relationship](#)

[Lecture 53 - Patterson Method](#)

[Lecture 54 - Powder X-Ray Diffractometer - Theory](#)

[Lecture 55 - Powder X-Ray Diffractometer - Lab](#)

[Lecture 56 - Polymorphs](#)

[Lecture 57 - Polymorphs](#)

[Lecture 58 - Review of Reciprocal Lattice](#)

[Lecture 59 - Review of Reciprocal Lattice](#)

[Lecture 60 - Review of Reciprocal Lattice and Bragg's Law in Reciprocal Lattice](#)

[Lecture 61 - Ewald's Sphere and Limiting Sphere](#)

[Lecture 62 - Origin of/Introduction to Systematic absences](#)

- Lecture 1 - Review of Classical Thermodynamics - 1
- Lecture 2 - Review of Classical Thermodynamics - 2
- Lecture 3 - Review of Classical Thermodynamics - 3
- Lecture 4 - Review of Classical Thermodynamics - 4
- Lecture 5 - Review of Classical Thermodynamics - 5
- Lecture 6 - Molecular Interactions - 1
- Lecture 7 - Molecular Interactions - 2
- Lecture 8 - Molecular Interactions - 3
- Lecture 9 - Molecular Interactions - 4
- Lecture 10 - Molecular Interactions - 5
- Lecture 11 - Transport Phenomena - 1
- Lecture 12 - Transport Phenomena - 2
- Lecture 13 - Transport Phenomena - 3
- Lecture 14 - Review of Chemical Kinetics - 1
- Lecture 15 - Review of Chemical Kinetics - 2
- Lecture 16 - Review of Chemical Kinetics - 3
- Lecture 17 - Review of Chemical Kinetics - 4
- Lecture 18 - Review of Chemical Kinetics - 5
- Lecture 19 - Advanced Topic in Chemical Kinetics - 1
- Lecture 20 - Advanced Topic in Chemical Kinetics - 2
- Lecture 21 - Advanced Topic in Chemical Kinetics - 3
- Lecture 22 - Introduction to statistical thermodynamics - 1
- Lecture 23 - Introduction to statistical thermodynamics - 2
- Lecture 24 - Introduction to statistical thermodynamics - 3
- Lecture 25 - Introduction to bimolecular reaction dynamics - 1
- Lecture 26 - Introduction to bimolecular reaction dynamics - 2
- Lecture 27 - Introduction to bimolecular reaction dynamics - 3
- Lecture 28 - Introduction to bimolecular reaction dynamics - 4
- Lecture 29 - Unimolecular reaction - 1
- Lecture 30 - Unimolecular reaction - 2
- Lecture 31 - Introduction to solution phase reactions dynamics - 1

- Lecture 32 - Introduction to solution phase reactions dynamics - 2
- Lecture 33 - Introduction to solution phase reactions dynamics - 3
- Lecture 34 - Introduction to solution phase reactions dynamics - 4
- Lecture 35 - Introduction to solution phase reactions dynamics - 5
- Lecture 36 - Non-ideal solutions, Activity of ions (Debye-Huckel theory) - 1
- Lecture 37 - Non-ideal solutions, Activity of ions (Debye-Huckel theory) - 2
- Lecture 38 - Electrochemistry: Insights into electrode processes, Ionic conductivity - 1
- Lecture 39 - Electrochemistry: Insights into electrode processes, Ionic conductivity - 2
- Lecture 40 - Reaction Dynamics: Femtosecond Pump Probe Spectroscopy
- Lecture 41 - Chemical Kinetics: Hydrolysis of an ester
- Lecture 42 - Transport Phenomena: Coefficient of viscosity
- Lecture 43 - Equilibrium constant using partition method
- Lecture 44 - Photochemistry: Degradation of a dye

Lecture 1 - Welcome

Lecture 2 - Elementary Mathematical Functions Used in Our Course

Lecture 3 - Schrodinger Equation: Particle in a One Dimensional Box

Lecture 4 - Particle in a One dimensional Box: Probabilities and Expectation Values

Lecture 5 - Elementary Mathematics: Introduction to Matrix Algebra - Part 1

Lecture 6 - Elementary Mathematics: Introduction to Matrix Algebra - Part 2

Lecture 7 - Elementary Mathematics: Matrix Eigenvalues and Eigenfunctions - Part I

Lecture 8 - Elementary Mathematics: Matrix Eigenvalues and Eigenfunctions - Part II

Lecture 9 - Particle in a Two Dimensional Box (Infinite Barrier)

Lecture 10 - Heisenberg's Uncertainty Principle

Lecture 11 - Expectation Values and Postulates in Quantum Mechanics

Lecture 12 - Problems and Solutions for Particle in One and Two Dimensional Boxes

Lecture 13 - Linear Vector Spaces: Matrix Representations

Lecture 14 - Linear Vector Spaces and Operators: Dirac's Bracket Notation

Lecture 15 - Simple Harmonic Oscillator: Classical Hamiltonian

Lecture 16 - Simple Harmonic Oscillator: Quantum Mechanical Solutions

Lecture 17 - Simple Harmonic Oscillator: Wave Functions, Probabilities and Average Values

Lecture 18 - Simple Harmonic Oscillator: Average Values for Position and Momentum

Lecture 19 - Particle on a Ring: The Quantum Model

Lecture 20 - Particle on a Ring: Expectation Values for Angular Momentum

Lecture 21 - Coordinate Transformation

Lecture 22 - Problems and Solutions for Harmonic Oscillator

Lecture 23 - Hydrogen Atom: The Hamiltonian in Spherical Polar Coordinates

Lecture 24 - Hydrogen Atom: Separation of the Schrödinger Equation

Lecture 25 - Hydrogen Atom: Radial and Angular Solutions and Animations - Part I

Lecture 26 - Hydrogen Atom: Radial and Angular Solutions and Animations - Part II

Lecture 27 - Hydrogen Atom: Radial Solutions and Probabilities

Lecture 28 - Power Series Method for Differential Equation - I

Lecture 29 - Hermite's Differential Equation

Lecture 30 - Legendre and Associated Legendre Equation

Lecture 31 - Born-Oppenheimer Approximation

[Lecture 32 - Introduction to Angular Momentum](#)

[Lecture 33 - Spin \$\hat{A}^{1/2}\$ Angular Momentum](#)

[Lecture 34 - Spin Angular Momentum and Coupling of Two Spin-1/2 Angular Momenta](#)

[Lecture 35 - Coupling of Two Angular Momenta](#)

[Lecture 36 - Video Tutorial for Hermite polynomials and hydrogen atom - Part 1](#)

[Lecture 37 - Video Tutorials - Part 2](#)

[Lecture 38 - Variational Principle in Quantum Chemistry: Linear superposition Principle](#)

[Lecture 39 - Introduction to Variational Principle in Quantum Chemistry](#)

[Lecture 40 - Variational Method: Method of Lagrange Multipliers](#)

[Lecture 41 - Hydrogen Molecule Ion: The Molecular Orbital Method](#)

[Lecture 42 - Hydrogen Molecule Ion: Calculations and Results](#)

[Lecture 43 - Hydrogen Molecule: The Valence Bond Method](#)

[Lecture 44 - Hydrogen Molecule: Calculations and Molecular Orbital Method](#)

[Lecture 45 - Video Tutorials on Angular Momentum \(Orbital and Spin\) and Variational Method - Part 1](#)

[Lecture 46 - Video Tutorials on Angular Momentum \(Orbital and Spin\) and Variational Method - Part 2](#)

[Lecture 47 - Introduction to Quantum Mechanical Perturbation Theory](#)

[Lecture 48 - First Order Time Independent perturbation Theory for Non-Degenerate states](#)

[Lecture 49 - First and Second Order Time Independent Perturbation Theory for Non-Degenerate States](#)

[Lecture 50 - First and Second Order Time Independent Perturbation Theory: Simple Examples](#)

[Lecture 51 - Time Independent Perturbation Theory for Degenerate States: First Order](#)

[Lecture 52 - General MO method for Homonuclear Diatomic Molecules](#)

[Lecture 53 - General MO method for Heteronuclear Diatomic Molecules](#)

[Lecture 54 - Introduction to Hybridization and Valence Bond for Polyatomic Molecules](#)

[Lecture 55 - Hückel Molecular Orbital Theory - I](#)

[Lecture 56 - Hückel Molecular Orbital Theory - II](#)

Lecture 1 - Electrochemistry, double layer, 3 electrode systems, supporting electrolyte

Lecture 2 - Rate constant, concept of impedance, Z of electrical elements, differential impedance

Lecture 3 - Time domain results

Lecture 4 - Graphical representation of data (Complex plane, Bode)

Lecture 5 - Introduction to other techniques

Lecture 6 - Tutorial 01

Lecture 7 - Type of analyzers, single and multi sine

Lecture 8 - FFT details, frequency range and resolution, cross correlation

Lecture 9 - Multi sine, odd harmonic, non-harmonics, crest factor, spectral leakage

Lecture 10 - Windowing

Lecture 11 - Tutorial 02

Lecture 12 - Introduction to KKT

Lecture 13 - Linearity, causality, stability, impedance vs. admittance, measurement model

Lecture 14 - Linear KKT illustration

Lecture 15 - Tutorial 03

Lecture 16 - Introduction to EEC, Choice of circuits, confidence intervals, AIC

Lecture 17 - EEC fitting, initial values, distinguishability

Lecture 18 - Zero/pole representation, R_t and R_p

Lecture 19 - Maxwell, Voigt, Ladder circuits, choice of initial values illustrated

Lecture 20 - Tutorial 04

Lecture 21 - Simple electron transfer reaction

Lecture 22 - Two step reaction with an intermediate (1 of 3)

Lecture 23 - Two step reaction with an intermediate (2 of 3)

Lecture 24 - Two step reaction with an intermediate (3 of 3)

Lecture 25 - E-EAR reaction, negative resistance (1 of 2)

Lecture 26 - E-EAR reaction, negative resistance (2 of 2)

Lecture 27 - Three step reaction with two adsorbed intermediates

Lecture 28 - Catalytic mechanism

Lecture 29 - Examples with Frumkin or Temkin isotherms

Lecture 30 - Challenges in RMA

Lecture 31 - Patterns Reported in Experiments

[Lecture 32 - Warburg part - 1](#)

[Lecture 33 - Warburg part - 2](#)

[Lecture 34 - Warburg part - 3](#)

[Lecture 35 - Bounded Warburg](#)

[Lecture 36 - CPE](#)

[Lecture 37 - Porous electrodes](#)

[Lecture 38 - Films, PDM](#)

[Lecture 39 - PDM](#)

[Lecture 40 - Applications](#)

[Lecture 41 - NLEIS. Introduction and mathematical background](#)

[Lecture 42 - Electron Transfer reaction](#)

[Lecture 43 - Two step reaction](#)

[Lecture 44 - Two step reaction \(Continued...\)](#)

[Lecture 45 - \$R_t\$ and \$R_p\$ estimation](#)

[Lecture 46 - Galvanostatic simulations](#)

[Lecture 47 - Instabilities](#)

[Lecture 48 - Solution resistance effects](#)

[Lecture 49 - Detection on nonlinearities using KKT](#)

[Lecture 50 - Frumkin and Temkin isotherms](#)

[Lecture 51 - NLEIS Experimental aspects. FFT, PSD, THD](#)

[Lecture 52 - Application - other techniques HA, EFM](#)

Lecture 1 - Introduction to Medicinal Chemistry - Part I

Lecture 2 - Introduction to Medicinal Chemistry - Part II

Lecture 3 - Intermolecular Binding Forces

Lecture 4 - Protein Structure and Function

Lecture 5 - Tutorial 1 - Acidity, Basicity and Related concepts

Lecture 6 - Tutorial 2 - Basic Concepts of Thermodynamics and Kinetics

Lecture 7 - Enzyme Catalysis - Part I

Lecture 8 - Enzyme Catalysis - Part II

Lecture 9 - Tutorial 3 - Binding Forces, Protein Structure and Function

Lecture 10 - Introduction to Receptors

Lecture 11 - Receptor Types and Functions

Lecture 12 - Tutorial 4 - Receptors, Binding Interactions, Ion Channels

Lecture 13 - Nucleic Acids

Lecture 14 - RNA and Protein Synthesis

Lecture 15 - Tutorial 5 - Nucleic acids, and Basics of Molecular Biology

Lecture 16 - Enzymes as Drug Targets

Lecture 17 - Enzyme Kinetics and Inhibition

Lecture 18 - Tutorial 6 - Enzyme Kinetics, Various Modes of Inhibition etc.

Lecture 19 - Receptors as Drug Targets - Part I

Lecture 20 - Receptors as Drug Targets - Part II

Lecture 21 - Tutorial 7 - Receptor-Drug Interactions, Stereochemistry, Chirality, Nomenclature

Lecture 22 - Receptor-Drug Interactions.

Lecture 23 - Stereochemistry and Conformation

Lecture 24 - Tutorial 8 - Determination of Drug-Receptor Interactions, Conformation of Cyclic and Acyclic Structures etc.

Lecture 25 - Nucleic Acids as Drug Targets - Part I

Lecture 26 - Nucleic Acids as Drug Targets - Part II

Lecture 27 - Miscellaneous Drug Targets

Lecture 28 - Tutorial 9 - Nucleic Acids and Related Topics

Lecture 29 - Mechanisms in Biological Chemistry - Part I

Lecture 30 - Mechanisms in Biological Chemistry - Part II

Lecture 31 - Mechanisms in Biological Chemistry - Part III

[Lecture 32 - Pharmacokinetics - Part I](#)

[Lecture 33 - Pharmacokinetics - Part II](#)

[Lecture 34 - Drug Metabolism - Part I](#)

[Lecture 35 - Drug Metabolism - Part II](#)

[Lecture 36 - Drug Metabolism - Part III](#)

[Lecture 37 - Drug Metabolism - Part IV](#)

[Lecture 38 - Tutorial 10 - ADME](#)

[Lecture 39 - Drug Administration Routes - Part I](#)

[Lecture 40 - Drug Administration Routes - Part II](#)

[Lecture 41 - Finding a Lead - Part I](#)

[Lecture 42 - Finding a Lead - Part II](#)

[Lecture 43 - Drug Screening](#)

[Lecture 44 - Tutorial 11 - Drug administration routes and finding a lead](#)

[Lecture 45 - Optimizing Drug-Target Interactions - Part I](#)

[Lecture 46 - Optimizing Drug-Target Interactions - Part II](#)

[Lecture 47 - Optimizing Drug-Target Interactions - Part III](#)

[Lecture 48 - Optimizing Drug-Target Interactions - Part IV](#)

[Lecture 49 - Tutorial 12](#)

[Lecture 50 - Optimizing Access to the Target](#)

[Lecture 51 - Prodrugs](#)

[Lecture 52 - Prodrugs and Drug Alliances](#)

[Lecture 53 - Endogenous Compounds, Peptidomimetics and Oligonucleotides as Drugs](#)

[Lecture 54 - Tutorial 13- Optimizing Access-Prodrugs](#)

[Lecture 55 - Combinatorial and parallel synthesis](#)

[Lecture 56 - Computer in Medicinal Chemistry](#)

[Lecture 57 - Antibacterial agents - 1](#)

[Lecture 58 - Antibacterial agents - 2](#)

[Lecture 59 - Tutorial14-Combinatorial and parallel synthesis, computers in med chem and anti-bacterial agents](#)

[Lecture 60 - Anti-viral agents - 1](#)

[Lecture 61 - Anti-viral agents - 2](#)

[Lecture 62 - Anti-cancer agents - 1](#)

[Lecture 63 - Anti-cancer agents - 2](#)

[Lecture 64 - Cholinergics](#)

[Lecture 65 - Anti-ulcer agents](#)

[Lecture 66 - QSAR - 1](#)

[Lecture 67 - QSAR - 2](#)

[Lecture 68 - QSAR - 3](#)

[Lecture 69 - Drug Resistance and Synergy](#)

- Lecture 1 - Introduction to The Thermodynamics
- Lecture 2 - History of Thermodynamic
- Lecture 3 - Thermodynamic Systems and Variables
- Lecture 4 - Zeroth Law of Thermodynamic
- Lecture 5 - Microscopic Definition of Temperature - Part 1
- Lecture 6 - Microscopic Definition of Temperature - Part 2
- Lecture 7 - Different Forms of Energy
- Lecture 8 - Real Gas and Virial Equation
- Lecture 9 - Van der Waals Gas
- Lecture 10 - Work and Heat - Part 1
- Lecture 11 - Work and Heat - Part 2
- Lecture 12 - First Law of Thermodynamics
- Lecture 13 - Microscopic Definition of Heat and Work
- Lecture 14 - Work done at a Constant Temperature
- Lecture 15 - Heat is a path function
- Lecture 16 - Joule-Thomson Effect (For Ideal Gases)
- Lecture 17 - Joule-Thomson Effect (For Van der Waals gas)
- Lecture 18 - Adiabatic Reversible Work
- Lecture 19 - Adiabatic Irreversible Work
- Lecture 20 - Tutorial Problem - 1
- Lecture 21 - Tutorial Problem - 2
- Lecture 22 - Thermochemistry - Part 1
- Lecture 23 - Thermochemistry - Part 2
- Lecture 24 - Second Law of Thermodynamics
- Lecture 25 - Statements of the Second Law of Thermodynamics
- Lecture 26 - Carnot Cycle and Definition of Entropy
- Lecture 27 - Ideal Stirling Engine
- Lecture 28 - Gasoline Engine and Diesel Engine
- Lecture 29 - Carnot Cycle: The Most Efficient Engine
- Lecture 30 - Thermodynamic Temperature
- Lecture 31 - Definition of Entropy

- Lecture 32 - Tutorial Problem - 3
- Lecture 33 - Tutorial Problem - 4
- Lecture 34 - Tutorial Problem - 5
- Lecture 35 - Tutorial Problem - 6
- Lecture 36 - Tutorial Problem - 7
- Lecture 37 - Tutorial Problem - 8
- Lecture 38 - Statistical Formulation of the Second Law
- Lecture 39 - Probability
- Lecture 40 - Microstates and Distributions
- Lecture 41 - Permutation and Combination
- Lecture 42 - Two-Level Systems
- Lecture 43 - Most Probable Distribution
- Lecture 44 - Calculation with Multi-Level systems
- Lecture 45 - Calculation with Multi-Level systems with fixed energy - Part 1
- Lecture 46 - Calculation with Multi-Level systems with fixed energy - Part 2
- Lecture 47 - Calculation with Multi-Level systems with fixed energy - Part 3
- Lecture 48 - Bose-Einstein, Fermi-Dirac and Maxwell-Boltzmann distribution
- Lecture 49 - Most Probable Distribution is the Boltzmann Distribution
- Lecture 50 - Demonstration of Boltzmann Distribution
- Lecture 51 - Estimating Entropy for Various Processes
- Lecture 52 - Microscopic equivalent of Heat and Work
- Lecture 53 - Probability and Boltzmann Distribution
- Lecture 54 - Thermodynamic Observables: It is all in the Average
- Lecture 55 - Tutorial Problem - 9
- Lecture 56 - Tutorial Problem - 10
- Lecture 57 - Tutorial Problem - 11
- Lecture 58 - Tutorial Problem - 12
- Lecture 59 - Thermodynamic free energy
- Lecture 60 - Condition for Spontaneity
- Lecture 61 - Legendre Transformation of Thermodynamic Potentials
- Lecture 62 - Maxwell Relations and Applications
- Lecture 63 - Thermodynamic Relations using Jacobian Method - Part 1
- Lecture 64 - Thermodynamic Relations using Jacobian Method - Part 2

[Lecture 65 - Tutorial Problem - 13](#)

[Lecture 66 - Tutorial Problem - 14](#)

[Lecture 67 - Tutorial Problem - 15](#)

[Lecture 68 - Tutorial Problem - 16](#)

[Lecture 69 - Chemical Principle II - Overview and Road Ahead](#)

[Lecture 1 - Feedback on Techniques in Organic Chemistry](#)

[Lecture 2 - Introduction to Claisen - Condensation](#)

[Lecture 3 - Introduction to Claisen - Condensation](#)

[Lecture 4 - How to separate different components from a mixture using column chromatography](#)

[Lecture 5 - Fluorescence phenomenon](#)

[Lecture 6 - Reaction Mechanism and Stereochemistry](#)

[Lecture 7 - Chemiluminescence Phenomenon](#)

[Lecture 8 - Post Lab Questions](#)

Lecture 1 - Introduction Structure of atom and molecules

Lecture 2 - Introduction to Molecular Orbital Theory - Part 1

Lecture 3 - Introduction to Molecular Orbital Theory - Part 2

Lecture 4 - Tutorial 01

Lecture 5 - Learning Objectives for week 2

Lecture 6 - Alkanes and Cycloalkanes - Part 1

Lecture 7 - Alkanes and Cycloalkanes - Part 2

Lecture 8 - Conformational Analysis of Cyclohexane - Part 1

Lecture 9 - Conformational Analysis of Cyclohexane - Part 2

Lecture 10 - Physical Properties of Alkanes

Lecture 11 - Nomenclature of Alkanes, Cycloalkanes and Bicycloalkanes

Lecture 12 - Tutorial 02

Lecture 13 - Learning Objectives for week 3

Lecture 14 - Chirality and Stereochemistry - Part 1

Lecture 15 - Chirality and Stereochemistry - Part 2

Lecture 16 - Chirality and Stereochemistry - Part 3

Lecture 17 - Tutorial 03

Lecture 18 - Learning Objectives for week 4

Lecture 19 - Acids and Bases - Part 1

Lecture 20 - Acids and Bases - Part 2

Lecture 21 - Acids and Bases - Part 3

Lecture 22 - Tutorial 04

Lecture 23 - Learning Objectives for week 5

Lecture 24 - Arrow Pushing mechanism in Organic Chemistry

Lecture 25 - Alkenes_Structure, Properties and Nomenclature

Lecture 26 - Reactions of Alkenes - Part 1

Lecture 27 - Reactions of Alkenes - Part 2

Lecture 28 - Reactions of Alkenes - Part 3

Lecture 29 - Tutorial 05 - Part 1

Lecture 30 - Tutorial 05 - Part 2

Lecture 31 - Learning Objectives for week 6

[Lecture 32 - Reactions of Alkenes - Part 4](#)

[Lecture 33 - Reactions of Alkenes - Part 5](#)

[Lecture 34 - Alkynes](#)

[Lecture 35 - Reactions of Alkynes - Part 1](#)

[Lecture 36 - Reactions of Alkynes - Part 2](#)

[Lecture 37 - Tutorial-6](#)

[Lecture 38 - Learning Objectives for week 7](#)

[Lecture 39 - Substitution and Elimination - Part 1](#)

[Lecture 40 - Substitution and Elimination - Part 2](#)

[Lecture 41 - Substitution and Elimination - Part 3](#)

[Lecture 42 - Substitution and Elimination - Part 4](#)

[Lecture 43 - Substitution and Elimination - Part 5](#)

[Lecture 44 - Tutorial-7](#)

[Lecture 45 - Learning Objectives for week 8](#)

[Lecture 46 - Alcohols - Part 1](#)

[Lecture 47 - Alcohols - Part 2](#)

[Lecture 48 - Alcohols - Part 3](#)

[Lecture 49 - Ethers and Epoxides - Part 1](#)

[Lecture 50 - Ethers and Epoxides - Part 2](#)

[Lecture 51 - Aromaticity](#)

[Lecture 52 - Tutorial-8](#)

Lecture 1 - A brief history of the beginnings of quantitation in Chemistry, defining chemical stoichiometry and molarity

Lecture 2 - Defining Molality and Normality, relationship with Molarity

Lecture 3 - Defining other parameters for concentration (% , ppm/ppb, p-value)

Lecture 4 - Relationship between various concentration parameters

Lecture 5 - Problems on acid-base equilibria, calculation of pH of strong and weak acids

Lecture 6 - Brief introduction to normal distribution and statistical analysis

Lecture 7 - Using a spreadsheet towards basic statistical analysis, exact equation of error propagation, accuracy and precision

Lecture 8 - Error propagation and its application to a few examples, significant figures

Lecture 9 - Introduction to use spreadsheets to analyze errors, reiteration of significant figures, repeats and reproducibility

Lecture 10 - Classification of errors

Lecture 11 - A look at uncertainties in a measurement taking an example

Lecture 12 - A comprehensive and step-wise look at an experimental protocol towards understanding systematic errors in an experiment

Lecture 13 - Introductory Statistics - Part 1

Lecture 14 - Introductory Statistics - Part 2

Lecture 15 - Hypothesis testing and Finding Outliers - Part 1

Lecture 16 - Hypothesis testing and Finding Outliers - Part 2

Lecture 17 - Pooling of data

Lecture 18 - Introduction to Analysis of Variance (ANOVA) and comparing precisions

Lecture 19 - Protocol for undertaking ANOVA - Part 1

Lecture 20 - Protocol for undertaking ANOVA - Part 2

Lecture 21 - ANOVA and Least Significant Difference (LSD)

Lecture 22 - ANOVA and solved Least Significant Difference example

Lecture 23 - Using spreadsheet software to perform data analysis towards calibrating a burette

Lecture 24 - Using spreadsheet to analyze linear dependence between two variables

Lecture 25 - Using spreadsheet and MATLAB towards data analysis with example of rate kinetics

Lecture 26 - Simulating simple straight lines and kinetic curves using MATLAB

Lecture 27 - Simulating the Michaelis Menten kinetics using MATLAB

Lecture 28 - Curve fitting and simulating with variance for the Michaelis Menten kinetics using MATLAB

Lecture 29 - Standards and Volumetric/Gravimetric titrations - Part 1

Lecture 30 - Standards and Volumetric/Gravimetric titrations - Part 2

Lecture 31 - Standards and Volumetric/Gravimetric titrations - Part 3

- [Lecture 32 - Standards and Volumetric/Gravimetric titrations - Part 4](#)
- [Lecture 33 - Standards and Volumetric/Gravimetric titrations - Part 5](#)
- [Lecture 34 - Analytical Separations - Multistage extractions - Part 1](#)
- [Lecture 35 - Analytical Separations - Multistage extractions - Part 2](#)
- [Lecture 36 - Analytical Separations - Chromatography - Part 1](#)
- [Lecture 37 - Analytical Separations - Chromatography - Part 2](#)
- [Lecture 38 - Analytical Separations - Electrophoresis, Capillary electrophoresis, Isoelectric Focusing](#)
- [Lecture 39 - Basics of Chromatography - Part 1](#)
- [Lecture 40 - Basics of Chromatography - Part 2](#)
- [Lecture 41 - Chromatography - Concept of Theoretical plates](#)
- [Lecture 42 - Chromatography - Rate Theory](#)
- [Lecture 43 - Practice of Chromatography - HPLC](#)
- [Lecture 44 - Practice of Chromatography - Gas Chromatography](#)
- [Lecture 45 - Supercritical Fluid Chromatography](#)
- [Lecture 46 - Detectors employed during chromatographic separations](#)
- [Lecture 47 - Course Revision](#)
- [Lecture 48 - Course Revision - Week 1 to 3](#)
- [Lecture 49 - Course Revision - Week 4 and 5](#)
- [Lecture 50 - Course Revision - Week 6 and 7](#)
- [Lecture 51 - Course Revision - Week 8 to 11](#)

Lecture 1 - Introduction to Spectroscopy

Lecture 2 - Introduction to Quantum Mechanics - I

Lecture 3 - Introduction to Quantum Mechanics - II

Lecture 4 - A Simple Quantum Mechanical System: Particle in a one Dimensional Box

Lecture 5 - Spectroscopic Transitions

Lecture 6 - Intensity of a Transition Depends on the Transition Dipole Moment - I

Lecture 7 - Intensity of a Transition Depends on the Transition Dipole Moment - II

Lecture 8 - Comparison between Chemical Reactions and Spectroscopic Transitions

Lecture 9 - Lineshape Analysis

Lecture 10 - Different Forms of Spectroscopy

Lecture 11 - Spectroscopic Timescales

Lecture 12 - Correspondence between Linear Motion and Rotational Motion

Lecture 13 - Diatomic Rigid Rotor

Lecture 14 - Selection Rules and Rotational Spectrum

Lecture 15 - Isotope effect

Lecture 16 - Degeneracy

Lecture 17 - Intensities of Rotational Lines

Lecture 18 - Non Rigid Rotor

Lecture 19 - Polyatomic Molecules - I

Lecture 20 - Polyatomic Molecules - II and Numericals

Lecture 21 - Origin of the Rotational Selection Rule

Lecture 22 - Simple Harmonic Oscillator

Lecture 23 - Energy Levels

Lecture 24 - Selection Rules

Lecture 25 - Anharmonicity

Lecture 26 - Effects of Anharmonicity

Lecture 27 - Ro-vibrational Spectrum - I

Lecture 28 - Ro-vibrational Spectrum - II

Lecture 29 - Harmonic Oscillator Eigenvalues and Eigenfunctions - I

Lecture 30 - Harmonic Oscillator Eigenvalues and Eigenfunctions - II

Lecture 31 - Vibration of a Diatomic Molecule and Derivation of the Vibrational Selection Rule

- Lecture 32 - Ro-vibrational Spectrum - III
- Lecture 33 - Vibration of Polyatomic Molecules - I
- Lecture 34 - Vibration of Polyatomic Molecules - II
- Lecture 35 - Vibration of Polyatomic Molecules - III
- Lecture 36 - Normal Mode Coordinates
- Lecture 37 - Introduction to Raman Spectroscopy
- Lecture 38 - Quantum theory of Raman effect
- Lecture 39 - Rotational Raman Spectroscopy
- Lecture 40 - Nuclear Spin Statistics
- Lecture 41 - Polarizability and Polarizability Ellipsoid
- Lecture 42 - Raman Activity of Vibrations
- Lecture 43 - Vibrational Raman Spectroscopy
- Lecture 44 - Polarization Effects and Numericals
- Lecture 45 - Resonance Spectroscopy - Introduction 1
- Lecture 46 - Resonance Spectroscopy - Introduction 2
- Lecture 47 - NMR Spectroscopy - 1
- Lecture 48 - NMR Spectroscopy - 2
- Lecture 49 - NMR Spectroscopy - 3
- Lecture 50 - NMR Spectroscopy - 4
- Lecture 51 - NMR Spectroscopy - 5
- Lecture 52 - NMR Spectroscopy - 6
- Lecture 53 - ESR Spectroscopy - 1
- Lecture 54 - ESR Spectroscopy - 2
- Lecture 55 - ESR Spectroscopy - 3
- Lecture 56 - ESR Spectroscopy - 4
- Lecture 57 - Electronic Spectroscopy - 1
- Lecture 58 - Electronic Spectroscopy - 2
- Lecture 59 - Electronic Spectroscopy - 3
- Lecture 60 - Electronic Spectroscopy - 4
- Lecture 61 - Electronic Spectroscopy - 5

- Lecture 1 - Introduction to stereochemistry
- Lecture 2 - Nomenclature of Various Organic Molecules
- Lecture 3 - Nomenclature of Cyclic molecules and other functional groups
- Lecture 4 - Nomenclature of some complex molecules
- Lecture 5 - Practising naming of molecules
- Lecture 6 - Symmetry, Stereochemistry and Applications
- Lecture 7 - Symmetry elements in organic molecules
- Lecture 8 - Molecular point groups - Part I
- Lecture 9 - Molecular point groups - Part II
- Lecture 10 - Conformations and Configurations
- Lecture 11 - Conformational Analysis - Part I
- Lecture 12 - Conformational Analysis - Part II
- Lecture 13 - Chair and Boat Conformation of Cyclohexane
- Lecture 14 - Conformational Analysis of Disubstituted Cyclohexane Molecules
- Lecture 15 - Isomerism and Representation of Isomers
- Lecture 16 - Stereoisomerism
- Lecture 17 - Drawing One Projection from Another
- Lecture 18 - Optical Activity of Organic Molecules and Isomerism
- Lecture 19 - Allenes and Biphenyls
- Lecture 20 - Absolute Configuration in Biphenyls and D/L Systems
- Lecture 21 - Asymmetry and Dissymmetry Molecules
- Lecture 22 - Stereoisomerism and Local Symmetry
- Lecture 23 - Topicity of Ligands
- Lecture 24 - Topicity of Faces
- Lecture 25 - Problems on Isomers and Topicity
- Lecture 26 - Diastereomerism in Ring System - Part 1
- Lecture 27 - Diastereomerism in Ring System - Part 2
- Lecture 28 - Diastereomerism in Ring System - Part 3
- Lecture 29 - Diastereomerism in PI System
- Lecture 30 - Nucleophilic Reactions
- Lecture 31 - Mechanism of Nucleophilic Substitution Reaction

[Lecture 32 - Stability of Carbocation](#)

[Lecture 33 - Elimination Reactions](#)

[Lecture 34 - Substitution VS Elimination Reactions](#)

[Lecture 35 - Addition Reactions to Alkenes and Alkynes - Part 1](#)

[Lecture 36 - Addition Reactions to Alkenes and Alkynes - Part 2](#)

[Lecture 37 - Oxidizing Agents in Organic Chemistry and Organometallic Compounds](#)

[Lecture 38 - Some Problems and their Answers in Stereochemistry](#)

[Lecture 39 - Dynamic Stereochemistry - Part 1](#)

[Lecture 40 - Dynamic Stereochemistry - Part 2](#)

[Lecture 41 - Reaction Specificity and Selectivity](#)

[Lecture 42 - Cram's Rule and Felkin-Anh Model](#)

[Lecture 43 - Kinetics of Organic Reactions](#)

[Lecture 44 - Name Reactions and Their Mechanism - Part 1](#)

[Lecture 45 - Name Reactions and Their Mechanism - Part 2](#)

[Lecture 46 - Modifications of Diels-Alder Reaction](#)

[Lecture 47 - Name Reactions and Their Mechanism - Part 3](#)

[Lecture 48 - Name Reactions and Their Mechanism - Part 4](#)

[Lecture 49 - Rearrangement Reactions in Organic Chemistry - Part 1](#)

[Lecture 50 - Rearrangement Reactions in Organic Chemistry - Part 2](#)

[Lecture 51 - Rearrangement Reactions in Organic Chemistry - Part 3](#)

[Lecture 52 - Rearrangement Reactions in Organic Chemistry - Part 4](#)

[Lecture 53 - Brief introduction to crystallographic symmetry](#)

[Lecture 54 - Symmetries in X-ray Crystallography](#)

[Lecture 55 - 2D lattices and space groups](#)

[Lecture 56 - 3D crystallographic point groups and space groups](#)

Lecture 1 - Course Contents

Lecture 2 - Symmetry and Parity Operator

Lecture 3 - Symmetry Elements and Operations - Part 1

Lecture 4 - Symmetry Elements and Operations - Part 2

Lecture 5 - Planes and Reflections

Lecture 6 - Tutorial - 1

Lecture 7 - Coordinate System and Inversion Center

Lecture 8 - Improper axis and improper rotation

Lecture 9 - Solved Examples of Symmetry Elements and Operations

Lecture 10 - Product of Symmetry Operations

Lecture 11 - Tutorial - 2

Lecture 12 - Symmetry Point Groups - Part 1

Lecture 13 - Symmetry Point Groups - Part 2

Lecture 14 - Symmetry Point Groups - Part 3

Lecture 15 - Dipole Moment and Optical Activity

Lecture 16 - Tutorial - 3

Lecture 17 - Point Group Definition and Examples

Lecture 18 - Sub-Group and Classes

Lecture 19 - Matrix Representation of Symmetry Operations

Lecture 20 - Matrix Representation of Point Group

Lecture 21 - Tutorial - 4

Lecture 22 - Matrix Representation of Point Group

Lecture 23 - Reducible and Irreducible Representations

Lecture 24 - Great Orthogonality Theorem

Lecture 25 - Properties of Great Orthogonality Theorem

Lecture 26 - Tutorial - 5

Lecture 27 - Irreducible Representation using GOT

Lecture 28 - Reducible to Irreducible Representation using GoT

Lecture 29 - Character Table and Mulliken Symbols

Lecture 30 - How to write a complete character table

Lecture 31 - Tutorial - 6

- Lecture 32 - Representations of a cyclic group
- Lecture 33 - Group Theory and Quantum Mechanics
- Lecture 34 - 1) Degenerate Eigen Functions 2) Direct Product
- Lecture 35 - Direct Product
- Lecture 36 - Tutorial - 7
- Lecture 37 - Direct Product Applications - Part 1
- Lecture 38 - Direct Product Applications - Part 2
- Lecture 39 - Symmetry Adapted Linear Combinations - Part 1
- Lecture 40 - Symmetry Adapted Linear Combinations - Part 2
- Lecture 41 - Tutorial - 8
- Lecture 42 - Incomplete Projection Operator
- Lecture 43 - SALC using Projection Operator
- Lecture 44 - Symmetry and Chemical Bonding
- Lecture 45 - Valence Bond Theory
- Lecture 46 - Tutorial - 9
- Lecture 47 - Molecular Orbital Theory
- Lecture 48 - Localised MO Theory
- Lecture 49 - Delocalized MO Theory - Part 1
- Lecture 50 - Delocalized MO Theory - Part 2
- Lecture 51 - Ascent and Descent in Symmetry - Part 1
- Lecture 52 - Ascent and Descent in Symmetry - Part 2
- Lecture 53 - Crystal Field Theory - Part 1
- Lecture 54 - Crystal Field Theory - Part 2
- Lecture 55 - Jahn-Teller Distortion - Part 1
- Lecture 56 - Jahn-Teller Distortion - Part 2
- Lecture 57 - Introduction to Spectroscopy - Part 1
- Lecture 58 - Introduction to Spectroscopy - Part 2
- Lecture 59 - Vibrational Spectroscopy
- Lecture 60 - 1) Raman Spectroscopy and 2) Atomic Motions
- Lecture 61 - Symmetry of Normal Modes of Vibration
- Lecture 62 - Visualizing Molecular Vibrations using Internal Coordinates
- Lecture 63 - Spectral Transition Probabilities - Part 1
- Lecture 64 - Spectral Transition Probabilities - Part 2

Lecture 1 - Introduction - 1

Lecture 2 - Essentials of NMR Spectroscopy - Part 1

Lecture 3 - Essentials of NMR Spectroscopy - Part 2

Lecture 4 - Essentials of NMR Spectroscopy - Part 3

Lecture 5 - Electrophilic Aromatic Substitution - Part 1

Lecture 6 - Electrophilic Aromatic Substitution - Part 2

Lecture 7 - Electrophilic Aromatic Substitution - Part 3

Lecture 8 - Tutorial - 1

Lecture 9 - Introduction - 2

Lecture 10 - Electrophilic Aromatic Substitution in Phenols

Lecture 11 - EAS_Effect of Electron Donating group

Lecture 12 - EAS_Effect of Electron Withdrawing group

Lecture 13 - Nucleophilic aromatic substitution - Part 1

Lecture 14 - Nucleophilic aromatic substitution - Part 2

Lecture 15 - Special Topic_Hammond's Postulate

Lecture 16 - Tutorial-2 - Part 1

Lecture 17 - Tutorial-2 - Part 2

Lecture 18 - Essentials of IR Spectroscopy

Lecture 19 - Introduction - 3

Lecture 20 - Basics of Carbonyl Compounds

Lecture 21 - Addition Reactions on Carbonyl functional group

Lecture 22 - Addition Reactions on Carbonyl functional group

Lecture 23 - Nucleophilic Addition Reactions and its stereochemistry

Lecture 24 - Nucleophilic Addition Reactions and its Stereochemistry

Lecture 25 - Tutorial - 3

Lecture 26 - Introduction - 4

Lecture 27 - Carboxylic acid and its derivatives - Part 1

Lecture 28 - Carboxylic acid and its derivatives - Part 2

Lecture 29 - Reactions of Carboxylic acid and its derivatives

Lecture 30 - Alcohols, Ethers, and Epoxides

Lecture 31 - Tutorial - 4

- Lecture 32 - Special Topic - E1CB reaction
- Lecture 33 - Introduction - 5
- Lecture 34 - Enols and Enolates_Intro
- Lecture 35 - Enols and Enolates_Molecular Orbital Picture
- Lecture 36 - Reactions of Enols and Enolates
- Lecture 37 - Tutorial - 5A
- Lecture 38 - Tutorial - 5B
- Lecture 39 - Introduction - 6
- Lecture 40 - Active methylene group
- Lecture 41 - Aldol and related Reactions
- Lecture 42 - Aldol Reactions: Specific enol equivalents - Part 1
- Lecture 43 - Aldol Reactions: Specific enol equivalents - Part 2
- Lecture 44 - Tutorial - 6
- Lecture 45 - Introduction - 7
- Lecture 46 - Conjugate Addition:1,2-addition and 1,4-addition
- Lecture 47 - Conjugate Addition: Kinetic versus thermodynamic products
- Lecture 48 - Conjugate Addition: Hard and Soft nucleophiles
- Lecture 49 - Enol and Enolate alkylation
- Lecture 50 - Regioselectivity of alkylation reactions
- Lecture 51 - Acylation of enol/enolates and related Name Reactions
- Lecture 52 - Tutorial-7: Felkin-Ahn Problems
- Lecture 53 - Introduction - 8
- Lecture 54 - Rearrangements - Part 1
- Lecture 55 - Rearrangements - Part 2
- Lecture 56 - Rearrangements - Part 3
- Lecture 57 - Rearrangements - Part 4
- Lecture 58 - Named Reactions - Part 1
- Lecture 59 - Named Reactions - Part 2
- Lecture 60 - Tutorial - 8
- Lecture 61 - Conclusion

- Lecture 1 - Introduction to Elementary Electrochemistry
- Lecture 2 - The Laws of Electrochemistry and Electrolysis
- Lecture 3 - Applications of Faraday's Laws of Electrolysis
- Lecture 4 - Electrolytic Conduction: Arrhenius Theory of Electrolytic Dissociation
- Lecture 5 - Electrochemical/Galvanic Cell: Construction and Cell Reactions
- Lecture 6 - Numerical Problems on Faraday's Laws of Electrolysis
- Lecture 7 - Estimation of EMF of a Cell Using Potentiometer
- Lecture 8 - EMF of a Cell and Free Energy Change of a Reaction
- Lecture 9 - EMF of a Cell and Equilibrium Constant of a Reaction: The Nernst Equation
- Lecture 10 - Various Types of Electrodes (Glass,SHE,Calomel) in Electrochemistry
- Lecture 11 - Electrode Potential and Applications of Nernst Equation
- Lecture 12 - Numerical Problems: Nernst Equation, EMF of Half Cell Reactions
- Lecture 13 - Measurement of Cell EMF
- Lecture 14 - Electrochemical Cells: Liquid Junction Potential
- Lecture 15 - Electrolytic Solutions: Determination of Activity Coefficient
- Lecture 16 - Theory of Potentiometric Titrations
- Lecture 17 - Preparation of Primary Standard and Standardization of NaOH
- Lecture 18 - Potentiometric Titration of Strong Acid and Strong Base
- Lecture 19 - Potentiometric Titration of Weak Acid with Strong Base
- Lecture 20 - Potentiometric Titration of Dibasic Acid with Strong Base
- Lecture 21 - Experimental Calculation of Potentiometric Titrations
- Lecture 22 - Conductance and Conductivity of the Solution
- Lecture 23 - Experimental Methods to Determine Transport Number
- Lecture 24 - Experimental Method to Calculate Transport Number
- Lecture 25 - Electrolytic Solutions
- Lecture 26 - Conductance Measurement
- Lecture 27 - Variation of Conductance with Concentration
- Lecture 28 - Ionic Mobilities in terms of ion Conductivities
- Lecture 29 - Application of Conductance Measurement - Part 1
- Lecture 30 - Application of Conductance Measurement - Part 2
- Lecture 31 - Activities in Electrolytic Solutions

[Lecture 32 - Ionic Strength of an Electrolyte and its Importance](#)

[Lecture 33 - Hydration of Ions and Their Ionic Mobility](#)

[Lecture 34 - Solubility and Activity Product](#)

[Lecture 35 - Applications of EMF and Conductance Measurement](#)

[Lecture 36 - Dissociation Constant of Weak Acids](#)

[Lecture 37 - Conductometric Titrations of Strong Acid with Strong Base](#)

[Lecture 38 - Conductometric Titrations of Weak Acid with Strong Base](#)

[Lecture 39 - Estimation of HCl and Ammonium Chloride in a Triple Mixture using NaOH](#)

[Lecture 40 - Estimation of Total Chloride ion Concentration in Triple Mixture using Primary Standard AgNO₃](#)

[Lecture 41 - Validation of Ostwald Dilution Law using HCl](#)

[Lecture 42 - Validation of Ostwald Dilution Law using Acetic Acid](#)

[Lecture 43 - Calculation and Graph Plotting for Conductometric Experiments](#)

[Lecture 1 - Phenols Structure, Preparation, Properties and Reactions - Part 1](#)

[Lecture 2 - Phenols Structure, Preparation, Properties and Reactions - Part 2](#)

[Lecture 3 - Phenols Structure, Preparation, Properties and Reactions - Part 3](#)

[Lecture 4 - Phenols Structure, Preparation, Properties and Reactions - Part 4](#)

[Lecture 5 - Phenols Structure, Preparation, Properties and Reactions - Part 5](#)

[Lecture 6 - Phenols Structure, Preparation, Properties and Reactions - Part 6](#)

[Lecture 7 - Phenol Assignment I and II - Part 7](#)

[Lecture 8 - Carbonyl Compounds - Part 1](#)

[Lecture 9 - Carbonyl Compounds - Part 2 \(Continued...\)](#)

[Lecture 10 - Carbonyl Compounds - Part 3 \(Continued...\)](#)

[Lecture 11 - Carbonyl Compounds - Part 4 \(Continued...\)](#)

[Lecture 12 - Carbonyl Compounds Assignment I and II - Part 5](#)

[Lecture 13 - Carboxylic Acids - Part 1](#)

[Lecture 14 - Functional Derivatives - Part 2](#)

[Lecture 15 - Appendices I and II - Part 3](#)

[Lecture 16 - Carboxylic Acids - Assignment I and II - Part 4](#)

[Lecture 17 - Nitro Compounds](#)

[Lecture 18 - Amines Structure, Preparation and Properties - Part 1](#)

[Lecture 19 - Amines Appendices I to IV - Part 1 \(Continued...\)](#)

[Lecture 20 - Assignments I to II - Part 2](#)

[Lecture 21 - Green Chemistry Introduction - Part 1](#)

[Lecture 22 - Green Chemistry Terminologies and strategies in green chemistry - Part 2 \(Continued...\)](#)

[Lecture 23 - Approches to Less Polluting Reactions - Part 3](#)

[Lecture 24 - Biocatalysis - Part 4](#)

[Lecture 25 - Microwave mediated and photochemical reactions and conclusion - Part 5](#)

[Lecture 26 - Acknowledgement](#)

Lecture 1 - Introduction to the immune system

Lecture 2 - Cells and Organs of the immune system - Part 1

Lecture 3 - Cells and Organs of the immune system - Part 2

Lecture 4 - Cells and Organs of the immune system - Part 3

Lecture 5 - Innate immunity - Part 1

Lecture 6 - Innate immunity - Part 2

Lecture 7 - Development and differentiation of B cells - Part 1

Lecture 8 - Signaling in B cells

Lecture 9 - Organization of immunoglobulin genes and Mechanism of immunoglobulin gene rearrangement

Lecture 10 - Generation of antibody diversity

Lecture 11 - Immunoglobulin class switching Regulation of Immunoglobulin gene regulation

Lecture 12 - Structures and functions of ImmunoglobulinTMs

Lecture 13 - The three complement pathways

Lecture 14 - Hypersensitivity type 1

Lecture 15 - Hypersensitivity types 2, 3, 4 and Autoimmunity

Lecture 16 - Autoimmunity Autoimmuno-deficiencies of the B cells

Lecture 17 - Autoimmuno-deficiencies of the B cells

Lecture 18 - Cancer

Lecture 19 - The major histocompatibility complex - Part 1

Lecture 20 - The major histocompatibility complex - Part 2

Lecture 21 - The major histocompatibility complex - Part 3

Lecture 22 - The Major Histocompatibility Complex

Lecture 23 - The Major Histocompatibility Complex: MHC class I pathway

Lecture 24 - The Major Histocompatibility Complex: MHC class II pathway

Lecture 25 - T cell receptors

Lecture 26 - T cell Activation

Lecture 27 - T cell Activation / Differentiation

Lecture 28 - T cell synapse, motility and subsets

Lecture 29 - T cell survival

Lecture 30 - Cytokines - Part 1

Lecture 31 - Cytokines - Part 2

[Lecture 32 - Autoimmunity](#)

[Lecture 33 - Immunodeficiency](#)

[Lecture 34 - Host response mechanisms during infectious diseases - Part 1](#)

[Lecture 35 - Host response mechanisms during infectious diseases - Part 2](#)

[Lecture 36 - Transplantation immunology](#)

[Lecture 37 - Vaccines](#)

[Lecture 38 - Antigens and Immunogens](#)

[Lecture 39 - Synthetic vaccines](#)

[Lecture 40 - Evolution of the immune system](#)

Lecture 1 - Eukaryotic RNA polymerases and basal transcription factors

Lecture 2 - Diversity in core promoter elements

Lecture 3 - Diversity in general transcription factors

Lecture 4 - Proximal & Distal Promoter Elements, Enhancers and Silencers, Gene-specific Regulators

Lecture 5 - Transcription factors - DNA binding domains

Lecture 6 - Transcription factors - Transcription activation domain

Lecture 7 - Role of chromatin in eukaryotic gene regulation

Lecture 8 - Role of histones in eukaryotic gene regulation

Lecture 9 - Role of DNA methylation in eukaryotic gene regulation

Lecture 10 - Chromatin remodelling & gene regulation

Lecture 11 - mRNA processing - Role of RNA Pol II in mRNA capping and mRNA splicing

Lecture 12 - mRNA processing - Role of RNA Pol II in polyadenylation & mRNA editing

Lecture 13 - Regulation of RNA Pol I transcription

Lecture 14 - Regulation of RNA Pol III transcription

Lecture 15 - Signal Transduction Pathways - Introduction

Lecture 16 - Regulation of gene expression by cyclicAMP

Lecture 17 - Regulation of gene expression by second messengers other than cAMP

Lecture 18 - Regulation of gene expression by Protein Kinase C

Lecture 19 - Regulation of gene expression by Growth factors

Lecture 20 - Regulation of gene expression by cytokines

Lecture 21 - Regulation of gene expression by steroid hormones

Lecture 22 - Regulation of gene expression by type II nuclear receptors

Lecture 23 - Mechanism of transcriptional activation by nuclear receptors

Lecture 24 - Gene Regulation during Drosophila Development

Lecture 25 - Signal transduction pathways involved in embryonic development

Lecture 26 - Homeotic genes

Lecture 27 - Epigenetic regulation of gene expression during development

Lecture 28 - Embryonic stem cells and Transcription factor-mediated epigenetic reprogramming

Lecture 29 - Cloning and Expression vectors

Lecture 30 - Eukaryotic protein expression systems - I

Lecture 31 - Eukaryotic protein expression systems - II

[Lecture 32 - Eukaryotic protein expression systems - III: Gene expression in mammalian cells using viral vectors](#)

[Lecture 33 - Human Gene Therapy](#)

[Lecture 34 - DNA vaccines](#)

[Lecture 35 - Transgenic animals](#)

[Lecture 36 - Transgenic plants](#)

[Lecture 37 - Knockout mic](#)

[Lecture 38 - Regulation of Eukaryotic Gene Expression by Small RNAs \(RNA Interference, RNAi\)](#)

[Lecture 39 - Genomics & Proteomics](#)

[Lecture 40 - Metabolic Engineering & Synthetic Biology](#)

Lecture 1 - Wave Particle Duality

Lecture 2 - Standing Waves

Lecture 3 - Path Integrals and Schrodinger Equation

Lecture 4 - Postulates - Part 1

Lecture 5 - Postulates - Part 2

Lecture 6 - Postulates - Part 3

Lecture 7 - Separating Variables and Particle in a Box - Part 1

Lecture 8 - Particle in a box - Part 2

Lecture 9 - Particle in a box - Part 3

Lecture 10 - Particle in a box-time dependent states-Expectations values and time dependent states

Lecture 11 - Particle in a 3 dimensional box

Lecture 12 - Particle in a well of finite depth

Lecture 13 - Finite well, Delta and Step Functions

Lecture 14 - Finite well (Continued...)

Lecture 15 - Tunneling - Part 1

Lecture 16 - Tunneling - Part 2

Lecture 17 - Schrodinger equation for Harmonic Oscillator

Lecture 18 - Harmonic Oscillator - The Series Solution

Lecture 19 - Harmonic Oscillator - Generating function

Lecture 20 - Harmonic Oscillator - Orthogonality of Eigenfunctions

Lecture 21 - Hydrogen Atom: Separating centre of mass motion and integral motion

Lecture 22 - Hydrogen Atom: Polar Co-ordinates

Lecture 23 - Hydrogen atom continued : Separation of variables

Lecture 24 - Hydrogen atom : Finding the functions $\hat{I}^2(\hat{I}_z)$ and $\hat{I}_z(\hat{I}^2)$

Lecture 25 - Finding R(r)

Lecture 26 - Atomic Orbitals - Part 1

Lecture 27 - Atomic Orbitals - Part 2

Lecture 28 - Atomic Orbitals - Part 3

Lecture 29 - Atomic Orbitals - Part 4 and Hermitian Operators

Lecture 30 - Measurement, Uncertainty Principle

Lecture 31 - Generalized Uncertainty Principle

- [Lecture 32 - Generalized Uncertainty Principle \(Continued...\)](#)
- [Lecture 33 - Angular Momentum](#)
- [Lecture 34 - Angular Momentum \(Continued...\)](#)
- [Lecture 35 - Angular Momentum \(Continued...\) and Spin](#)
- [Lecture 36 - Perturbation Theory](#)
- [Lecture 37 - Perturbation Theory \(Continued...\)](#)
- [Lecture 38 - Variation Method - Introduction](#)
- [Lecture 39 - Variation Method - Proof and Illustration](#)
- [Lecture 40 - He atom wave function with spin included - Pauli's principle](#)
- [Lecture 41 - Hydrogen Molecular ion - Linear variation method](#)
- [Lecture 42 - Hydrogen Molecular ion \(Continued...\)](#)
- [Lecture 43 - Hydrogen Molecular ion \(Continued...\)](#)
- [Lecture 44 - Molecular Orbitals The Hydrogen Molecule](#)
- [Lecture 45 - MO and VB theory](#)
- [Lecture 46 - MO theory of diatoms](#)
- [Lecture 47 - Di-atomics \(Continued...\)](#)
- [Lecture 48 - Hybridization Huckel theory](#)
- [Lecture 49 - Huckel MO Theory \(Continued...\)](#)

- Lecture 1 - Introduction to Organometallic chemistry
- Lecture 2 - Metal carbonyl complexes
- Lecture 3 - Metal carbonyls - Part II
- Lecture 4 - Ligand substitution reactions
- Lecture 5 - Substitutes for carbonyl ligands
- Lecture 6 - Carbene complexes
- Lecture 7 - Carbene complexes (Continued...)
- Lecture 8 - Non-Carbon Ancillary ligands
- Lecture 9 - Non-Carbon Ancillary ligands (Continued...)
- Lecture 10 - Metal alkyl complexes
- Lecture 11 - Ligand Insertion Reactions
- Lecture 12 - Metal alkene complexes
- Lecture 13 - Alkynes π bonding
- Lecture 14 - Metal dihydrogen and hydrides
- Lecture 15 - Migratory Insertion reaction with alkynes
- Lecture 16 - η^m ($m=4$ dienes and $m=2n$, polyenes)
- Lecture 17 - Oxidative addition & Vaska's complex mechanism
- Lecture 18 - Reductive elimination
- Lecture 19 - Reductive Elimination mechanism
- Lecture 20 - Oxidative coupling with C-C bond formation
- Lecture 21 - Metathesis reactions
- Lecture 22 - Metal-allyls - η^3 complexes-synthesis, bonding
- Lecture 23 - Metal-allyls - η^3 complexes-fluxionality, reactivity
- Lecture 24 - C-C single bond forming reactions
- Lecture 25 - η^5 Cyclopentadienyl - complexes
- Lecture 26 - η^6 arene Metal complexes
- Lecture 27 - Half sandwich complexes
- Lecture 28 - Reactivity changes in coordinated ligands
- Lecture 29 - The isolobal analogy
- Lecture 30 - Fluxional Properties of Organometallics
- Lecture 31 - Quantifying Steric and electronic factors

[Lecture 32 - Hydrogenation reactions](#)

[Lecture 33 - Addition of HX to olefins](#)

[Lecture 34 - Reactions with CO insertion](#)

[Lecture 35 - Organometallics promoted C-X coupling](#)

[Lecture 36 - Organometallic polymerization](#)

[Lecture 37 - C-H activation](#)

[Lecture 38 - Asymmetric Catalysis](#)

[Lecture 39 - Medicinal applications of organometallic complexes](#)

[Lecture 40 - Special Properties and Applications](#)

Lecture 1 - Introduction to NMR spectroscopy

Lecture 2 - The alignment of nuclear spins in presence of magnetic field

Lecture 3 - Introduction to rotating frame

Lecture 4 - Free induction decay and Fourier transformation of FID

Lecture 5 - NMR Hardware

Lecture 6 - The concept of chemical shift

Lecture 7 - Factors that affect chemical shifts

Lecture 8 - Chemical shift referencing

Lecture 9 - J-coupling

Lecture 10 - Recap of basics

Lecture 11 - Introduction to general one dimensional NMR experiment

Lecture 12 - Practical aspects of recording a 1D NMR experiment - I

Lecture 13 - Practical aspects of recording a 1D NMR experiment - II

Lecture 14 - Practical aspects of recording a 1D NMR experiment - III

Lecture 15 - NMR Data processing

Lecture 16 - Basic aspects of 1D proton NMR analysis

Lecture 17 - Analysis of an example 1D proton spectrum

Lecture 18 - Analysis of 1D ¹H NMR spectra of molecules - I

Lecture 19 - Analysis of 1D ¹H NMR spectra of molecules - II

Lecture 20 - 1D ¹³C NMR

Lecture 21 - Why do we need 2D NMR

Lecture 22 - A qualitative explanation of how 2D NMR experiment works

Lecture 23 - Principles of 2D COSY and Total correlation spectroscopy (2D TOCSY)

Lecture 24 - 2D NOE-spectroscopy

Lecture 25 - 2D NOESY and 2D ROESY

Lecture 26 - What is heteronuclear correlation NMR spectroscopy

Lecture 27 - Sensitivity enhancement of heteronuclei via polarization transfer

Lecture 28 - Heteronuclear multiple quantum NMR spectroscopy (2D HMQC) and Heteronuclear single quantum NMR spectroscopy (2D HSQC)

Lecture 29 - Practical aspects of recording and processing 2D HMQC or HSQC

Lecture 30 - HMBC and its utility

[Lecture 31 - 2D HSQC TOCSY and its analysis with examples](#)

[Lecture 32 - Structure determination of molecules by NMR](#)

[Lecture 33 - Structure determination of peptides - I](#)

[Lecture 34 - Structure determination of peptides - II](#)

[Lecture 35 - Structure determination of peptides - III](#)

[Lecture 36 - Chemical exchange](#)

[Lecture 37 - Hydrogen or deuterium exchange](#)

[Lecture 38 - Diffusion ordered spectroscopy DOSY I](#)

[Lecture 39 - DOSY II](#)

[Lecture 40 - STD NMR for drug target interactions](#)

Lecture 1 - Introduction to NMR spectroscopy

Lecture 2 - Energy levels in NMR spectroscopy: Quantum mechanical model and Vector model

Lecture 3 - Observing the NMR signal

Lecture 4 - Basic concepts in 1D NMR: Chemical shift and Spin-spin coupling

Lecture 5 - Basic concepts in 1D NMR: Nuclear Spin Relaxation, ¹H NMR and ¹³C NMR

Lecture 6 - Basic concepts in 2D NMR spectroscopy

Lecture 7 - Principles of 2D correlation spectroscopy COSY

Lecture 8 - Principles of 2D Total correlation spectroscopy (TOCSY)

Lecture 9 - 2D Nuclear Overhauser Effect Spectroscopy (NOESY)

Lecture 10 - 2D NOESY and 2D ROESY

Lecture 11 - Principles of 2D Heteronuclear NMR

Lecture 12 - 2D Heteronuclear NMR: HSQC

Lecture 13 - Heteronuclear multiple quantum coherence (HMQC) and single quantum coherence (HSQC) - Part I

Lecture 14 - Heteronuclear multiple quantum coherence (HMQC) and single quantum coherence (HSQC) - Part II

Lecture 15 - 2D HSQC-TOCSY

Lecture 16 - 3D NMR Spectroscopy - Part I

Lecture 17 - 3D NMR Spectroscopy - Part II

Lecture 18 - 3D HNCA and 3D HNCO

Lecture 19 - 3D HNCACB and 3D HN(CO)CACB

Lecture 20 - Protein Backbone resonance assignment and side chain resonance assignment

Lecture 21 - Basic concepts of protein structure

Lecture 22 - Introduction to Structure Determination of Bio-Molecules by NMR

Lecture 23 - Over-expression of proteins in Bacteria

Lecture 24 - Isotope labeling of proteins for NMR studies - Part I

Lecture 25 - Isotope labeling of proteins for NMR studies - Part II

Lecture 26 - Isotope labeling of proteins for NMR studies - Part III

Lecture 27 - Isotope labeling of proteins for NMR studies - Part IV

Lecture 28 - Resonance assignments of Proteins - Part I

Lecture 29 - Resonance assignments of Proteins - Part II

Lecture 30 - Resonance assignments of Proteins - Part III

Lecture 31 - Determination of protein secondary structure from NMR data: CSI method

[Lecture 32 - Determination of protein secondary structure from NMR data: J coupling based method](#)

[Lecture 33 - Determination of protein tertiary structure from NMR data - Part I](#)

[Lecture 34 - 3D NOESY HSQC](#)

[Lecture 35 - Determination of protein tertiary structure from NMR data - Part II](#)

[Lecture 36 - Understanding Protein ligand interaction by NMR : Chemical shift perturbation](#)

[Lecture 37 - Understanding Protein ligand interaction by NMR : Chemical exchange](#)

[Lecture 38 - Understanding Protein ligand interaction by NMR : T2 Filter](#)

[Lecture 39 - Understanding Protein ligand interaction by NMR : STD NMR](#)

[Lecture 40 - Understanding Protein ligand interaction by NMR : Transfer NOE NMR](#)

[Lecture 41 - Understanding Protein ligand interaction by NMR : Diffusion ordered Spectroscopy \(DOSY\) - Part I](#)

[Lecture 42 - Understanding Protein ligand interaction by NMR : Diffusion ordered Spectroscopy \(DOSY\) - Part II](#)

Lecture 1 - Symmetry in 3D World

Lecture 2 - Two Fold Axis Representation with the Help of Esher Diagrams

Lecture 3 - Pure Rotation Axes

Lecture 4 - Properties of Crystal

Lecture 5 - Point Group Generation

Lecture 6 - Combination of Symmetry Elements

Lecture 7 - Arrangement of Symmetry Equivalent Objects

Lecture 8 - Introduction to Plane Lattices

Lecture 9 - Bravais Lattices

Lecture 10 - Details of Stereographic Projections

Lecture 11 - Stereographic Projections (Continued)

Lecture 12 - Point Group and Crystal Systems - 1

Lecture 13 - Point Group and Crystal Systems - 2

Lecture 14 - Point Groups to Space Groups

Lecture 15 - Translation components in Monoclinic System

Lecture 16 - Additional Symmetry Elements

Lecture 17 - Additional Symmetry Elements (Continued...)

Lecture 18 - Space Groups - 1

Lecture 19 - Space Groups - 2

Lecture 20 - Space Groups - 3

Lecture 21 - Space Groups - 4

Lecture 22 - Additional Information on Space Groups

Lecture 23 - Details of Space Groups - 1

Lecture 24 - Details of Space Groups - 2

Lecture 25 - Details of Space Groups - 3

Lecture 26 - Details of Space Groups - 4

Lecture 27 - Crystal Structure of Calcium Carbonate

Lecture 28 - Crystal Structure of Some Minerals

Lecture 29 - Atoms in the Crystal: Positions and Relevant Properties

Lecture 30 - Crystallographic Directions and Planes

Lecture 31 - Interference of Waves

Lecture 32 - X Ray Scattering ; optical Analogy

Lecture 33 - X Ray Scattering ; Fourier transforms

Lecture 34 - X Ray Scattering ; Deriving Laue Conditions from scattering theory

Lecture 35 - X Ray Scattering ; Laue conditions to Bragg's Law, Introduction to Reciprocal lattice

Lecture 36 - Bragg's Law in Reciprocal Space - 1

Lecture 37 - Bragg's Law in Reciprocal Space - 2

Lecture 38 - Calculation of Intensities - 1

Lecture 39 - Calculation of Intensities - 2

Lecture 40 - Conversion from Direct to reciprocal space, the inverse relations

Lecture 41 - Diffraction and Reciprocal Space (Continued...)

Lecture 42 - Limits of Resolution

Lecture 43 - Concept of Structure Factors

Lecture 44 - Systematic Absences - 1

Lecture 45 - Systematic Absences - 2

Lecture 46 - Systematic Absences - 3

Lecture 47 - Friedel's Law and Laue classes

Lecture 48 - Experimental Aspects of Data Collection

Lecture 49 - Structure Determination - 1

Lecture 50 - Structure Determination - 2

Lecture 51 - Data Reduction

Lecture 52 - Fourier Syntheses

Lecture 53 - Patterson Method - 1

Lecture 54 - Patterson Method - 2

Lecture 55 - Direct Method

Lecture 56 - Powder Diffraction - 1

Lecture 57 - Powder Diffraction - 2

Lecture 58 - Powder Diffraction - 3

Lecture 59 - Quantum Crystallography - 1

Lecture 60 - Quantum Crystallography - 2

Lecture 61 - Intermolecular Interactions

[Lecture 1](#)

[Lecture 2](#)

[Lecture 3](#)

[Lecture 4](#)

[Lecture 5](#)

[Lecture 6](#)

[Lecture 7](#)

[Lecture 8 - Nonlinear Effects](#)

[Lecture 9 - Nonlinear Effects \(Continued...\)](#)

[Lecture 10 - Nonlinear Effects \(Continued...\)](#)

[Lecture 11 - Nonlinear Effects \(Continued...\)](#)

[Lecture 12 - Nonlinear Effects \(Continued...\)](#)

[Lecture 13 - Nonlinear Effects \(Continued...\)](#)

[Lecture 14 - Nonlinear Effects \(Continued...\)](#)

[Lecture 15 - Dispersion Effects](#)

[Lecture 16 - Nonlinear and Dispersion Effects \(Continued...\)](#)

[Lecture 17 - Nonlinear and Dispersion Effects \(Continued...\)](#)

[Lecture 18 - Transverse Electromagnetic Mode](#)

[Lecture 19 - Transverse Electromagnetic Mode \(Continued...\)](#)

[Lecture 20 - Construction of Ultrafast Laser](#)

[Lecture 21 - Construction of Ultrafast Laser \(Continued...\)](#)

[Lecture 22 - Construction of Ultrafast Laser \(Continued...\)](#)

[Lecture 23 - Measurement of Ultrafast Pulse](#)

[Lecture 24 - Measurement of Ultrafast Pulse \(Continued...\)](#)

[Lecture 25 - Measurement Techniques in Ultrafast Spectroscopy](#)

[Lecture 26 - Kinetic Model of Ultrafast Spectroscopy](#)

[Lecture 27 - Kinetic Model of Ultrafast Spectroscopy \(Continued...\)](#)

[Lecture 28 - Quantum Mechanical Model of Ultrafast Spectroscopy](#)

[Lecture 29 - Ultrafast Physical Chemistry: Photophysics and Photochemistry](#)

[Lecture 30 - Ultrafast Physical Chemistry: Solid State](#)

[Lecture 31 - Ultrafast Physical Chemistry: Transition Metal Complexes and Biomolecules](#)

[Lecture 32 - Maxwell's Equations](#)

[Lecture 33 - Maxwell's Equations \(Continued...\)](#)

[Lecture 34 - Ab Initio Molecular Dynamics - 1](#)

[Lecture 35 - Ab Initio Molecular Dynamics - 2](#)

[Lecture 36 - Ab Initio Molecular Dynamics - 3](#)

[Lecture 37 - Ab Initio Molecular Dynamics - 4](#)

[Lecture 38 - Attosecond Chemical Dynamics - 1](#)

[Lecture 39 - Attosecond Chemical Dynamics - 2](#)

[Lecture 40 - Attosecond Chemical Dynamics - 3](#)

[Lecture 41 - Attosecond Chemical Dynamics - 4](#)

[Lecture 42 - Femtochemistry of Nanocatalysis - 1](#)

[Lecture 43 - Femtochemistry of Nanocatalysis - 2](#)

Lecture 1 - NMR an historical perspective and NMR active nuclei

Lecture 2 - Spin Angular Momentum and Magnetic moment

Lecture 3 - Interaction of Spins with the magnetic field

Lecture 4 - Larmor Precession and Energy of interaction

Lecture 5 - NMR detection and sensitivity

Lecture 6 - Inducing Resonance and Bulk Magnetization

Lecture 7 - Signal detection and Rotating Frame Concept

Lecture 8 - Pulse phase and signal phase

Lecture 9 - FID and Fourier Transformation

Lecture 10 - Selection rules and transitions

Lecture 11 - External and Internal interactions in NMR

Lecture 12 - Chemical Shifts

Lecture 13 - NMR Spectrum and chemical equivalence

Lecture 14 - Conversion of frequency and ppm

Lecture 15 - Field dependence and factors affecting chemical shift

Lecture 16 - Factors contributing to chemical shifts - 1

Lecture 17 - Factors contributing to chemical shifts - 2

Lecture 18 - Scalar Couplings - 1

Lecture 19 - Scalar Couplings - 2

Lecture 20 - Energy levels of coupled spins

Lecture 21 - Spin system classification and multiplicity

Lecture 22 - Multiplicity pattern of coupled spins

Lecture 23 - Active and passive coupling

Lecture 24 - Coupling among equivalent spins - 1

Lecture 25 - Coupling among equivalent spins - 2

Lecture 26 - Coupling among non-equivalent spins

Lecture 27 - Geminal and Vicinal couplings

Lecture 28 - Spin system Nomenclature

Lecture 29 - Isotope effect

Lecture 30 - Analysis of Strongly coupled spin systems

Lecture 31 - Eigen values of A2 and AMX spin systems

- Lecture 32 - Analysis of Three spin coupled systems
- Lecture 33 - Analysis of Proton NMR spectra - 1
- Lecture 34 - Analysis of Proton NMR spectra - 2
- Lecture 35 - Analysis of Proton NMR spectra - 3
- Lecture 36 - Basics of ^{13}C -NMR
- Lecture 37 - Coupled and Decoupled ^{13}C -Spectra
- Lecture 38 - Broadband decoupling in ^{13}C -NMR
- Lecture 39 - Analysis of ^{13}C spectra and DEPT
- Lecture 40 - Heteronuclear couplings and satellite analysis - 1
- Lecture 41 - Heteronuclear couplings and satellite analysis - 2
- Lecture 42 - Coupling among magnetic equivalent nuclei and isotope effect
- Lecture 43 - Analysis of spectra of other nuclei
- Lecture 44 - Spin Echoes
- Lecture 45 - Polarization transfer techniques
- Lecture 46 - INEPT and DEPT
- Lecture 47 - Decoupling and NOE
- Lecture 48 - NOE-2
- Lecture 49 - Introduction to 2D NMR
- Lecture 50 - Two-dimensional NMR
- Lecture 51 - Two dimensional NMR
- Lecture 52 - Two dimensional COSY
- Lecture 53 - COSY and examples
- Lecture 54 - Variants of COSY and TOCSY spectra
- Lecture 55 - Heteronuclear correlation and inverse detection
- Lecture 56 - Coupled and decoupled HSQC and HMBC
- Lecture 57 - NMR data acquisition - 1
- Lecture 58 - NMR data acquisition - 2
- Lecture 59 - Practical considerations of 1D NMR
- Lecture 60 - NMR Data processing
- Lecture 61 - NMR Data processing
- Lecture 62 - NMR Instrumentation - 1
- Lecture 63 - NMR Instrumentation - 2
- Lecture 64 - Relaxation processes - 1

Lecture 1 - Introduction to TDSE

Lecture 2 - Solution to TDSE, Stationary and Non-stationary States

Lecture 3 - Electron and Vibrational Superposition States

Lecture 4 - Optical Analogy to Quantum Superposition

Lecture 5 - Introduction to Python Programming

Lecture 6 - Simple Computation with Python Programming

Lecture 7 - Plotting Graph with Python Programming

Lecture 8 - Meaning of Probability Density

Lecture 9 - Time Evolution of Normalization Constant

Lecture 10 - Expectation Value and its Time Evolution

Lecture 11 - Equation of Continuity

Lecture 12 - Bohmian Mechanics

Lecture 13 - Bohmian Mechanics and Standard Interpretation

Lecture 14 - Grid Representation of Wavefunction

Lecture 15 - Normalizing the Discretized Wavefunction and Finding Expectation Value

Lecture 16 - Plane Matter Wave and Wavepacket

Lecture 17 - Wavepacket

Lecture 18 - Stationary Gaussian Wavepacket

Lecture 19 - Travelling Gaussian Wavepacket

Lecture 20 - General Form of the Gaussian Wavepacket

Lecture 21 - Fourier Transform of a wavefunction

Lecture 22 - x-grid to k-grid

Lecture 23 - Fourier Transform using fft

Lecture 24 - Hilbert Space and Its Properties

Lecture 25 - Basis Set Approach to Quantum Mechanics

Lecture 26 - Matrix Algebra

Lecture 27 - Eigenvalue and Eigenfunction

Lecture 28 - Matrix Representation of Operators

Lecture 29 - Matrix Representation of Hamiltonian Operator

Lecture 30 - Python Tutorial 4 (Eigenvalue and Eigenfunction)

Lecture 31 - Python Tutorial 4 (Eigenvalue and Eigenfunction)

[Lecture 32 - Time Evolution Operator](#)

[Lecture 33 - Split Operator Metho](#)

[Lecture 34 - Numerical Implementation of Split Operator Method](#)

[Lecture 35 - Wavepacket Dynamics under zero interaction potential](#)

[Lecture 36 - Wavepacket Dynamics under zero interaction potential \(Continued...\)](#)

[Lecture 37 - Wavepacket Dynamics under linear interaction potential](#)

[Lecture 38 - Quantum Adiabatic Theory](#)

[Lecture 39 - Formal Derivation of Quantum Adiabatic](#)

[Lecture 40 - Geometric Phase and Dynamical Phase](#)

[Lecture 41 - Nonradiative Transition - Part 1](#)

[Lecture 42 - Nonradiative Transition - Part 2](#)

[Lecture 43 - Nonradiative Transition](#)

[Lecture 44 - Quantum Dissipative Dynamics](#)

[Lecture 45 - Quantum Dissipative Dynamics](#)

[Lecture 46 - Formal Derivation of Dissipative Quantum Dynamics](#)

[Lecture 47 - Classical Description of Light](#)

[Lecture 48 - Vector and Scalar Potential](#)

[Lecture 49 - Vector and Scalar Potential](#)

[Lecture 50 - Master Equation of Light](#)

[Lecture 51 - Hamiltonian for Light-Atom Interaction](#)

[Lecture 52 - Hamiltonian for Light-Atom Interaction](#)

[Lecture 53 - Absorption and Stimulated Emission](#)

[Lecture 54 - Absorption and Stimulated Emission](#)

[Lecture 55 - Time Correlation Function](#)

[Lecture 56 - Fourier Transform of Time Correlation Function](#)