

Lecture 1 - Introduction of Organometallic Chemistry

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Lecture 8 - Migratory Insertion and Elimination Reactions

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Lecture 11 - Beta-Migratory Insertion

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

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- Lecture 35 - Strong and weak acids and bases
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- Lecture 55 - Identifying sites for Drug-Protein Interactions, DSC of Protein-Ligand Complexes. Enthalpy-Entropy Compensation
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- Lecture 16 - Role of Alkali, Alkaline earth elements in life
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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 [R<sub>3</sub>SiH, including polymethylhydrosiloxanes (PMHS)] as reducing agents
- Lecture 32 - Further aspects of silanes as reducing agents and Barton-McCombie deoxygenation
- Lecture 33 - Tributyltinhydride (n-Bu<sub>3</sub>SnH) 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

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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

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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

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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

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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

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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

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Lecture 62 - Intermolecular forces: Dipole-dipole, hydrogen bonding

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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

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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

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Lecture 2 - NMR Basic Concepts - II

Lecture 3 - NMR Basic Concepts - III

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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
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- 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
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- 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

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Lecture 2 - History of Periodic Table - 2

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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]

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Lecture 26 - Preparation of metal Complexes

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Lecture 28 - Classification of ligands by donor atoms - Hydrogen

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

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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
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- 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
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- Lecture 56 - UV-Visible Spectroscopy
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- Lecture 60 - Summary and Conclusion

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Lecture 2 - Radioactive decay

Lecture 3 - Radioactive decay chain

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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

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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

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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

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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

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Lecture 20 - Relating Canonical Partition Function Internal Energy and Entropy

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

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

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

Lecture 29 - The Rotational Contribution to Molecular Partition Function

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**NPTEL : Heterocyclic Chemistry (Chemistry and Biochemistry)**

**Co-ordinators : Prof. D.R. Mal**

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

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

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**NPTEL : Rate processes (Chemistry and Biochemistry)**

**Co-ordinators : Dr. M. Halder**

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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...)

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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...)

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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 \(Continued...\)](#)

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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

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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...)

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

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

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

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

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

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

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

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

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

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

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

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Lecture 2 - Definition

Lecture 3 - Classification of Ligands - I

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Lecture 5 - Ligands- III and Nomenclature - I

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Lecture 7 - Coordination Number - I

Lecture 8 - Coordination Number - II

Lecture 9 - Coordination Number - III

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Lecture 11 - Isomerism - I

Lecture 12 - Isomerism - II

Lecture 13 - Co-ordination Equilibria - I

Lecture 14 - Co-ordination Equilibria - II

Lecture 15 - Bonding in Complexes - I

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Lecture 17 - Bonding in Complexes - III

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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

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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

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Lecture 8 - Absolute Configuration (Continued...)

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Lecture 12 - Relative Configuration, Prochiral Faces and Prochiral Centres

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Lecture 17 - Conformations of Acyclic Molecules Containing Heteroatoms

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

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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 exploratioin

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

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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

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Lecture 23 - Fg based strategy

Lecture 24 - Fg based strategy based on protecting groups

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Lecture 30 - Fg based strategy

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Lecture 36 - Fg/Tf/SM based strategies

Lecture 37 - Fg based strategies

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

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Lecture 40 - Fg/SM/Tf based combined strategies

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Lecture 42 - Fg based strategies

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Lecture 46 - Symmetry based strategy

Lecture 47 - Symmetry based strategies

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Lecture 49 - Topological based strategies

Lecture 50 - Topological strategies

Lecture 51 - Topological strategies

Lecture 52 - Stereochemical strategies

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Lecture 54 - Stereochemical strategies

Lecture 55 - Stereochemical Strategies

Lecture 56 - Stereochemical strategies

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Lecture 2 - Buffers

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[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: Eneidyne (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<sup>+</sup>) channels

Lecture 24 - (Na<sup>+</sup>) channels

Lecture 25 - (Na<sup>+</sup>)-(K<sup>+</sup>) ATPase

Lecture 26 - (Mg<sup>2+</sup>) dependent enzymes and kinases

Lecture 27 - Phosphatases and enolases

Lecture 28 - Photoreception and enzymes

Lecture 29 - (Ca<sup>2+</sup>) transporting, binding and sensor proteins

Lecture 30 - Cell signaling by (Ca<sup>2+</sup>) binding and sensing

Lecture 31 - Functions of iron ions and iron ion proteins

- Lecture 32 - Heme proteins for (O<sub>2</sub>) transport and storage
- Lecture 33 - Activators of (O<sub>2</sub>) 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 - Introduction

Lecture 2 - System, Equilibrium States

Lecture 3 - Mathematical foundation - Exact differentials

Lecture 4 - Mathematical foundation - Inexact differentials

Lecture 5 - First law - Introduction to Internal energy

Lecture 6 - First law - Heat and work

Lecture 7 - First law - Pressure-volume work

Lecture 8 - First law - Internal energy revisited

Lecture 9 - First Law - Enthalpy

Lecture 10 - First law - Estimation of change in internal energy and enthalpy

Lecture 11 - Second law - Introduction

Lecture 12 - Second law - Carnot engine and entropy

Lecture 13 - Entropy and Third law

Lecture 14 - Entropy and Spontaneity in isolated systems

Lecture 15 - Spontaneity and equilibrium - Thermodynamic potentials

Lecture 16 - Spontaneity and equilibrium - Non-isolated systems

Lecture 17 - Thermodynamic potentials and Maxwell's relations

Lecture 18 - Application of Maxwell's relations

Lecture 19 - Thermodynamic response functions

Lecture 20 - Using Maxwell's relations to solve numerical problems

Lecture 21 - Fundamental Equation of Chemical Thermodynamics

Lecture 22 - Open systems and chemical potential

Lecture 23 - Chemical potential in one and many component ideal gas

Lecture 24 - Gibbs-Duhem relation and thermodynamics of ideal gas mixture

Lecture 25 - Numerical applications of Gibbs-Duhem relation

Lecture 26 - Phase equilibrium - Part 1

Lecture 27 - Phase equilibrium - Part 2

Lecture 28 - Phase equilibrium - Part 3

Lecture 29 - Phase equilibrium - Part 4

Lecture 30 - Numerical problems in phase equilibrium

Lecture 31 - Simple non-reactive mixtures - Part 1



- Lecture 32 - Simple non-reactive mixtures - Part 2
- Lecture 33 - Numerical problems in simple mixtures
- Lecture 34 - Numerical problems on phase equilibrium in simple mixtures
- Lecture 35 - Chemical potential of real systems - Activity and concentration
- Lecture 36 - Numerical problems on chemical potential in real systems
- Lecture 37 - Chemical Equilibrium - Part I
- Lecture 38 - Chemical Equilibrium - Part II
- Lecture 39 - Chemical Equilibrium - Part III
- Lecture 40 - Chemical Equilibrium - Part IV
- Lecture 41 - Numerical problems on chemical equilibrium
- Lecture 42 - Numerical problems on chemical equilibrium (Continued...)
- Lecture 43 - Electrochemical equilibrium - Part I
- Lecture 44 - Electrochemical equilibrium - Part II
- Lecture 45 - Electrochemical equilibrium - Part III
- Lecture 46 - Electrochemical equilibrium - Part IV
- Lecture 47 - Electrochemical equilibrium - Part V
- Lecture 48 - Electrochemical equilibrium - Part VI
- Lecture 49 - Numerical problems on electrochemistry
- Lecture 50 - Numerical problems on electrochemistry (Continued...)
- Lecture 51 - Numerical problems on electrochemistry (Continued...)
- Lecture 52 - Numerical problems on electrochemistry (Continued...)
- Lecture 53 - Numerical problems on electrochemistry (Continued...)
- Lecture 54 - Thermodynamic stability
- Lecture 55 - Thermodynamics in action - Part I
- Lecture 56 - Thermodynamics in action - Part II
- Lecture 57 - Thermodynamics in action - Part III
- Lecture 58 - Thermodynamics in action - Part IV
- Lecture 59 - Demonstration
- Lecture 60 - Concluding Lecture

Lecture 1 - Carbocation

Lecture 2 - Carbocation (Continued...)

Lecture 3 - Carbocation (Continued...)

Lecture 4 - Carbocation (Continued...)

Lecture 5 - Carbocation (Continued...)

Lecture 6 - Carbanion

Lecture 7 - Carbanion (Continued...)

Lecture 8 - Carbanion (Continued...)

Lecture 9 - Carbanion (Continued...)

Lecture 10 - Carbanion (Continued...)

Lecture 11 - Carbene

Lecture 12 - Carbene (Continued...)

Lecture 13 - Carbene (Continued...)

Lecture 14 - Carbene (Continued...)

Lecture 15 - Nitrene

Lecture 16 - Nitrene(Continued...)

Lecture 17 - Radical

Lecture 18 - Radical (Continued...)

Lecture 19 - Free Radical

Lecture 20 - Radical

Lecture 21 - Radical

Lecture 22 - Free Radical (Continued...)

Lecture 23 - Radical

Lecture 24 - Free Radical Reactions

Lecture 25 - Radical (Continued...)

Lecture 26 - Radical (Continued...)

Lecture 27 - Radical (Continued...)

Lecture 28 - Benzyne

Lecture 29 - Benzyne (Continued...)

Lecture 30 - Benzyne (Continued...)

Lecture 31 - Benzyne question answer discussion

[Lecture 32 - Organolithium](#)

[Lecture 33 - Organolithium \(Continued...\)](#)

[Lecture 34 - Organolithium \(Continued...\)](#)

[Lecture 35 - Organolithium \(Continued...\)](#)

[Lecture 36 - Organolithium \(Continued...\)](#)

[Lecture 37 - Grignard](#)

[Lecture 38 - Grignard \(Continued...\)](#)

[Lecture 39 - Organocopper](#)

[Lecture 40 - Organozinc](#)

[Lecture 41 - Organoboron Chemistry](#)

[Lecture 42 - Organoboron Chemistry \(Continued...\)](#)

[Lecture 43 - Organoboron Chemistry \(Continued...\)](#)

[Lecture 44 - Organoboron Chemistry \(Continued...\)](#)

[Lecture 45 - Organoboron](#)

[Lecture 46 - Organoboron Chemistry](#)

[Lecture 47 - Organosilicon Chemistry](#)

[Lecture 48 - Organosilicon Chemistry \(Continued...\)](#)

[Lecture 49 - Organosilicon Chemistry \(Continued...\)](#)

[Lecture 50 - Organosulfur Chemistry](#)

[Lecture 51 - Organosulfur](#)

[Lecture 52 - Organosulfur \(Continued...\)](#)

[Lecture 53 - Organosulfur \(Continued...\)](#)

[Lecture 54 - Organophosphorus Chemistry](#)

[Lecture 55 - Organophosphorus Chemistry \(Continued...\)](#)

[Lecture 56 - Tutorial 1](#)

[Lecture 57 - Tutorial 2](#)

[Lecture 58 - Tutorial 3](#)

[Lecture 59 - Tutorial 4](#)

[Lecture 60 - Tutorial 5](#)

[Lecture 61 - Tutorial 6](#)

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

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- 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
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- Lecture 19 - Pericyclic reactions  $\hat{A}$ - Sigmatropic rearrangements (Continued...)
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- Lecture 22 - Pericyclic reactions  $\hat{A}$ - Chelotropic reactions - introduction, SO<sub>2</sub> extrusion reactions
- Lecture 23 - Pericyclic reactions  $\hat{A}$ - Tutorial session 3 - Problems on sigmatropic reactions
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- Lecture 27 - Introduction to organic photochemistry
- Lecture 28 - Photochemistry of alkenes cis-trans isomerization
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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

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Lecture 22 - Origin of Reciprocal Lattice

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Lecture 11 - Expectation Values and Postulates in Quantum Mechanics

Lecture 12 - Problems and Solutions for Particle in One and Two Dimensional Boxes

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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

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Lecture 20 - Particle on a Ring: Expectation Values for Angular Momentum

Lecture 21 - Coordinate Transformation

Lecture 22 - Problems and Solutions for Harmonic Oscillator

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Lecture 24 - Hydrogen Atom: Separation of the Schrödinger Equation

Lecture 25 - Hydrogen Atom: Radial and Angular Solutions and Animations - Part I

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Lecture 36 - Video Tutorial for Hermite polynomials and hydrogen atom - Part 1

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Lecture 42 - Hydrogen Molecule Ion: Calculations and Results

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Lecture 11 - Receptor Types and Functions

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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

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Lecture 29 - Atomic Orbitals - Part 4 and Hermitian Operators

Lecture 30 - Measurement, Uncertainty Principle

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- Lecture 2 - Metal carbonyl complexes
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- 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  $\pi$  bonding
- Lecture 14 - Metal dihydrogen and hydrides
- Lecture 15 - Migratory Insertion reaction with alkynes
- Lecture 16 -  $\eta^m$  ( $m=4$  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 -  $\eta^3$  complexes-synthesis, bonding
- Lecture 23 - Metal-allyls -  $\eta^3$  complexes-fluxionality, reactivity
- Lecture 24 - C-C single bond forming reactions
- Lecture 25 -  $\eta^5$  Cyclopentadienyl - complexes
- Lecture 26 -  $\eta^6$  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
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Lecture 2 - The alignment of nuclear spins in presence of magnetic field

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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

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Lecture 14 - Practical aspects of recording a 1D NMR experiment - III

Lecture 15 - NMR Data processing

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Lecture 17 - Analysis of an example 1D proton spectrum

Lecture 18 - Analysis of 1D <sup>1</sup>H NMR spectra of molecules - I

Lecture 19 - Analysis of 1D <sup>1</sup>H NMR spectra of molecules - II

Lecture 20 - 1D <sup>13</sup>C 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

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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, <sup>1</sup>H NMR and <sup>13</sup>C 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

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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

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Lecture 19 - 3D HNCACB and 3D HN(CO)CACB

Lecture 20 - Protein Backbone resonance assignment and side chain resonance assignment

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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

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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

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Lecture 11 - Stereographic Projections (Continued)

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Lecture 14 - Point Groups to Space Groups

Lecture 15 - Translation components in Monoclinic System

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Lecture 17 - Additional Symmetry Elements (Continued...)

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Lecture 19 - Space Groups - 2

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Lecture 22 - Additional Information on Space Groups

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Lecture 27 - Crystal Structure of Calcium Carbonate

Lecture 28 - Crystal Structure of Some Minerals

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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

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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

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Lecture 59 - Quantum Crystallography - 1

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Lecture 61 - Intermolecular Interactions

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Lecture 9 - Nonlinear Effects (Continued...)

Lecture 10 - Nonlinear Effects (Continued...)

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Lecture 16 - Nonlinear and Dispersion Effects (Continued...)

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Lecture 19 - Transverse Electromagnetic Mode (Continued...)

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Lecture 1 - NMR an historical perspective and NMR active nuclei

Lecture 2 - Spin Angular Momentum and Magnetic moment

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Lecture 5 - NMR detection and sensitivity

Lecture 6 - Inducing Resonance and Bulk Magnetization

Lecture 7 - Signal detection and Rotating Frame Concept

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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

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Lecture 18 - Scalar Couplings - 1

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Lecture 20 - Energy levels of coupled spins

Lecture 21 - Spin system classification and multiplicity

Lecture 22 - Multiplicity pattern of coupled spins

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Lecture 28 - Spin system Nomenclature

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- Lecture 32 - Analysis of Three spin coupled systems
- Lecture 33 - Analysis of Proton NMR spectra - 1
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- Lecture 36 - Basics of  $^{13}\text{C}$ -NMR
- Lecture 37 - Coupled and Decoupled  $^{13}\text{C}$ -Spectra
- Lecture 38 - Broadband decoupling in  $^{13}\text{C}$ -NMR
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- Lecture 40 - Heteronuclear couplings and satellite analysis - 1
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- Lecture 42 - Coupling among magnetic equivalent nuclei and isotope effect
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- Lecture 54 - Variants of COSY and TOCSY spectra
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- Lecture 56 - Coupled and decoupled HSQC and HMBC
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- Lecture 59 - Practical considerations of 1D NMR
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Lecture 4 - Optical Analogy to Quantum Superposition

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