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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

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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

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[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](#)

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

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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

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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
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- Lecture 35 - Determination of Structure and Dynamics of Proteins - 5
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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
- 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
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- 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

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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

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Lecture 30 - Radioisotope production using charged particles

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Lecture 42 - Actinide concept

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Lecture 45 - pH-pE concept

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Lecture 49 - Ln/An emission spectroscopy - II

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Lecture 51 - Complexation of actinides - I

Lecture 52 - Complexation of actinides - II

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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

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

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

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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)

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Lecture 51 - Topological strategies

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Lecture 54 - Stereochemical strategies

Lecture 55 - Stereochemical Strategies

Lecture 56 - Stereochemical strategies

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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)

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Lecture 8 - Amino Acid Titrations

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Lecture 10 - pI Determination of Lysine

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Lecture 22 - Protein Folding and Denaturation Summary

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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

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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 SO₂Cl₂, 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

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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

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Lecture 30 - Bromine and bromine compounds

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Lecture 32 - Iodine and iodine compounds

Lecture 33 - Mineral fertilizers

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Lecture 44 - Silicon and its compounds

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Lecture 48 - Inorganic solids: glass

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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

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

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

[Lecture 14 - Reaction of Carbene \(Continued...\)](#)

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[Lecture 18 - Reaction of Nitrene](#)

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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

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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...)

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[Lecture 48 - Antimicrobial drugs](#)

[Lecture 49 - Chemistry of penicillins](#)

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[Lecture 59 - Aromatase inhibition and Anti-ulcer drugs](#)

[Lecture 60 - Cholesterol lowering agents](#)

[Lecture 61 - Cholesterol Biosynthesis](#)

[Lecture 62 - Pharmacokinetics and pharmacodynamics](#)

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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](#)

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[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](#)

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[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⁺) 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

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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 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

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- 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
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- 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 17 - Lecture 17 - The Quantum Mechanics of Hydrogen Atom - Part IV
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- Lecture 19 - Lecture 19A - Assignment 1 Solution/Hints
- Lecture 20 - Lecture 19B - Assignment 1 Solution/Hints
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- 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
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- Lecture 28 - Lecture 24 - Particle on a Ring - Part I
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Lecture 4 - Equivalent Points and 1D Lattices

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Lecture 6 - 2D Space Lattices

Lecture 7 - Crystallographic Point Groups

Lecture 8 - Stereographic Projections of Point Groups

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Lecture 10 - 2D Projection of Space Groups

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Lecture 13 - Obtaining Equivalent Points by Shifting of Origin

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Lecture 18 - Cubic Structures and atomic packing factors

Lecture 19 - Ceramic Structures

Lecture 20 - Theory of X-Ray Diffraction

Lecture 21 - Tutorial - 03

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Lecture 23 - Bragg's Law in Reciprocal Lattice and Origin of Systematic Absences

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- Lecture 36 - Non-ideal solutions, Activity of ions (Debye-Huckel theory) - 1
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- Lecture 38 - Electrochemistry: Insights into electrode processes, Ionic conductivity - 1
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- 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

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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

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Lecture 7 - Elementary Mathematics: Matrix Eigenvalues and Eigenfunctions - Part I

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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

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- 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 Adiat](#)

[Lecture 40 - Geometric Phase and Dynamical Phase](#)

[Lecture 41 - Nonradiative Transition - Part 1](#)

[Lecture 42 - Nonradiative Transition - Part 2](#)

[Lecture 43 - Nonradiative Transition](#)

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[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](#)