

Lecture 1 - Introduction of Organometallic Chemistry

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Lecture 5 - Oxidative Addition [2. SN2 Mechanism]

Lecture 6 - Oxidative Addition [3. Radical Mechanism]

Lecture 7 - Reductive Elimination

Lecture 8 - Migratory Insertion and Elimination Reactions

Lecture 9 - Migration and Insertion Reactions

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

Lecture 11 - Beta-Migratory Insertion

Lecture 12 - Beta-Elimination Reaction

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

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Lecture 16 - Hydrogenation Reaction

Lecture 17 - Hydrogenation Reaction [Dihydride Catalyst]

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

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

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Lecture 12 - Discussion on Gibbs Energy

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Lecture 14 - Further discussion on properties of Gibbs energy

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Lecture 17 - Tutorial session

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

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

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

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

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Lecture 3 - Classification of Main Group Compounds

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Lecture 6 - 18 Valence Electron Rule and Classification

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Lecture 5 - Cyclopropanation Reaction

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

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

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Lecture 11 - Groups and subgroups

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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

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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

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

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

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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

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- 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
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- 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
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Lecture 14 - Molecular orbital theory 2: Diatomic molecules

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Lecture 18 - Molecular orbital theory 6: Polyatomic molecules

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

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Lecture 58 - Extraction of metals

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- Lecture 15 - Chirality and biology - V
- Lecture 16 - Origin of chirality
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Lecture 3 - Configuration and Weights (Continued...)

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[Lecture 53 - Mechanistic enzymology of Isopenicillin N synthase](#)

[Lecture 54 - Polyketide Biosynthesis](#)

[Lecture 55 - Biosynthesis of macrolide polyketides and introduction to virus](#)

[Lecture 56 - Anti-viral drugs](#)

[Lecture 57 - Cancer and Chemotherapy](#)

[Lecture 58 - Anti-cancer drugs \(Continued...\)](#)

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

[Lecture 60 - Cholesterol lowering agents](#)

[Lecture 61 - Cholesterol Biosynthesis](#)

[Lecture 62 - Pharmacokinetics and pharmacodynamics](#)

[Lecture 63 - QSAR principles](#)

Lecture 1 - Importance of Polymer Science and Brief Historical background

Lecture 2 - Definitions/Terminologies, Classifications

Lecture 3 - Classifications, Nomenclature

Lecture 4 - Classification by Polymerization Mechanism, Nomenclature

Lecture 5 - Molecular Weight, Big Picture of Polymer Science, Common Polymers

Lecture 6 - Examples of Step Polymers, Linear Step Polymerization

Lecture 7 - Linear Step Polymerization: MW Control, MW Distribution, Kinetics

Lecture 8 - Linear Step Polymerization: Kinetics (Continued...), Equilibrium Consideration, General Requirements for Achieving High MW; Non-linear Step Polymerization

Lecture 9 - Linear Step Polymerization: Summary - General Requirement, Non-Linear Step Polymerization

Lecture 10 - Types of Chain polymerization, Mechanism and Kinetics of Radical Chain Polymerization

Lecture 11 - Kinetics of Radical Chain Polymerization (Continued...), Various Types of Initiators

Lecture 12 - Thermal Initiation (Continued...), Molecular Weight and Kinetic Chain Length, Other Types of Radical Initiators, Transfer Reactions

Lecture 13 - Transfer Reactions, Effect of Temperature on Rate and MW, MW Distribution, ceiling Temperature

Lecture 14 - Energetics and Thermodynamics of Chain Polymerization, MW Distribution, Common Polymers

Lecture 15 - Thermodynamics of Chain Polymerization, MW Distribution, Common Polymers

Lecture 16 - Process Conditions, Emulsion Polymerization

Lecture 17 - Emulsion Polymerization (Continued...), Common Polymers by Radical Chain Polymerization, RDRP

Lecture 18 - Reversible - Deactivation Radical Polymerizations (RDRP)

Lecture 19 - RAFT Polymerization (Continued...), Ionic Polymerization

Lecture 20 - Polymer Stereochemistry and Zeigler - Natta Coordination Polymerization

Lecture 21 - Ring Opening Polymerization, Copolymers

Lecture 22 - Copolymerization (Continued...)

Lecture 23 - Polymers in Solution : Flory - Huggins Theory

Lecture 24 - Polymers in Solution : Application of Flory - Huggins Theory

Lecture 25 - Polymers in Solution : Solubility Parameter, Polymer Phase Separation and Fractionation

Lecture 26 - Polymers Chain Dimensions

Lecture 27 - Frictional Properties of Polymer Molecules in Dilute Solution, Determination of Polymer MW (Overview)

Lecture 28 - Membrane Osmometry, End Group Analysis, Dilute Solution Viscometry

Lecture 29 - Dilute Solution Viscometry, Light Scattering Techniques for MW

Lecture 30 - Gel Permeation Chromatography

[Lecture 31 - Light Scattering Techniques for MW and Size Measurements \(Continued...\)](#)

[Lecture 32 - Mass Spectroscopy of Polymers](#)

[Lecture 33 - Polymer Processing](#)

[Lecture 34 - Mechanical Properties, Amorphous State](#)

[Lecture 35 - Thermal Properties: Amorphous State](#)

[Lecture 36 - Thermal Properties: Crystalline State](#)

[Lecture 37 - Thermal Properties: Factors Influencing \$T_m\$, Determination of \$T_g\$ and \$T_m\$, Other Thermal Properties](#)

[Lecture 38 - Thermomechanical Properties, Viscoelasticity](#)

[Lecture 39 - Thermomechanical Properties, Viscoelasticity \(Continued...\)](#)

[Lecture 40 - Optical, Electrical, Barrier Properties; Chemical Resistance and Weathering of Polymers](#)

[Lecture 41 - Polymer Additives](#)

[Lecture 42 - Polymer Blends, Concluding Remarks](#)

NPTEL : NOC:Structure, Stereochemistry and Reactivity of Organic Compounds and Intermediates: A Problem Solving Approach (Chemistry and Biochemistry)

Co-ordinators : Prof. A. Basak

Lecture 1 - Introduction to structure and stereochemistry of organic molecules: salient features of symmetry elements; Role of principal axis, sigma plane, centre of symmetry, and alternating axis of symmetry in deciding chirality

Lecture 2 - Introduction to point group notation, classification, symmetry number and order

Lecture 3 - Examples of various point group notations, chiral and achiral point groups, examples of various point groups

Lecture 4 - Solving problems on point groups (C_n , C_{nv} , C_{nh} , D_{nd})

Lecture 5 - Conformational Analysis of Perhydrophenanthrene

Lecture 6 - Concept Clearing Session on Achiral Point Groups

Lecture 7 - Axial, Planar and Helical Chirality, assignment of absolute configuration to such molecules

Lecture 8 - Concept of pseudoasymmetry; Reflection variance/invariance problem; methods of nomenclature system

Lecture 9 - Conformational analysis of bicyclic systems: the Decalins

Lecture 10 - Conformational analysis of Perhydrophenanthrene

Lecture 11 - Conformational analysis of Perhydroanthracene

Lecture 12 - Revisiting conformational analysis of Perhydrophenanthrene

Lecture 13 - Revisiting conformational analysis of Perhydroanthracene

Lecture 14 - Introduction to Linear Polarized light and interaction with chiral materials; Circular Birefringence, Circular Dichroism

Lecture 15 - ORD, CD and Cotton Effect (CE); Empirical rule to determine the sign of CE, 2-axial haloketone rule

Lecture 16 - Octant rule: application to substituted cyclohexanone and decalone system

Lecture 17 - Application of Octant rule to tricyclic system; drawing of octant projection

Lecture 18 - Application of Octant rule to steroidal ketones; drawing of octant projection

Lecture 19 - Stereoelectronic effects on conformation and reactivity

Lecture 20 - Examples of anomeric effect and Stereoelectronic effect

Lecture 21 - Baldwin rules

Lecture 22 - Cyclization in enolic systems

Lecture 23 - Problem solving on Baldwin rules

Lecture 24 - Reactive Functionalities: Chemistry of Alkynes

Lecture 25 - Reactive Functionalities: Chemistry of Alkynes (Continued...), arynes and enediynes

Lecture 26 - Reactive Functionalities: Ene-diynes (Continued...), allenes and Ketenes

Lecture 27 - Beta - Lactam Synthesis

Lecture 28 - Chemistry of radicals

Lecture 29 - Reactivity of radicals: Frontier orbital approach.

Lecture 30 - Radical mediated C-C bond formation

[Lecture 31 - Radical mediated C-C bond formation \(Continued...\)](#).

[Lecture 32 - Radical mediated decarboxylation and deoxygenation](#)

[Lecture 33 - Dynamic Stereochemistry: Conformationally rigid and mobile systems](#)

[Lecture 34 - Dynamic Stereochemistry: Conformational analysis of elimination and addition](#)

[Lecture 35 - Dynamic Stereochemistry: Stereoselectivity in carbonyl reduction](#)

[Lecture 36 - Dynamic Stereochemistry: Reactivity of unsaturated carbonyl and enolate systems](#)

[Lecture 37 - Dynamic Stereochemistry: Enolate as nucleophile](#)

[Lecture 38 - Dynamic Stereochemistry: stereochemical issues in cyclohexenone reduction and alpha-electrophilic substitution in carbonyls](#)

[Lecture 39 - Dynamic Stereochemistry: Asymmetric aldol reactions](#)

[Lecture 40 - Dynamic Stereochemistry: Asymmetric aldol reaction \(Continued...\)](#)

Lecture 1 - Review of Quantum Chemistry

Lecture 2 - Postulates of Quantum Mechanics - I

Lecture 3 - Postulates of Quantum Mechanics - II

Lecture 4 - Exactly Solvable Models - I

Lecture 5 - Exactly Solvable Models - II

Lecture 6 - Exactly Solvable Models - II (Continued...)

Lecture 7 - Variational Principle - I

Lecture 8 - Variational Principle - II

Lecture 9 - Variational Method: Applications - I

Lecture 10 - Linear Variational Method

Lecture 11 - Applications of Linear Variational Method

Lecture 12 - Variational Method in Chemical Bonding - I

Lecture 13 - Variational Method in Chemical Bonding - II

Lecture 14 - Variational Method in Chemical Bonding - III

Lecture 15 - Molecular Orbital Treatment of Polyatomics

Lecture 16 - Molecular Orbital Treatment of Polyatomics

Lecture 17 - Perturbation Theory

Lecture 18 - Examples of Perturbation Theory - I

Lecture 19 - Examples of Perturbation Theory - II

Lecture 20 - Molecular Response to Electric Field - I

Lecture 21 - Molecular Response to Electric Field - II

Lecture 22 - Degenerate Perturbation Theory

Lecture 23 - Excited States of He Atom - I

Lecture 24 - Excited States of He Atom - II

Lecture 25 - Slater Determinants - I

Lecture 26 - Slater Determinants - II

Lecture 27 - Energy Expectation Value with Slater Determinants - I

Lecture 28 - Energy Expectation Value with Slater Determinants - II

Lecture 29 - Self-Consistent Field Method

Lecture 30 - Canonical HF Equations

Lecture 31 - Hartree-Fock Energy

[Lecture 32 - Hartree-Fock-Roothan Equations](#)

[Lecture 33 - The Density Matrix](#)

[Lecture 34 - Evaluation of Molecular Properties](#)

[Lecture 35 - Basis Sets - I](#)

[Lecture 36 - Basis Sets - II](#)

[Lecture 37 - Electron Correlation and Post HF Methods](#)

[Lecture 38 - Time-Dependent Perturbation Theory - I](#)

[Lecture 39 - Time-Dependent Perturbation Theory - II](#)

[Lecture 40 - Slowly Switched Constant Perturbation](#)

[Lecture 41 - Oscillating Perturbation](#)

[Lecture 42 - Einstein's Coefficients](#)

Lecture 1 - Metal Ions In Biological Systems

Lecture 2 - Metallobiosite structures

Lecture 3 - Biomolecular structure and molecular biology component

Lecture 4 - Structures of nucleic acids

Lecture 5 - Coordination Chemistry in action

Lecture 6 - Coordination of peptide building blocks

Lecture 7 - Occurrence and availability

Lecture 8 - Potential ligands of different types

Lecture 9 - Metal ion insertion

Lecture 10 - Organic cofactors and siderophores

Lecture 11 - Introduction

Lecture 12 - CD and Raman spectroscopy

Lecture 13 - EPR

Lecture 14 - NMR and X-ray

Lecture 15 - Electrochemical methods

Lecture 16 - Metal ion assimilation

Lecture 17 - Transport of metal ions in bacteria and plants

Lecture 18 - Transport of metal ions in fungi and mammals

Lecture 19 - Homeostasis in bacteria and plants

Lecture 20 - Homeostasis in fungi and mammals

Lecture 21 - Transport across membranes

Lecture 22 - Ion channels and ion pumps

Lecture 23 - (K⁺) channels

Lecture 24 - (Na⁺) channels

Lecture 25 - (Na⁺)-(K⁺) ATPase

Lecture 26 - (Mg²⁺) dependent enzymes and kinases

Lecture 27 - Phosphatases and enolases

Lecture 28 - Photoreception and enzymes

Lecture 29 - (Ca²⁺) transporting, binding and sensor proteins

Lecture 30 - Cell signaling by (Ca²⁺) binding and sensing

Lecture 31 - Functions of iron ions and iron ion proteins

- Lecture 32 - Heme proteins for (O₂) transport and storage
- Lecture 33 - Activators of (O₂) and electron transport proteins
- Lecture 34 - Iron-sulfur proteins
- Lecture 35 - Mononuclear and dinuclear non-heme enzymes
- Lecture 36 - Oxygen transport and SOD activity
- Lecture 37 - Type 1 blue copper proteins
- Lecture 38 - Type 2 non-blue copper proteins
- Lecture 39 - Type 3 dinuclear copper proteins
- Lecture 40 - Multicopper and mixed-copper enzymes
- Lecture 41 - Coordination chemistry and function of zinc ions
- Lecture 42 - Carbonic anhydrase and lyases
- Lecture 43 - Carboxypeptidase and metalloproteinases
- Lecture 44 - Alcohol dehydrogenase and Beta-lactamase
- Lecture 45 - Redox catalysis by manganese ions
- Lecture 46 - Redox catalysis by manganese ions
- Lecture 47 - Catalysis by manganese and cobalt ions
- Lecture 48 - Cobalt ion dependent proteins and enzymes
- Lecture 49 - Nickel proteins and enzymes
- Lecture 50 - More nickel ion bearing enzymes
- Lecture 51 - Carbon, hydrogen and oxygen
- Lecture 52 - Nitrogen and Silicon
- Lecture 53 - Phosphorus
- Lecture 54 - Sulfur and Selenium
- Lecture 55 - Chlorine and Iodine
- Lecture 56 - Brain and blood-brain barrier (BBB)
- Lecture 57 - Zinc and copper ions
- Lecture 58 - Iron ions
- Lecture 59 - Metal ion based drugs and metallotherapeutics
- Lecture 60 - Chemotherapy, radiotherapy and contrast agents

- Lecture 1 - Enolate generation, structure of enolates and related topic - I
- Lecture 2 - Enolate generation, structure of enolates and related topic - II
- Lecture 3 - Enolate generation, structure of enolates and related topic - III
- Lecture 4 - Different mode of asymmetric induction in enolate alkylation
- Lecture 5 - Revisit again, Different mode of asymmetric induction in enolate alkylation
- Lecture 6 - Substrate directed stereocontrol in acyclic and cyclic system
- Lecture 7 - Substrate directed enolate alkylation in bicyclic system
- Lecture 8 - Seebach's SRS principle and related systems - I
- Lecture 9 - Seebach's SRS principle and related systems - II
- Lecture 10 - Seebach's SRS principle and related systems - III
- Lecture 11 - Evans oxazolidinone and related systems - I
- Lecture 12 - Evans oxazolidinone and related systems - II
- Lecture 13 - Evans oxazolidinone and related systems - III
- Lecture 14 - Evans oxazolidinone and related systems - IV
- Lecture 15 - Evans oxazolidinone and related systems - V
- Lecture 16 - Helmchen's auxiliary, Oppolzer's sultam based auxiliary
- Lecture 17 - Camphor based N-acyloxazolidinones as chiral auxiliary
- Lecture 18 - Myer's ephedrine, Chiral Weinreb amide equivalents and related systems
- Lecture 19 - Myer's ephedrine and related systems
- Lecture 20 - Chiral Weinreb amide equivalents and related systems
- Lecture 21 - Meyer's oxazoline based alkylation - I
- Lecture 22 - Meyer's oxazoline based alkylation - II
- Lecture 23 - Meyer's bicyclic lactam based enolate alkylation
- Lecture 24 - Meyer's bicyclic lactam based alkylation
- Lecture 25 - Meyer's bicyclic lactams, Gleason's bicyclic thioglycolate lactam based systems
- Lecture 26 - Few problem solving from Meyer's oxazoline/bicyclic lactam based alkylation
- Lecture 27 - Schollkopf's bis-lactim ether and related systems; Auxiliary induced chiral relay
- Lecture 28 - Chiral relay systems in amino acid derived enolate alkylation
- Lecture 29 - Williams oxazinone, Yamada's chiral glycine enolate and related system
- Lecture 30 - Tricycloiminolactone as chiral glycine equivalents
- Lecture 31 - Najera's auxiliary, Davies diketopiperazine and related system

Lecture 32 - Ender's RAMP/SAMP, Coltart's cyclic carbamate hydrazone, Ellman's sulfinamide and related

Lecture 33 - Ender's RAMP/SAMP based systems

Lecture 34 - Ender's RAMP/SAMP based systems

Lecture 35 - Ender's RAMP/SAMP, Coltart's cyclic carbamate hydrazone, Ellman's sulfinamide

Lecture 36 - Coltart's cyclic carbamate hydrazone and its exploration

Lecture 37 - Memory of chirality in enolate alkylation

Lecture 38 - Organocatalytic methods for enolate alkylation (SOMO activation)

Lecture 39 - Enantioselective alkylation with chiral PTC

Lecture 40 - Overall analysis of the entire discussion

Lecture 1 - Bioenergetics: Understanding the significance in Biological Systems

Lecture 2 - Regulation of Enzyme Activity

Lecture 3 - Digestion and Absorption of Carbohydrates

Lecture 4 - Glycolysis, alcohol and lactic acid fermentation

Lecture 5 - Biochemistry of TCA Cycle (I)

Lecture 6 - TCA Cycle (II) - Regulation and special characteristics

Lecture 7 - Neoglucogenesis

Lecture 8 - Regulation of Glycolysis and Neoglucogenesis - I

Lecture 9 - Regulation of Glycolysis and Neoglucogenesis - II Cori Cycle, Rapoport Leubering

Lecture 10 - Hexose Monophosphate Shunt : Steps and Phases

Lecture 11 - Hexose Monophosphate Shunt : Regulation and Significance

Lecture 12 - Glycogen Metabolism - I

Lecture 13 - Glycogen Metabolism - II

Lecture 14 - Glycogen Metabolism - III

Lecture 15 - Glycogen Metabolism - IV

Lecture 16 - Galactose Metabolism and Associated Disorders

Lecture 17 - Fructose Metabolism and Associated Disorders

Lecture 18 - Regulation of Blood Glucose

Lecture 19 - Diabetes Mellitus and Metabolic Alterations

Lecture 20 - Digestion and absorption of Lipid

Lecture 21 - Lipoprotein Metabolism - I

Lecture 22 - Lipoprotein Metabolism - II

Lecture 23 - Lipoprotein metabolism - III

Lecture 24 - Fatty acid catabolism (Oxidation of Fatty acids) - I

Lecture 25 - Fatty acid catabolism (Oxidation of Fatty acids) - II

Lecture 26 - Fatty acid catabolism (Oxidation of Fatty acids) - III

Lecture 27 - Metabolism of Ketone Bodies

Lecture 28 - Biosynthesis of Fatty acid and its regulation

Lecture 29 - Biosynthesis of triacylglycerol, phosphoglycerides and sphingolipids

Lecture 30 - Cholesterol Metabolism

Lecture 31 - Digestion and absorption of Protein

Lecture 32 - Transformation of Amino acids

Lecture 33 - Metabolism of Ammonia and ammonia toxicity

Lecture 34 - Urea cycle - Steps, Significance and Energetics

Lecture 35 - Urea Cycle - Regulation and Enzyme Deficiency Disorders

Lecture 36 - Metabolism of Phenylalanine and Associated Disorders

Lecture 37 - Tyrosine Metabolism - I

Lecture 38 - Tyrosine Metabolism - II (Catecholamines)

Lecture 39 - Tyrosine Metabolism - III

Lecture 40 - Tryptophan Metabolism

Lecture 41 - Metabolism of Sulphur containing Amino acids (Methionine and Cysteine)

Lecture 42 - Metabolism of Glycine and its disorders

Lecture 43 - Metabolism of Serine, Threonine and Alanine

Lecture 44 - Branched chain amino acid metabolism and their disorders

Lecture 45 - Metabolism of Histidine, Proline, Arginine and Lysine

Lecture 46 - Heme Metabolism - I (Heme Synthesis and Regulation)

Lecture 47 - Heme Metabolism - II (Disorders of Heme Synthesis - Porphyrrias)

Lecture 48 - Heme Metabolism - III (Heme Degradation, Transport and Bilirubin Metabolism)

Lecture 49 - Disorders of Bilirubin Metabolism

Lecture 50 - Nucleotide Metabolism - I (Purine Metabolism)

Lecture 51 - Nucleotide Metabolism - II (Disorders of Purine Metabolism)

Lecture 52 - Nucleotide Metabolism - III (Pyrimidine Metabolism and Disorders)

Lecture 53 - Inborn errors of Metabolism

Lecture 54 - Integration of Metabolism - I (Cellular and Organ level integration)

Lecture 55 - Integration of Metabolism - II (Starve feed cycle)

Lecture 56 - Integration of Metabolism - III (Metabolic Control Analysis)

Lecture 57 - Obesity, Metabolic Syndrome and Role of Adipokines

Lecture 58 - Fatty Liver and alcohol metabolism

Lecture 59 - Energy metabolism and Nutritional disorders, Protein Energy Malnutrition and Dietary

Lecture 60 - Metabolism in Cancer Cells

Lecture 1 - 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 - 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](#)

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[Lecture 5 - Part V](#)

[Lecture 6 - Part I](#)

[Lecture 6 - Part II](#)

[Lecture 6 - Part III](#)

[Lecture 6 - Part IV](#)

[Lecture 7 - Part I](#)

[Lecture 7 - Part II](#)

[Lecture 8 - Part I](#)

[Lecture 8 - Part II](#)

[Lecture 8 - Part III](#)

[Lecture 9 - Part I](#)

[Lecture 9 - Part II](#)

[Lecture 9 - Part III](#)

[Lecture 10](#)

- Lecture 1 - Electromagnetic radiation
- Lecture 2 - Interaction of radiation with matter
- Lecture 3 - Introduction to chemical applications
- Lecture 4 - Analysis of spectra
- Lecture 5 - Radiation densities and Einstein's semi classical model
- Lecture 6 - Introduction to quantum mechanics - I
- Lecture 7 - Introduction to quantum mechanics - II
- Lecture 8 - Born-Oppenheimer approximation
- Lecture 9 - Beer-Lambert law
- Lecture 10 - Diatomic Vibration Spectra Hermonic Model
- Lecture 11 - Diatomic Vibration Morse Oscillator Model
- Lecture 12 - Normal Vibrational modes Triatomic molecules
- Lecture 13 - Normal Vibrational modes Polyatomic molecules
- Lecture 14 - Vibrational Polyatomic Infrared Spectroscopy Local Modes and Group Frequencies
- Lecture 15 - Microwave spectra of di-atomic molecules
- Lecture 16 - Diatomic Molecules Microwave Energies and Transitions
- Lecture 17 - Methodology of solving problems
- Lecture 18 - Rotational and Vibrational Line Intensities
- Lecture 19 - Microwave Spectra of Polyatomic molecules (Symmetric tops)
- Lecture 20 - Video Tutorial 2 : Part - I
- Lecture 21 - Video Tutorial 2 : Part - II
- Lecture 22 - Introduction to Tensors
- Lecture 23 - Polarizability Tensor
- Lecture 24 - Introduction to Rotational Raman Spectra.
- Lecture 25 - Review of basic concepts in Molecular Spectroscopy
- Lecture 26 - Review of Microwave Spectroscopy
- Lecture 27 - Review of Elementary Vibrational Spectroscopy

[Module 1](#)

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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

[Lecture 31 - Photochemistry of carbonyl compounds, enone and dienone photochemistry](#)

[Lecture 32 - Photochemistry of Nitrogen compounds](#)

[Lecture 33 - Photochemistry of aromatic compounds](#)

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