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NPTEL : NOC:Organo Metallic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof.Debabrata Maiti

Lecture 1 - Introduction of Organometallic Chemistry

Lecture 2 - Counting of Electrons

Lecture 3 - Ligand Substitution Reactions

Lecture 4 - Oxidative Addition [1.Concerted Mechanism]

Lecture 5 - Oxidative Addition [2.SN2 Mechanism]

Lecture 6 - Oxidative Addition [3. Radical Mechanism]

Lecture 7 - Reductive Elimination

Lecture 8 - Migratory Insertion and Elimination Reactions

Lecture 9 - Migration and Insertion Reactions

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

Lecture 11 - Beta-Migratory Insertion

Lecture 12 - Beta-Elimination Reaction

Lecture 13 - Alpha-Abstraction and beta-Abstraction

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

Lecture 15 - External Attack by a Ligand and Reductive Coupling

Lecture 16 - Hydrogenation Reaction

Lecture 17 - Hydrogenation Reaction [Dihydride Catalyst]

Lecture 18 - Stereoselective Hydrogenation Reaction

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

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

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NPTEL : NOC:Chemical and Biological Thermodynamics - Principles to Applications (Chemistry and Biochemistry)

Co-ordinators : Prof. Nand Kishore

Lecture 1 - Fundamentals of Chemical thermodynamics

Lecture 2 - Work

Lecture 3 - Tutorial-1

Lecture 4 - First Law of Thermodynamics

Lecture 5 - Tutorial-2

Lecture 6 - Adiabatic processes

Lecture 7 - Entropy

Lecture 8 - Entropy and Second Law: Basics

Lecture 9 - Entropy and Second Law: Applications

Lecture 10 - Third Law of Thermodynamics

Lecture 11 - Discussion on Helmholtz energy

Lecture 12 - Discussion on Gibbs Energy

Lecture 13 - Maxwell relations, Properties of Gibbs energy

Lecture 14 - Further discussion on properties of Gibbs energy

Lecture 15 - Fugacity

Lecture 16 - Tutorial session

Lecture 17 - Tutorial session

Lecture 18 - Chemical potential of a substance in mixture

Lecture 19 - Chemical potential of Liquids, Raoultâ€™s Law, Henryâ€™s Law

Lecture 20 - Thermodynamics of mixing, Excess functions

Lecture 21 - Partial molar volume

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

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

Lecture 24 - Further discussion on relation between C p and C v

Lecture 25 - Chemical Equilibrium

Lecture 26 - Perfect gas equilibria

Lecture 27 - Equilibrium constant

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

Lecture 29 - Effect of temperature on equilibria

Lecture 30 - Biological standard states and pH

Lecture 31 - Tutorial 1 - Equilibrium constant

Lecture 32 - Tutorial 2 - Equilibrium constant

Lecture 33 - Acids and bases and Equilibrium concepts

Lecture 34 - pH Scale Strong and weak acids and bases

Lecture 35 - Strong and weak acids and bases

Lecture 36 - Acid-base titrations

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

Lecture 38 - Thermodynamics in systems of biological interest

Lecture 39 - Calorimetry

Lecture 40 - Differential scanning calorimetry (DSC)

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

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

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

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

Lecture 45 - Isothermal Titration calorimetry (ITC)

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

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

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

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

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

Lecture 51 - Thermodynamic Characterization of Partially Folded States of Proteins

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

Lecture 53 - ITC in Drug-Protein Interactions

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

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

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

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

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

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

Lecture 60 - Summary of the course

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NPTEL : NOC:Chemistry of Main Group Elements (Chemistry and Biochemistry)

Co-ordinators : Prof. M. S. Balakrishna

Lecture 1 - Classification of Elements and Periodic Properties

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

Lecture 3 - Classification of Main Group Compounds

Lecture 4 - Effective Nuclear Charge

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

Lecture 6 - Structure and Bonding Aspects: VSEPR Theory

Lecture 7 - Structure and Bonding Aspects: Valence Bond Theory

Lecture 8 - Structure and Bonding Aspects: Valence Bond Theory

Lecture 9 - Structure and Bonding Aspects: MO Theory

Lecture 10 - Structure and Bonding Aspects: MO Theory

Lecture 11 - Structure and Bonding Aspects: MO Theory

Lecture 12 - Structure and Bonding Aspects: MO Theory

Lecture 13 - Chemistry of Hydrogen

Lecture 14 - Chemistry of Hydrogen

Lecture 15 - Chemistry of Hydrogen, Hydrides and Hydrogen Bonding

Lecture 16 - Chemistry of Group 1 Elements

Lecture 17 - Chemistry of Group 1 Elements

Lecture 18 - Chemistry of Group 1 Elements

Lecture 19 - Chemistry of Group 1 Elements

Lecture 20 - Chemistry of Group 2 Elements

Lecture 21 - Chemistry of Group 2 Elements

Lecture 22 - Chemistry of Group 2 Elements

Lecture 23 - Chemistry of Group 2 Elements

Lecture 24 - Chemistry of Group 2 Elements

Lecture 25 - Chemistry of Group 13 Elements

Lecture 26 - Chemistry of Group 13 Elements

Lecture 27 - Chemistry of Group 13 Elements

Lecture 28 - Chemistry of Group 13 Elements

Lecture 29 - Chemistry of Group 13 Elements

Lecture 30 - Wades Rules

Lecture 31 - Chemistry of Group 13 Elements

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Lecture 32 - Chemistry of Group 14 Elements

Lecture 33 - Chemistry of Group 14 Elements

Lecture 34 - Chemistry of Group 14 Elements

Lecture 35 - Chemistry of Group 14 Elements

Lecture 36 - Chemistry of Group 14 Elements

Lecture 37 - Chemistry of Group 14 Elements

Lecture 38 - Chemistry of Group 14 Elements

Lecture 39 - Chemistry of Group 15 Elements

Lecture 40 - Chemistry of Group 15 Elements

Lecture 41 - Chemistry of Group 15 Elements

Lecture 42 - Chemistry of Group 15 Elements

Lecture 43 - Chemistry of Group 15 Elements

Lecture 44 - Chemistry of Group 15 Elements

Lecture 45 - Chemistry of Group 15 Elements

Lecture 46 - Chemistry of Group 15 Elements

Lecture 47 - Chemistry of Group 16 Elements

Lecture 48 - Chemistry of Group 16 Elements

Lecture 49 - Chemistry of Group 16 Elements

Lecture 50 - Chemistry of Group 16 Elements

Lecture 51 - Chemistry of Group 16 Elements

Lecture 52 - Chemistry of Group 17 Elements

Lecture 53 - Chemistry of Group 17 Elements

Lecture 54 - Chemistry of Group 18 Elements

Lecture 55 - Chemistry of Group 12 Elements

Lecture 56 - Organometallic Compounds of Main Group Elements

Lecture 57 - Organometallic Compounds of Main Group Elements

Lecture 58 - Organometallic Compounds of Main Group Elements

Lecture 59 - Organometallic Compounds of Main Group Elements

Lecture 60 - Overall Summary

NPTEL : NOC:Transition Metal Organometallic Chemistry - Principles to Applications (Chemistry and Biochemistry)

Co-ordinators : Prof. P. Ghosh

Lecture 1 - History of Organometallic Compounds

Lecture 2 - Polarity and Reactivity of Mâ''C bonds

Lecture 3 - Reactivity of Organometallic Compounds

Lecture 4 - Reactivity of Organometallic Compounds

Lecture 5 - 18 Valence Electron Rule and Classification

Lecture 6 - 18 Valence Electron Rule and Classification

Lecture 7 - Reactivity and types of Organometallic compounds

Lecture 8 - Sigma-Donor Ligands

Lecture 9 - Preparation of Sigma-Alkyl Compounds

Lecture 10 - Preparation and Properties of Sigma-Alkyl Compounds

Lecture 11 - Properties of Sigma-Alkyl Compounds

Lecture 12 - Î²â''elimination in Sigma-Alkyl Compounds

Lecture 13 - Î²â''elimination in Detail

Lecture 14 - TM Sigma-Alkyl Complexes and its Application

Lecture 15 - TM Sigma-Alkyl Complexes and its Application

Lecture 16 - Câ''H Activation

Lecture 17 - Câ''H Activation in Details

Lecture 18 - Câ''H Activation in Details

Lecture 19 - Characterization of Câ''H Activation

Lecture 20 - Bonding in Câ''H Activation

Lecture 21 - Câ''C Bond Activation

Lecture 22 - Câ''C Bond Activation

Lecture 23 - Câ''C Bond Activation in Details

Lecture 24 - Transition Metal Perfluoroalkyl (RFâ''TM) Complexes

Lecture 25 - Preparation of Transition Metal Perfluoroalkyl (RFâ''TM) Complexes

Lecture 26 - Câ''F Activation

Lecture 27 - Transition Metal Alkenyl/Aryl Complexes

Lecture 28 - Transition Metal Aryl Complexes

Lecture 29 - Transition Metal Aryl/Alkyne Complexes

Lecture 30 - Transition Metal Alkyne/Carbene Complexes

Lecture 31 - Transition Metal Carbene Complexes: Preparations

Lecture 32 - Transition Metal Carbene Complexes: Properties

Lecture 33 - Transition Metal Carbene Complexes: Reactivities

Lecture 34 - Transition Metal Carbene Complexes: Reactivities

Lecture 35 - Transition Metal Carbene Complexes: Reactivities

Lecture 36 - Transition Metal Carbene Complexes: Reactivities

Lecture 37 - Reactivity of Schrock type Carbene Complexes and Transition Metal Carbynes

Lecture 38 - Transition Metal Carbynes: Preparation

Lecture 39 - Transition Metal Carbynes: Properties

Lecture 40 - Transition Metal Carbynes: Properties

Lecture 41 - Properties of Transition Metal Carbynes And Transition Metal Carbonyls

Lecture 42 - Transition Metal Carbonyls

Lecture 43 - Transition Metal Carbonyls

Lecture 44 - Transition Metal Carbonyls: Bonding Properties

Lecture 45 - Transition Metal Carbonyls: Bonding properties

Lecture 46 - Transition Metal Carbonyls: Reactivities

Lecture 47 - Transition Metal Carbonyls: Reactivity and Carbonyl Metallates

Lecture 48 - Transition Metal Carbonyl Hydrides

Lecture 49 - Application of Carbonyl Metallates and Metal Halides

Lecture 50 - Application of Metal Halides and Metal Alkenes

Lecture 51 - Transition Metal Olefin Complexes

Lecture 52 - Transition Metal Olefin Complexes

Lecture 53 - Transition Metal Olefin Complexes: Reactivity

Lecture 54 - Bonding Properties in Olefin Complexes

Lecture 55 - Transition Metal Diolefin Complexes

Lecture 56 - Transition Metal Diolefin and Alkyne Complexes

Lecture 57 - Transition Metal Alkyne Complexes

Lecture 58 - Transition Metal Alkyne Complexes: Reactivity

Lecture 59 - Transition Metal Alkyne Complexes: Reactivity

Lecture 60 - Summary: Transition Metal Organometallic Chemistry: Principles to Applications

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NPTEL : NOC:Metal Mediated Synthesis-I (Chemistry and Biochemistry)

Co-ordinators : Prof.Debabrata Maiti

Lecture 1 - Assymetric Hydrogenation

Lecture 2 - Transition Metal Carbenes Fischerand Schrock Carbenes

Lecture 3 - Olefin Metathesis

Lecture 4 - Alkyne Metathesis

Lecture 5 - Cyclopropanation Reaction

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

Lecture 7 - Kumada Coupling Reaction

Lecture 8 - Suzuki Coupling Reaction

Lecture 9 - Stille Coupling Reaction

Lecture 10 - Assymetric Suzuki Coupling Reaction

Lecture 11 - Sonogashira Coupling Reaction

Lecture 12 - Heck Coupling Reaction

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

Lecture 14 - Buchwald-Hartwig Coupling Reaction

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

Lecture 16 - Oxidative Cyclization Process

Lecture 17 - Application of Oxidative Cyclization in Natural Product Synthesis

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

Lecture 19 - Kulinkovich Reaction and its Mechanism

Lecture 20 - Pausonâ€“Khand Reaction

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NPTEL : NOC:Inorganic Chemistry of Life: Principles and Perspectives (Chemistry and Biochemistry)

Co-ordinators : Prof. C.P. Rao

Lecture 1 - Overview of inorganic chemistry of life

Lecture 2 - Elements in biology and or life

Lecture 3 - Selection and criteria for elements

Lecture 4 - Biomolecules

Lecture 5 - Coordination in enzymes

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

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

Lecture 8 - General introduction of metalloproteins

Lecture 9 - Coordination chemistry aspects - An introduction

Lecture 10 - Stability and lability

Lecture 11 - Techniques used inorganic chemistry life

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

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

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

Lecture 15 - Recap on metalloenzymes

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

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

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

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

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

Lecture 21 - Role of vanadium in life - General perspectives

Lecture 22 - Role of vanadium in life - Haloperoxidases

Lecture 23 - Enzymes based on manganese in life

Lecture 24 - Role of Iron in life - General perspectives

Lecture 25 - Role of Iron in life - Transport systems

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

Lecture 27 - Role of Iron in life - Electron transfer

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

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

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

Lecture 31 - Role of Iron in life - Reductases

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Lecture 32 - Role of Iron in life - Reductases and Phosphatases

Lecture 33 - Role of Iron in life - Reductases and Phosphatases (Continued...)

Lecture 34 - Role of Cobalt in life

Lecture 35 - Role of Nickel in life - General perspectives

Lecture 36 - Role of Nickel in life - Hydrolase, hydrogenase and SOD

Lecture 37 - Role of Nickel in life - Carbonmonoxide dehydrogenase (CODH)

Lecture 38 - Role of Copper in life - General perspectives

Lecture 39 - Role of Copper in life - Type I and Type 2 copper enzymes

Lecture 40 - Role of Copper in life - Multicenter copper oxidases and SOD

Lecture 41 - Role of Zinc in life - General perspectives including oxidoreductases and hydrolases

Lecture 42 - Role of Zinc in life - Carbonic anhydrase and carboxypeptidase

Lecture 43 - Role of Zinc in life - Transferases, ligages and isomerases

Lecture 44 - Role of Molybdenum in life - Introductory aspects

Lecture 45 - Role of Molybdenum in life - Nitrogenase

Lecture 46 - Role of Molybdenum in life - Oxidoreductases

Lecture 47 - Role of Mercury in the environment - Mercury reductase

Lecture 48 - Role of Selenium in life - Glutathione perioxidase

Lecture 49 - Inorganics in medicine - Introductory aspects and cis-platin

Lecture 50 - Inorganics in medicine - Apoptosis

Lecture 51 - Inorganics in medicine - PDT, MRI and Barium tests

Lecture 52 - Inorganics in medicine - Titanium in biomedical

Lecture 53 - Highlights of the course - Part I

Lecture 54 - Highlights of the course - Part II

Lecture 55 - Highlights of the course - Part III

Lecture 56 - Highlights of the course - Part IV

Lecture 57 - Tutorials - Part I

Lecture 58 - Tutorials - Part II

Lecture 59 - Tutorials - Part III

Lecture 60 - Tutorials - Part IV and overall

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NPTEL : NOC:Symmetry and Group Theory (Chemistry and Biochemistry)

Co-ordinators : Prof. Anindya Datta

Lecture 1 - Symmetry point group: Introduction

Lecture 2 - Symmetry point group: Examples - Part I

Lecture 3 - Symmetry point group: Examples - Part II

Lecture 4 - Symmetry point group: Examples - Part III

Lecture 5 - Symmetry point group: Examples - Part IV

Lecture 6 - Transformation matrices and Matrix representation

Lecture 7 - More on Matrix representation: Cartesian coordinates in C2v point group

Lecture 8 - Matrix representation: the way ahead

Lecture 9 - Introduction to Group Theory

Lecture 10 - Group Multiplication Tables

Lecture 11 - Groups and subgroups

Lecture 12 - Classes, Similarity transformations

Lecture 13 - Introduction to Matrices

Lecture 14 - Application of matrices in solution of simultaneous equations

Lecture 15 - Matrix eigenvalue equation

Lecture 16 - Matrix eigenvalue equation: an example

Lecture 17 - Similarity Transformations

Lecture 18 - Back to transformation matrices

Lecture 19 - Matrix representation revisited

Lecture 20 - Function space and Transformation Operators

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

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

Lecture 23 - Transformation Operators: Switching Bases

Lecture 24 - Equivalent representations

Lecture 25 - Unitary Transformation

Lecture 26 - Unitary Transformations (Continued...)

Lecture 27 - Reducible and Irreducible Representations

Lecture 28 - Irreducible Representations and Great Orthogonality Theorem

Lecture 29 - Character Tables: C2v

Lecture 30 - Character Tables: C2v and C3v

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

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Lecture 32 - Reducible to Irreducible Representations

Lecture 33 - Character Tables of Cyclic Groups

Lecture 34 - Symmetry of Normal Modes: D3h

Lecture 35 - Symmetry of Normal Modes: D3h (Continued...)

Lecture 36 - Symmetry of Normal Modes: a shortcut

Lecture 37 - Recap: Reducible Representation for Normal Modes

Lecture 38 - Contribution of internal motion to normal modes

Lecture 39 - Normal mode analysis: some examples

Lecture 40 - Infrared and Raman spectroscopy

Lecture 41 - IR and Raman activity

Lecture 42 - IR and Raman activity: examples

Lecture 43 - Symmetry Adapted Linear Combinations (SALC)

Lecture 44 - SALC:BeH2

Lecture 45 - SALC:CH4 Introduction

Lecture 46 - SALC:CH4

Lecture 47 - Projection Operators

Lecture 48 - Projection Operators (Continued...)

Lecture 49 - Generating SALCâ€™s using Projection Operators

Lecture 50 - Generating SALCâ€™s using Projection Operators (Continued...)

Lecture 51 - Oh complex and Group-subgroup relation

Lecture 52 - Group-Subgroup Relation

Lecture 53 - SALCs as Pi-MO andCyclopropenyl group

Lecture 54 - SALCs as Pi-MO, Cyclopropenyl group

Lecture 55 - SALCs as Pi-MO, Benzene

Lecture 56 - LCAO Huckel approximation

Lecture 57 - Huckel approximation: Naphthalene

Lecture 58 - Stationary states, Multiplicity, Ethylene

Lecture 59 - Napthalene - I

Lecture 60 - Napthalene - II

Lecture 61 - Napthalene - III

Lecture 62 - Transition Metal Complexes: CFT and LFT

Lecture 63 - Jahn-Teller Theorem, Tetragonal Distortion MOT:ML6, Sigma and Pi Bonds

Lecture 64 - MOT approach of bonding,H2O,Ferrocene

Lecture 65 - MOT approach of bonding,H2O,Ferrocene

Lecture 66 - Derivation: Great Orthogonality Theorem - I (Schurrs Lemma 1)

Lecture 67 - Derivation: Great Orthogonality Theorem - II (Schurrs Lemma 2)

Lecture 68 - Derivation: Great Orthogonality Theorem - III

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NPTEL : NOC:Computational Chemistry and Classical Molecular Dynamics (Chemistry and Biochemistry)

Co-ordinators : Prof. B.L. Tembe

Lecture 1 - Introduction to Computational Chemistry

Lecture 2 - Writing Simple Programs: Compilation and Execution

Lecture 3 - Programming Techniques 1 - Evaluating the sine function

Lecture 4 - Programming Techniques 2 - Do loops and if statements

Lecture 5 - Programming Techniques 3 - Roots of a quadratic equation and arrays

Lecture 6 - Programming Techniques 4 - Arrays and matrices

Lecture 7 - Practical Session of Programming 1

Lecture 8 - Programming Techniques 5 - Formats, Functions and Subroutines

Lecture 9 - Programming Techniques 6 - Functions and Subroutines, arranging numbers in as ascending order

Lecture 10 - Programming Techniques 7 - Functions and Subroutines, and the common statement

Lecture 11 - Numerical Methods. Analysis of errors

Lecture 12 - Practical Session on Programming 2 - The exponential function

Lecture 13 - Practical Session on Programming 3 - Functions and Subroutines

Lecture 14 - Interpolation Methods-1

Lecture 15 - Interpolation Methods-2: Newtonâ€™s and Lagrange Interpolation

Lecture 16 - Errors in interpolation, Matrix operations

Lecture 17 - Gauss elimination method for matrix inversion

Lecture 18 - Matrix diagonalization, Similarity transformations

Lecture 19 - Matrix inversion, Matrix diagonalization

Lecture 20 - Curve fitting, Newton Raphson method

Lecture 21 - Random numbers, Numerical integration using Simpsonâ€™s rule

Lecture 22 - Numerical Integration and Differential Equations

Lecture 23 - Practical Session on Programming 3: Random numbers, Simpsonâ€™s rule; Introduction to Scilab

Lecture 24 - Scilab-2: Matrix equations and Roots of Polynomials

Lecture 25 - Scilab-3: Functions, Integrals, Differential Equations and graphs

Lecture 26 - Scilab-4: Curve Fitting and Execution of Scilab programs

Lecture 27 - Scilab-5: Legendre polynomials, Multiple plots and Curve fitting

Lecture 28 - Scilab-6: Integral Transforms; Introduction to Molecular Dynamics (MD)

Lecture 29 - Classical Molecular Dynamics-2, Force Fields and Equations of Motion

Lecture 30 - Classical Molecular Dynamics-3, Force Fields and MD Algorithms

Lecture 31 - Classical MD-4 Thermodynamic Properties and Distribution Functions.

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Lecture 32 - Classical MD-5, Execution of programs on liquid argon

Lecture 33 - Molecular Dynamics using Gromacs-1

Lecture 34 - Molecular Dynamics using Gromacs-2: Simulating Liquid Argon

Lecture 35 - Molecular Dynamics using Gromacs-3: Installing Gromacs

Lecture 36 - Molecular Dynamics using Gromacs-4: Liquid Water: Input Files

Lecture 37 - Molecular Dynamics using Gromacs-5: Liquid Water: Analysis of Results

Lecture 38 - Molecular Dynamics using Gromacs-6: Mixture of Water and Methanol

Lecture 39 - Molecular Dynamics using Gromacs-7: Gromacs Installation

Lecture 40 - Molecular Dynamics using Gromacs-8: Simulation of s-peptide

Lecture 41 - Molecular Dynamics using Gromacs-9: Free Energy of Solvation of Methane, Concluding remarks

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NPTEL : NOC:Molecular Spectroscopy: A Physical Chemists Perspective (Chemistry and Biochemistry)

Co-ordinators : Prof. Anindya Datta

Lecture 1 - Frequency Domain Spectroscopy: An Introduction

Lecture 2 - Schematics of Instrumentation for FD Spectroscopy

Lecture 3 - Sensitivity Light Collection and Signal to Noise Ratio

Lecture 4 - Time Domain Spectroscopy

Lecture 5 - Frequency Modulation for Fourier Transform Spectroscopy

Lecture 6 - Rigid Rotor Model for Diatomic Molecules

Lecture 7 - Recapitulation of Quantum Mechanics

Lecture 8 - Conditions for Microwave Activity - I

Lecture 9 - Conditions for Microwave Activity - II

Lecture 10 - Microwave Spectra: Diatomic Molecules

Lecture 11 - Simple Harmonic Oscillator

Lecture 12 - Selection Rule

Lecture 13 - High Resolution IR Spectra

Lecture 14 - Anharmonic Oscillator and Raman Effect

Lecture 15 - Semi Classical Treatment: Radiation-Matter

Lecture 16 - Time Dependent Perturbation Theory

Lecture 17 - Transition Moment Integral

Lecture 18 - Transition Probability and Natural Linewidth

Lecture 19 - Einstein Treatment

Lecture 20 - Relationship Between Theoretical and Experimental Quantities

Lecture 21 - Level System: Concluding Remark - I

Lecture 22 - Level System: Concluding Remark - II

Lecture 23 - Laser Basic

Lecture 24 - Applications of Laser in Spectroscopy

Lecture 25 - Laser in Spectroscopy : Ultrafast Dynamics

Lecture 26 - Snapshot of Bond Breaking

Lecture 27 - Raman Effect

Lecture 28 - Raman Spectroscopy: Quantum Theory of Raman Effect

Lecture 29 - Raman Spectroscopy and Beyond Dipole Approximation

Lecture 30 - Symmetry in Chemistry : An Introduction

Lecture 31 - Symmetry Operations : Transformation Matrices

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Lecture 32 - Representations Reducible and Irreducible

Lecture 33 - Matrix Representation of Symmetry Point Group

Lecture 34 - Group Theory : Character Table

Lecture 35 - Character Table : Compendium of Irreducible Representations

Lecture 36 - Mulliken Nomenclature, 2D Irreducible Representations and Bases

Lecture 37 - Character Tables for Different Symmetry Point Groups

Lecture 38 - Wave Functions as Basis

Lecture 39 - Symmetry of Atomic and Molecular Orbitals

Lecture 40 - Polyatomic Molecules : Normal Modes of Vibration

Lecture 41 - Determination of Symmetries of Normal Modes of Vibration - I

Lecture 42 - Determination of Symmetries of Normal Modes of Vibration - II

Lecture 43 - A Shortcut to Symmetry of Normal Modes

Lecture 44 - Normal Modes : Internal Motion IR and Raman Activity

Lecture 45 - IR and Raman Activity - I

Lecture 46 - IR and Raman Activity - II

Lecture 47 - Electronic Spectroscopy : Introduction

Lecture 48 - Electronic Spectra

Lecture 49 - Rotational Fine Structure

Lecture 50 - Symmetry of Electronic States

Lecture 51 - Electronic States of Oxygen

Lecture 52 - Electronic States and Transitions of Benzene

Lecture 53 - Vibronic Coupling

Lecture 54 - Electronic Spectrum of Benzene

Lecture 55 - Basics of NMR Spectroscopy - I

Lecture 56 - Basics of NMR Spectroscopy - II

Lecture 57 - Spin Spin Coupling- AX systems

Lecture 58 - Coupling in A2 systems

Lecture 59 - Coupling in A2 systems (Continued...)

Lecture 60 - NMR: Spectra and Measurement, FT NMR 900 Pulses

Lecture 61 - FT NMR 1800 Pulses and Relaxation Phenomenon

Lecture 62 - Relaxation Phenomenon: Inversion Recovery

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NPTEL : NOC:Advanced Transition Metal Organometallic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. P. Ghosh

Lecture 1 - Transition Metal Allyl and Enyl Complexes

Lecture 2 - Transition Metal Allyl and Enyl complexes: Preparation

Lecture 3 - Transition Metal Allyl and Enyl complexes: Preparation

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

Lecture 5 - Types of Transition Metal Sandwich Complexes

Lecture 6 - Transition Metal Cyclobutadiene Complexes

Lecture 7 - Transition Metal Cyclobutadiene Complexes: Preparations

Lecture 8 - Transition Metal Cyclobutadiene Complexes: Reactivity

Lecture 9 - Transition Metal Cyclopentadiene Complexes

Lecture 10 - Transition Metal Cyclopentadiene Complexes: Preparation and Properties

Lecture 11 - Transition Metal Cyclopentadiene Complexes: Bonding Properties

Lecture 12 - Transition Metal Cyclopentadiene Complexes: Molecular Orbital Diagram

Lecture 13 - Transition Metal Cyclopentadiene Complexes: Reactivity of Metallocene

Lecture 14 - Transition Metal Cyclopentadiene Complexes: Reactivity of Ferrocene

Lecture 15 - Transition Metal Cyclopentadienyl Carbonyl Complexes: Preparation

Lecture 16 - Transition Metal Cyclopentadienyl Carbonyl Complexes: Reactivity

Lecture 17 - Transition Metal Cyclopentadienyl Nitrosyl Complexes

Lecture 18 - Transition Metal Cyclopentadienyl Hydride Complexes

Lecture 19 - Transition Metal Cyclopentadienyl Hydride and Halide Complexes

Lecture 20 - Transition Metal Cyclopentadienyl Halide Complexes

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

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

Lecture 23 - Transition Metal Arene Complexes: Structure and Bonding

Lecture 24 - Transition Metal Arene Complexes: Reactivity

Lecture 25 - Transition Metal Arene Complexes: Reactivity

Lecture 26 - Transition Metal Arene Carbonyl Complexes: Reactivity

Lecture 27 - Transition Metal Arene Carbonyl Complexes: Reactivity

Lecture 28 - Transition Metal Arene Cyclopentadienyl Complexes

Lecture 29 - Transition Metal Arene Cyclopentadienyl and C7H7 Complexes

Lecture 30 - Transition Metal C7H7 Complexes: Preparation

Lecture 31 - Transition Metal C7H7 Complexes: Reactivity

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Lecture 32 - Transition Metal C8H8 and C7H7 Complexes

Lecture 33 - Transition Metal C8H8 Complexes: Properties

Lecture 34 - Transition Metal Ãâ,¬- complexes of heterocycles

Lecture 35 - CÃ¢â,¬â€œC Cross Coupling Reactions

Lecture 36 - CÃ¢â,¬â€œC Cross Coupling Reactions: Allylic Alkylation

Lecture 37 - CÃ¢â,¬â€œC Cross Coupling Reactions: Heck Reaction

Lecture 38 - CÃ¢â,¬â€œC Cross Coupling Reactions: Suzuki Reaction

Lecture 39 - CÃ¢â,¬â€œC Cross Coupling Reactions: Suzuki Reaction

Lecture 40 - CÃ¢â,¬â€œC Cross Coupling Reactions: Stille Reaction

Lecture 41 - CÃ¢â,¬â€œC Cross Coupling Reactions: Stille Coupling

Lecture 42 - CÃ¢â,¬â€œC Cross Coupling Reactions: Sonogashira Coupling

Lecture 43 - Hydrocyanation Reactions

Lecture 44 - CÃ¢Ë†â€™heteroatom Coupling

Lecture 45 - CÃ¢Ë†â€™heteroatom Coupling: Arylamination

Lecture 46 - CÃ¢Ë†â€™Heteroatom Coupling: Hydroamination

Lecture 47 - CÃ¢Ë†â€™Heteroatom Coupling: Hydroboration

Lecture 48 - CÃ¢Ë†â€™Heteroatom Coupling: Hydrosilation

Lecture 49 - Organometallic Catalysis Reactions: Olefin oxidation

Lecture 50 - Organometallic Catalysis Reactions: Olefin oxidation

Lecture 51 - Organometallic Catalysis Reactions: Enantioselective Sharpless Epoxidation

Lecture 52 - Organometallic Catalysis Reactions: Water Gas Shift Reaction

Lecture 53 - Organometallic Catalysis Reactions: Fisher Tropsch Synthesis

Lecture 54 - Organometallic Catalysis Reactions: Fisher Tropsch Mechanism

Lecture 55 - Organometallic Catalysis Reactions: Carbonylation of alcohols

Lecture 56 - Organometallic Catalysis Reactions: Hydrogenation of Alkenes

Lecture 57 - Organometallic Catalysis Reactions: Asymmetric Hydrogenation of Alkenes

Lecture 58 - Organometallic Catalysis Reactions: Asymmetric Hydrogenation of Alkenes

Lecture 59 - Organometallic Catalysis Reactions: Hydroformylation

Lecture 60 - Summary of Advanced Transition Metal Organometallic Chemistry

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NPTEL : NOC:Mechanisms in Organic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Nandita Madhavan

Lecture 1 - Introduction to Reaction Mechanisms

Lecture 2 - Writing Reaction Mechanisms: Arrow pushing

Lecture 3 - Types of Polar Reactions

Lecture 4 - The Radical Reactions

Lecture 5 - Reaction Co-ordinate Diagrams

Lecture 6 - The Hammond Postulate

Lecture 7 - Kinetic versus Thermodynamic Control

Lecture 8 - Curtin-Hammett Principle

Lecture 9 - An Introduction to Reaction Kinetics

Lecture 10 - Deriving the Rate Laws

Lecture 11 - Distinguishing Reaction Mechanisms Using Rate Laws

Lecture 12 - Methods to Monitor a Reaction

Lecture 13 - The Hammett Equation

Lecture 14 - Linear Free Energy Relationships (LFER)

Lecture 15 - Hammett Plots for Electronic Effects

Lecture 16 - Scales used in Hammett Plots

Lecture 17 - Deviation from Linear Free Energy Relationships

Lecture 18 - LFER for Sterics: The Taft Parameters

Lecture 19 - Solvent Effects - Part A

Lecture 20 - Solvent Effects - Part B

Lecture 21 - Kinetic Isotope Effect

Lecture 22 - Primary Kinetic Isotope Effect

Lecture 23 - Secondary Kinetic Isotope Effect - Part A

Lecture 24 - Secondary Kinetic Isotope Effect - Part B

Lecture 25 - Heavy Atom Isotope Effects

Lecture 26 - Equilibrium Isotope Effects

Lecture 27 - Isotope Labelling

Lecture 28 - Trapping Intermediates - Part A

Lecture 29 - Trapping Intermediates - Part B

Lecture 30 - Trapping Intermediates - Part C

Lecture 31 - Checking for Common Intermediates

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Lecture 32 - Catalysis - Part A

Lecture 33 - Catalysis - Part B

Lecture 34 - Specific Catalysis

Lecture 35 - General Catalysis - Part A

Lecture 36 - General Catalysis - Part B

Lecture 37 - Enzyme Catalysis

Lecture 38 - Electrophilic Catalysis

Lecture 39 - Other Types of Catalysis

Lecture 40 - Course Summary

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NPTEL : NOC:Metals in Biology (Chemistry and Biochemistry)

Co-ordinators : Prof.Debabrata Maiti

Lecture 1 - Importance of metals in biology

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

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

Lecture 4 - Metal mediated folding of biopolymers

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

Lecture 6 - Electron transfer (ET) in living systems

Lecture 7 - Oxygen transport and activation

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

Lecture 9 - Hydrolytic Enzymes - Part II - Carbopeptidase

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

Lecture 11 - Hemerythrin and azidomethemerythrin

Lecture 12 - Dioxygen reactivity in copper

Lecture 13 - Cu-O2 intermediates

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

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

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

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

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

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

Lecture 20 - Nitrous oxide reductase and its model complex

Lecture 21 - Cytochrome C-oxidase

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

Lecture 23 - Mononuclear nonheme iron (NHI) enzymes

Lecture 24 - Alpha-Keto Glutarate dependent Halogenases

Lecture 25 - Cytochrome P450 - Part I - Introduction

Lecture 26 - Cytochrome P450 - Part II - Reactions

Lecture 27 - Cytochrome P450 - Part III - Mechanism

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

Lecture 29 - Methane monooxygenase

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

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

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Lecture 32 - Photosynthesis - Part I

Lecture 33 - Photosynthesis - Part II

Lecture 34 - Pumps and channels

Lecture 35 - Quick summary on O2 transport

Lecture 36 - Summary of Dioxygen reactivity in copper

Lecture 37 - Summary of Dioxygen reactivity in iron

Lecture 38 - Summary of Fe-O2 chemistry

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NPTEL : NOC:NMR Spectroscopy for Chemists and Biologists (Chemistry and Biochemistry)

Co-ordinators : Prof. Ashutosh Kumar

Lecture 1 - Basic concepts

Lecture 2 - Resonance absorption

Lecture 3 - Bloch Equations

Lecture 4 - Relaxation

Lecture 5 - Introduction to Chemical Shift

Lecture 6 - Factors affecting Isotropic Chemical Shifts

Lecture 7 - Spin-Spin Coupling

Lecture 8 - Interpretation of multiplet structure using first order analysis

Lecture 9 - Analysis of NMR spectra of molecules

Lecture 10 - Quantum Mechanical Analysis - Part I

Lecture 11 - Quantum Mechanical Analysis - Part II

Lecture 12 - Dynamic effects in the NMR Spectra

Lecture 13 - Fourier Transform NMR

Lecture 14 - Theorems on Fourier Transform

Lecture 15 - Practical aspects of Fourier Transform NMR spectra

Lecture 16 - Data Processing in Fourier Transform NMR

Lecture 17 - Dynamic range in Fourier Transform NMR

Lecture 18 - Spin Echo and Solvent Suppression

Lecture 19 - Spin Decoupling in FT NMR and Relaxation Measurements

Lecture 20 - Polarization Transfer

Lecture 21 - Nuclear Overhauser Effect

Lecture 22 - Steady state NOE and Transient NOE

Lecture 23 - Distance and NOE

Lecture 24 - Selective Population Inversion

Lecture 25 - INEPT and Sensitivity Enhancement

Lecture 26 - Rotating Frame Experiments

Lecture 27 - Density matrix description of NMR - I

Lecture 28 - Density matrix description of NMR - II

Lecture 29 - Density matrix description of NMR - III

Lecture 30 - Time evolution of density operator

Lecture 31 - Density matrix description of NMR - IV

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Lecture 32 - Evolution of density operator in the presence of RF

Lecture 33 - Product operator formalism

Lecture 34 - Product operator formalism (Continued...)

Lecture 35 - Product operator formalism (Continued...)

Lecture 36 - Time evolution of basis operators

Lecture 37 - Observable and Non-observable basis operators, Spin echo

Lecture 38 - Spin echo (Continued...)

Lecture 39 - INEPT

Lecture 40 - Multidimensional NMR Spectroscopy

Lecture 41 - Two Dimensional NMR - Part I

Lecture 42 - Two Dimensional NMR - Part II

Lecture 43 - Types of 2D NMR Spectra

Lecture 44 - Two Dimensional Separation of Interaction in NMR

Lecture 45 - Two Dimensional Correlation Experiments - I

Lecture 46 - Two Dimensional Correlation Experiments - II

Lecture 47 - Two Dimensional Correlation Experiments - III

Lecture 48 - Double Quantum Filtered COSY (DQF-COSY)

Lecture 49 - Two Dimensional Nuclear Overhauser Effect Spectroscopy (2D- NOESY)

Lecture 50 - Constant-time COSY

Lecture 51 - Scaling in 2D NMR

Lecture 52 - Total Correlation Spectroscopy

Lecture 53 - 2D Heteronuclear Experiment - I

Lecture 54 - 2D Heteronuclear Experiment - II

Lecture 55 - Multidimensional NMR

Lecture 56 - Structure Determination of Peptides by NMR - I

Lecture 57 - Structure Determination of Peptides by NMR - II

Lecture 58 - Protein-Ligand Interaction - I

Lecture 59 - Protein-Ligand Interaction - II

Lecture 60 - Diffusion Ordered Spectroscopy

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NPTEL : NOC:Basics in Inorganic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof.Debabrata Maiti

Lecture 1 - Concept of Effective Nuclear Charge

Lecture 2 - Electronic Configuration of Elements

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

Lecture 4 - Extraction of Metals

Lecture 5 - Ellingham Diagram

Lecture 6 - Thermit Process and Zone Refining

Lecture 7 - Coordination Chemistry: 18 electron rule and VBT

Lecture 8 - Crystal Field Theory: Octahedral Complex

Lecture 9 - Crystal Field Theory: Tetrahedral Complex

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

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

Lecture 12 - Introduction to Molecular Magnetism

Lecture 13 - Problem Solving Approach

Lecture 14 - Magnetism

Lecture 15 - Spectroscopic Term Symbol

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

Lecture 17 - Introduction to Bio-Inorganic Chemistry

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

Lecture 19 - Oxygen Transportation Mechanism

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NPTEL : NOC:Ultrafast Laser Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. Anindya Datta

Lecture 1 - Introduction

Lecture 2 - Steady State Spectra

Lecture 3 - Spectro Photometer

Lecture 4 - How to record Absorption and Emission Spectra

Lecture 5 - Excited state processes

Lecture 6 - TCSPC for picosecond- Nanosecond Time Domain

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

Lecture 8 - TCSPC Lab

Lecture 9 - Data Fitting 1

Lecture 10 - Data Fitting 2

Lecture 11 - Femtosecond Fluorescence Upconversion - 1

Lecture 12 - Femtosecond Fluorescence Upconversion - 2

Lecture 13 - Femtosecond Fluorescence Upconversion - 3

Lecture 14 - FOG Lab

Lecture 15 - Gate Detectors and Streak Camera - Part 1

Lecture 16 - Gate Detectors and Streak Camera - Part 2

Lecture 17 - Stimulated Emission

Lecture 18 - Two Level System

Lecture 19 - 3 and 4 level system

Lecture 20 - From CW to Pulsed Laser

Lecture 21 - Longitudinal modes

Lecture 22 - Modelocking for short pulses

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

Lecture 24 - Kerr lens Modelocking for femtosecond pulses

Lecture 25 - Titanium Sapphire lasers

Lecture 26 - Active and Passive Modelocking

Lecture 27 - Modelocking and cavity damping

Lecture 28 - Ti:Sapphire laser (Lab visit)

Lecture 29 - Cavity Dumping

Lecture 30 - Cavity dumping (Continued...)

Lecture 31 - Q switching

Lecture 32 - Stretching and compressing ultrafast laser pulses

Lecture 33 - Pulse stretcher/Compressor: Single Grating

Lecture 34 - Chirped pulsed amplification

Lecture 35 - Oscillators and Amplifier: Design and materials

Lecture 36 - Alexandrite and fibril lasers

Lecture 37 - Regenerative amplifier in our lab

Lecture 38 - Brief overview of nonlinear optical phenomena

Lecture 39 - Brief overview of nonlinear optical phenomena (Continued...)

Lecture 40 - Brief overview of nonlinear optical phenomena (Continued...)

Lecture 41 - SFG and SHG with ultrafast pulses

Lecture 42 - SFG and SHG with ultrafast pulses (Continued...)

Lecture 43 - Optical parametric generation and amplification

Lecture 44 - OPA in our lab TOPAS C - Part 1

Lecture 45 - OPA in our lab TOPAS C - Part 2

Lecture 46 - OPA in our lab TOPAS C - Part 3

Lecture 47 - Snapshots of bond breaking

Lecture 48 - Twisted Intramolecular Charge Transfer - Part 1

Lecture 49 - Twisted Intramolecular Charge Transfer - Part 2

Lecture 50 - Solvation dynamics - Part 1

Lecture 51 - Solvation dynamics - Part 2

Lecture 52 - Vibrational energy transfer in water

Lecture 53 - Excited state proton transfer: Introduction

Lecture 54 - Excited state double proton transfer of 7-Azaindole dimer - 1

Lecture 55 - Excited state double proton transfer of 7-Azaindole dimer - 2

Lecture 56 - Excited state double proton transfer of 7-Azaindole dimer - 3

Lecture 57 - Plasmonic nanoparticles - 1

Lecture 58 - Plasmonic nanoparticles - 2

Lecture 59 - Nanoclusters

Lecture 60 - Semiconductor Nanocrystals - Part 1

Lecture 61 - Semiconductor nanocrystals - Part 2

Lecture 62 - Radiative and Nonradiative Relaxation Pathways in CdSe Nanocrystals - Part 1

Lecture 63 - Radiative and Nonradiative Relaxation Pathways in CdSe Nanocrystals - Part 2

Lecture 64 - Multiexciton in semiconductor nanocrystals - Part 1

Lecture 65 - Multiexciton in semiconductor nanocrystals - Part 2

Lecture 66 - Two dimensional Infrared spectroscopy: Introduction

Lecture 67 - 2DIR: Techniques

NPTEL : NOC:Transition Metal Organometallics in Catalysis and Biology (Chemistry and Biochemistry)

Co-ordinators : Prof. Prasenjit Ghosh

Lecture 1 - Introduction

Lecture 2 - Reppe Synthesis (Introduction)

Lecture 3 - Reppe Reactions - Part 1

Lecture 4 - Reppe Reactions - Part 2

Lecture 5 - Reppe Reactions - Part 3

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

Lecture 7 - Origin of Olefin Metathesis

Lecture 8 - Mechanistic approaches of Metathesis Reaction - Part 1

Lecture 9 - Mechanistic approaches of Metathesis Reaction - Part 2

Lecture 10 - Mechanistic approaches of Metathesis Reaction - Part 3

Lecture 11 - Mechanistic approaches of Metathesis Reaction - Part 4

Lecture 12 - Types of Carbenes

Lecture 13 - Types of Metathesis Reactions

Lecture 14 - Alkyne Metathesis

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

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

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

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

Lecture 19 - Cross Metathesis - Part 1

Lecture 20 - Cross Metathesis - Part 2

Lecture 21 - Cross Metathesis - Part 3

Lecture 22 - Ring Opening Metathesis - Part 1

Lecture 23 - Ring Opening Metathesis - Part 2

Lecture 24 - Ring Opening Metathesis - Part 3

Lecture 25 - Ring Closing Metathesis - Part 1

Lecture 26 - Ring Closing Metathesis - Part 2

Lecture 27 - Ring Closing Metathesis - Part 3

Lecture 28 - Alkyne Metathesis

Lecture 29 - Alkene Alkyne Metathesis - Part 1

Lecture 30 - Alkene Alkyne Metathesis - Part 2

Lecture 31 - Alkene Alkyne Metathesis - Part 3

Lecture 32 - Ring Closing Eneyne Metathesis (RCEYM) - Part 1

Lecture 33 - Ring Closing Eneyne Metathesis (RCEYM) - Part 2

Lecture 34 - Ring Closing Eneyne Metathesis (RCEYM) and Alkenes and Alkynes oligomerization reactions

Lecture 35 - Oligomerization of alkenes and alkynes - Part 1

Lecture 36 - Oligomerization of alkenes and alkynes - Part 2

Lecture 37 - Oligomerization of alkenes and alkynes - Part 3

Lecture 38 - Oligomerization of alkenes and alkynes - Part 4

Lecture 39 - Alkene oligomerization and Polymerization.

Lecture 40 - Olefin Polymerization - Part 1

Lecture 41 - Olefin Polymerization - Part 2

Lecture 42 - Olefin Polymerization - Part 3

Lecture 43 - Olefin Polymerization - Part 4

Lecture 44 - Olefin Polymerization - Part 5

Lecture 45 - Olefin Polymerization - Part 6

Lecture 46 - Olefin Polymerization - Part 7

Lecture 47 - Olefin Polymerization - Part 8

Lecture 48 - Olefin Polymerization - Part 9

Lecture 49 - Olefin Polymerization - Part 10

Lecture 50 - Olefin Polymerization - Part 11

Lecture 51 - Olefin Polymerization - Part 12

Lecture 52 - Olefin Polymerization - Part 13

Lecture 53 - Olefin Polymerization - Part 14

Lecture 54 - Olefin Polymerization - Part 15

Lecture 55 - Olefin Polymerization - Part 16

Lecture 56 - Homo and Copolymerization; Functionalized olefins, Cycloolefins and Diolefins

Lecture 57 - Non- Group IV Metal based olefin polymerization catalysts

Lecture 58 - Non- Group IV Metal based olefin polymerization catalysts

Lecture 59 - Bioorganometallic Chemistry

Lecture 60 - Overall summary of Transition metal organometallics in catalysis and biology

NPTEL : NOC:Quantum Chemistry of Atoms and Molecules (Chemistry and Biochemistry)

Co-ordinators : Prof. Anindya Datta

Lecture 1 - Basic Introduction

Lecture 2 - Bohr Model and Beyond

Lecture 3 - The wave nature of matter

Lecture 4 - Ground Rules: Postulates of Quantum mechanics - Part I

Lecture 5 - Ground Rules: Postulates of Quantum mechanics - Part II

Lecture 6 - Particle in a box - Part I

Lecture 7 - Particle in a box - Part II

Lecture 8 - Particle in a box - Part III

Lecture 9 - Particle in a box - Uncertainity Priciple

Lecture 10 - Particle in a box - Uncertainity Priciple (Continued...)

Lecture 11 - Quantum Mechanical Tunneling

Lecture 12 - Harmonic Oscillator - Part 1

Lecture 13 - Harmonic Oscillator - Part 2

Lecture 14 - Harmonic Oscillator - Part 3

Lecture 15 - Harmonic Oscillators - Wave Functions and Recursion formulae

Lecture 16 - Harmonic Oscillators - Wave Functions and Recursion formulae (Continued...)

Lecture 17 - Harmonic Oscillators: Conclusions

Lecture 18 - Rigid Rotor - Part 1

Lecture 19 - Rigid Rotor - Part 2

Lecture 20 - Rigid Rotor - Part 3

Lecture 21 - Polar Plots of Spherical Harmonics

Lecture 22 - Angular Momentum

Lecture 23 - Angular Momentum (Continued...)

Lecture 24 - Hydrogen Atom: Schrodinger Equation

Lecture 25 - Hydrogen Atom: Schrodinger Equation (Continued...)

Lecture 26 - Hydrogen atom: Quantum numbers

Lecture 27 - Radial Probability distribution functions

Lecture 28 - Hydrogen atom wavefunctions: s orbitals

Lecture 29 - 2s orbital

Lecture 30 - 2p orbitals

Lecture 31 - 3pz and 3d orbitals

Lecture 32 - Atomic orbitals and orbital approximation

Lecture 33 - Multi electron atoms

Lecture 34 - He atom wavefunction

Lecture 35 - Excited states of many electron atoms

Lecture 36 - Introduction to Perturbation theory

Lecture 37 - Scope of Perturbation theory

Lecture 38 - Application of Perturbation theory: Anharmonic oscillator

Lecture 39 - Higher order perturbations

Lecture 40 - Perturbation theory for non-degenerate states

Lecture 41 - Perturbation Theory for degenerate states

Lecture 42 - Application of Perturbation Theory for degenerate States

Lecture 43 - Variation Method

Lecture 44 - Variational Method (Continued...)

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

Lecture 46 - Secular equations in Variational calculations

Lecture 47 - Secular equations for particle in a box

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

Lecture 49 - Perturbation theory for many electron atoms

Lecture 50 - Variational method for many electron atoms

Lecture 51 - Hartree-Fock Equations and Self Consistent Fields

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

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

Lecture 54 - Electronic Wavefunctions of He atom

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

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

Lecture 57 - Molecular shape and hybrid orbitals

Lecture 58 - sp2 hybridization

Lecture 59 - sp3 hybridization

Lecture 60 - Non-equivalent hybrid orbitals

Lecture 61 - Molecular Orbital Theory for H2+

Lecture 62 - Molecular orbital theory for homonuclear diatomic molecules

Lecture 63 - Beyond Homonuclear diatomic molecules

Lecture 64 - MOT for polyatomic molecules

Lecture 65 - Huckel MOT-1

Lecture 66 - Huckel MOT-2

Lecture 67 - The last word

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NPTEL : NOC:Basic Statistical Mechanics (Chemistry and Biochemistry)

Co-ordinators : Prof. Biman Bagchi

Lecture 1 - Why Study Statistical Mechanics?

Lecture 2 - Thermodynamics

Lecture 3 - Probability Theory - Part 1

Lecture 4 - Probability Theory - Part 2

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

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

Lecture 7 - From Postulates to Formulation

Lecture 8 - Microcanonical Ensemble

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

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

Lecture 11 - Canonical Ensemble - Part 1

Lecture 12 - Canonical Ensemble - Part 2

Lecture 13 - Thermodynamic Potential for Canonical ensemble

Lecture 14 - Grand Canonical Ensemble

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

Lecture 16 - Fluctuations and Response Function - Part 1

Lecture 17 - Fluctuations and Response Function - Part 2

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

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

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

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

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

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

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

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

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

Lecture 27 - Ideal Gas of Polyatomic molecules

Lecture 28 - Cluster Expansion and Mayerâ€™s Theory of Condensation - Part 1

Lecture 29 - Cluster Expansion and Mayerâ€™s Theory of Condensation - Part 2

Lecture 30 - Cluster Expansion and Mayerâ€™s Theory of Condensation - Part 3

Lecture 31 - Cluster Expansion and Mayerâ€™s Theory of Condensation - Part 4

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Lecture 32 - Cluster Expansion and Mayerâ€™s Theory of Condensation - Part 5

Lecture 33 - Cluster Expansion and Mayerâ€™s Theory of Condensation - Part 6

Lecture 34 - Phase Transition and Landau Theory - Part 1

Lecture 35 - Phase Transition and Landau Theory - Part 2

Lecture 36 - Phase Transition and Landau Theory - Part 3

Lecture 37 - Comments on some important Concepts of Statistical Mechanics

Lecture 38 - Nucleation Part 1: Introduction, Thermodynamics of Nucleation

Lecture 39 - Nucleation Part 2: Kinetics of Nucleation

Lecture 40 - Nucleation Part 3: Kinetics of Nucleation, Classical Nucleation Theory, Heterogeneous Nucleation

Lecture 41 - Nucleation Part 4: Ostwald Step Rule

Lecture 42 - Spinodal Decomposition and Pattern Formation: Evolution of Structure through Dynamics - Part 1

Lecture 43 - Spinodal Decomposition and Pattern Formation: Evolution of Structure through Dynamics - Part 2

Lecture 44 - Ising Model and Other Lattice Models - Part 1

Lecture 45 - Ising Model and Other Lattice Models - Part 2

Lecture 46 - Ising Model and Other Lattice Models - Part 3

Lecture 47 - Ising Model and Other Lattice Models - Part 4

Lecture 48 - Ising Model and Other Lattice Models - Part 5

Lecture 49 - Binary Mixtures: Towards Understanding Non-Ideality and Osmotic Pressure - Part 1

Lecture 50 - Binary Mixtures: Towards Understanding Non-Ideality and Osmotic Pressure - Part 2

Lecture 51 - Theory of Liquids - Part 1

Lecture 52 - Theory of Liquids - Part 2

Lecture 53 - Theory of Liquids - Part 3

Lecture 54 - Theory of Liquids - Part 4

Lecture 55 - Polymers in Solution and Polymer Collapse - Part 1

Lecture 56 - Polymers in Solution and Polymer Collapse - Part 2

Lecture 57 - Polymers in Solution and Polymer Collapse - Part 3

Lecture 58 - Polymers in Solution and Polymer Collapse - Part 4

Lecture 59 - Computer Simulation Methods in Statistical Mechanics - Part 1

Lecture 60 - Computer Simulation Methods in Statistical Mechanics - Part 2

Lecture 61 - Conclusion

NPTEL : NOC:Quantum Mechanics and Molecular Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. Naresh Patwari

Lecture 1 - Introduction to quantum Mechanics - Part 1

Lecture 2 - Introduction to quantum Mechanics - Part 2

Lecture 3 - Introduction to quantum Mechanics - Part 3

Lecture 4 - Time Dependant Perturbation Theory of Two states - Part 1

Lecture 5 - Time Dependent Perturbation Theory of Two States - Part 2

Lecture 6 - Time Dependent Perturbation Theory of Two States - Part 3

Lecture 7 - Time Dependent Perturbation Theory of Many States - Part 1

Lecture 8 - Time Dependent Perturbation Theory of Many States - Part 2

Lecture 9 - First-Order Correction to Time- Dependent Perturbation Theory

Lecture 10 - Properties of Light (Classical Treatment)

Lecture 11 - Interaction Hamiltonian - Part 1

Lecture 12 - Interaction Hamiltonian - Part 2

Lecture 13 - Interaction Hamiltonian - Part 3

Lecture 14 - Transition Moment Integral

Lecture 15 - Absorption Probability - Part 1

Lecture 16 - Absorption Probability - Part 2

Lecture 17 - Transition to Continuum States: Fermiâ€™s Golden Rule

Lecture 18 - Einsteinâ€™s Coefficient - Part 1

Lecture 19 - Einsteinâ€™s Coefficient - Part 2

Lecture 20 - Einsteinâ€™s Coefficient - Part 3

Lecture 21 - Spontaneous Emission Lifetime

Lecture 22 - Relationship between Transition Dipole and Extinction Coefficient

Lecture 23 - Spectral Lineshapes

Lecture 24 - Selection Rules

Lecture 25 - Molecular Rotations - Part 1

Lecture 26 - Molecular Rotations - Part 2

Lecture 27 - Molecular Rotations - Part 3

Lecture 28 - Rotational Selection Rules

Lecture 29 - Rotational Spectrum

Lecture 30 - Molecular Vibrations - Part 1

Lecture 31 - Molecular Vibrations - Part 2

Lecture 32 - Vibrational Selection rules

Lecture 33 - Electronic Transition

Lecture 34 - Rotations of Polyatomic Molecules - Part 1

Lecture 35 - Rotations of Polyatomic Molecules - Part 2

Lecture 36 - Selection Rules for particle in a box

Lecture 37 - Interpretation of Rotational Spectra

Lecture 38 - Features of vibrational and electronic spectroscopy

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

Co-ordinators : Prof. Yashwant D Vankar

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

Lecture 2 - Sulfur based oxidations of alcohols

Lecture 3 - Sulfur based oxidations and Pummerer rearrangement

Lecture 4 - Further aspects of sulfur and selenium based oxidations

Lecture 5 - Organoselenium chemistry and SeO2 based oxidations

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

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

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

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

Lecture 10 - Dess-Martin periodinane oxidation

Lecture 11 - Iodoxybenzoic acid (IBX) based oxidations

Lecture 12 - Silver based oxidations: Prevost reaction and use of Fetizonâ€™s reagent

Lecture 13 - Further aspects of oxidations using Fetizonâ€™s reagent: Mechanism and Stereochemistry

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

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

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

Lecture 17 - Oxidations with dimethyl dioxirane (DMDO)

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

Lecture 19 - Asymmetric alpha-hydroxylations using oxaziridine based reactions

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

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

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

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

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

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

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

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

Lecture 28 - Reductions with LS/KS selectrides and NaCNBH3

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

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

ketones

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

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

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

Lecture 34 - Asymmetric synthesis: An introduction

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

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

Lecture 37 - Katsuki-Jacobsen epoxidation: Mechanism and stereochemistry

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

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

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

Lecture 41 - Asymmetric reduction with oxazaborilidines

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 Oppolzerâ€™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 Evansâ€™ 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

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NPTEL : NOC:Chemical Kinetics and Transition State Theory (Chemistry and Biochemistry)

Co-ordinators : Prof. Amber Jain

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

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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 molecualr 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 micrononical RRKM model

Lecture 42 - Sum and density of states

Lecture 43 - Unimolecular decay - revisited

Lecture 44 - Unimolecular decay: RRK's approach

Lecture 45 - Unimolecular decay: RRKM's approach

Lecture 46 - Problem solving session - 6

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NPTEL : NOC:Concepts of Chemistry for Engineering (Chemistry and Biochemistry)

Co-ordinators : Prof. Anindya Datta

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-diatomic molecules - I

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

Lecture 17 - Molecular orbital theory 5: Hetero-diatomic 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

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Lecture 32 - Crystal Field Theory: Octahedral vs. Tetrahedral Complex

Lecture 33 - Application of CFSE: Spinel and J-T Distortion

Lecture 34 - Introduction to Molecular Magnetism

Lecture 35 - Problem Solving Approach

Lecture 36 - Magnetism

Lecture 37 - Spectroscopic Term Symbol

Lecture 38 - Magnetic States of Matter: Paramagnetic, Ferro and Antiferromagnetic

Lecture 39 - Band structures of solid materials

Lecture 40 - Density of states and doping in semiconductors

Lecture 41 - Introduction to molecular spectroscopy

Lecture 42 - Rotational spectroscopy

Lecture 43 - Vibrational spectroscopy

Lecture 44 - Electronic Spectroscopy - I

Lecture 45 - Electronic Spectroscopy - II

Lecture 46 - Electronic Spectroscopy - III

Lecture 47 - Fluorescence Spectroscopy

Lecture 48 - Fundamentals of NMR spectroscopy and MRI

Lecture 49 - Surface characterization techniques

Lecture 50 - Introduction to thermodynamics: Work, heat and energy

Lecture 51 - First law of thermodynamics: Diathermic and adiabatic systems,exothermic and endothermic processes

Lecture 52 - Enthalpy, Hess's law

Lecture 53 - Second law of thermodynamics: Entropy and third law of thermodynamics

Lecture 54 - Helmholtz and Gibbs free energies, Concept of spontaneity

Lecture 55 - Electrochemical equilibrium, Nernst equation

Lecture 56 - Acid base and solubility equilibria

Lecture 57 - Corrosion

Lecture 58 - Extraction of metals

Lecture 59 - Ellingham Diagram

Lecture 60 - Problems From Thermodynamics

Lecture 61 - Intermolecular forces: Electrostatic and Ion-Dipole Interaction

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

Lecture 63 - Real gases - Part 1

Lecture 64 - Real gases - Part 2

Lecture 65 - Introduction to Potential Energy Surfaces

Lecture 66 - Potential energy surface of H3 system

Lecture 67 - Salient features of H3 potential energy surface

Lecture 68 - Potential Energy Surfaces of HCN and H2F system

Lecture 69 - Representation of three dimensional structures

Lecture 70 - Structural isomers and stereoisomers

Lecture 71 - Configurations, Symmetry and Chirality

Lecture 72 - Enantiomers and Diastereomers

Lecture 73 - Optical activity, Conformational analysis, and absolute configuration

Lecture 74 - Substitution reactions

Lecture 75 - Elimination reactions

Lecture 76 - Addition, Oxidation and Reduction reactions

Lecture 77 - Synthesis of a drug molecule

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NPTEL : NOC:Classics in Total Synthesis-I (Chemistry and Biochemistry)

Co-ordinators : Prof. Krishna P Kaliappan

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)

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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)

NPTEL : NOC:Circular Dichroism (CD) and Mossbauer Spectroscopy for Chemists (Chemistry and Biochemistry)

Co-ordinators : Prof. Arnab Dutta

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 - MÃƒÂ¶ssbauer Spectroscopy: Introduction

Lecture 37 - MÃƒÂ¶ssbauer Spectroscopy Fundamentals - I

Lecture 38 - MÃƒÂ¶ssbauer Spectroscopy

Lecture 39 - MÃƒÂ¶ssbauer Spectroscopy Fundamentals - II

Lecture 40 - MÃƒÂ¶ssbauer Spectroscopy Fundamentals - III

Lecture 41 - MÃƒÂ¶ssbauer Spectroscopy Fundamentals - IV

Lecture 42 - MÃƒÂ¶ssbauer Spectroscopy: Isomer shift - I

Lecture 43 - MÃƒÂ¶ssbauer Spectroscopy: Isomer shift - II

Lecture 44 - MÃƒÂ¶ssbauer Spectroscopy: Isomer shift - III

Lecture 45 - MÃƒÂ¶ssbauer Spectroscopy: Quadrupolar splitting - I

Lecture 46 - MÃƒÂ¶ssbauer Spectroscopy: Quadrupolar splitting - II

Lecture 47 - MÃƒÂ¶ssbauer Spectroscopy: Applications - I

Lecture 48 - MÃƒÂ¶ssbauer Spectroscopy: Applications - II

Lecture 49 - MÃƒÂ¶ssbauer Spectroscopy: Applications - III

Lecture 50 - MÃƒÂ¶ssbauer Spectroscopy: Data measurement

Lecture 51 - MÃƒÂ¶ssbauer Spectroscopy: Applications - IV

Lecture 52 - MÃƒÂ¶ssbauer Spectroscopy: Effect of ligands - I

Lecture 53 - MÃƒÂ¶ssbauer Spectroscopy: Effect of ligands - II

Lecture 54 - MÃƒÂ¶ssbauer Spectroscopy: Applications - V

Lecture 55 - MÃƒÂ¶ssbauer Spectroscopy: Probing ferrocenes - I

Lecture 56 - MÃƒÂ¶ssbauer Spectroscopy: Probing ferrocenes - II

Lecture 57 - MÃƒÂ¶ssbauer Spectroscopy: Probing ferrocenes - III

Lecture 58 - MÃƒÂ¶ssbauer Spectroscopy: Mixed valent complexes - I

Lecture 59 - MÃƒÂ¶ssbauer Spectroscopy: Mixed valent complexes - II

Lecture 60 - MÃƒÂ¶ssbauer Spectroscopy: Mixed valent complexes - III

Lecture 61 - Conclusion section: CD spectroscopy

Lecture 62 - Conclusion section: MÃƒÂ¶ssbauer Spectroscopy

NPTEL : NOC:NMR Spectroscopy for Structural Biology (Chemistry and Biochemistry)

Co-ordinators : Prof. Ashutosh Kumar, Prof. R. V Hosur

Lecture 1 - NMR Basic Concepts - I

Lecture 2 - NMR Basic Concepts - II

Lecture 3 - NMR Basic Concepts - III

Lecture 4 - NMR Basic Concepts - IV

Lecture 5 - NMR Spectra of Molecules

Lecture 6 - Chemical Shifts and Coupling constant

Lecture 7 - Fine Structures in NMR Spectra

Lecture 8 - Pulse Excitation and FT-NMR

Lecture 9 - Practical Aspects of FT-NMR - 1

Lecture 10 - Practical Aspects of FT-NMR - 2

Lecture 11 - Practical Aspects of FT-NMR - 3

Lecture 12 - Practical Aspects of FT-NMR - 4

Lecture 13 - Polarization Transfer Technique - 1

Lecture 14 - Polarization Transfer Technique - 2

Lecture 15 - General Concept of Multidimensional NMR - 1

Lecture 16 - General Concept of Multidimensional NMR - 2

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

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

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

Lecture 20 - Introduction to NOESY and HSQC - 1

Lecture 21 - Introduction to NOESY and HSQC - 2

Lecture 22 - Introduction to NOESY and HSQC - 3

Lecture 23 - Introduction to NOESY and HSQC - 4

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

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

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

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

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

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

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

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

Lecture 32 - Determination of Structure and Dynamics of Proteins - 2

Lecture 33 - Determination of Structure and Dynamics of Proteins - 3

Lecture 34 - Determination of Structure and Dynamics of Proteins - 4

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

Lecture 36 - Determination of Structure and Dynamics of Proteins - 6

Lecture 37 - NMR Analysis of Protein Dynamics - I

Lecture 38 - NMR Analysis of Protein Dynamics - II

Lecture 39 - NMR Analysis of Protein Dynamics - III

Lecture 40 - NMR Analysis of Protein Dynamics - IV

Lecture 41 - Protein-Ligand and Protein-Protein Interaction

Lecture 42 - NMR Analysis of Ligand specific parameters in a Protein-Ligand Interaction - I

Lecture 43 - NMR Analysis of Ligand specific parameters in a Protein-Ligand Interaction - II

Lecture 44 - NMR Analysis of Protein Specific Parameters in a Protein-Ligand Interaction - I

Lecture 45 - NMR Analysis of Protein Specific Parameters in a Protein-Ligand Interaction - II

Lecture 46 - NMR in Drug Design

Lecture 47 - NMR in Drug Discovery

Lecture 48 - NMR in Drug metabolism - I

Lecture 49 - NMR in Drug metabolism - II

Lecture 50 - NMR in Drug metabolism - III

Lecture 51 - Probing Protein Dynamics by NMR Spectroscopy - I

Lecture 52 - Probing Protein Dynamics by NMR Spectroscopy - II

Lecture 53 - Probing Protein Dynamics by NMR Spectroscopy - III

Lecture 54 - Probing Protein Dynamics by NMR Spectroscopy - IV

Lecture 55 - Probing Protein Dynamics by NMR Spectroscopy - V

Lecture 56 - Basics of solid state NMR spectroscopy - I

Lecture 57 - Basics of solid state NMR spectroscopy - II

Lecture 58 - Basics of solid state NMR spectroscopy - III

Lecture 59 - Basics of solid state NMR spectroscopy - IV

Lecture 60 - Basics of solid state NMR spectroscopy - V

NPTEL : NOC:Transition Metal Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. M S Balakrishna

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 - WernerÃ¢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 - MetalÃ¢ Metal Multiple Bonds

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

Lecture 25 - Preparation of metal Complexes

Lecture 26 - Preparation of metal Complexes

Lecture 27 - Classification of ligands by donor atoms

Lecture 28 - Classification of ligands by donor atoms - Hydrogen

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

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

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

Lecture 32 - Classification of ligands by donor atoms - Carbon - 4

Lecture 33 - Classification of ligands by donor atoms - Nitrogen - 1

Lecture 34 - Classification of ligands by donor atoms - Nitrogen - 2

Lecture 35 - Classification of ligands by donor atoms - Nitrogen - 3

Lecture 36 - Classification of ligands by donor atoms - Oxygen, Phosphorus

Lecture 37 - Classification of ligands by donor atoms - Phosphorus - 1

Lecture 38 - Classification of ligands by donor atoms - Phosphorus - 2

Lecture 39 - Classification of ligands by donor atoms - Phosphorus - 3

Lecture 40 - Classification of ligands by donor atoms - Halogens

Lecture 41 - Oxidative addition and reductive elimination reactions - 1

Lecture 42 - Oxidative addition and reductive elimination reactions - 2

Lecture 43 - Oxidative addition and reductive elimination reactions - 3

Lecture 44 - Oxidative addition and reductive elimination reactions - 4

Lecture 45 - Inorganic Reaction Mechanisms

Lecture 46 - Inorganic Reaction Mechanisms Square planar complexes

Lecture 47 - Trans-Effect

Lecture 48 - Substitution Reactions in Square Planar Complexes, Trans-Effect

Lecture 49 - Substitution Reactions in Octahedral Complexes

Lecture 50 - Substitution Reactions in Octahedral Complexes; Stereochemistry of Products

Lecture 51 - Electron-Transfer Processes

Lecture 52 - Electron-Transfer Processes

Lecture 53 - Methods of Characterization UV-Visible Spectroscopy

Lecture 54 - Methods of Characterization UV-Visible Spectroscopy

Lecture 55 - UV-Visible Spectroscopy

Lecture 56 - UV-Visible Spectroscopy

Lecture 57 - NMR Spectroscopy

Lecture 58 - NMR Spectroscopy

Lecture 59 - NMR and IR Spectroscopy

Lecture 60 - Summary and Conclusion

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NPTEL : NOC:Nuclear and Radiochemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. B.S.Tomar, Prof. P.K.Mohapatra

Lecture 1 - Radioactivity

Lecture 2 - Radioactive decay

Lecture 3 - Radioactive decay chain

Lecture 4 - Radioactive equilibria

Lecture 5 - Nuclear structure and stability

Lecture 6 - Nuclear force and nuclear properties

Lecture 7 - Liquid drop model

Lecture 8 - Applications of Liquid drop model

Lecture 9 - Nuclear Shell model

Lecture 10

Lecture 11 - Alpha decay

Lecture 12 - Beta decay

Lecture 13 - Gamma decay

Lecture 14 - Interaction of radiations with matter

Lecture 15 - Interaction of fast electrons with matter

Lecture 16 - Interaction of electromegnetic radiations with matter

Lecture 17 - Principles of radiation detectors

Lecture 18 - Gas filled detectors

Lecture 19 - Scintillator detectors

Lecture 20 - Semiconductor detectors

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26 - Compound nucleus reactions

Lecture 27 - Nuclear fission

Lecture 28 - Nuclear fusion

Lecture 29 - Production of radioisotopes using neutrons

Lecture 30 - Radioisotope production using charged particles

Lecture 31 - Radiochemical practices

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Lecture 32 - Radioanalytical techniques and applications

Lecture 33 - Nuclear analytical techniques

Lecture 34 - Applications of neutron activation analysis

Lecture 35 - Ion beam analysis

Lecture 36 - Nuclear reaction analysis and particle induced gamma emission

Lecture 37 - Nuclear Probes: Positron annihilation spectroscopy

Lecture 38 - Perturbed angular corelation

Lecture 39 - Radioisotope applications in healthcare

Lecture 40 - Radioisotope applications in Industry, agriculture and food technology

Lecture 41 - History of actinides

Lecture 42 - Actinide concept

Lecture 43 - Actinide ionic species in water

Lecture 44 - Actinide hydration and Hydrolysis

Lecture 45 - pH-pE concept

Lecture 46 - Ln/An absorption spectroscopy - I

Lecture 47 - Ln/An absorption spectroscopy - II

Lecture 48 - Ln/An emission spectroscopy - I

Lecture 49 - Ln/An emission spectroscopy - II

Lecture 50 - Solution chemistry Actinides

Lecture 51 - Complexation of actinides - I

Lecture 52 - Complexation of actinides - II

Lecture 53 - Solvent extraction of actinides - I

Lecture 54 - Solvent extraction of actinides - II

Lecture 55 - Actinide partitioning

Lecture 56 - Analytical chemistry of actinides

Lecture 57 - Transactinides

Lecture 58 - Fast radiochemical separations

Lecture 59 - Actinides in the environment

Lecture 60 - Actinides sorption and migration

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NPTEL : NOC:Fundamentals of Statistical Thermodynamics (Chemistry and Biochemistry)

Co-ordinators : Prof. Nand Kishore

Lecture 1 - General introduction to Statistical Thermodynamics

Lecture 2 - Configuration and Weights

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

Lecture 4 - Boltzmann Distribution

Lecture 5 - The Molecular Partition Function

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

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

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

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

Lecture 10 - Numerical Problems Set-II

Lecture 11 - The Internal Energy

Lecture 12 - Obtaining expression for beta

Lecture 13 - The Statistical Entropy

Lecture 14 - Connecting partition function with entropy

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

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

Lecture 17 - Negative Temperature

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

Lecture 19 - The Canonical Partition Function

Lecture 20 - Relating Canonical Partition Function Internal Energy and Entropy

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

Lecture 22 - Entropy of a monatomic gas

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

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

Lecture 25 - The Thermodynamic Functions (Pressure)

Lecture 26 - The Thermodynamic Functions (Enthalpy)

Lecture 27 - The Thermodynamic Functions (The Gibbs Energy)

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

Lecture 29 - The Rotational Contribution to Molecular Partition Function

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

Lecture 31 - The Rotational Contribution to Molecular Partition Function

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Lecture 32 - Rotational Partition Function

Lecture 33 - Vibrational Partition Function - I

Lecture 34 - Vibrational Partition Function - II

Lecture 35 - Vibrational Partition Function - Applications

Lecture 36 - Electronic Partition Function

Lecture 37 - Mean Energies

Lecture 38 - Mean Energies (Continued...)

Lecture 39 - Heat Capacity

Lecture 40 - Heat Capacity (Continued...)

Lecture 41 - Mean Energies (Applications)

Lecture 42 - Problem Solving

Lecture 43 - Residual Entropy

Lecture 44 - Residual Entropy (Continued...)

Lecture 45 - Relation between equilibrium constant K and partition function q

Lecture 46 - Relation between equilibrium constant K and partition function q (Continued...)

Lecture 47 - Relation between equilibrium constant K and partition function q (Applications-1)

Lecture 48 - Relation between equilibrium constant K and partition function q (Applications-2)

Lecture 49 - Contributions to equilibrium constant

Lecture 50 - Contributions to equilibrium constant (Continued...)

Lecture 51 - Contributions to equilibrium constant (Continued...) and Problems Solving

Lecture 52 - Problem Solving

Lecture 53 - Problem Solving (Continued...)

Lecture 54 - Equations of state

Lecture 55 - Bose-Einstein Statistics

Lecture 56 - Problem Solving

Lecture 57 - FERMI-DIRAC Statistics

Lecture 58 - Radial Distribution Function

Lecture 59 - Recap - 1

Lecture 60 - Recap - 2

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NPTEL : NOC:Interpretative Molecular Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. M. S. Balakrishna

Lecture 1 - Various Analytical Techniques and their applications

Lecture 2 - Introduction to 1H NMR Spectroscopy

Lecture 3 - NMR signals and magnetic shielding

Lecture 4 - Introduction to the concept of Chemical Shifts in NMR spectra

Lecture 5 - Chemical Shifts for different type of protons

Lecture 6 - N+1 Rule and Pascal's Triangle

Lecture 7 - Coupling constants for different types of molecules

Lecture 8 - Second Order Coupling

Lecture 9 - Introduction to 13C NMR Spectroscopy

Lecture 10 - Introduction to 31P NMR Spectroscopy

Lecture 11 - Chemical Shift Range in 31P NMR Spectroscopy

Lecture 12 - Examples explaining Multinuclear NMR Spectroscopy - 1

Lecture 13 - Examples explaining Multinuclear NMR Spectroscopy - 2

Lecture 14 - Examples explaining Multinuclear NMR Spectroscopy - 3

Lecture 15 - Examples explaining Multinuclear NMR Spectroscopy - 4

Lecture 16 - Examples explaining Multinuclear NMR Spectroscopy - 5

Lecture 17 - Monitoring reaction through 31P NMR Spectroscopy

Lecture 18 - 19F, 14N and 15N NMR Spectroscopy

Lecture 19 - 6Li and 7Li NMR Spectroscopy

Lecture 20 - 11B, 10B and 199Hg NMR Spectroscopy

Lecture 21 - Introduction to UV Spectroscopy

Lecture 22 - Types of Electronic Transitions and Woodward-Fieser Rules

Lecture 23 - Spin Orbit Coupling and Term Symbols

Lecture 24 - Ground State Term Symbol

Lecture 25 - Calculating microstates for different electronic configuration

Lecture 26 - Selection Rule of Electronic Transition

Lecture 27 - Orgel Level Diagrams

Lecture 28 - Racah Parameters and Tanabe-Sugano Diagrams

Lecture 29 - Introduction to IR Spectroscopy - 1

Lecture 30 - Introduction to IR Spectroscopy - 2

Lecture 31 - Interpretation of IR Spectra

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Lecture 32 - IR stretching frequencies for various functional groups

Lecture 33 - Hook's Law - Numericals

Lecture 34 - IR Spectra of carbonyl compounds - 1

Lecture 35 - IR Spectra of carbonyl compounds - 2

Lecture 36 - Numerical Problems related to IR Spectroscopy - 1

Lecture 37 - Numerical Problems related to IR Spectroscopy - 2

Lecture 38 - Introduction to Mass Spectrometry

Lecture 39 - Isotope Peaks in Mass Spectrometry

Lecture 40 - Hydrogen deficiency Index

Lecture 41 - EI Mass Spectra of various molecules - 1

Lecture 42 - EI Mass Spectra of various molecules - 2

Lecture 43 - EI Mass Spectra of various molecules - 3

Lecture 44 - Types of Mass Spectrometry

Lecture 45 - Introduction to EPR Spectroscopy - 1

Lecture 46 - Introduction to EPR Spectroscopy - 2

Lecture 47 - Hyperfine Interactions

Lecture 48 - Examples of Hyperfine Interactions

Lecture 49 - Introduction to MÃƒÂ¶ssbauer Spectroscopy (MÃƒÂ¶s)

Lecture 50 - More discussion, problems and solutions (MÃƒÂ¶s)

Lecture 51 - Problems and Solutions - 1

Lecture 52 - Problems and Solutions - 2

Lecture 53 - Problems and Solutions - 3

Lecture 54 - Problems and Solutions - 4

Lecture 55 - Problems and Solutions - 5

Lecture 56 - Rule of Thirteen and Nitrogen Rule

Lecture 57 - Problems and Solutions - 6

Lecture 58 - Problems and Solutions - 7

Lecture 59 - Problems and Solutions - 8

Lecture 60 - Summary and conclusion

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NPTEL : NOC:Many Body Methods in Quantum Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Sourav Pal, Prof. Achintya Kumar Dutta

Lecture 1 - Failure of classical mechanics

Lecture 2 - Postulates of quantum mechanics

Lecture 3 - Postulate 5 and 6

Lecture 4 - Overview of exactly solvable system

Lecture 5 - Introduction to many electron problem

Lecture 6 - Non-interacting and interacting quantum particles

Lecture 7 - Spin orbital concept

Lecture 8 - Slater determinant introduction

Lecture 9 - Form of exact wave function for interacting particles

Lecture 10 - A brief introduction to Configuration Interaction (CI)

Lecture 11 - Variational method and Rayleigh-Ritz variation

Lecture 12 - Linear variation method

Lecture 13 - Hartree-Fock theory introduction

Lecture 14 - Slater rules for matrix elements

Lecture 15 - Spin integrated for closed shell determinant

Lecture 16 - Examples of spin integrated determinants

Lecture 17 - Introduction to Lagrange variation

Lecture 18 - General lagrange variation

Lecture 19 - Lagrange variation to minimize the the Hartree-Fock energy

Lecture 20 - Non-canonical HF equation

Lecture 21 - Interpretation of coulomb and exchange terms

Lecture 22 - Unitary transformation of non-canonical HF equation

Lecture 23 - Canonical Hartree-Fock equation

Lecture 24 - Koopmans' approximation for IP

Lecture 25 - Koopmans' approximation for EA

Lecture 26 - Spin integrated Hartree-Fock for closed shell system (RHF)

Lecture 27 - Molecular Hartree-Fock introduction

Lecture 28 - Hartree-Fock Rothaan Hall equation

Lecture 29 - Symmetry of two electron integrals

Lecture 30 - HF Roothan equation in terms of atomic orbitals

Lecture 31 - Koopmans' IP for molecules

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Lecture 32 - Koopmans' EA for molecules

Lecture 33 - Roothaan equation in orthonormalized basis

Lecture 34 - Review of Hartree-Fock theory

Lecture 35 - Charge density, Bond order and Population analysis

Lecture 36 - Dipole Moment

Lecture 37 - Introduction to basis set

Lecture 38 - Dunning and Pople basis set

Lecture 39 - Polarization and diffuse function

Lecture 40 - Brillouin's theorem and Slater's rule type-2

Lecture 41 - Slater rule type-2

Lecture 42 - Spin adapted determinant

Lecture 43 - Dissociation of Hydrogen molecule problem

Lecture 44 - Inadequacies of restricted Hartree-Fock theory

Lecture 45 - Hartree-Fock perturbation theory and correlation correction

Lecture 46 - Hartree-Fock perturbation theory (Continued...)

Lecture 47 - Introduction of 2nd order perturbation theory

Lecture 48 - Intermediate normalization and an expression for the Correlation energy

Lecture 49 - Slater rule -3 and derivation of 2-nd order perturbation energy

Lecture 50 - Physical insight of pair correlation theory

Lecture 51 - Introduction to configuration intercation (CI)

Lecture 52 - Determine the parameter of CI

Lecture 53 - Construction of CIS hamiltonian matrix

Lecture 54 - Importance of doubly excited determinants in correlation contribution

Lecture 55 - Intermediate normalization and an expression for the Correlation energy

Lecture 56 - CI equation in terms of Normal-Ordered hamiltonian

Lecture 57 - Doubly excited CI function (D-CI)

Lecture 58 - Matrix structure of CISD (singly and doubly excited CI)

Lecture 59 - Some illustrative example

Lecture 60 - Effects of singly excited determinant in the calculation

Lecture 61 - D-CI for non-interacting hydrogen molecules

Lecture 62 - Size consistency problem in truncated CI

Lecture 63 - N-dependence of D-CI correlation energy

Lecture 64 - problem of truncating CI

Lecture 65 - Introduction of second quantization operator in quantum mechanics

Lecture 66 - Creation and annihilation operator and their properties

Lecture 67 - Operators in second quantization

Lecture 68 - Some basic examples related with second quantization operator

Lecture 69 - Hole-Particle formalism

Lecture 70 - Hugenholtz rule for diagrammatic construction of MP perturbation theory

Lecture 71 - Linked cluster diagram

Lecture 72 - Energy expression for higher order Moller-Plasset perturbation theory

Lecture 73 - Diagrammatic representation of MP3 energy and some practice problem

Lecture 74 - Overview of the some other correlation calculation method

Lecture 75 - A brief introduction to Coupled cluster theory

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NPTEL : Bio-Physical Chemistry (Chemistry and Biochemistry)

Co-ordinators : Dr. P.K. Chowdhury

Lecture 1 - A Course on Bio-physical Chemistry

Lecture 2 - Protein Structure

Lecture 3 - Secondary Structure of Proteins

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

Lecture 5 - Tertiary Structure

Lecture 6 - Forces in Protein Folding

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

Lecture 8 - Electrostatics (Continued...)

Lecture 9 - Intermolecular Interactions

Lecture 10 - Dipole-Dipole Interaction

Lecture 11 - Electrostatics (Continued...)

Lecture 12 - Hydrophobic Effect

Lecture 13 - Hydrophobic Effect (Continued...)

Lecture 14 - Hydrogen Bonding

Lecture 15 - Protein Stability Curves

Lecture 16 - Thermodynamics of Protein Unfolding

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

Lecture 18 - Mechanism of Chemical Denaturation

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

Lecture 20 - Protein Folding Pathways and Energy Landscapes

Lecture 21 - Diffusion

Lecture 22 - Diffusion (Continued...)

Lecture 23 - Diffusion (Continued...)

Lecture 24 - Langevin Equation and Brownian Motion

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

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

Lecture 27 - Protein Folding : Mechanisms and Kinetics

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

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

Lecture 30 - Protein Folding : The Chevron-Plot

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

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

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

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

Lecture 35 - Experimental Tools

Lecture 36 - Spectroscopy : The Franck Condon Principle

Lecture 37 - Spectroscopy : The Franck Condon Principle (Continued...)

Lecture 38 - Electronic Spectroscopy Absorption and Fluorescence

Lecture 39 - Fluorescence

Lecture 40 - Fluorescence Quenching

Lecture 41 - Infrared Spectroscopy of Proteins

Lecture 42 - Infrared Spectroscopy of Proteins (Continued...)

NPTEL : NOC:Spectroscopic Techniques for Pharmaceutical and Biopharmaceutical Industries (Chemistry and Biochemistry)

Co-ordinators : Dr. Shashank Deep

Lecture 1 - Introduction to Spectroscopy - I

Lecture 2 - Introduction to Spectroscopy - II

Lecture 3 - Introduction to Spectroscopy - III

Lecture 4 - Introduction to Spectroscopy - IV

Lecture 5 - Introduction to Spectroscopy - V

Lecture 6 - Introduction to Spectroscopy - VI

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

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

Lecture 9 - Vibrational Spectroscopy Theory and Application - I

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

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

Lecture 12 - Problems on Rotational, Vibrational and Raman Spectroscopy

Lecture 13 - Atomic Spectroscopy - I

Lecture 14 - Atomic Spectroscopy - II

Lecture 15 - Atomic Spectroscopy - III

Lecture 16 - Atomic Spectroscopy - IV

Lecture 17 - Atomic and Molecular Spectroscopy

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

Lecture 19 - UV-Visible Spectroscopy of Conjugated Molecules

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

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

Lecture 22 - UV-Vis and Fluorescence Spectroscopy

Lecture 23 - Fluorescence Spectroscopy (Continued...)

Lecture 24 - Application of Fluorescence Spectroscopy

Lecture 25 - Application of Steady-State Fluorescence

Lecture 26 - Time- resolved Fluorescence Spectroscopy

Lecture 27 - Microscopy

Lecture 28 - Contrast in Microscopy, Fluorescence Microscopy

Lecture 29 - Fluorescence Microscopy and Application

Lecture 30 - Principle of NMR

Lecture 31 - NMR data processing and Chemical shift

Lecture 32 - Structure Informations from NMR

Lecture 33 - Structure Calculation and 2D-NMR Spectroscopy

Lecture 34 - Mass Spectroscopy

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NPTEL : NOC:Introductory Non-Linear Dynamics (Chemistry and Biochemistry)

Co-ordinators : Prof. Ramakrishna Ramaswamy

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

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

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

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

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

Lecture 6 - Logistic map. Simple Examples of Bifurcations

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

Lecture 8 - Characterizing The Period-Doubling Route to Chaos

Lecture 9 - Lyapunov Exponents; Invariant measures

Lecture 10 - Intermittency. Crises

Lecture 11 - Fractals

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

Lecture 13 - The Baker and Horseshoe Maps

Lecture 14 - Hamiltonian Chaos - 1

Lecture 15 - Hamiltonian Chaos - 2

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NPTEL : NOC:Principles of Organic Synthesis (Chemistry and Biochemistry)

Co-ordinators : Prof. T. Punniyamurthy

Lecture 1 - Aldol Reaction

Lecture 2 - Perkin, Claisen and Thorpe Reactions

Lecture 3 - Reaction of Enolates

Lecture 4 - Mannich Reaction

Lecture 5 - Reaction of Alkenes and Carbonyl Compounds

Lecture 6 - Friedel-Crafts and Prins Reactions

Lecture 7 - Grignard Reagents

Lecture 8 - Organolithium Reagents

Lecture 9 - Organocopper, Organozinc and Organomercury Reagents

Lecture 10 - Ritter Reaction and Gabriel Synthesis

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

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

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

Lecture 14 - Formylation/acylation and related reactions

Lecture 15 - Nitration, Sulfonation and other reactions

Lecture 16 - Principle, Substitution mechanism and reactions of Benzyne

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

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

Lecture 19 - Preparation, properties and reactions

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

Lecture 21 - Applications of diazonium salts

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

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

Lecture 24 - Rearrangement to electron-Rich carbon

Lecture 25 - Reactivity and several reactions

Lecture 26 - Reactions of sulfur and silicon containing reagents

Lecture 27 - Preparation and reactions of organoborane and organotin reagents

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

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

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

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NPTEL : NOC:Reagents in Organic Synthesis (Chemistry and Biochemistry)

Co-ordinators : Prof.Subhas Chandra

Lecture 1 - Chromium Based Reagents for Oxidation

Lecture 2 - Non-metal based Reagents for Oxidation

Lecture 3 - Organic Peroxides

Lecture 4 - Oxidation Mediated by DDQ, CAN and SeO2

Lecture 5 - Oxidation Mediated by Mn and Ag

Lecture 6 - Oxidation by Ru, Hypervalent Iodine, Al and Na based Reagents

Lecture 7 - Na and Li Metal based Reduction

Lecture 8 - Hydride based Reduction

Lecture 9 - Hydrogenation

Lecture 10 - Al, Zn and Li Based Reagents for Reduction

Lecture 11 - Reduction With Boranes, Diimide and Trialkylsilanes

Lecture 12 - Li Based Reagents in Organic Synthesis

Lecture 13 - Mg and Na Based Reagents in Organic Synthesis

Lecture 14 - B Based Reagents in Organic Synthesis

Lecture 15 - B and Al Based Reagents in Organic Synthesis

Lecture 16 - S Based Reagents in Organic Synthesis

Lecture 17 - P Based Reagents in Organic Synthesis

Lecture 18 - Si and Pb Based Reagents in Organic Synthesis

Lecture 19 - Sn and Bi Based Reagents in Organic Synthesis

Lecture 20 - Ti Based Reagents in Organic Synthesis

Lecture 21 - Ru Based Reagents in Organic Synthesis

Lecture 22 - Pd Based Reagents in Organic Synthesis

Lecture 23 - Cu Based Reagents in Organic Synthesis

Lecture 24 - Cr and Mn Based Reagents in Organic Synthesis

Lecture 25 - Zn and Hg Based Reagents in Organic Synthesis

Lecture 26 - Au Based Reagents in Organic Synthesis

Lecture 27 - Fe and Co Based Reagents in Organic Synthesis

Lecture 28 - Ag and Rh Based Reagents in Organic Synthesis

Lecture 29 - Ni, Pt and Ir Based Reagents in Organic Synthesis

Lecture 30 - Introduction to Lanthanides and Sm Based Reagents

Lecture 31 - Samarium(Ii) Iodide Based Reagents in Organic Synthesis

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Lecture 32 - Sm and Yb Based Reagents in Organic Synthesis

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NPTEL : NOC:Thermodynamics: Classical to Statistical (Chemistry and Biochemistry)

Co-ordinators : Prof. Sandip Paul

Lecture 1 - Cocepts of heat and work; First Law of Thermodynamics

Lecture 2 - Concepts of enthalpy and heat capacity

Lecture 3 - Introduction to entropy

Lecture 4 - Calculation of entropy for various processes

Lecture 5 - Gibbs and Helmholtz free energy

Lecture 6 - Introduction to chemical potential

Lecture 7 - Clapeyron equation and phase transition; concept of fugacity

Lecture 8 - Calculation of fugacity; free energy of mixing

Lecture 9 - Partial molar quantities; excess thermodynamic quantities

Lecture 10 - Concept of activity and activity coefficients; Debye-Huckel limiting law

Lecture 11 - Phase Diagram of one component systems

Lecture 12 - Phase Diagram of two component systems

Lecture 13 - Phase Diagram of three component system; one dimensional random walk

Lecture 14 - Macroscopic and microscopic states; Boltzmann distribution; Canonical partition function

Lecture 15 - Calculation of different thermodynamical quantities using canonical partition function

Lecture 16 - Introduction to molecular partition function

Lecture 17 - Translational, electronic and nuclear partition function

Lecture 18 - Rotational partition function

Lecture 19 - Vibrational partitition function; Introduction to grand canonical ensemble

Lecture 20 - Grand canonical distribution; Introduction to microcanonical ensemble

Lecture 21 - Problems on classical thermodynamics - 1

Lecture 22 - Problems on classical thermodynamics - 2

Lecture 23 - Problems on statistical thermodynamics - 1

Lecture 24 - Problems on statistical thermodynamics - 2

Lecture 25 - Problems on statistical thermodynamics - 3

Lecture 26 - Fermi-Dirac and Bose-Einstein statistics

Lecture 27 - Ideal Fermi gas

Lecture 28 - Ideal Bose gas;Introduction to Bose-Einstein condensation

Lecture 29 - Bose-Einstein condensations

Lecture 30 - Nuclear spin statistics; Ortho- and para-hydrogens

Lecture 31 - Specific Heats of solids

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Lecture 32 - Problems on statistical thermodynamics - 4

Lecture 33 - Advance problems - 1

Lecture 34 - Advance Problems - 2

Lecture 35 - Advance Problems - 3

Lecture 36 - Advance Problems - 4

Lecture 37 - Advance Problems - 5

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NPTEL : NOC:Essentials of Biomolecules: Nucleic Acids and Peptides (Chemistry and Biochemistry)

Co-ordinators : Prof. Lal Mohan Kundu

Lecture 1 - Importance of Biomolecules

Lecture 2 - DNA double helix: Chemical parameters

Lecture 3 - DNA and Proteins

Lecture 4 - Amino acids and Proteins

Lecture 5 - Protein 3D structures, folding and denaturation

Lecture 6 - Chemical synthesis pyrimidine nucleobases

Lecture 7 - Chemical synthesis purine nucleobases, Prebiotic chemistry

Lecture 8 - Synthesis of nucleosides

Lecture 9 - Solid phase DNA synthesis

Lecture 10 - Chemistry and Biology of DNA Replication

Lecture 11 - Chemistry of Polymerase Chain Reaction

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

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

Lecture 14 - DNA sequencing: Maxam- Gilbert method

Lecture 15 - Numerical Problem-1

Lecture 16 - Sugar Chemistry

Lecture 17 - Chemistry behind DNA damage and mutation

Lecture 18 - Chemistry behind DNA damage and mutation

Lecture 19 - DNA repair

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

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

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

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

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

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

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

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

Lecture 28 - Spectroscopic techniques

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

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

Lecture 31 - Molecular probes: PNA and LNA-I

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Lecture 32 - Molecular Probes: PNA and LNA-II

Lecture 33 - Carbohydrate chemistry - I: Introduction and Synthesis

Lecture 34 - Carbohydrate chemistry - II: Polysaccharides and its nanoparticles

Lecture 35 - Carbohydrate chemistry - III: Synthesis of nanoparticles; Recap of all modules

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NPTEL : Chemistry of Materials (Chemistry and Biochemistry)

Co-ordinators : Prof. S. Sundar Manoharan

Lecture 1 - Introduction to Materials Chemistry

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

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

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

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

Lecture 6 - Preparative routes: Un Conventional - Combustion technique

Lecture 7 - Preparative routes: Un Conventional - Microwave technique

Lecture 8 - Preparative routes: High Pressure - Hydrothermal Technique

Lecture 9 - Preparative routes: Coventional Solid State Technique

Lecture 10 - Molecular Beam Epitaxy: Monolayers to Multilayers

Lecture 11 - Pulsed Laser Deposition: Oxide thin films

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

Lecture 13 - Sputtering deposited thin films and applications

Lecture 14 - Crystal growth-Single crystals.

Lecture 15 - Applications of X-ray diffraction

Lecture 16 - Applications of X-ray Photoelectron spectroscopy

Lecture 17 - Applications of X-ray Absorption spectroscopy

Lecture 18 - Applications of Thermal analysis techniques

Lecture 19 - Applications of Scanning Tunneling microscopy

Lecture 20 - Applications of Electron Microscopy

Lecture 21 - Case Study of ZnO

Lecture 22 - Magnetic materials - I

Lecture 23 - Magnetic Materials - II

Lecture 24 - Magnetic Materials - III & Related Phenomena

Lecture 25 - Shape Memory Materials

Lecture 26 - Spintronic Materials - I Colossal Magentoresistive Oxides

Lecture 27 - Spintronic Materials - II Giant Magnetoresistive Materials

Lecture 28 - Spintronic Materials - III Tunelling Magnetoresistive Materials

Lecture 29 - Spintronic Materials - IV Dilute Magnetic Semicondcutors

Lecture 30 - High Tc Superconductors

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

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Lecture 32 - The New Carbon family - II - Graphene

Lecture 33 - Optoelectronic Materials - I - OLEDS

Lecture 34 - Optoelectronic Materials - II - OLEDS

Lecture 35 - Inorganic Phosphors - I

Lecture 36 - Inorganic Phosphors - II

Lecture 37 - Phosphor Materials

Lecture 38 - Solar Cells

Lecture 39 - Interview with C N R Rao and Interview with E C Subba Rao

Lecture 40 - Perceptions & Projections

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NPTEL : Mathematics for Chemistry (Chemistry and Biochemistry)

Co-ordinators : Dr. Madhav Ranganathan, Dr. P.P. Thankachan

Lecture 1 - Mathematics for Chemistry

Lecture 2 - Mathematics for Chemistry

Lecture 3 - Mathematics for Chemistry

Lecture 4 - Mathematics for Chemistry

Lecture 5 - Mathematics for Chemistry

Lecture 6 - Mathematics for Chemistry

Lecture 7 - Mathematics for Chemistry

Lecture 8 - Mathematics for Chemistry

Lecture 9 - Mathematics for Chemistry

Lecture 10 - Mathematics for Chemistry

Lecture 11 - Mathematics for Chemistry

Lecture 12 - Mathematics for Chemistry

Lecture 13 - Mathematics for Chemistry

Lecture 14 - Mathematics for Chemistry

Lecture 15 - Mathematics for Chemistry

Lecture 16 - Mathematics for Chemistry

Lecture 17 - Mathematics for Chemistry

Lecture 18 - Mathematics for Chemistry

Lecture 19 - Mathematics for Chemistry

Lecture 20 - Mathematics for Chemistry

Lecture 21 - Mathematics for Chemistry

Lecture 22 - Mathematics for Chemistry

Lecture 23 - Mathematics for Chemistry

Lecture 24 - Mathematics for Chemistry

Lecture 25 - Mathematics for Chemistry

Lecture 26 - Mathematics for Chemistry

Lecture 27 - Mathematics for Chemistry

Lecture 28 - Mathematics for Chemistry

Lecture 29 - Mathematics for Chemistry

Lecture 30 - Mathematics for Chemistry

Lecture 31 - Mathematics for Chemistry

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Lecture 32 - Mathematics for Chemistry

Lecture 33 - Mathematics for Chemistry

Lecture 34 - Mathematics for Chemistry

Lecture 35 - Mathematics for Chemistry

Lecture 36 - Mathematics for Chemistry

Lecture 37 - Mathematics for Chemistry

Lecture 38 - Mathematics for Chemistry

Lecture 39 - Mathematics for Chemistry

Lecture 40 - Mathematics for Chemistry

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NPTEL : Advance Analytical Course (Chemistry and Biochemistry)

Co-ordinators : Dr. Padma S Vankar

Lecture 1 - Advance Analytical Course

Lecture 2 - Advance Analytical Course

Lecture 3 - Advance Analytical Course

Lecture 4 - Advance Analytical Course

Lecture 5 - Advance Analytical Course

Lecture 6 - Advance Analytical Course

Lecture 7 - Advance Analytical Course

Lecture 8 - Advance Analytical Course

Lecture 9 - Advance Analytical Course

Lecture 10 - Advance Analytical Course

Lecture 11 - Advance Analytical Course

Lecture 12 - Advance Analytical Course

Lecture 13 - Advance Analytical Course

Lecture 14 - Advance Analytical Course

Lecture 15 - Advance Analytical Course

Lecture 16 - Advance Analytical Course

Lecture 17 - Advance Analytical Course

Lecture 18 - Advance Analytical Course

Lecture 19 - Advance Analytical Course

Lecture 20 - Advance Analytical Course

Lecture 21 - Advance Analytical Course

Lecture 22 - Advance Analytical Course

Lecture 23 - Advance Analytical Course

Lecture 24 - Advance Analytical Course

Lecture 25 - Advance Analytical Course

Lecture 26 - Advance Analytical Course

Lecture 27 - Advance Analytical Course

Lecture 28 - Advance Analytical Course

Lecture 29 - Advance Analytical Course

Lecture 30 - Advance Analytical Course

Lecture 31 - Advance Analytical Course

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Lecture 32 - Advance Analytical Course

Lecture 33 - Advance Analytical Course

Lecture 34 - Advance Analytical Course

Lecture 35 - Advance Analytical Course

Lecture 36 - Advance Analytical Course

Lecture 37 - Advance Analytical Course

Lecture 38 - Advance Analytical Course

Lecture 39 - Advance Analytical Course

Lecture 40 - Advance Analytical Course

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NPTEL : NOC:Chemical Applications of Symmetry and Group Theory (Chemistry and Biochemistry)

Co-ordinators : Prof. Manabendra Chandra

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

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Lecture 32

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Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

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NPTEL : NOC:Mathematics for Chemistry (Chemistry and Biochemistry)

Co-ordinators : Dr. Madhav Ranganathan

Lecture 1 - Errors, precision and accuracy

Lecture 2 - Probability and distributions

Lecture 3 - Gaussian distribution and integrals

Lecture 4 - Gaussian distribution, integrals, averages

Lecture 5 - Practice problems 1

Lecture 6 - Vectors and Vector Spaces

Lecture 7 - Linear Independence

Lecture 8 - Scalar and vector fields

Lecture 9 - Gradient, divergence and curl

Lecture 10 - Practice problems 2

Lecture 11 - Line integrals, Potential Theory

Lecture 12 - Surface and Volume Integrals

Lecture 13 - Matrices

Lecture 14 - Linear Systems, Cramer's Rule

Lecture 15 - Practice Problems 3

Lecture 16 - Rank and Inverse of a Matrix

Lecture 17 - Eigenvalues and Eigenvectors

Lecture 18 - Special matrices

Lecture 19 - Spectral decomposition and Normal modes

Lecture 20 - Practice Problems 4

Lecture 21 - Differential equations, Order

Lecture 22 - Exact and Inexact differentials

Lecture 23 - Integrating Factors

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

Lecture 25 - Practice Problems 5

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

Lecture 27 - Homogeneous 2nd order ODEs

Lecture 28 - Homogeneous and nonhomogeneous equations

Lecture 29 - Nonhomogeneous equations Â– Variation of parameters

Lecture 30 - Practice Problems 6

Lecture 31 - Power series method for solving Legendre DE

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Lecture 32 - Properties of Legendre Polynomials

Lecture 33 - Associated Legendre Polynomials, Spherical Harmonics

Lecture 34 - Hermite Polynomials, Solution of Quantum Harmonic Oscillator

Lecture 35 - Practice Problems 7

Lecture 36 - Conditions for power series solution

Lecture 37 - Frobenius Method, Bessel Functions

Lecture 38 - Properties of Bessel Functions, circular boundary problems

Lecture 39 - Leguerre Polynomials, solution to radial part of H-atom

Lecture 40 - Practice Problems 8

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NPTEL : NOC:Quantum Computing (Chemistry and Biochemistry)

Co-ordinators : Prof. Debabrata Goswami

Lecture 1 - Introduction - Motivation and Overview

Lecture 2 - Introduction - Technical Details

Lecture 3 - Introduction - Basic tools

Lecture 4 - Computational Tools

Lecture 5 - Quantum Measurement and Teleportation

Lecture 6 - Quantum Teleportation and Cryptography

Lecture 7 - DJ Algorithm and Implementation Aspects

Lecture 8 - Grover's Algorithm

Lecture 9 - Basics of Shor's Algorithm

Lecture 10 - Shor's Algorithm and Quantum Fourier Transform (QFT)

Lecture 11 - Basics of Quantum Mechanics

Lecture 12 - Modern look at Quantum Mechanics

Lecture 13 - Basics of NMR

Lecture 14 - Concepts in NMR Quantum Computing

Lecture 15 - Laser Basics

Lecture 16 - Continuous Wave Lasers

Lecture 17 - Pulsed Lasers

Lecture 18 : Optical Implementation 'Linear Approach

Lecture 19 : Various Aspects of Linear Optical Quantum Computing

Lecture 20 : Laser Experimental Implementation for Grover's Algorithm

Lecture 21 - Optical Implementation

Lecture 22 - Solutions to problem set - 1

Lecture 23 - Basics of Ion Traps

Lecture 24 - Applications of Ion Traps in QIQC

Lecture 25 - Reviewing Concepts and clarifying problems - 1

Lecture 26 - Reviewing Concepts and clarifying problems - 2

Lecture 27 - Qubits used in Commercial Quantum Computing

Lecture 28 - Spintronics Quantum Computing

Lecture 29 - Back to Basics - I

Lecture 30 - Back to Basics - II

Lecture 31 - Understanding Implementation Issues from the Basics - I

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Lecture 32 - Understanding Implementation Issues from the Basics - II

Lecture 33 - Implementation with Solid-State Super conducting Qubits

Lecture 34 - Concept of Density Matrix for Quantum Computing

Lecture 35 - Understanding the ensemble of Qubits from Density Matrix

Lecture 36 - Understanding Quantum Measurement, Entanglement etc. in Quantum Computing using Density Matrix

Lecture 37 - Principles: Quantum Mechanics and Computers

Lecture 38 - Measurements: Single vs Ensemble Averaged

Lecture 39 - Working of Quantum Computers: NMR QC

Lecture 40 - Academic Development in Quantum Computing - I

Lecture 41 - Academic Development in Quantum Computing - II

Lecture 42 - Commercial Development in Quantum Computing Implementation

Lecture 43 - Use of Atomic Quibts in Quantum Computing

Lecture 44 - Futuristic Aspects in Implementing Quantum Computing - I

Lecture 45 - Futuristic Aspects in Implementing Quantum Computing - II

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NPTEL : NOC:Basics of Fluroscence Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. Pratik Sen

Lecture 1

Lecture 2

Lecture 3

Lecture 4

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Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

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Lecture 31

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Lecture 32

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Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

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NPTEL : NOC:Laser - Fundamentals and Applications (Chemistry and Biochemistry)

Co-ordinators : Prof. Manabendra Chandra

Lecture 1 - Unique properties of LASERs and their applications

Lecture 2 - LASER and its history

Lecture 3 - Interaction of Light with matter

Lecture 4 - Einsteins Concept of stimulated emission

Lecture 5 - Calculation of Einsteins coefficient

Lecture 6 - Population inversion, 2-level system and 3-level system

Lecture 7 - 3-level System and 4-level system

Lecture 8 - Components of LASERs

Lecture 9 - Modes of LASER cavity and standing waves

Lecture 10 - Transverse Modes of LASER cavity

Lecture 11 - Threshold Condition

Lecture 12 - Properties of Laser: Directionality and Intensity

Lecture 13 - Properties of Laser: Coherence and Monochromaticity

Lecture 14 - Continuous and Pulsed Lasers

Lecture 15 - Some Numerical problem

Lecture 16 - Cavity Dumping

Lecture 17 - Q-switching

Lecture 18 - Q-switching and Pockels effect

Lecture 19 - Passive Q-switching, Mode-Locking

Lecture 20 - Mode Locking

Lecture 21 - Mode - locking

Lecture 22 - Mode - locking (Continued...)

Lecture 23 - Passive Mode - locking and Types of LASERs

Lecture 24 - Solid state LASERs

Lecture 25 - Semiconductor LASERs and Gas LASERs

Lecture 26 - Gas LASERs

Lecture 27 - Chemical and Dye LASERs

Lecture 28 - Introduction to Non Linear Optics

Lecture 29 - Non Linear Optics

Lecture 30 - 2nd order Nonlinear optics

Lecture 31 - Non-linear optical processes

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Lecture 32 - Aspects of SHG and Application of non-linear optics

Lecture 33 - Application of LASER: LIDAR

Lecture 34 - Application of Laser: Laser Spectroscopy

Lecture 35 - Application of Laser: Enrichment of Isotope

Lecture 36 - Laser Induced Chemistry

Lecture 37 - Laser Induced Chemistry and Ultrafast chemical Dynamics

Lecture 38 - Lasers in Medical Sciences

Lecture 39 - Lasers in Material sciences and engineering and Optical Communications

Lecture 40 - Laser safety and summary

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NPTEL : NOC:Advanced Mathematical Methods for Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Madhav Ranganathan

Lecture 1 - Vectors, Vector Operations and Linear Independence

Lecture 2 - Vector Operations, Generalization of Vectors

Lecture 3 - Vector Differentiation, Vector Transformations

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

Lecture 5 - Practice Problems

Lecture 6 - Matrix as a vector transformation, linear system

Lecture 7 - Special Matrices: Symmetric, Orthogonal, Complex

Lecture 8 - Rotational Matrices, Eigenvalues and Eigenvectors

Lecture 9 - Determinants, Matrix Inverse

Lecture 10 - Practice Problems

Lecture 11 - Step Function, Delta Function

Lecture 12 - Gamma Function, Error Function

Lecture 13 - Spherical Polar Coordinates

Lecture 14 - Cylindrical Polar Coordinates, Integrals

Lecture 15 - Recap of Module 3, Practice Problems

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

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

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

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

Lecture 20 - Recap of Module 4, Practice problems

Lecture 21 - Homogeneous 2nd Order ODE, Basis Functions

Lecture 22 - Nonhomogeneous 2nd Order ODE

Lecture 23 - Power Series Method of Solving ODEs

Lecture 24 - Frobenius Method / Power Series Method

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

Lecture 26 - Maxima and Minima, Taylor Series

Lecture 27 - Taylor Series for functions of several variables

Lecture 28 - Critical Points of Functions

Lecture 29 - Lagranges Method of Undetermined Multipliers

Lecture 30 - Recap of Module 6, Practice Problems

Lecture 31 - Nonlinear Differential Equations

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Lecture 32 - Phase Plane of A Pendulum

Lecture 33 - Stability of Critical Points

Lecture 34 - Population Dynamics Models

Lecture 35 - Recap of Module 7, Practice Problems

Lecture 36 - Fourier Series, Fourier Expansion of Periodic Functions

Lecture 37 - (Part A): Fourier Expansions and Differential Equations

Lecture 38 - (Part B): Fourier Expansions and Differential Equations

Lecture 39 - Orthogonal Eigenfunctions, Sturm-Liouville Theory

Lecture 40 - Recap of Module 8, Practice Problems

Lecture 41 - Fourier Transforms

Lecture 42 - Properties of Fourier Transforms

Lecture 43 - Fourier Transforms and Partial Differential Equations

Lecture 44 - Laplace Transforms

Lecture 45 - Recap of Module 9, Practice Problems

Lecture 46 - Partial Differential Equations, Boundary Conditions

Lecture 47 - Separation of Variables

Lecture 48 - (Part A): Two-dimensional Wave Equation, Bessel Functions

Lecture 49 - (Part B): Two-dimensional Wave Equation, Bessel Functions

Lecture 50 - Recap of Module 10, Practice Problems

Lecture 51 - Discrete and Continuous Random Variables

Lecture 52 - Probability Distribution Functions

Lecture 53 - Poisson Distribution, Gaussain Distribution

Lecture 54 - Error Estimates, Least Square Fit, Correlation Functions

Lecture 55 - Recap of Module 11, Practice Problems

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NPTEL : NOC:Solid State Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Madhav Ranganathan

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

Lecture 2 - Thermodynamics of solids

Lecture 3 - Crystallisation Kinetics

Lecture 4 - Synthetic Strategy

Lecture 5 - Review of week 1 and Practice problems

Lecture 6 - Unit Cells

Lecture 7 - Conventional Unit Cell and Primitive Unit Cell

Lecture 8 - Bravais Lattices

Lecture 9 - Bravais Lattices, Basis and crystal

Lecture 10 - Summery of week 2 and Practices Problems

Lecture 11 - Symmetry In Crystals, Point Symmetries

Lecture 12 - Reflections, Inversions and Rotoinversions

Lecture 13 - Schonflies and Hermann-Mauguin Conventions

Lecture 14 - Fractional Coordinates, Planer Visualization

Lecture 15 - Review of week 3 And Practice Problems

Lecture 16 - Combining symmetry operations, translational symmetries

Lecture 17 - Screw Axis

Lecture 18 - Glide Planes

Lecture 19 - Symmetry and Symmetry Notations

Lecture 20 - Summary of week 4 and Practice Problems

Lecture 21 - Crystal Systems

Lecture 22 - Crystal Systems and Unit Cells

Lecture 23 - Point Groups

Lecture 24 - Space Groups

Lecture 25 - Week 5 Summary and Practice Problems

Lecture 26 - 32 Crystal Classes Based on Symmetry

Lecture 27 - Notation for 32 Crystal Classes

Lecture 28 - Short Form of Hermann-Mauguin Notations

Lecture 29 - Hermann - Mauguin notation for Space Groups

Lecture 30 - Summary and Practice Problems

Lecture 31 - Coordination number, Voids

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Lecture 32 - Lattice Imperfections and Crystals

Lecture 33 - Line Planner and Bulk defects and crystals

Lecture 34 - Thermodynamics of defects in crystals

Lecture 35 - Review of Week 7,Practice Problems

Lecture 36 - Miller Planes, Miller Indices

Lecture 37 - Miller Indices for Hexagonal Systems, Distance between Planes

Lecture 38 - X-ray diffraction, Bragg's Law, Reciprocal Lattice

Lecture 39 - Reciprocal Lattice, XRD instrumentation

Lecture 40 - Review of week 8, Practice Problems

Lecture 41 - XRD - Analysis of Pattern

Lecture 42 - Geometric Structure Factor - Missing Peaks

Lecture 43 - X-Ray Crystallography

Lecture 44 - Electron Microscopy

Lecture 45 - Review of Week 9. Practice Problems

Lecture 46 - Closed - Packed Structures and Voids

Lecture 47 - Crystal Structures of Binary Compounds

Lecture 48 - Perovskites and Spinals

Lecture 49 - Space filling Polyhedra, Alloys

Lecture 50 - Summary of Week 10 and Practice Problems

Lecture 51 - Free electron Models

Lecture 52 - Bloch Theorem

Lecture 53 - Band Theory of Solids

Lecture 54 - Bands in Higher Dimensions

Lecture 55 - Summary of Week 11 and Practice Problems

Lecture 56 - More about Band Theory, Crystal Momentum

Lecture 57 - Density of States

Lecture 58 - Metals, Insulators and Semiconductors

Lecture 59 - Band Gap and Optical Properties

Lecture 60 - Summary of Week 12 and Practice Problems

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NPTEL : NOC:Bioinorganic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. S. P. Rath

Lecture 1 - General Introduction and Prospects

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

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

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

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

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

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

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

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

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

Lecture 11 - Life with Oxygen: Cytochrome c oxidase

Lecture 12 - Life with Oxygen: Superoxide Dismutase Activity

Lecture 13 - Life with Oxygen: Catalase and Peroxidase Activities

Lecture 14 - Life with Oxygen: Oxygenase Activity

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

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

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

Lecture 18 - Life with Oxygen: Heme Oxygenase Activity

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

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

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NPTEL : NOC:Chemistry and Physics of Surfaces and Interfaces (Chemistry and Biochemistry)

Co-ordinators : Prof. Thiruvancheril G. Gopakumar

Lecture 1 - Intro-Chemistry and Physics of Surfaces and Interfaces

Lecture 2 - Historic perspective to surface science

Lecture 3 - Creating surfaces from bulk lattices

Lecture 4 - Reconstruction of surfaces

Lecture 5 - Hexagonal lattice and miller bravais indices

Lecture 6 - Introduction to ultra-high Vaccum and Preparation of Clean Surfaces

Lecture 7 - Adsorption and the Energetic of Adsorption

Lecture 8 - Nomenclature and types of Adlayers

Lecture 9 - Thermal Desorption Spectroscopy

Lecture 10 - Different types of Preparation methods for Thin Films

Lecture 11 - Examples of PVD and CVD

Lecture 12 - Moire Pattern at Solid-Solid Interface

Lecture 13 - Growth Modes of Adlayers

Lecture 14 - Energies that Control the Growth of Adlayers

Lecture 15 - Kinetic and Thermodynamic Control in Adlayer Growth

Lecture 16 - Molecular Adsorbates: Preparation

Lecture 17 - Molecular Adsorbates: Factors Controlling Molecular Adlayer Formation - I

Lecture 18 - Molecular Adsorbates: Factors Controlling Molecular Adlayer Formation - II

Lecture 19 - Molecular Adsorbates: Factors Controlling Molecular Adlayer Formation - III

Lecture 20 - Scanning Tunneling Microscopy

Lecture 21 - Tip-vaccum Tunneling Junction

Lecture 22 - Scanning Tunneling Spectroscopy - I

Lecture 23 - Scanning Tunneling Spectroscopy - II

Lecture 24 - Scanning Tunneling Spectroscopy: Applications - I

Lecture 25 - Scanning Tunneling Spectroscopy: Applications - II

Lecture 26 - Imaging Molecules and Atom Manipulation on Surfaces

Lecture 27 - Single Molecule Manipulation on Surfaces

Lecture 28 - Inelastic Tunneling Spectroscopy

Lecture 29 - Ultra-violet Photo-electron Spectroscopy (UPS)

Lecture 30 - Ultra-violet Photo-electron Spectroscopy (UPS): Applications

Lecture 31 - X-ray Photo-electron Spectroscopy (XPS)

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Lecture 32 - X-Ray Photo-electron Spectroscopy (XPS): Applications - 1

Lecture 33 - X-Ray Photo-electron Spectroscopy (XPS): Applications - 2

Lecture 34 - 2D Molecular Materials on Surface - 1

Lecture 35 - 2D Molecular Materials on Surface - 2

Lecture 36 - Atomic Force Microscopy (AFM) - I

Lecture 37 - Atomic Force Microscopy (AFM) - II

Lecture 38 - Atomic Force Microscopy (AFM) - III

Lecture 39 - Dynamics of Atoms on Surfaces

Lecture 40 - Summary

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NPTEL : NOC:Supramolecular Chemistry-I (Chemistry and Biochemistry)

Co-ordinators : Prof. Parimal Kanti Bharadwaj

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

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Lecture 30

Lecture 31

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Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

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NPTEL : Bio-inorganic chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. D. Ray

Lecture 1 - Introduction

Lecture 2 - Iron Storage and Transport - I

Lecture 3 - Iron Storage and Transport - II

Lecture 4 - Iron Storage and Transport - III

Lecture 5 - Electron Transport Proteins - I

Lecture 6 - Electron transport Proteins - II

Lecture 7 - Electron Transport Proteins - III

Lecture 8 - Electron Transport Proteins - IV

Lecture 9 - Electron Transport Proteins - V

Lecture 10 - Electron Transport Proteins - VI

Lecture 11 - Electron Transport Proteins - VII

Lecture 12 - Electron Transport Proteins - VIII

Lecture 13 - Electron Transport Proteins - IX

Lecture 14 - Electron Transfer in Photosynthesis - I

Lecture 15 - Electron Transfer in Photosynthesis - II

Lecture 16 - Manganese Enzymes

Lecture 17 - Nickel Enzymes - I

Lecture 18 - Nickel Enzymes - II

Lecture 19 - Nickel Enzymes - III

Lecture 20 - Nickel Enzymes - IV

Lecture 21 - Nickel Enzymes - V

Lecture 22 - Molybdenum Enzymes - I

Lecture 23 - Molybdenum Enzymes - II

Lecture 24 - Molybdenum Enzymes - III

Lecture 25 - Molybdenum Enzymes - IV

Lecture 26 - Molybdenum Enzymes - V

Lecture 27 - Molybdenum Enzymes - VI

Lecture 28 - Molybdenum and Tungsten in Biology

Lecture 29 - Tungsten Enzymes - I

Lecture 30 - Tungsten Enzymes - II

Lecture 31 - Tungsten Enzymes - III

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Lecture 32 - Tungsten Enzymes - IV

Lecture 33 - Vanadium Enzymes - I

Lecture 34 - Vanadium Enzymes - II

Lecture 35 - Vanadium Enzymes - III

Lecture 36 - Vanadium Enzymes - IV

Lecture 37 - Non-metals in Biology - I

Lecture 38 - Non-metals in Biology - II

Lecture 39 - Non-metals in Biology - III

Lecture 40 - Non-metals in Biology - IV

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NPTEL : Co-ordination Chemistry (Chemistry of Transition Elements) (Chemistry and Biochemistry)

Co-ordinators : Prof. D. Ray

Lecture 1 - Introduction

Lecture 2 - Definition

Lecture 3 - Classification of Ligands - I

Lecture 4 - Classification of Ligands - II

Lecture 5 - Ligands - III and Nomenclature - I

Lecture 6 - Nomenclature - II

Lecture 7 - Coordination Number - I

Lecture 8 - Coordination Number - II

Lecture 9 - Coordination Number - III

Lecture 10 - Coordination Number - IV

Lecture 11 - Isomerism - I

Lecture 12 - Isomerism - II

Lecture 13 - Coordination Equilibria - I

Lecture 14 - Coordination Equilibria - II

Lecture 15 - Bonding in Complexes - I

Lecture 16 - Bonding in Complexes - II

Lecture 17 - Bonding in Complexes - III

Lecture 18 - Bonding in Complexes - IV

Lecture 19 - Jahn-Teller Effect

Lecture 20 - Spin Crossover and Colour

Lecture 21 - Optical Spectra

Lecture 22 - d-d Transitions

Lecture 23 - Charge Transfer

Lecture 24 - Orgel Diagram

Lecture 25 - Tanabe Sugano Diagram

Lecture 26 - MLCT Transitions

Lecture 27 - Application of CFT

Lecture 28 - Spinels

Lecture 29 - Magnetochemistry

Lecture 30 - Magnetic Properties

Lecture 31 - Magnetic Measurements

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Lecture 32 - Ligand Field Theory

Lecture 33 - Sigma Orbitals

Lecture 34 - Pi Orbitals

Lecture 35 - Reaction Mechanism - I

Lecture 36 - Reaction Mechanism - II

Lecture 37 - Reaction Mechanism - III

Lecture 38 - Reaction Mechanism - IV

Lecture 39 - Reaction Mechanism - V

Lecture 40 - Biological Inorganic Chemistry

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NPTEL : Heterocyclic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. D.R. Mal

Lecture 1 - Definition and Scope

Lecture 2 - Single - Step Methods for IVPs

Lecture 3 - Systematic Nomenclature

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

Lecture 5 - Overview of Structure Determination in Heterocyclic Chemistry

Lecture 6 - 15N NMR in Heterocyclic Chemistry

Lecture 7 - Effects of Ring Nitrogen - A

Lecture 8 - Effects of Ring Nitrogen - B

Lecture 9 - Effects of Ring Nitrogen - C

Lecture 10 - Oxidation in Heterocyclic Chemistry

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

Lecture 12 - Reduction in Heterocyclic Chemistry

Lecture 13 - Radicals in Heterocylic Chemistry - I

Lecture 14 - Radicals in Heterocylic Chemistry - II

Lecture 15 - Lithiation for 5-membered heterocycles

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

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

Lecture 18 - Magnetiation and Zincation in Heterocyclic Chemistry

Lecture 19 - Transition metal catalyzed cross coupling

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

Lecture 21 - Dehydrogenative (Oxidative) cross coupling

Lecture 22 - Tert-amino effect in heterocycle synthesis

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

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

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

Lecture 26 - Cycloaddition : Revisited

Lecture 27 - [4 plus 3] Cycloaddition

Lecture 28 - [5 plus 2] Cycloaddition

Lecture 29 - [2 plus 2 plus 2] Cycloaddition

Lecture 30 - Pyrrole Synthesis - I

Lecture 31 - Pyrrole Synthesis - II

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Lecture 32 - Indole Synthesis - I

Lecture 33 - Indole Synthesis - II

Lecture 34 - Furan Synthesis

Lecture 35 - Thiophene Synthesis

Lecture 36 - Oxazole, Imidazole and Thiazole Synthesis

Lecture 37 - Pyridine Synthesis

Lecture 38 - Synthesis of Quinolines and Isoquinolines

Lecture 39 - Bycyclic Polyheteroatomic Heterocycles

Lecture 40 - Heterocyclic Rearrangements

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NPTEL : Organic Photochemistry and Pericyclic Reactions (Chemistry and Biochemistry)

Co-ordinators : Dr. N.D. Pradeep Singh

Lecture 1 - Introduction to Organic Photochemistry

Lecture 2 - Introduction to Organic Photochemistry (Continued...)

Lecture 3 - Reactivity of n-pi*

Lecture 4 - Î± - cleavage - I

Lecture 5 - Î± - cleavage - II

Lecture 6 - Î± - cleavage - III

Lecture 7 - Î² - cleavage

Lecture 8 - Intramolecular Hydrogen Abstraction - I

Lecture 9 - Intramolecular Hydrogen Abstraction - II

Lecture 10 - Intramolecular Hydrogen Abstraction - III

Lecture 11 - Intramolecular Hydrogen Abstraction

Lecture 12 - Addition to Î - System

Lecture 13 - Intramolecular Paterno-Buchi Reaction

Lecture 14 - Energy of Electron Transfer Reaction

Lecture 15 - Reactivity of Î - Î *

Lecture 16 - Addition Reaction of Î - Î *

Lecture 17 - Addition Reaction of Î - Î * (Continued...)

Lecture 18 - Di-Pi Methane Rearrangement

Lecture 19 - Photochemistry of Cyclohexanone

Lecture 20 - Singlet Oxygen Chemistry

Lecture 21 - Carbenes and Nitrenes

Lecture 22 - Remote Functionalisation

Lecture 23 - Introduction to Pericyclic Reaction

Lecture 24 - Sigmatropic Reactions - I

Lecture 25 - Sigmatropic Reactions - II

Lecture 26 - Sigmatropic Reactions - III

Lecture 27 - Cycloaddition Reactions - I

Lecture 28 - Cycloaddition Reactions - II

Lecture 29 - Cycloaddition - Diels-Alder Reactions

Lecture 30 - Cycloaddition - Diels-Alder Reactions (Continued...)

Lecture 31 - Cycloaddition - Ene Reactions

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Lecture 32 - 1,3 Dipolar Cycloaddition - I

Lecture 33 - 1,3 Dipolar Cycloaddition - II

Lecture 34 - Electrocyclic Reaction - I

Lecture 35 - Electrocyclic Reaction - II

Lecture 36 - Practice Problems in Pericyclic Reaction - I

Lecture 37 - Practice Problems in Pericyclic Reaction - II

Lecture 38 - Practice Problems in Pericyclic Reaction - III

Lecture 39 - Chelotropic Reaction

Lecture 40 - Application of Photochemistry

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NPTEL : Polymer Chemistry (Chemistry and Biochemistry)

Co-ordinators : Dr. D. Dhara

Lecture 1 - Introduction to Polymers

Lecture 2 - Introduction to Polymers (Continued...)

Lecture 3 - Introduction to Polymers (Continued...)

Lecture 4 - Step - growth Polymerization

Lecture 5 - Step - growth Polymerization (Continued...)

Lecture 6 - Step - growth Polymerization (Continued...)

Lecture 7 - Step - growth Polymerization (Continued...)

Lecture 8 - Step - growth Polymerization (Continued...)

Lecture 9 - Radical Chain Polymerization

Lecture 10 - Radical Chain Polymerization (Continued...)

Lecture 11 - Radical Chain Polymerization (Continued...)

Lecture 12 - Radical Chain Polymerization (Continued...)

Lecture 13 - Radical Chain Polymerization (Continued...)

Lecture 14 - Radical Chain Polymerization (Continued...)

Lecture 15 - Radical Chain Polymerization (Continued...)

Lecture 16 - Radical Chain Polymerization (Continued...)

Lecture 17 - Ionic Chain Polymerization

Lecture 18 - Ionic Chain Polymerization (Continued...)

Lecture 19 - Ionic Chain Polymerization (Continued...) and Chain Copolymerization

Lecture 20 - Chain Copolymerization (Continued...)

Lecture 21 - Chain Copolymerization (Continued...)

Lecture 22 - Chain Copolymerization (Continued...) and Ring Opening Polymerization

Lecture 23 - Polymer Stereochemistry and Coordination Polymerization

Lecture 24 - Polymer Stereochemistry and Coordination Polymerization (Continued...)

Lecture 25 - Polymer Solutions

Lecture 26 - Polymer Solutions (Continued...)

Lecture 27 - Polymer Solutions (Continued...)

Lecture 28 - Polymer Solutions (Continued...) and Chain Dimensions

Lecture 29 - Chain Dimensions (Continued...) and Frictional Properties of Solution

Lecture 30 - Frictional Properties of Solutions (Continued...) and Determination of Molecular Weight

Lecture 31 - Determination of Molecular Weight of Polymers (Continued...)

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Lecture 32 - Determination of Molecular Weight of Polymers (Continued...)

Lecture 33 - Determination of Molecular Weight of Polymers (Continued...)

Lecture 34 - Structural Analysis of Polymers by Spectroscopic Methods

Lecture 35 - Amorphous and Crystalline State : Tg and Tm

Lecture 36 - Amorphous and Crystalline State : Tg and Tm (Continued...)

Lecture 37 - Polymer Properties and Evaluation : Mechanical Properties

Lecture 38 - Polymer Properties and Evaluation : Mechanical Properties (Continued...) and Other Properties

Lecture 39 - Other Properties (Continued...) and Polymer Additives

Lecture 40 - Polymer Additives (Continued...)

Lecture 41 - Polymer Additives (Continued...), Blends, Concluding Remarks

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NPTEL : Rate processes (Chemistry and Biochemistry)

Co-ordinators : Dr. M. Halder

Lecture 1 - Rate Processes

Lecture 2 - Reaction Rates and Rate Laws

Lecture 3 - Effect of Temperature on Reaction Rate

Lecture 4 - Effect of Temperature on Reaction Rate (Continued...)

Lecture 5 - Complex Reaction

Lecture 6 - Complex Reaction (Continued...)

Lecture 7 - Complex Reaction (Continued...)

Lecture 8 - Complex Reaction (Continued...)

Lecture 9 - Theories of Reaction Rate

Lecture 10 - Theories of Reaction Rate (Continued...)

Lecture 11 - Theories of Reaction Rate (Continued...)

Lecture 12 - Theories of Reaction Rate (Continued...)

Lecture 13 - Theories of Reaction Rate (Continued...)

Lecture 14 - Kinetics of Some Specific Reactions

Lecture 15 - Kinetics of Some Specific Reactions (Continued...)

Lecture 16 - Enzyme Inhibition

Lecture 17 - Oscillatory Reactions

Lecture 18 - Acid Base Catalysis

Lecture 19 - Acid Base Catalysis (Continued...)

Lecture 20 - Kinetic Isotope Effects

Lecture 21 - Fast Reactions

Lecture 22 - Fast Reactions (Continued...)

Lecture 23 - Magneto Kinetics

Lecture 24 - Reactions in Solutions

Lecture 25 - Reactions in Solutions (Continued...)

Lecture 26 - Kinetics at Electrodes

Lecture 27 - Kinetics at Electrodes (Continued...)

Lecture 28 - Ultrafast Process

Lecture 29 - Ultrafast Process (Continued...)

Lecture 30 - Ultrafast Process (Continued...)

Lecture 31 - Reaction Dynamics

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Lecture 32 - Reaction Dynamics (Continued...)

Lecture 33 - Reaction Dynamics (Continued...)

Lecture 34 - Reaction Dynamics : Scattering

Lecture 35 - Reaction Dynamics : Scattering (Continued...)

Lecture 36 - Reaction Dynamics : Controlling Reagents etc

Lecture 37 - Reaction Dynamics : Controlling Reagents etc (Continued...)

Lecture 38 - Reaction Dynamics : Controlling Reagents etc (Continued...)

Lecture 39 - Reaction Dynamics : Concluding

Lecture 40 - Concluding Remarks

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NPTEL : NOC:Biochemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. S. Dasgupta

Lecture 1 - Amino Acid - I

Lecture 2 - Amino Acid - II

Lecture 3 - Protein Structure - I

Lecture 4 - Protein Structure - II

Lecture 5 - Protein Structure - III

Lecture 6 - Protein Structure - IV

Lecture 7 - Enzymes - I

Lecture 8 - Enzymes - II

Lecture 9 - Enzymes - III

Lecture 10 - Enzyme Mechanisms - I

Lecture 11 - Enzyme Mechanisms - II

Lecture 12 - Myoglobin and Hemoglobin

Lecture 13 - Lipids and Membranes - I

Lecture 14 - Lipids and Membranes - II

Lecture 15 - Membrane Transport

Lecture 16 - Nucleic Acids - I

Lecture 17 - Nucleic Acids - II

Lecture 18 - Nucleic Acids - III

Lecture 19 - Vitamins and Coenzymes - I

Lecture 20 - Vitamins and Coenzymes - II

Lecture 21 - Carbohydrates - I

Lecture 22 - Carbohydrates - II

Lecture 23 - Bioenergetics - I

Lecture 24 - Bioenergetics - II

Lecture 25 - Metabolism - I

Lecture 26 - Metabolism - II

Lecture 27 - Metabolism - III

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NPTEL : NOC:Analytical Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Debashis Ray

Lecture 1 - Chemicals and Materials Analysis

Lecture 2 - Methods

Lecture 3 - Methods (Continued...)

Lecture 4 - Methods (Continued...)

Lecture 5 - Methods (Continued...)

Lecture 6 - Role of Analytical Chemistry

Lecture 7 - Techniques, Wet Ashing

Lecture 8 - Apparatus and Weighing

Lecture 9 - Filtration, Ignition

Lecture 10 - Crucibles, Filter Papers and their Uses

Lecture 11 - Chemical Equilibria

Lecture 12 - Chemical Equilibria (Continued...)

Lecture 13 - Chemical Equilibria (Continued...)

Lecture 14 - Chemical Equilibria (Continued...)

Lecture 15 - Chemical Equilibria (Continued...)

Lecture 16 - Spectrochemic Methods - I

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

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

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

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

Lecture 21 - Spectrochemical Methods - II

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

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

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

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

Lecture 26 - Spectrochemical Methods - III

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

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

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

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

Lecture 31 - Thermal Methods of Analysis - I

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Lecture 32 - Thermal Methods of Analysis - I (Continued...)

Lecture 33 - Thermal Methods of Analysis - I (Continued...)

Lecture 34 - Thermal Methods of Analysis - I (Continued...)

Lecture 35 - Thermal Methods of Analysis - I (Continued...)

Lecture 36 - Thermal Methods of Analysis - II

Lecture 37 - Thermal Methods of Analysis - II (Continued...)

Lecture 38 - Thermal Methods of Analysis - II (Continued...)

Lecture 39 - Thermal Methods of Analysis - II (Continued...)

Lecture 40 - Thermal Methods of Analysis - II (Continued...)

Lecture 41 - Electrochemical Methods - I

Lecture 42 - Electrochemical Methods - I (Continued...)

Lecture 43 - Electrochemical Methods - I (Continued...)

Lecture 44 - Electrochemical Methods - I (Continued...)

Lecture 45 - Electrochemical Methods - I (Continued...):

Lecture 46 - Electrochemical Methods - II

Lecture 47 - Electrochemical Methods - II (Continued...)

Lecture 48 - Electrochemical Methods - II (Continued...)

Lecture 49 - Electrochemical Methods - II (Continued...)

Lecture 50 - Electrochemical Methods - II (Continued...)

Lecture 51 - Electrochemical Methods - III

Lecture 52 - Electrochemical Methods - III (Continued...)

Lecture 53 - Electrochemical Methods - III (Continued...)

Lecture 54 - Electrochemical Methods - III (Continued...)

Lecture 55 - Electrochemical Methods - III (Continued...)

Lecture 56 - Applications

Lecture 57 - Applications (Continued...)

Lecture 58 - Applications (Continued...)

Lecture 59 - Applications (Continued...)

Lecture 60 - Applications (Continued...)

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NPTEL : NOC:Co-ordination Chemistry (Chemistry of Transition Elements) (Chemistry and Biochemistry)

Co-ordinators : Prof. Debashis Ray

Lecture 1 - Introduction

Lecture 2 - Definition

Lecture 3 - Classification of Ligands - I

Lecture 4 - Classification of Ligands - II

Lecture 5 - Ligands- III and Nomenclature - I

Lecture 6 - Nomenclature - II

Lecture 7 - Coordination Number - I

Lecture 8 - Coordination Number - II

Lecture 9 - Coordination Number - III

Lecture 10 - Coordination Number - IV

Lecture 11 - Isomerism - I

Lecture 12 - Isomerism - II

Lecture 13 - Co-ordination Equilibria - I

Lecture 14 - Co-ordination Equilibria - II

Lecture 15 - Bonding in Complexes - I

Lecture 16 - Bonding in Complexes - II

Lecture 17 - Bonding in Complexes - III

Lecture 18 - Bonding in Complexes - IV

Lecture 19 - Jahn - Teller Effect

Lecture 20 - Spin Crossover and Colour

Lecture 21 - Optical Spectra

Lecture 22 - d-d Transitions

Lecture 23 - Charge Transfer

Lecture 24 - Orgel Diagram

Lecture 25 - Tanabe Sugano Diagram

Lecture 26 - MLCT Transitions

Lecture 27 - Application of CFT

Lecture 28 - Spinels

Lecture 29 - Magnetochemistry

Lecture 30 - Magnetic Properties

Lecture 31 - Magnetic Measurements

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Lecture 32 - Ligand Field Theory

Lecture 33 - Sigma Orbitals

Lecture 34 - Pi Orbitals

Lecture 35 - Reaction Mechanism - I

Lecture 36 - Reaction Mechanism - II

Lecture 37 - Reaction Mechanism - III

Lecture 38 - Reaction Mechanism - IV

Lecture 39 - Reaction Mechanism - V

Lecture 40 - Biological Inorganic Chemistry

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NPTEL : NOC:Stereochemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. A. Basak

Lecture 1 - Constitution and Configuration

Lecture 2 - Chirality, Symmetry Elements

Lecture 3 - Project Ion Formulae Rules for Drawing

Lecture 4 - Project Ion Formulae Rules for Drawing

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

Lecture 6 - Chirotopicity and Stereogenicity

Lecture 7 - Absolute Configuration

Lecture 8 - Absolute Configuration (Continued...)

Lecture 9 - Problems on the above topics

Lecture 10 - Topicity

Lecture 11 - Axial Chirality in Allenes, Biphenyls

Lecture 12 - Relative Configuration, Prochiral Faces and Prochiral Centres

Lecture 13 - Chirality in Heteroatom Systems

Lecture 14 - Conformations and Conformers

Lecture 15 - Conformational Analysis of Acyclic Molecules

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

Lecture 17 - Conformations of Acyclic Molecues Containing Heteroatoms

Lecture 18 - Conformations of Cyclic Systems

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

Lecture 20 - Conformation of Cyclobutane and Cyclopentane

Lecture 21 - Conformation of Cyclohexane

Lecture 22 - Energy Changes During Flipping

Lecture 23 - Energy Comparison between Chair and Boat Conformations

Lecture 24 - Conformational Analysis of Substituted Cyclohexanes

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

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

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

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

Lecture 29 - Conformation and Reactivity

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

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

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Lecture 32 - Stereoelectronic Effects

Lecture 33 - Stereoelectronic Effects (Continued...)

Lecture 34 - Substitution and Elimination in Cyclohexane Systems

Lecture 35 - Stereospecific and Stereoselective Reactions and Asymmetric Synthesis (Elementary Idea)

Lecture 36 - Asymmetric Induction: Nucleophilic Addition to Chiral Carbonyl Compounds

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

Lecture 38 - Asymmetric Induction (Continued...)

Lecture 39 - Facial Selectivity and Examples of Asymmetric Synthesis

Lecture 40 - Revisiting the Contents Covered

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NPTEL : NOC:A Study Guide in Organic Retrosynthesis - Problem Solving Approach (Chemistry and Biochemistry)

Co-ordinators : Prof. Samik Nanda

Lecture 1 - Introductory Remarks

Lecture 2 - Introductory remarks (Continued...)

Lecture 3 - Introductory remarks and some rapid fire quiz

Lecture 4 - Retro Quiz based on simple Transformation

Lecture 5 - Transformation based strategy for a given target

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

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

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

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

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

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

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

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

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

Lecture 15 - Multiple Tf based strategy for small molecule disconnection

Lecture 16 - Multiple Tf based strategies

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

Lecture 18 - Specific transformation

Lecture 19 - Selective transformations

Lecture 20 - Functional Group (Fg) based strategies

Lecture 21 - Functional group based strategy

Lecture 22 - Fg based strategy

Lecture 23 - Fg based strategy

Lecture 24 - Fg based strategy based on protecting groups

Lecture 25 - Fg based strategy

Lecture 26 - Protecting group based strategic disconnection

Lecture 27 - Fg group based strategy

Lecture 28 - Fg based strategy

Lecture 29 - Fg based strategies

Lecture 30 - Fg based strategy

Lecture 31 - Fg based strategy

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Lecture 32 - Fg based strategy

Lecture 33 - Starting material (SM) based strategy

Lecture 34 - Fg/Tf/SM based strategies

Lecture 35 - Fg/Tf/SM based strategies

Lecture 36 - Fg/Tf/SM based strategies

Lecture 37 - Fg based strategies

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

Lecture 39 - Fg/SM/Tf based combined strategies

Lecture 40 - Fg/SM/Tf based combined strategies

Lecture 41 - Fg based strategies

Lecture 42 - Fg based strategies

Lecture 43 - Symmetry based strategy

Lecture 44 - Symmetry based strategies

Lecture 45 - Symmetry based strategies

Lecture 46 - Symmetry based strategy

Lecture 47 - Symmetry based strategies

Lecture 48 - Symmetry based strategies

Lecture 49 - Topological based strategies

Lecture 50 - Topological strategies

Lecture 51 - Topological strategies

Lecture 52 - Stereochemical strategies

Lecture 53 - Stereochemical strategies

Lecture 54 - Stereochemical strategies

Lecture 55 - Stereochemical Strategies

Lecture 56 - Stereochemical strategies

Lecture 57 - Stereochemical strategies

Lecture 58 - Stereochemical strategies

Lecture 59 - Synthon concept revisited

Lecture 60 - Concluding remarks

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NPTEL : NOC:Introduction to Molecular Thermodynamics (Chemistry and Biochemistry)

Co-ordinators : Prof. Srabani Taraphder

Lecture 1 - Review of Classical Thermodynamics - Part I

Lecture 2 - Review of Classical Thermodynamics - Part II

Lecture 3 - Thermodynamic potentials - Part 1

Lecture 4 - Thermodynamic potentials - Part 2

Lecture 5 - Microstates of a system

Lecture 6 - Microstates of a System (Continued...)

Lecture 7 - Microstates of a system (Continued...)

Lecture 8 - Microstates of a system (Continued...)

Lecture 9 - Microstates of a system

Lecture 10 - Microstates of a system

Lecture 11 - Microstates of a system (Continued...)

Lecture 12 - Microstates of a system (Continued...)

Lecture 13 - Microstates of a System (Continued...)

Lecture 14 - Fundamentals of Statistical Mechanics

Lecture 15 - Statistical Ensembles

Lecture 16 - Microstates of a system

Lecture 17 - Canonical ensemble - Part I

Lecture 18 - Canonical Ensemble - Part I (Continued...)

Lecture 19 - Canonical Ensemble - Part II

Lecture 20 - Canonical Ensemble - Part III

Lecture 21 - Ideal gas

Lecture 22 - Ideal gases (Continued...)

Lecture 23 - Ideal gases (Continued...)

Lecture 24 - Ideal gases (Continued...)

Lecture 25 - Statistical thermodynamics of ideal gases (Continued...)

Lecture 26 - Statistical Thermodynamics of ideal gases (Continued...)

Lecture 27 - Statistical thermodynamics of ideal gases (Continued...)

Lecture 28 - Statistical thermodynamics of ideal gases (Continued...)

Lecture 29 - Statistical thermodynamics of ideal gases (Continued...)

Lecture 30 - Statistical thermodynamics of diatomic ideal gases

Lecture 31 - Statistical thermodynamics of ideal gas

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Lecture 32 - Chemical reaction equilibrium

Lecture 33 - Specific heat of solids

Lecture 34 - Application of Molecular Thermodynamics

Lecture 35 - Introduction to classical statistical mechanics

Lecture 36 - Introduction to classical statistical mechanics (Continued...)

Lecture 37 - Classical Statistical Mechanics

Lecture 38 - Classical Statistical Mechanics

Lecture 39 - Classical Statistical Mechanics

Lecture 40 - Rate of Chemical Reaction

NPTEL : NOC:Molecules in Motion (Chemistry and Biochemistry)

Co-ordinators : Prof. Amita Pathak Mahanty

Lecture 1 - Kinetic theory of gases

Lecture 2 - Kinetic theory of gases (Continued...)

Lecture 3 - Kinetic theory of gases (Continued...)

Lecture 4 - Kinetic theory of gases (Continued...)

Lecture 5 - Kinetic theory of gases (Continued...)

Lecture 6 - Kinetic theory of gases (Continued...)

Lecture 7 - Kinetic theory of gases (Continued...)

Lecture 8 - Kinetic theory of gases (Continued...)

Lecture 9 - Kinetic theory of gases (Continued...)

Lecture 10 - Kinetic theory of gases (Continued...)

Lecture 11 - Transport properties

Lecture 12 - Transport properties (Continued...)

Lecture 13 - Transport properties of gases

Lecture 14 - Molecular motion in Liquids

Lecture 15 - Molecular motion in Liquids (Continued...)

Lecture 16 - Molecular motion in Liquids (Continued...)

Lecture 17 - Molecular motion in Liquids (Continued...)

Lecture 18 - Molecular motion in Liquids (Continued...)

Lecture 19 - Molecular motion in Liquids (Continued...)

Lecture 20 - Molecular motion in Liquids (Continued...)

Lecture 21 - Molecular motion in Liquids (Continued...)

Lecture 22 - Molecular motion in Liquids (Continued...)

Lecture 23 - Molecular motion in Liquids (Continued...)

Lecture 24 - Molecular motion in Liquids (Continued...)

Lecture 25 - Molecular motion in Liquids (Continued...)

Lecture 26 - Molecular motion in Liquids (Continued...)

Lecture 27 - Molecular motion in Liquids (Continued...)

Lecture 28 - Molecular motion in Liquids (Continued...)

Lecture 29 - Molecular motion in Liquids (Continued...)

Lecture 30 - Molecular motion in Liquids (Continued...)

Lecture 31 - Molecular motion in Liquids (Continued...)

Lecture 32 - Molecular motion in Liquids (Continued...)

Lecture 33 - Molecular motion in Liquids (Continued...)

Lecture 34 - Molecular motion in Liquids (Continued...)

Lecture 35 - Molecular motion in Liquids (Continued...)

Lecture 36 - Molecular motion in Liquids (Continued...)

Lecture 37 - Molecular motion in Liquids (Continued...)

Lecture 38 - Molecular motion in gases

Lecture 39 - Molecular motion in gases

Lecture 40 - Molecular motion in gases

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NPTEL : NOC:Experimental Biochemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Soumya De, Prof. Swagata Dasgupta

Lecture 1 - Introduction

Lecture 2 - Buffers

Lecture 3 - Introduction to Biochemistry Laboratory Equipments and Safety Measures

Lecture 4 - Practical Aspects of Making Buffer

Lecture 5 - Making Tris Buffer (pH=8.2)

Lecture 6 - Making Phosphate Buffer (100mM)

Lecture 7 - Amino Acids and Their Properties

Lecture 8 - Amino Acid Titrations

Lecture 9 - pI Determination of Glycine

Lecture 10 - pI Determination of Lysine

Lecture 11 - Summary

Lecture 12 - UV and Visible Spectroscopy

Lecture 13 - Fluorescence Spectroscopy

Lecture 14 - UV/Visible Spectra of Amino Acids and Proteins

Lecture 15 - Fluorescence Spectra of Amino Acids and proteins

Lecture 16 - Spectroscopic Techniques Summary

Lecture 17 - Protein Folding and Denaturation - I

Lecture 18 - Protein Folding and Denaturation - II

Lecture 19 - Urea denaturation of HSA studied by UV/Vis absorbance

Lecture 20 - Temperature denaturation of HSA studied by UV/Vis absorbance

Lecture 21 - Denaturation of HSA by GdnHCl studied by Trp fluorescence

Lecture 22 - Protein Folding and Denaturation Summary

Lecture 23 - Chromatographic Techniques - I

Lecture 24 - Chromatographic Techniques - II

Lecture 25 - Protein Purification by Size Exclusion Chromatography (SEC)

Lecture 26 - Protein Purification by Affinity Chromatography

Lecture 27 - Gel Electrophoresis of DNA and Proteins - Part I

Lecture 28 - Gel Electrophoresis of DNA and Proteins - Part II

Lecture 29 - Gel Electrophoresis of DNA and Proteins - Part II

Lecture 30 - Isolation and Characterization of Proteins Part - I

Lecture 31 - Isolation and Characterization of Proteins Part - II

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Lecture 32 - Isolation and Purification of Proteins

Lecture 33 - Quality and Quantity of the Isolated Protein

Lecture 34 - Enzyme Kinetics - I

Lecture 35 - Enzyme Kinetics - II

Lecture 36 - Enzyme Kinetics (by using enzyme from apple juice)

Lecture 37 - Enzyme Kinetics (by using enzyme from apple juice) (Continued...)

Lecture 38 - Isolation and Characterization of DNA Part - I

Lecture 39 - Isolation and Characterization of DNA Part - II

Lecture 40 - Bacterial Culture for Plasmid DNA Isolation

Lecture 41 - Isolation of Plasmid DNA

Lecture 42 - Isolation and Characterization of DNA Summary

Lecture 43 - Basics of rDNA Technology Part - I

Lecture 44 - Basics of rDNA Technology Part - II

Lecture 45 - Cloning : Polymerase Chain Reaction, Restriction Enzyme Digestion and Ligation

Lecture 46 - DNA Transformation

Lecture 47 - Protein-Ligand Interaction

Lecture 48 - Protein-Ligand Interaction (Continued...)

Lecture 49 - Interaction study of HSA protein with Curcumin and Gallic acid using UV-Vis spectroscopy

Lecture 50 - Interaction study of HSA protein with Circumin and Gallic acid using UV-Vis spectroscopy (Continued...)

Lecture 51 - Analysis of the Structure of Protein ligand complex

Lecture 52 - Immunoassay Techniques

Lecture 53 - Western Blotting Technique

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NPTEL : NOC:Industrial Inorganic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Debashis Ray

Lecture 1 - Introduction

Lecture 2 - Importance of chemical industry, chemicals from materials

Lecture 3 - Bulk and commodity chemicals

Lecture 4 - Fine and speciality chemicals

Lecture 5 - Water

Lecture 6 - Hydrogen

Lecture 7 - Inorganic peroxide compounds

Lecture 8 - Nitrogen compounds

Lecture 9 - Chloramine and Hydroxylamine

Lecture 10 - Nitric acid, Ostwald process and uses

Lecture 11 - Phosphorus and its components

Lecture 12 - Phosphoric acid salts

Lecture 13 - Tetrapotassium diphosphate preparation

Lecture 14 - Hydroxy apatite

Lecture 15 - P4S10 and phosphide preparation

Lecture 16 - Sulfur and copper (1) phosphide

Lecture 17 - Sulfur compounds and sulfur from H2S and SO2

Lecture 18 - Sulfuric acid, catalyst and S2Cl2, applications

Lecture 19 - Sulfur dichloride, thionyl chloride

Lecture 20 - Thiosulfates and dithionite

Lecture 21 - Sodium hydroxyl methanesulfinate and hydrogen sulfide

Lecture 22 - Halogen and halogen compounds

Lecture 23 - Fluorine and inorganic fluorides

Lecture 24 - Hydrogen fluoride and aluminum fluoride

Lecture 25 - Cryolite and other industrially important fluoride salts

Lecture 26 - Electrochemical fluorination, sulfonyl fluorides

Lecture 27 - Chloralkali electrolysis

Lecture 28 - Ion conduction membrane in electrolysis

Lecture 29 - Hydrochloric acid manufacture

Lecture 30 - Bromine and bromine compounds

Lecture 31 - Hydrogen bromide and alkali bromates

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Lecture 32 - Iodine and iodine compounds

Lecture 33 - Mineral fertilizers

Lecture 34 - Nitrogen fertilizer and Urea

Lecture 35 - Potassium fertilizer

Lecture 36 - Metals and their compounds: Lithium

Lecture 37 - Sodium and its compounds

Lecture 38 - Potassium and its compounds

Lecture 39 - Magnesium and its compounds

Lecture 40 - Calcium and its compounds

Lecture 41 - Barium and its compounds

Lecture 42 - Chromium and its compounds

Lecture 43 - Manganese and its industrially important compounds

Lecture 44 - Silicon and its compounds

Lecture 45 - Organosilicon compounds, organoalkoxysilanes

Lecture 46 - Organomercapto silanes and silicones

Lecture 47 - Silicone rubber

Lecture 48 - Inorganic solids: glass

Lecture 49 - Zeolites

Lecture 50 - Inorganic Fibres: asbestos, textile glass and optical fibres

Lecture 51 - Glass fibre production and construction materials

Lecture 52 - Ceramics and its manufacturing processes

Lecture 53 - Specialty ceramic products

Lecture 54 - Ferrites and porcelain enamel

Lecture 55 - Layers of enamelling

Lecture 56 - Carbon modifications: Glassy carbon, foamed carbon, carbon black

Lecture 57 - Activated carbon

Lecture 58 - Metallic hard materials: Carbides, borides, silicides

Lecture 59 - Fillers and inorganic pigments

Lecture 60 - Oxide pigments, luminescent pigments, corrosion protection pigments, magnetic pigments

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NPTEL : NOC:Reactive Intermediates Carbene and Nitrene (Chemistry and Biochemistry)

Co-ordinators : Prof. Rajarshi Samanta

Lecture 1 - Introduction

Lecture 2 - Structure and Geometry of Carbenes

Lecture 3 - Structure and Geometry of Carbenes (Continued...)

Lecture 4 - Generation of Carbene

Lecture 5 - Generation of Carbene (Continued...)

Lecture 6 - Generation of Carbene (Continued...)

Lecture 7 - Reaction of Carbene

Lecture 8 - Reaction of Carbene (Continued...)

Lecture 9 - Reaction of Carbene (Continued...)

Lecture 10 - Reaction of Carbene (Continued...)

Lecture 11 - Reaction of Carbene (Continued...)

Lecture 12 - Reaction of Carbene (Continued...)

Lecture 13 - Reaction of Carbene (Continued...)

Lecture 14 - Reaction of Carbene (Continued...)

Lecture 15 - Reaction of Carbene (Continued...)

Lecture 16 - Nitrene

Lecture 17 - Nitrene (Continued...)

Lecture 18 - Reaction of Nitrene

Lecture 19 - Reaction of Nitrene (Continued...)

Lecture 20 - Reaction of Nitrene (Continued...)

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NPTEL : NOC:Organic Chemistry in Biology and Drug Development (Chemistry and Biochemistry)

Co-ordinators : Prof. A. Basak

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; Merrifieldâ€™s method of solid phase peptide synthesis

Lecture 10 - Hierarchial structure of proteins: Secondary, tertiary and quaternary structure

Lecture 11 - Ramachandran plot and protein purification techniques

Lecture 12 - Protein purification techniques (Continued...)

Lecture 13 - Introduction to Enzymes and its kinetics

Lecture 14 - Enzyme catalysed reactions and introduction to catalytic activity of proteases

Lecture 15 - Enzyme Kinetics (Continued...)

Lecture 16 - Concept of Enzyme Inhibition

Lecture 17 - Concept of Enzyme Inhibition (Continued...)

Lecture 18 - Problems on Enzyme Kinetics and Enzyme Inhibition

Lecture 19 - Synthetic Biology

Lecture 20 - Synthetic Biology (Continued...)

Lecture 21 - Synthetic Biology (Continued...)

Lecture 22 - Nucleic Acid

Lecture 23 - Nucleic Acid (Continued...)

Lecture 24 - DNA sequencing method

Lecture 25 - DNA sequencing method (Continued...)

Lecture 26 - DNA sequencing method (Continued...)

Lecture 27 - Synthesis of oligonucleotide

Lecture 28 - Central dogma: DNA replication, transcription and translation

Lecture 29 - Central dogma: DNA replication, transcription and translation (Continued...)

Lecture 30 - Central dogma: DNA replication, transcription and translation (Continued...)

Lecture 31 - Central dogma: DNA replication, transcription and translation (Continued...)

Lecture 32 - Central dogma: DNA replication, transcription and translation (Continued...)

Lecture 33 - Molecular Biology

Lecture 34 - Molecular Biology (Continued...)

Lecture 35 - Chemistry of cofactors/coenzymes

Lecture 36 - Chemistry of cofactors/coenzymes (Continued...)

Lecture 37 - Chemistry of cofactors/coenzymes (Continued...)

Lecture 38 - Chemistry of cofactors/coenzymes (Continued...)

Lecture 39 - Chemistry of cofactors/coenzymes (Continued...)

Lecture 40 - Chemistry of cofactors/coenzymes (Continued...)

Lecture 41 - Introduction to Drug Discovery Process

Lecture 42 - Fundamental Principles of Drug Development Process

Lecture 43 - Combinatorial chemistry

Lecture 44 - Neurotransmitters

Lecture 45 - Catechol amine based and GABA neurotransmitters

Lecture 46 - Hypertension: humoral mechanism and renin/angiotensin system

Lecture 47 - Inhibitor design of angiotensin converting enzyme

Lecture 48 - Antimicrobial drugs

Lecture 49 - Chemistry of penicillins

Lecture 50 - Resistance to beta-lactam antibiotics

Lecture 51 - Mechanistic studies of beta-lactamase

Lecture 52 - Non beta-lactam antibiotics

Lecture 53 - Mechanistic enzymology of Isopenicillin N synthase

Lecture 54 - Polyketide Biosynthesis

Lecture 55 - Biosynthesis of macrolide polyketides and introduction to virus

Lecture 56 - Anti-viral drugs

Lecture 57 - Cancer and Chemotherapy

Lecture 58 - Anti-cancer drugs (Continued...)

Lecture 59 - Aromatase inhibition and Anti-ulcer drugs

Lecture 60 - Cholesterol lowering agents

Lecture 61 - Cholesterol Biosynthesis

Lecture 62 - Pharmakinetics and pharmadynamics

Lecture 63 - QSAR principles

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NPTEL : NOC:Introduction to Polymer Science (Chemistry and Biochemistry)

Co-ordinators : Dr. D. Dhara

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

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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 Tm, Determination of Tg and Tm, 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

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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 (Cn, Cnv, Cnh, Dnd)

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: Enediynes (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

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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...)

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NPTEL : NOC:Approximate Methods in Quantum Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Sabyashachi Mishra

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

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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 - Einsteinâ€™s Coefficients

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NPTEL : NOC:Biological Inorganic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Debashis Ray

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

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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

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NPTEL : NOC:Principles and Applications of Enolate Alkylation (Chemistry and Biochemistry)

Co-ordinators : Prof. Samik Nanda

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 - SeebachÃ¢'s SRS principle and related systems - I

Lecture 9 - SeebachÃ¢'s SRS principle and related systems - II

Lecture 10 - SeebachÃ¢'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 - HelmchenÃ¢'s auxiliary, OppolzerÃ¢'s sultam based auxiliary

Lecture 17 - Camphor based N-acyloxazolidinones as chiral auxiliary

Lecture 18 - MyerÃ¢'s ephedrine, Chiral Weinreb amide equivalents and related systems

Lecture 19 - MyerÃ¢'s ephedrine and related systems

Lecture 20 - Chiral Weinreb amide equivalents and related systems

Lecture 21 - MeyerÃ¢'s oxazoline based alkylation - I

Lecture 22 - MeyerÃ¢'s oxazoline based alkylation - II

Lecture 23 - MeyerÃ¢'s bicyclic lactam based enolate alkylation

Lecture 24 - MeyerÃ¢'s bicyclic lactam based alkylation

Lecture 25 - MeyerÃ¢'s bicyclic lactams, GleasonÃ¢'s bicyclic thioglycolate lactam based systems

Lecture 26 - Few problem solving from MeyerÃ¢'s oxazoline/bicyclic lactam based alkylation

Lecture 27 - SchollkopfÃ¢'s bis-lactim ether and related systems; Auxiliary induced chiral relay

Lecture 28 - Chiral relay systems in amino acid derived enolate alkylation

Lecture 29 - Wiliams oxazinone, Yamada's chiral glycine enolate and related system

Lecture 30 - Tricycloiminolactone as chiral glycine equivalents

Lecture 31 - Najera's auxiliary, Davies diketopoperazine and related system

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Lecture 32 - EnderÃ¢'s RAMP/SAMP,ColtartÃ¢'s cyclic carbamate hydrazone,EllmanÃ¢'s sulfinamide and related

Lecture 33 - EnderÃ¢'s RAMP/SAMP based systems

Lecture 34 - EnderÃ¢'s RAMP/SAMP based systems

Lecture 35 - EnderÃ¢'s RAMP/SAMP, ColtartÃ¢'s cyclic carbamate hydrazone,EllmanÃ¢'s sulfinamide

Lecture 36 - ColtartÃ¢'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

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NPTEL : NOC:Overview and Integration of Cellular Metabolism (Chemistry and Biochemistry)

Co-ordinators : Dr. Arindam Ghosh, Dr. Aritri Bir

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

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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 - Porphyrias)

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

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NPTEL : NOC:Elementary Thermodynamics for All (Chemistry and Biochemistry)

Co-ordinators : Prof. Srabani Taraphder

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

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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

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NPTEL : NOC:Molecular Rearrangements and Reactive Intermediates in Organic Synthesis (Chemistry and Biochemistry)

Co-ordinators : Prof. Santanu Panda

Lecture 1 - Carbocation

Lecture 2 - Carbocation (Continued...)

Lecture 3 - Carbocation (Continued...)

Lecture 4 - Carbocation (Continued...)

Lecture 5 - Carbocation (Continued...)

Lecture 6 - Carbanion

Lecture 7 - Carbanion (Continued...)

Lecture 8 - Carbanion (Continued...)

Lecture 9 - Carbanion (Continued...)

Lecture 10 - Carbanion (Continued...)

Lecture 11 - Carbene

Lecture 12 - Carbene (Continued...)

Lecture 13 - Carbene (Continued...)

Lecture 14 - Carbene (Continued...)

Lecture 15 - Nitrene

Lecture 16 - Nitrene(Continued...)

Lecture 17 - Radical

Lecture 18 - Radical (Continued...)

Lecture 19 - Free Radical

Lecture 20 - Radical

Lecture 21 - Radical

Lecture 22 - Free Radical (Continued...)

Lecture 23 - Radical

Lecture 24 - Free Radical Reactions

Lecture 25 - Radical (Continued...)

Lecture 26 - Radical (Continued...)

Lecture 27 - Radical (Continued...)

Lecture 28 - Benzyne

Lecture 29 - Benzyne (Continued...)

Lecture 30 - Benzyne (Continued...)

Lecture 31 - Benzyne question answer discussion

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Lecture 32 - Organolithium

Lecture 33 - Organolithium (Continued...)

Lecture 34 - Organolithium (Continued...)

Lecture 35 - Organolithium (Continued...)

Lecture 36 - Organolithium (Continued...)

Lecture 37 - Grignard

Lecture 38 - Grignard (Continued...)

Lecture 39 - Organocopper

Lecture 40 - Organozinc

Lecture 41 - Organoboron Chemistry

Lecture 42 - Organoboron Chemistry (Continued...)

Lecture 43 - Organoboron Chemistry (Continued...)

Lecture 44 - Organoboron Chemistry (Continued...)

Lecture 45 - Organoboron

Lecture 46 - Organoboron Chemistry

Lecture 47 - Organosilicon Chemistry

Lecture 48 - Organosilicon Chemistry (Continued...)

Lecture 49 - Organosilicon Chemistry (Continued...)

Lecture 50 - Organosulfur Chemistry

Lecture 51 - Organosulfur

Lecture 52 - Organosulfur (Continued...)

Lecture 53 - Organosulfur (Continued...)

Lecture 54 - Organophosphorus Chemistry

Lecture 55 - Organophosphorus Chemistry (Continued...)

Lecture 56 - Tutorial 1

Lecture 57 - Tutorial 2

Lecture 58 - Tutorial 3

Lecture 59 - Tutorial 4

Lecture 60 - Tutorial 5

Lecture 61 - Tutorial 6

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NPTEL : Principles and Application of Electron Paramagnetic Resonance (Chemistry and Biochemistry)

Co-ordinators : Prof. Ranjan Das

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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NPTEL : NOC:Chemistry-I (Chemistry and Biochemistry)

Co-ordinators : Prof. K. Mangala Sunder

Lecture 1

Lecture 2

Lecture 3 - Part I

Lecture 3 - Part II

Lecture 4 - Part I

Lecture 4 - Part II

Lecture 4 - Part III

Lecture 5 - Part I

Lecture 5 - Part II

Lecture 5 - Part III

Lecture 5 - Part IV

Lecture 5 - Part V

Lecture 6 - Part I

Lecture 6 - Part II

Lecture 6 - Part III

Lecture 6 - Part IV

Lecture 7 - Part I

Lecture 7 - Part II

Lecture 8 - Part I

Lecture 8 - Part II

Lecture 8 - Part III

Lecture 9 - Part I

Lecture 9 - Part II

Lecture 9 - Part III

Lecture 10

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NPTEL : NOC:Chemistry-II (Chemistry and Biochemistry)

Co-ordinators : Prof. K. Mangala Sunder

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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NPTEL : NOC:Application of Spectroscopic Methods in Molecular Structure Determination (Chemistry and Biochemistry)

Co-ordinators : Prof. S. Sankararaman

Module 1

Module 2

Module 3

Module 4

Module 5

Module 6

Module 7

Module 8

Module 9

Module 10

Module 11

Module 12

Module 13

Module 14

Module 15

Module 16

Module 17

Module 18

Module 19

Module 20

Module 21

Module 22

Module 23

Module 24

Module 25

Module 26

Module 27

Module 28

Module 29

Module 30

Module 31

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Module 32

Module 33

Module 34

Module 35

Module 36

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NPTEL : NOC:Pericyclic Reactions and Organic Photochemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. S. Sankararaman

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 Â– examples of 3, 4 and 5 membered ring systems (2e and 4e systems)

Lecture 5 - Electrocyclic reactions Â– examples of 6 and larger ring systems (6e and more)

Lecture 6 - Tutorial session 1

Lecture 7 - Cycloaddtion reactions - Introduction and Woodward Hoffmann rules - [2+2] cycloadditions

Lecture 8 - Cycloaddition reactions Â– ketene cycloadditions

Lecture 9 - Cycloaddition reactions Â– 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 Â– Sigmatropic rearrangements Â– Introduction and [1,3] migrations

Lecture 17 - Pericyclic reactions Â– Sigmatropic rearrangements (Continued...) [1,5] H and C migrations and Cope rearrangement

Lecture 18 - Pericyclic reactions Â– Sigmatropic rearrangements (Continued...) oxy Cope and Claisen Rearrangement

Lecture 19 - Pericyclic reactions Â– Sigmatropic rearrangements (Continued...)

Lecture 20 - Pericyclic reactions Â– Sigmatropic rearrangements (Continued...) [2,3] sigmatropic shifts and higher order rearrangements Completed

Lecture 21 - Pericyclic reactions Â– Sigmatropic rearrangements (Continued...) Wittig rearrangement and higher order Sigmatropic shifts

Lecture 22 - Pericyclic reactions Â– Chelotropic reactions - introduction, SO2 extrusion reactions

Lecture 23 - Pericyclic reactions Â– 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 31 - Photochemistry of carbonyl compounds, enone and dienone photochemistry

Lecture 32 - Photochemistry of Nitrogen compounds

Lecture 33 - Photochemistry of aromatic compounds

Lecture 34 - Photoinduced electron transfer reactions

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NPTEL : NOC:Chemistry I:Introduction To Quantum Chemistry And Molecular Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. K. Mangala Sunder

Lecture 1 - Lecture 1 - Historical context and experiments: Introducing the SchrÃ¶dinger equation

Lecture 2 - Lecture 2 - Bohr's atom, De Broglie Matter Waves and Schrodinger equation

Lecture 3 - Lecture 3 - Electromagnetic Radiation

Lecture 4 - Lecture 4 - Interaction of Radiation with Matter

Lecture 5 - Lecture 5 - Molecular Spectroscopy

Lecture 6 - Lecture 6 - Elementary Mathematical Functions 1

Lecture 7 - Lecture 7 - Review of Properties of Elementary Functions II

Lecture 8 - Lecture 8 - Time Dependent SchrÃ¶dinger Equation & Time Independent SchrÃ¶dinger Equation

Lecture 9 - Lecture 9 - SchrÃ¶dinger Equation Particle in a One-dimensional Box : Part I

Lecture 10 - Lecture 10 - SchrÃ¶dinger Equation Particle in a One-dimensional Box : Part II

Lecture 11 - Lecture 11 - SchrÃ¶dinger Equation Particle in Two-dimensional Box : Part I

Lecture 12 - Lecture 12 - Particle in Two-dimensional Box : Part II Uncertainty Principle

Lecture 13 - Lecture 13 - Particle in Two-dimensional Box : Part III Expectation Values

Lecture 14 - Lecture 14 - The Quantum Mechanics of Hydrogen Atom - Part I

Lecture 15 - Lecture 15 - The Quantum Mechanics of Hydrogen Atom - Part II

Lecture 16 - Lecture 16 - The Quantum Mechanics of Hydrogen Atom - Part III

Lecture 17 - Lecture 17 - The Quantum Mechanics of Hydrogen Atom - Part IV

Lecture 18 - Lecture 18 - The Quantum Mechanics of Hydrogen Atom - Part V

Lecture 19 - Lecture 19A - Assignment 1 Solution/Hints

Lecture 20 - Lecture 19B - Assignment 1 Solution/Hints

Lecture 21 - Lecture 19C - Assignment 1 Solution/Hints

Lecture 22 - Lecture 19D - Assignment 1 Solution/Hints

Lecture 23 - Lecture 19E - Assignment 1 Solution/Hints

Lecture 24 - Lecture 20 - Harmonic Oscillator Model - Part I

Lecture 25 - Lecture 21 - Harmonic Oscillator Model - Part II

Lecture 26 - Lecture 22 - Harmonic Oscillator Model - Part III

Lecture 27 - Lecture 23 - Harmonic Oscillator Model - Part IV

Lecture 28 - Lecture 24 - Particle on a Ring - Part I

Lecture 29 - Lecture 25 - Particle on a Ring - Part II

Lecture 30 - Lecture 26 - HeisenbergÂ's Uncertainty Relation

Lecture 31 - Lecture 27A - Operators, Commutators, Eigenvalues and Eigenvectors

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Lecture 32 - Lecture 27B - Operators, Commutators, Eigenvalues and Eigenvectors

Lecture 33 - Lecture 28 - Introduction to Chemical Applications

Lecture 34 - Lecture 29 - Radiation Densities and EinsteinÂ's Semiclassical model

Lecture 35 - Lecture 30 - Born Oppenheimer Approximation

Lecture 36 - Lecture 31 - Beer Lambert Law

Lecture 37 - Lecture 32 - Diatomic Vibrational Spectra Harmonic Model

Lecture 38 - Lecture 33 - Diatomic Vibration Morse Oscillator Model

Lecture 39 - Lecture 34 - Molecular Vibrations in Polyatomic Molecules - Qualitative Account

Lecture 40 - Lecture 35 - Polyatomic Vibrations - Illustrative examples of normal vibrations

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NPTEL : NOC:Introduction to Chemical Thermodynamics and Kinetics (Chemistry and Biochemistry)

Co-ordinators : Prof.Arijit Kumar De

Lecture 1 - Introduction to Chemical Thermodynamics and Kinetics

Lecture 2 - Properties of gases - Part 1

Lecture 3 - Properties of gases - Part 2

Lecture 4 - Introduction - Part 1

Lecture 5 - Introduction - Part 2

Lecture 6 - First law - Part 1

Lecture 7 - First law - Part 2

Lecture 8 - First law - Part 3

Lecture 9 - First law - Part 4

Lecture 10 - First law - Part 5

Lecture 11 - Second law - Part 1

Lecture 12 - Second law - Part 2

Lecture 13 - Spontaneity and equilibrium - Part 1

Lecture 14 - Spontaneity and equilibrium - Part 2

Lecture 15 - Spontaneity and equilibrium - Part 3

Lecture 16 - Phase equilibrium - Part 1

Lecture 17 - Phase equilibrium - Part 2

Lecture 18 - Phase equilibrium - Part 3

Lecture 19 - Phase equilibrium - Part 4

Lecture 20 - Phase equilibrium - Part 5

Lecture 21 - Phase equilibrium - Part 6

Lecture 22 - Phase equilibrium - Part 7

Lecture 23 - Mixtures - Part 1

Lecture 24 - Mixtures - Part 2

Lecture 25 - Mixtures - Part 3

Lecture 26 - Mixtures - Part 4

Lecture 27 - Mixtures - Part 5

Lecture 28 - Chemical Equilibrium - Part 1

Lecture 29 - Chemical Equilibrium - Part 2

Lecture 30 - Chemical Equilibrium - Part 3

Lecture 31 - Chemical Equilibrium - Part 4

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Lecture 32 - Chemical Equilibrium - Part 5

Lecture 33 - Chemical equilibrium - Part 2B

Lecture 34 - Chemical equilibrium - Part 2C

Lecture 35 - Electrochemistry - Part 1

Lecture 36 - Electrochemistry - Part 2

Lecture 37 - Electrochemistry - Part 3

Lecture 38 - Surfaces and interfaces

Lecture 39 - Chemical Kinetics: Rate laws - Part 1

Lecture 40 - Chemical Kinetics: Rate laws - Part 2

Lecture 41 - Chemical Kinetics: Rate laws - Part 3

Lecture 42 - Chemical Kinetics: Rate laws - Part 4

Lecture 43 - Chemical Kinetics: Mechanisms - Part 1

Lecture 44 - Chemical Kinetics: Mechanisms - Part 2

Lecture 45 - Chemical Kinetics: Mechanisms - Part 3

Lecture 46 - Chemical Kinetics: Mechanisms - Part 4

Lecture 47 - Chemical Kinetics: Mechanisms - Part 5

Lecture 48 - Chemical Kinetics: Mechanisms - Part 6

Lecture 49 - Reaction dynamics - Part 1

Lecture 50 - Reaction dynamics - Part 2

Lecture 51 - Reaction dynamics - Part 3

Lecture 52 - Reaction dynamics - Part 4

Lecture 53 - Reaction dynamics - Part 5

Lecture 54 - Reaction dynamics - Part 6

Lecture 55 - Reaction dynamics - Part 7

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NPTEL : NOC:Chemical Crystallography (Chemistry and Biochemistry)

Co-ordinators : Prof.Angshuman Roy Choudhury

Lecture 1 - Introduction to X-Ray Crystallography

Lecture 2 - Sources of X-Rays, Crystal Systems and Bravais lattices

Lecture 3 - Crystallographic Symmetries

Lecture 4 - Equivalent Points and 1D Lattices

Lecture 5 - 5 Fold Symmetry and 2D Lattices

Lecture 6 - 2D Space Lattices

Lecture 7 - Crystallographic Point Groups

Lecture 8 - Stereographic Projections of Point Groups

Lecture 9 - Understanding of Crystallographic Space Groups

Lecture 10 - 2D Projection of Space Groups

Lecture 11 - Tutorial - 01

Lecture 12 - 3D Space Groups and Equivalent Points

Lecture 13 - Obtaining Equivalent Points by Shifting of Origin

Lecture 14 - Representation of Orthorhombic and Tetragonal Space Groups

Lecture 15 - Miller Indices for Crystallographic Directions and Planes

Lecture 16 - Miller Indices and Planar Densities

Lecture 17 - Tutorial - 02

Lecture 18 - Cubic Structues and atomic packing factors

Lecture 19 - Ceramic Structures

Lecture 20 - Theory of X-Ray Diffraction

Lecture 21 - Tutorial - 03

Lecture 22 - Origin of Reciprocal Lattice

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

Lecture 24 - Systematic Absences and Crystallisation Methods

Lecture 25 - Special Method of Crystallisation

Lecture 26 - Tutorial

Lecture 27 - Single Crystal X-Ray Diffraction Data Collection

Lecture 28 - Diffractometers

Lecture 29 - Diffractometers and Detectors

Lecture 30 - Laue's and Bragg's Analysis

Lecture 31 - Experimental Methods and Theoretical Understanding of X-Ray Diffraction

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Lecture 32 - Derivation of Friedel's Law from Structure Factor by Vector Space Diagram

Lecture 33 - Structure Fcator and Electron Density

Lecture 34 - Systematic Absence Conditions from Special Structure Factor Expression

Lecture 35 - Structure Refinement

Lecture 36 - Single Crystal X-Ray Diffractometer

Lecture 37 - Understanding the X-Ray Data

Lecture 38 - Data Handling (Solution and Refinement) using Various Crystallographic Packages

Lecture 39 - Structure Solution using Apex II (Bruker Diffractometer)

Lecture 40 - Direct Methods - Part 1

Lecture 41 - Direct Methods - Part 2

Lecture 42 - Disorder Treatment using Olex 2

Lecture 43 - Cambridge Structure Database and its Application

Lecture 44 - Data Reduction - Absorption Correction

Lecture 45 - Data Reduction - Lorentz and Polarization Correction

Lecture 46 - Data Reduction - Scale and Temperature Factor

Lecture 47 - Identification from Intensity Statistics the Correct Crystal System and Presence of Inversion Center

Lecture 48 - Identification from Intensity Statistics the presence of 2 fold axis in Lattice

Lecture 49 - Phase Problem

Lecture 50 - Direct Methods - Part 1

Lecture 51 - Direct Methods - Part 2

Lecture 52 - Sigma 1 and Triplet Relationship

Lecture 53 - Patterson Method

Lecture 54 - Powder X-Ray Diffractometer - Theory

Lecture 55 - Powder X-Ray Diffractometer - Lab

Lecture 56 - Polymorphs

Lecture 57 - Polymorphs

Lecture 58 - Review of Reciprocal Lattice

Lecture 59 - Review of Reciprocal Lattice

Lecture 60 - Review of Reciprocal Lattice and Bragg's Law in Reciprocal Lattice

Lecture 61 - Ewald's Sphere and Limiting Sphere

Lecture 62 - Origin of/Introduction to Systematic absences

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NPTEL : NOC:Advanced Chemical Thermodynamics and Kinetics (Chemistry and Biochemistry)

Co-ordinators : Prof.Arijit Kumar De

Lecture 1 - Review of Classical Thermodynamics - 1

Lecture 2 - Review of Classical Thermodynamics - 2

Lecture 3 - Review of Classical Thermodynamics - 3

Lecture 4 - Review of Classical Thermodynamics - 4

Lecture 5 - Review of Classical Thermodynamics - 5

Lecture 6 - Molecular Interactions - 1

Lecture 7 - Molecular Interactions - 2

Lecture 8 - Molecular Interactions - 3

Lecture 9 - Molecular Interactions - 4

Lecture 10 - Molecular Interactions - 5

Lecture 11 - Transport Phenomena - 1

Lecture 12 - Transport Phenomena - 2

Lecture 13 - Transport Phenomena - 3

Lecture 14 - Review of Chemical Kinetics - 1

Lecture 15 - Review of Chemical Kinetics - 2

Lecture 16 - Review of Chemical Kinetics - 3

Lecture 17 - Review of Chemical Kinetics - 4

Lecture 18 - Review of Chemical Kinetics - 5

Lecture 19 - Advanced Topic in Chemical Kinetics - 1

Lecture 20 - Advanced Topic in Chemical Kinetics - 2

Lecture 21 - Advanced Topic in Chemical Kinetics - 3

Lecture 22 - Introduction to statistical thermodynamics - 1

Lecture 23 - Introduction to statistical thermodynamics - 2

Lecture 24 - Introduction to statistical thermodynamics - 3

Lecture 25 - Introduction to bimolecular reaction dynamics - 1

Lecture 26 - Introduction to bimolecular reaction dynamics - 2

Lecture 27 - Introduction to bimolecular reaction dynamics - 3

Lecture 28 - Introduction to bimolecular reaction dynamics - 4

Lecture 29 - Unimolecular reaction - 1

Lecture 30 - Unimolecular reaction - 2

Lecture 31 - Introduction to solution phase reactions dynamics - 1

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Lecture 32 - Introduction to solution phase reactions dynamics - 2

Lecture 33 - Introduction to solution phase reactions dynamics - 3

Lecture 34 - Introduction to solution phase reactions dynamics - 4

Lecture 35 - Introduction to solution phase reactions dynamics - 5

Lecture 36 - Non-ideal solutions, Activity of ions (Debye-Huckel theory) - 1

Lecture 37 - Non-ideal solutions, Activity of ions (Debye-Huckel theory) - 2

Lecture 38 - Electrochemistry: Insights into electrode processes, Ionic conductivity - 1

Lecture 39 - Electrochemistry: Insights into electrode processes, Ionic conductivity - 2

Lecture 40 - Reaction Dynamics: Femtosecond Pump Probe Spectroscopy

Lecture 41 - Chemical Kinetics: Hydrolysis of an ester

Lecture 42 - Transport Phenomena: Coefficient of viscosity

Lecture 43 - Equilibrium constant using partition method

Lecture 44 - Photochemistry: Degradation of a dye

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NPTEL : NOC:Chemistry: Atomic Structure and Chemical Bonding (Chemistry and Biochemistry)

Co-ordinators : Prof. K. Mangala Sunder

Lecture 1 - Welcome

Lecture 2 - Elementary Mathematical Functions Used in Our Course

Lecture 3 - Schrodinger Equation: Particle in a One Dimensional Box

Lecture 4 - Particle in a One dimensional Box: Probabilities and Expectation Values

Lecture 5 - Elementary Mathematics: Introduction to Matrix Algebra - Part 1

Lecture 6 - Elementary Mathematics: Introduction to Matrix Algebra - Part 2

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

Lecture 8 - Elementary Mathematics: Matrix Eigenvalues and Eigenfunctions - Part II

Lecture 9 - Particle in a Two Dimensional Box (Infinite Barrier)

Lecture 10 - Heisenbergâ€™s Uncertainty Principle

Lecture 11 - Expectation Values and Postulates in Quantum Mechanics

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

Lecture 13 - Linear Vector Spaces: Matrix Representations

Lecture 14 - Linear Vector Spaces and Operators: Diracâ€™s Bracket Notation

Lecture 15 - Simple Harmonic Oscillator: Classical Hamiltonian

Lecture 16 - Simple Harmonic Oscillator: Quantum Mechanical Solutions

Lecture 17 - Simple Harmonic Oscillator: Wave Functions, Probabilities and Average Values

Lecture 18 - Simple Harmonic Oscillator: Average Values for Position and Momentum

Lecture 19 - Particle on a Ring: The Quantum Model

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

Lecture 21 - Coordinate Transformation

Lecture 22 - Problems and Solutions for Harmonic Oscillator

Lecture 23 - Hydrogen Atom: The Hamiltonian in Spherical Polar Coordinates

Lecture 24 - Hydrogen Atom: Separation of the SchrÃ¶dinger Equation

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

Lecture 26 - Hydrogen Atom: Radial and Angular Solutions and Animations - Part II

Lecture 27 - Hydrogen Atom: Radial Solutions and Probabilities

Lecture 28 - Power Series Method for Differential Equation - I

Lecture 29 - Hermiteâ€™s Differential Equation

Lecture 30 - Legendre and Associated Legendre Equation

Lecture 31 - Born-Oppenheimer Approximation

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Lecture 32 - Introduction to Angular Momentum

Lecture 33 - Spin Â½ Angular Momentum

Lecture 34 - Spin Angular Momentum and Coupling of Two Spin-1/2 Angular Momenta

Lecture 35 - Coupling of Two Angular Momenta

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

Lecture 37 - Video Tutorials - Part 2

Lecture 38 - Variational Principle in Quantum Chemistry: Linear superposition Principle

Lecture 39 - Introduction to Variational Principle in Quantum Chemistry

Lecture 40 - Variational Method: Method of Lagrange Multipliers

Lecture 41 - Hydrogen Molecule Ion: The Molecular Orbital Method

Lecture 42 - Hydrogen Molecule Ion: Calculations and Results

Lecture 43 - Hydrogen Molecule: The Valence Bond Method

Lecture 44 - Hydrogen Molecule: Calculations and Molecular Orbital Method

Lecture 45 - Video Tutorials on Angular Momentum (Orbital and Spin) and Variational Method - Part 1

Lecture 46 - Video Tutorials on Angular Momentum (Orbital and Spin) and Variational Method - Part 2

Lecture 47 - Introduction to Quantum Mechanical Perturbation Theory

Lecture 48 - First Order Time Independent perturbation Theory for Non-Degenerate states

Lecture 49 - First and Second Order Time Independent Perturbation Theory for Non-Degenerate States

Lecture 50 - First and Second Order Time Independent Perturbation Theory: Simple Examples

Lecture 51 - Time Independent Perturbation Theory for Degenerate States: First Order

Lecture 52 - General MO method for Homonuclear Diatomic Molecules

Lecture 53 - General MO method for Heteronuclear Diatomic Molecules

Lecture 54 - Introduction to Hybridization and Valence Bond for Polyatomic Molecules

Lecture 55 - HÃœckel Molecular Orbital Theory - I

Lecture 56 - HÃœckel Molecular Orbital Theory - II

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NPTEL : NOC:Electrochemical Impedance Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Dr. S. Ramanathan

Lecture 1 - Electrochemistry, double layer, 3 electrode systems, supporting electrolyte

Lecture 2 - Rate constant, concept of impedance, Z of electrical elements, differential impedance

Lecture 3 - Time domain results

Lecture 4 - Graphical representation of data (Complex plane, Bode)

Lecture 5 - Introduction to other techniques

Lecture 6 - Tutorial 01

Lecture 7 - Type of analyzers, single and multi sine

Lecture 8 - FFT details, frequency range and resolution, cross correlation

Lecture 9 - Multi sine, odd harmonic, non-harmonics, crest factor, spectral leakage

Lecture 10 - Windowing

Lecture 11 - Tutorial 02

Lecture 12 - Introduction to KKT

Lecture 13 - Linearity, causality, stability, impedance vs. admittance, measurement model

Lecture 14 - Linear KKT illustration

Lecture 15 - Tutorial 03

Lecture 16 - Introduction to EEC, Choice of circuits, confidence intervals, AIC

Lecture 17 - EEC fitting, initial values, distinguishability

Lecture 18 - Zero/pole representation, Rt and Rp

Lecture 19 - Maxwell, Voigt, Ladder circuits, choice of initial values illustrated

Lecture 20 - Tutorial 04

Lecture 21 - Simple electron transfer reaction

Lecture 22 - Two step reaction with an intermediate (1 of 3)

Lecture 23 - Two step reaction with an intermediate (2 of 3)

Lecture 24 - Two step reaction with an intermediate (3 of 3)

Lecture 25 - E-EAR reaction, negative resistance (1 of 2)

Lecture 26 - E-EAR reaction, negative resistance (2 of 2)

Lecture 27 - Three step reaction with two adsorbed intermediates

Lecture 28 - Catalytic mechanism

Lecture 29 - Examples with Frumkin or Temkin isotherms

Lecture 30 - Challenges in RMA

Lecture 31 - Patterns Reported in Experiments

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Lecture 32 - Warburg part - 1

Lecture 33 - Warburg part - 2

Lecture 34 - Warburg part - 3

Lecture 35 - Bounded Warburg

Lecture 36 - CPE

Lecture 37 - Porous electrodes

Lecture 38 - Films, PDM

Lecture 39 - PDM

Lecture 40 - Applications

Lecture 41 - NLEIS. Introduction and mathematical background

Lecture 42 - Electron Transfer reaction

Lecture 43 - Two step reaction

Lecture 44 - Two step reaction (Continued...)

Lecture 45 - Rt and Rp estimation

Lecture 46 - Galvanostatic simulations

Lecture 47 - Instabilities

Lecture 48 - Solution resistance effects

Lecture 49 - Detection on nonlinearities using KKT

Lecture 50 - Frumkin and Temkin isotherms

Lecture 51 - NLEIS Experimental aspects. FFT, PSD, THD

Lecture 52 - Application - other techniques HA, EFM

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NPTEL : NOC:Medicinal Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Harinath Chakrapani

Lecture 1 - Introduction to Medicinal Chemistry - Part I

Lecture 2 - Introduction to Medicinal Chemistry - Part II

Lecture 3 - Intermolecular Binding Forces

Lecture 4 - Protein Structure and Function

Lecture 5 - Tutorial 1 - Acidity, Basicity and Related concepts

Lecture 6 - Tutorial 2 - Basic Concepts of Thermodynamics and Kinetics

Lecture 7 - Enzyme Catalysis - Part I

Lecture 8 - Enzyme Catalysis - Part II

Lecture 9 - Tutorial 3 - Binding Forces, Protein Structure and Function

Lecture 10 - Introduction to Receptors

Lecture 11 - Receptor Types and Functions

Lecture 12 - Tutorial 4 - Receptors, Binding Interactions, Ion Channels

Lecture 13 - Nucleic Acids

Lecture 14 - RNA and Protein Synthesis

Lecture 15 - Tutorial 5 - Nucleic acids, and Basics of Molecular Biology

Lecture 16 - Enzymes as Drug Targets

Lecture 17 - Enzyme Kinetics and Inhibition

Lecture 18 - Tutorial 6 - Enzyme Kinetics, Various Modes of Inhibition etc.

Lecture 19 - Receptors as Drug Targets - Part I

Lecture 20 - Receptors as Drug Targets - Part II

Lecture 21 - Tutorial 7 - Receptor-Drug Interactions, Stereochemistry, Chirality, Nomenclature

Lecture 22 - Receptor-Drug Interactions.

Lecture 23 - Stereochemistry and Conformation

Lecture 24 - Tutorial 8 - Determination of Drug-Receptor Interactions, Conformation of Cyclic and Acyclic Structures etc.

Lecture 25 - Nucleic Acids as Drug Targets - Part I

Lecture 26 - Nucleic Acids as Drug Targets - Part II

Lecture 27 - Miscellaneous Drug Targets

Lecture 28 - Tutorial 9 - Nucleic Acids and Related Topics

Lecture 29 - Mechanisms in Biological Chemistry - Part I

Lecture 30 - Mechanisms in Biological Chemistry - Part II

Lecture 31 - Mechanisms in Biological Chemistry - Part III

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Lecture 32 - Pharmacokinetics - Part I

Lecture 33 - Pharmacokinetics - Part II

Lecture 34 - Drug Metabolism - Part I

Lecture 35 - Drug Metabolism - Part II

Lecture 36 - Drug Metabolism - Part III

Lecture 37 - Drug Metabolism - Part IV

Lecture 38 - Tutorial 10 - ADME

Lecture 39 - Drug Administration Routes - Part I

Lecture 40 - Drug Administration Routes - Part II

Lecture 41 - Finding a Lead - Part I

Lecture 42 - Finding a Lead - Part II

Lecture 43 - Drug Screening

Lecture 44 - Tutorial 11 - Drug administration routes and finding a lead

Lecture 45 - Optimizing Drug-Target Interactions - Part I

Lecture 46 - Optimizing Drug-Target Interactions - Part II

Lecture 47 - Optimizing Drug-Target Interactions - Part III

Lecture 48 - Optimizing Drug-Target Interactions - Part IV

Lecture 49 - Tutorial 12

Lecture 50 - Optimizing Access to the Target

Lecture 51 - Prodrugs

Lecture 52 - Prodrugs and Drug Alliances

Lecture 53 - Endogenous Compounds, Peptidomimetics and Oligonucleotides as Drugs

Lecture 54 - Tutorial 13- Optimizing Access-Prodrugs

Lecture 55 - Combinatorial and parallel synthesis

Lecture 56 - Computer in Medicinal Chemistry

Lecture 57 - Antibacterial agents - 1

Lecture 58 - Antibacterial agents - 2

Lecture 59 - Tutorial14-Combinatorial and parallel synthesis, computers in med chem and anti-bacterial agents

Lecture 60 - Anti-viral agents - 1

Lecture 61 - Anti-viral agents - 2

Lecture 62 - Anti-cancer agents - 1

Lecture 63 - Anti-cancer agents - 2

Lecture 64 - Cholinergics

Lecture 65 - Anti-ulcer agents

Lecture 66 - QSAR - 1

Lecture 67 - QSAR - 2

Lecture 68 - QSAR - 3

Lecture 69 - Drug Resistance and Synergy

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NPTEL : NOC:Chemical Principles-II (Chemistry and Biochemistry)

Co-ordinators : Prof. Arnab Mukherjee

Lecture 1 - Introduction to The Thermodynamics

Lecture 2 - History of Thermodynamic

Lecture 3 - Thermodynamic Systems and Variables

Lecture 4 - Zeroth Law of Thermodynamic

Lecture 5 - Microscopic Definition of Temperature - Part 1

Lecture 6 - Microscopic Definition of Temperature - Part 2

Lecture 7 - Different Forms of Energy

Lecture 8 - Real Gas and Virial Equation

Lecture 9 - Van der Waals Gas

Lecture 10 - Work and Heat - Part 1

Lecture 11 - Work and Heat - Part 2

Lecture 12 - First Law of Thermodynamics

Lecture 13 - Microscopic Definition of Heat and Work

Lecture 14 - Work done at a Constant Temperature

Lecture 15 - Heat is a path function

Lecture 16 - Joule-Thomson Effect (For Ideal Gases)

Lecture 17 - Joule-Thomson Effect (For Van der Waals gas)

Lecture 18 - Adiabatic Reversible Work

Lecture 19 - Adiabatic Irreversible Work

Lecture 20 - Tutorial Problem - 1

Lecture 21 - Tutorial Problem - 2

Lecture 22 - Thermochemistry - Part 1

Lecture 23 - Thermochemistry - Part 2

Lecture 24 - Second Law of Thermodynamics

Lecture 25 - Statements of the Second Law of Thermodynamics

Lecture 26 - Carnot Cycle and Definition of Entropy

Lecture 27 - Ideal Stirling Engine

Lecture 28 - Gasoline Engine and Diesel Engine

Lecture 29 - CarnotÃ¢â‚¬â„¢ Cycle: The Most Efficient Engine

Lecture 30 - Thermodynamic Temperature

Lecture 31 - Definition of Entropy

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Lecture 32 - Tutorial Problem - 3

Lecture 33 - Tutorial Problem - 4

Lecture 34 - Tutorial Problem - 5

Lecture 35 - Tutorial Problem - 6

Lecture 36 - Tutorial Problem - 7

Lecture 37 - Tutorial Problem - 8

Lecture 38 - Statistical Formulation of the Second Law

Lecture 39 - Probability

Lecture 40 - Microstates and Distributions

Lecture 41 - Permutation and Combination

Lecture 42 - Two-Level Systems

Lecture 43 - Most Probable Distribution

Lecture 44 - Calculation with Multi-Level systems

Lecture 45 - Calculation with Multi-Level systems with fixed energy - Part 1

Lecture 46 - Calculation with Multi-Level systems with fixed energy - Part 2

Lecture 47 - Calculation with Multi-Level systems with fixed energy - Part 3

Lecture 48 - Bose-Einstein, Fermi-Dirac and Maxwell-Boltzmann distribution

Lecture 49 - Most Probable Distribution is the Boltzmann Distribution

Lecture 50 - Demonstration of Boltzmann Distribution

Lecture 51 - Estimating Entropy for Various Processes

Lecture 52 - Microscopic equivalent of Heat and Work

Lecture 53 - Probability and Boltzmann Distribution

Lecture 54 - Thermodynamic Observables: It is all in the Average

Lecture 55 - Tutorial Problem - 9

Lecture 56 - Tutorial Problem - 10

Lecture 57 - Tutorial Problem - 11

Lecture 58 - Tutorial Problem - 12

Lecture 59 - Thermodynamic free energy

Lecture 60 - Condition for Spontaneity

Lecture 61 - Legendre Transformation of Thermodynamic Potentials

Lecture 62 - Maxwell Relations and Applications

Lecture 63 - Thermodynamic Relations using Jacobian Method - Part 1

Lecture 64 - Thermodynamic Relations using Jacobian Method - Part 2

Lecture 65 - Tutorial Problem - 13

Lecture 66 - Tutorial Problem - 14

Lecture 67 - Tutorial Problem - 15

Lecture 68 - Tutorial Problem - 16

Lecture 69 - Chemical Principle II - Overview and Road Ahead

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NPTEL : Organic Chemistry Lab Certification (Chemistry and Biochemistry)

Co-ordinators : Prof. Harinath Chakrapani

Lecture 1 - Feedback on Techniques in Organic Chemistry

Lecture 2 - Introduction to Claesen - Condensation

Lecture 3 - Introduction to Claesen - Condensation

Lecture 4 - How to separate different components from a mixture using column chromatography

Lecture 5 - Flurescence phenomenon

Lecture 6 - Reaction Mechanism and Sterochemistry

Lecture 7 - Chemiluminescence Phenomenon

Lecture 8 - Post Lab Questions

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NPTEL : NOC:Introductory Organic Chemistry-I (Chemistry and Biochemistry)

Co-ordinators : Prof. Harinath Chakrapani

Lecture 1 - Introduction Structure of atom and molecules

Lecture 2 - Introduction to Molecular Orbital Theory - Part 1

Lecture 3 - Introduction to Molecular Orbital Theory - Part 2

Lecture 4 - Tutorial 01

Lecture 5 - Learning Objectives for week 2

Lecture 6 - Alkanes and Cycloalkanes - Part 1

Lecture 7 - Alkanes and Cycloalkanes - Part 2

Lecture 8 - Conformational Analysis of Cyclohexane - Part 1

Lecture 9 - Conformational Analysis of Cyclohexane - Part 2

Lecture 10 - Physical Properties of Alkanes

Lecture 11 - Nomenclature of Alkanes, Cycloalkanes and Bicycloalkanes

Lecture 12 - Tutorial 02

Lecture 13 - Learning Objectives for week 3

Lecture 14 - Chirality and Stereochemistry - Part 1

Lecture 15 - Chirality and Stereochemistry - Part 2

Lecture 16 - Chirality and Stereochemistry - Part 3

Lecture 17 - Tutorial 03

Lecture 18 - Learning Objectives for week 4

Lecture 19 - Acids and Bases - Part 1

Lecture 20 - Acids and Bases - Part 2

Lecture 21 - Acids and Bases - Part 3

Lecture 22 - Tutorial 04

Lecture 23 - Learning Objectives for week 5

Lecture 24 - Arrow Pushing mechanism in Organic Chemistry

Lecture 25 - Alkenes_Structure, Properties and Nomenclature

Lecture 26 - Reactions of Alkenes - Part 1

Lecture 27 - Reactions of Alkenes - Part 2

Lecture 28 - Reactions of Alkenes - Part 3

Lecture 29 - Tutorial 05 - Part 1

Lecture 30 - Tutorial 05 - Part 2

Lecture 31 - Learning Objectives for week 6

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Lecture 32 - Reactions of Alkenes - Part 4

Lecture 33 - Reactions of Alkenes - Part 5

Lecture 34 - Alkynes

Lecture 35 - Reactions of Alkynes - Part 1

Lecture 36 - Reactions of Alkynes - Part 2

Lecture 37 - Tutorial-6

Lecture 38 - Learning Objectives for week 7

Lecture 39 - Substitution and Elimination - Part 1

Lecture 40 - Substitution and Elimination - Part 2

Lecture 41 - Substitution and Elimination - Part 3

Lecture 42 - Substitution and Elimination - Part 4

Lecture 43 - Substitution and Elimination - Part 5

Lecture 44 - Tutorial-7

Lecture 45 - Learning Objectives for week 8

Lecture 46 - Alcohols - Part 1

Lecture 47 - Alcohols - Part 2

Lecture 48 - Alcohols - Part 3

Lecture 49 - Ethers and Epoxides - Part 1

Lecture 50 - Ethers and Epoxides - Part 2

Lecture 51 - Aromaticity

Lecture 52 - Tutorial-8

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NPTEL : NOC:Quantitative Methods in Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Aasheesh Srivastava, Prof. Bharathwaj Sathyamoorthy

Lecture 1 - A brief history of the beginnings of quantitation in Chemistry, defining chemical stoichiometry and molarity

Lecture 2 - Defining Molality and Normality, relationship with Molarity

Lecture 3 - Defining other parameters for concentration (%, ppm/ppb, p-value)

Lecture 4 - Relationship between various concentration parameters

Lecture 5 - Problems on acid-base equilibria, calculation of pH of strong and weak acids

Lecture 6 - Brief introduction to normal distribution and statistical analysis

Lecture 7 - Using a spreadsheet towards basic statistical analysis, exact equation of error propagation, accuracy and precision

Lecture 8 - Error propagation and its application to a few examples, significant figures

Lecture 9 - Introduction to use spreadsheets to analyze errors, reiteration of significant figures, repeats and reproducibility

Lecture 10 - Classification of errors

Lecture 11 - A look at uncertainties in a measurement taking an example

Lecture 12 - A comprehensive and step-wise look at an experimental protocol towards understanding systematic errors in an experiment

Lecture 13 - Introductory Statistics - Part 1

Lecture 14 - Introductory Statistics - Part 2

Lecture 15 - Hypothesis testing and Finding Outliers - Part 1

Lecture 16 - Hypothesis testing and Finding Outliers - Part 2

Lecture 17 - Pooling of data

Lecture 18 - Introduction to Analysis of Variance (ANOVA) and comparing precisions

Lecture 19 - Protocol for undertaking ANOVA - Part 1

Lecture 20 - Protocol for undertaking ANOVA - Part 2

Lecture 21 - ANOVA and Least Significant Difference (LSD)

Lecture 22 - ANOVA and solved Least Significant Difference example

Lecture 23 - Using spreadsheet software to perform data analysis towards calibrating a burette

Lecture 24 - Using spreadsheet to analyze linear dependence between two variables

Lecture 25 - Using spreadsheet and MATLAB towards data analysis with example of rate kinetics

Lecture 26 - Simulating simple straight lines and kinetic curves using MATLAB

Lecture 27 - Simulating the Michaelis Menten kinetics using MATLAB

Lecture 28 - Curve fitting and simulating with variance for the Michaelis Menten kinetics using MATLAB

Lecture 29 - Standards and Volumetric/Gravimetric titrations - Part 1

Lecture 30 - Standards and Volumetric/Gravimetric titrations - Part 2

Lecture 31 - Standards and Volumetric/Gravimetric titrations - Part 3

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Lecture 32 - Standards and Volumetric/Gravimetric titrations - Part 4

Lecture 33 - Standards and Volumetric/Gravimetric titrations - Part 5

Lecture 34 - Analytical Separations - Multistage extractions - Part 1

Lecture 35 - Analytical Separations - Multistage extractions - Part 2

Lecture 36 - Analytical Separations - Chromatography - Part 1

Lecture 37 - Analytical Separations - Chromatography - Part 2

Lecture 38 - Analytical Separations - Electrophoresis, Capillary electrophoresis, Isoelectric Focusing

Lecture 39 - Basics of Chromatography - Part 1

Lecture 40 - Basics of Chromatography - Part 2

Lecture 41 - Chromatography - Concept of Theoretical plates

Lecture 42 - Chromatography - Rate Theory

Lecture 43 - Practice of Chromatography - HPLC

Lecture 44 - Practice of Chromatography - Gas Chromatography

Lecture 45 - Supercritical Fluid Chromatography

Lecture 46 - Detectors employed during chromatographic separations

Lecture 47 - Course Revision

Lecture 48 - Course Revision - Week 1 to 3

Lecture 49 - Course Revision - Week 4 and 5

Lecture 50 - Course Revision - Week 6 and 7

Lecture 51 - Course Revision - Week 8 to 11

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NPTEL : NOC:Fundamentals of Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. Sayan Bagchi, Prof. Anirban Hazra

Lecture 1 - Introduction to Spectroscopy

Lecture 2 - Introduction to Quantum Mechanics - I

Lecture 3 - Introduction to Quantum Mechanics - II

Lecture 4 - A Simple Quantum Mechanical System: Particle in a one Dimensional Box

Lecture 5 - Spectroscopic Transitions

Lecture 6 - Intensity of a Transtion Depends on the Transition Dipole Moment - I

Lecture 7 - Intensity of a Transtion Depends on the Transition Dipole Moment - II

Lecture 8 - Comparision between Chemical Reactions and Spectroscopic Transitions

Lecture 9 - Lineshape Analysis

Lecture 10 - Different Forms of Spectroscopy

Lecture 11 - Spectroscopic Timescales

Lecture 12 - Correspondence between Linear Motion and Rotational Motion

Lecture 13 - Diatomic Rigid Rotor

Lecture 14 - Selection Rules and Rotational Spectrum

Lecture 15 - Isotope effect

Lecture 16 - Degeneracy

Lecture 17 - Intensities of Rotational Lines

Lecture 18 - Non Rigid Rotor

Lecture 19 - Polyatomic Molecules - I

Lecture 20 - Polyatomic Molecules - II and Numericals

Lecture 21 - Origin of the Rotational Selection Rule

Lecture 22 - Simple Harmonic Oscillator

Lecture 23 - Energy Levels

Lecture 24 - Selection Rules

Lecture 25 - Anharmonicity

Lecture 26 - Effects of Anharmonicity

Lecture 27 - Ro-vibrational Spectrum - I

Lecture 28 - Ro-vibrational Spectrum - II

Lecture 29 - Harmonic Oscillator Eigenvalues and Eigenfunctions - I

Lecture 30 - Harmonic Oscillator Eigenvalues and Eigenfunctions - II

Lecture 31 - Vibration of a Diatomic Molecule and Derivation of the Vibrational Selection Rule

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Lecture 32 - Ro-vibrational Spectrum - III

Lecture 33 - Vibration of Polyatomic Molecules - I

Lecture 34 - Vibration of Polyatomic Molecules - II

Lecture 35 - Vibration of Polyatomic Molecules - III

Lecture 36 - Normal Mode Coordinates

Lecture 37 - Introduction to Raman Spectroscopy

Lecture 38 - Quantum theory of Raman effect

Lecture 39 - Rotational Raman Spectroscopy

Lecture 40 - Nuclear Spin Statistics

Lecture 41 - Polarizability and Polarizability Ellipsoid

Lecture 42 - Raman Activity of Vibrations

Lecture 43 - Vibrational Raman Spectroscopy

Lecture 44 - Polarization Effects and Numericals

Lecture 45 - Resonance Spectroscopy - Introduction 1

Lecture 46 - Resonance Spectroscopy - Introduction 2

Lecture 47 - NMR Spectroscopy - 1

Lecture 48 - NMR Spectroscopy - 2

Lecture 49 - NMR Spectroscopy - 3

Lecture 50 - NMR Spectroscopy - 4

Lecture 51 - NMR Spectroscopy - 5

Lecture 52 - NMR Spectroscopy - 6

Lecture 53 - ESR Spectroscopy - 1

Lecture 54 - ESR Spectroscopy - 2

Lecture 55 - ESR Spectroscopy - 3

Lecture 56 - ESR Spectroscopy - 4

Lecture 57 - Electronic Spectroscopy - 1

Lecture 58 - Electronic Spectroscopy - 2

Lecture 59 - Electronic Spectroscopy - 3

Lecture 60 - Electronic Spectroscopy - 4

Lecture 61 - Electronic Spectroscopy - 5

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NPTEL : NOC:Symmetry, Stereochemistry and Applications (Chemistry and Biochemistry)

Co-ordinators : Prof. Angshuman Roy Choudhury

Lecture 1 - Introduction to stereochemistry

Lecture 2 - Nomenclature of Various Organic Molecules

Lecture 3 - Nomenclature of Cyclic molecules and other functional groups

Lecture 4 - Nomenclature of some complex molecules

Lecture 5 - Practising naming of molecules

Lecture 6 - Symmetry, Stereochemistry and Applications

Lecture 7 - Symmetry elements in organic molecules

Lecture 8 - Molecular point groups - Part I

Lecture 9 - Molecular point groups - Part II

Lecture 10 - Conformations and Configurations

Lecture 11 - Conformational Analysis - Part I

Lecture 12 - Conformational Analysis - Part II

Lecture 13 - Chair and Boat Conformation of Cyclohexane

Lecture 14 - Conformational Analysis of Disubstituted Cyclohexane Molecules

Lecture 15 - Isomerism and Representation of Isomers

Lecture 16 - Stereoisomerism

Lecture 17 - Drawing One Projection from Another

Lecture 18 - Optical Activity of Organic Molecules and Isomerism

Lecture 19 - Allenes and Biphenyls

Lecture 20 - Absolute Configuration in Biphenyls and D/L Systems

Lecture 21 - Asymmetry and Dissymmetry Molecules

Lecture 22 - Stereoisomerism and Local Symmetry

Lecture 23 - Topicity of Ligands

Lecture 24 - Topicity of Faces

Lecture 25 - Problems on Isomers and Topicity

Lecture 26 - Diastereomerism in Ring System - Part 1

Lecture 27 - Diastereomerism in Ring System - Part 2

Lecture 28 - Diastereomerism in Ring System - Part 3

Lecture 29 - Diastereomerism in PI System

Lecture 30 - Nucleophilic Reactions

Lecture 31 - Mechanism of Nucleophilic Substitution Reaction

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Lecture 32 - Stability of Carbocation

Lecture 33 - Elimination Reactions

Lecture 34 - Substitution VS Elimination Reactions

Lecture 35 - Addition Reactions to Alkenes and Alkynes - Part 1

Lecture 36 - Addition Reactions to Alkenes and Alkynes - Part 2

Lecture 37 - Oxidizing Agents in Organic Chemistry and Organometallic Compounds

Lecture 38 - Some Problems and their Answers in Stereochemistry

Lecture 39 - Dynamic Stereochemistry - Part 1

Lecture 40 - Dynamic Stereochemistry - Part 2

Lecture 41 - Reaction Specificity and Selectivity

Lecture 42 - Cram's Rule and Felkin-Anh Model

Lecture 43 - Kinetics of Organic Reactions

Lecture 44 - Name Reactions and Their Mechanism - Part 1

Lecture 45 - Name Reactions and Their Mechanism - Part 2

Lecture 46 - Modifications of Diels-Alder Reaction

Lecture 47 - Name Reactions and Their Mechanism - Part 3

Lecture 48 - Name Reactions and Their Mechanism - Part 4

Lecture 49 - Rearrangement Reactions in Organic Chemistry - Part 1

Lecture 50 - Rearrangement Reactions in Organic Chemistry - Part 2

Lecture 51 - Rearrangement Reactions in Organic Chemistry - Part 3

Lecture 52 - Rearrangement Reactions in Organic Chemistry - Part 4

Lecture 53 - Brief introduction to crystallographic symmetry

Lecture 54 - Symmetries in X-ray Crystallography

Lecture 55 - 2D lattices and space groups

Lecture 56 - 3D crystallographic point groups and space groups

NPTEL : NOC:Symmetry and Group Theory (2021) (Chemistry and Biochemistry)

Co-ordinators : Prof. Jeetender Chugh

Lecture 1 - Course Contents

Lecture 2 - Symmetry and Parity Operator

Lecture 3 - Symmetry Elements and Operations - Part 1

Lecture 4 - Symmetry Elements and Operations - Part 2

Lecture 5 - Planes and Reflections

Lecture 6 - Tutorial - 1

Lecture 7 - Coordinate System and Inversion Center

Lecture 8 - Improper axis and improper rotation

Lecture 9 - Solved Examples of Symmetry Elements and Operations

Lecture 10 - Product of Symmetry Operations

Lecture 11 - Tutorial - 2

Lecture 12 - Symmetry Point Groups - Part 1

Lecture 13 - Symmetry Point Groups - Part 2

Lecture 14 - Symmetry Point Groups - Part 3

Lecture 15 - Dipole Moment and Optical Acitivity

Lecture 16 - Tutorial - 3

Lecture 17 - Point Group Definition and Examples

Lecture 18 - Sub-Group and Classes

Lecture 19 - Matrix Representation of Symmetry Operations

Lecture 20 - Matrix Representation of Point Group

Lecture 21 - Tutorial - 4

Lecture 22 - Matrix Representation of Point Group

Lecture 23 - Reducible and Irreducible Representations

Lecture 24 - Great Orthogonality Theorem

Lecture 25 - Properties of Great Orthogonality Theorem

Lecture 26 - Tutorial - 5

Lecture 27 - Irreducible Representation using GOT

Lecture 28 - Reducible to Irreducible Representation using GoT

Lecture 29 - Character Table and Mulliken Symbols

Lecture 30 - How to write a complete character table

Lecture 31 - Tutorial - 6

Lecture 32 - Representations of a cyclic group

Lecture 33 - Group Theory and Quantum Mechanics

Lecture 34 - 1) Degenerate Eigen Functions 2) Direct Product

Lecture 35 - Direct Product

Lecture 36 - Tutorial - 7

Lecture 37 - Direct Product Applications - Part 1

Lecture 38 - Direct Product Applications - Part 2

Lecture 39 - Symmetry Adapted Linear Combinations - Part 1

Lecture 40 - Symmetry Adapted Linear Combinations - Part 2

Lecture 41 - Tutorial - 8

Lecture 42 - Incomplete Projection Operator

Lecture 43 - SALC using Projection Operator

Lecture 44 - Symmetry and Chemical Bonding

Lecture 45 - Valence Bond Theory

Lecture 46 - Tutorial - 9

Lecture 47 - Molecular Orbital Theory

Lecture 48 - Localised MO Theory

Lecture 49 - Delocalized MO Theory - Part 1

Lecture 50 - Delocalized MO Theory - Part 2

Lecture 51 - Ascent and Descent in Symmetry - Part 1

Lecture 52 - Ascent and Descent in Symmetry - Part 2

Lecture 53 - Crystal Field Theory - Part 1

Lecture 54 - Crystal Field Theory - Part 2

Lecture 55 - Jahn-Teller Distortion - Part 1

Lecture 56 - Jahn-Teller Distortion - Part 2

Lecture 57 - Introduction to Spectroscopy - Part 1

Lecture 58 - Introduction to Spectroscopy - Part 2

Lecture 59 - Vibrational Spectroscopy

Lecture 60 - 1) Raman Spectroscopy and 2) Atomic Motions

Lecture 61 - Symmetry of Normal Modes of Vibration

Lecture 62 - Visualizing Molecular Vibrations using Internal Coordinates

Lecture 63 - Spectral Transition Probabilities - Part 1

Lecture 64 - Spectral Transition Probabilities - Part 2

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NPTEL : NOC:Introductory Organic Chemistry - II (Chemistry and Biochemistry)

Co-ordinators : Prof. Harinath Chakrapani

Lecture 1 - Introduction - 1

Lecture 2 - Essentials of NMR Spectroscopy - Part 1

Lecture 3 - Essentials of NMR Spectroscopy - Part 2

Lecture 4 - Essentials of NMR Spectroscopy - Part 3

Lecture 5 - Electrophilic Aromatic Substitution - Part 1

Lecture 6 - Electrophilic Aromatic Substitution - Part 2

Lecture 7 - Electrophilic Aromatic Substitution - Part 3

Lecture 8 - Tutorial - 1

Lecture 9 - Introduction - 2

Lecture 10 - Electrophilic Aromatic Substitution in Phenols

Lecture 11 - EAS_Effect of Electron Donating group

Lecture 12 - EAS_Effect of Electron Withdrawing group

Lecture 13 - Nucleophilic aromatic substitution - Part 1

Lecture 14 - Nucleophilic aromatic substitution - Part 2

Lecture 15 - Special Topic_Hammond's Postulate

Lecture 16 - Tutorial-2 - Part 1

Lecture 17 - Tutorial-2 - Part 2

Lecture 18 - Essentials of IR Spectroscopy

Lecture 19 - Introduction - 3

Lecture 20 - Basics of Carbonyl Compounds

Lecture 21 - Addition Reactions on Carbonyl functional group

Lecture 22 - Addition Reactions on Carbonyl functional group

Lecture 23 - Nucleophilic Addition Reactions and its stereochemistry

Lecture 24 - Nucleophilic Addition Reactions and its Stereochemistry

Lecture 25 - Tutorial - 3

Lecture 26 - Introduction - 4

Lecture 27 - Carboxylic acid and its derivatives - Part 1

Lecture 28 - Carboxylic acid and its derivatives - Part 2

Lecture 29 - Reactions of Carboxylic acid and its derivatives

Lecture 30 - Alcohols, Ethers, and Epoxides

Lecture 31 - Tutorial - 4

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Lecture 32 - Special Topic - E1CB reaction

Lecture 33 - Introduction - 5

Lecture 34 - Enols and Enolates_Intro

Lecture 35 - Enols and Enolates_Molecular Orbital Picture

Lecture 36 - Reactions of Enols and Enolates

Lecture 37 - Tutorial - 5A

Lecture 38 - Tutorial - 5B

Lecture 39 - Introduction - 6

Lecture 40 - Active methylene group

Lecture 41 - Aldol and related Reactions

Lecture 42 - Aldol Reactions: Specific enol equivalents - Part 1

Lecture 43 - Aldol Reactions: Specific enol equivalents - Part 2

Lecture 44 - Tutorial - 6

Lecture 45 - Introduction - 7

Lecture 46 - Conjugate Addition:1,2-addition and 1,4-addition

Lecture 47 - Conjugate Addition: Kinetic versus thermodynamic products

Lecture 48 - Conjugate Addition: Hard and Soft nucleophiles

Lecture 49 - Enol and Enolate alkylation

Lecture 50 - Regioselectivity of alkylation reactions

Lecture 51 - Acylation of enol/enolates and related Name Reactions

Lecture 52 - Tutorial-7: Felkin-Ahn Problems

Lecture 53 - Introduction - 8

Lecture 54 - Rearrangements - Part 1

Lecture 55 - Rearrangements - Part 2

Lecture 56 - Rearrangements - Part 3

Lecture 57 - Rearrangements - Part 4

Lecture 58 - Named Reactions - Part 1

Lecture 59 - Named Reactions - Part 2

Lecture 60 - Tutorial - 8

Lecture 61 - Conclusion

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NPTEL : NOC:Elementary Electrochemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Angshuman Roy Choudhury

Lecture 1 - Introduction to Elementary Electrochemistry

Lecture 2 - The Laws of Electrochemistry and Electrolysis

Lecture 3 - Applications of Faraday's Laws of Electrolysis

Lecture 4 - Electrolytic Conduction: Arrhenius Theory of Electrolytic Dissociation

Lecture 5 - Electrochemical/Galvanic Cell: Construction and Cell Reactions

Lecture 6 - Numerical Problems on Faraday's Laws of Electrolysis

Lecture 7 - Estimation of EMF of a Cell Using Potentiometer

Lecture 8 - EMF of a Cell and Free Energy Change of a Reaction

Lecture 9 - EMF of a Cell and Equilibrium Constant of a Reaction: The Nernst Equation

Lecture 10 - Various Types of Electrodes (Glass,SHE,Calomel) in Electrochemistry

Lecture 11 - Electrode Potential and Applications of Nernst Equation

Lecture 12 - Numerical Problems: Nernst Equation, EMF of Half Cell Reactions

Lecture 13 - Measurement of Cell EMF

Lecture 14 - Electrochemical Cells: Liquid Junction Potential

Lecture 15 - Electrolytic Solutions: Determination of Activity Coefficient

Lecture 16 - Theory of Potentiometric Titrations

Lecture 17 - Preparation of Primary Standard and Standardization of NaOH

Lecture 18 - Potentiometric Titration of Strong Acid and Strong Base

Lecture 19 - Potentiometric Titration of Weak Acid with Strong Base

Lecture 20 - Potentiometric Titration of Dibasic Acid with Strong Base

Lecture 21 - Experimental Calculation of Potentiometric Titrations

Lecture 22 - Conductance and Conductivity of the Solution

Lecture 23 - Experimental Methods to Determine Transport Number

Lecture 24 - Experimental Method to Calculate Transport Number

Lecture 25 - Electrolytic Solutions

Lecture 26 - Conductance Measurement

Lecture 27 - Variation of Conductance with Concentration

Lecture 28 - Ionic Mobilities in terms of ion Conductivities

Lecture 29 - Application of Conductance Measurement - Part 1

Lecture 30 - Application of Conductance Measurement - Part 2

Lecture 31 - Activities in Electrolytic Solutions

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Lecture 32 - Ionic Strength of an Electrolyte and its Importance

Lecture 33 - Hydration of Ions and Their Ionic Mobility

Lecture 34 - Solubility and Activity Product

Lecture 35 - Applications of EMF and Conductance Measurement

Lecture 36 - Dissociation Constant of Weak Acids

Lecture 37 - Conductometric Titrations of Strong Acid with Strong Base

Lecture 38 - Conductometric Titrations of Weak Acid with Strong Base

Lecture 39 - Estimation of HCl and Ammonium Chloride in a Triple Mixture using NaOH

Lecture 40 - Estimation of Total Chloride ion Concentration in Triple Mixture using Primary Standard AgNO3

Lecture 41 - Validation of Ostwald Dilution Law using HCl

Lecture 42 - Validation of Ostwald Dilution Law using Acetic Acid

Lecture 43 - Calculation and Graph Plotting for Conductometric Experiments

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NPTEL : NOC:Organic Chemistry-I (Tamil) (Chemistry and Biochemistry)

Co-ordinators : Prof. Srinivasan Venkataraman

Lecture 1 - Phenols Structure, Preparation, Properties and Reactions - Part 1

Lecture 2 - Phenols Structure, Preparation, Properties and Reactions - Part 2

Lecture 3 - Phenols Structure, Preparation, Properties and Reactions - Part 3

Lecture 4 - Phenols Structure, Preparation, Properties and Reactions - Part 4

Lecture 5 - Phenols Structure, Preparation, Properties and Reactions - Part 5

Lecture 6 - Phenols Structure, Preparation, Properties and Reactions - Part 6

Lecture 7 - Phenol Assignment I and II - Part 7

Lecture 8 - Carbonyl Compounds - Part 1

Lecture 9 - Carbonyl Compounds - Part 2 (Continued...)

Lecture 10 - Carbonyl Compounds - Part 3 (Continued...)

Lecture 11 - Carbonyl Compounds - Part 4 (Continued...)

Lecture 12 - Carbonyl Compounds Assignment I and II - Part 5

Lecture 13 - Carboxylic Acids - Part 1

Lecture 14 - Functional Derivatives - Part 2

Lecture 15 - Appendices I and II - Part 3

Lecture 16 - Carboxylic Acids - Assignment I and II - Part 4

Lecture 17 - Nitro Compounds

Lecture 18 - Amines Structure, Preparation and Properties - Part 1

Lecture 19 - Amines Appendices I to IV - Part 1 (Continued...)

Lecture 20 - Assignments I to II - Part 2

Lecture 21 - Green Chemistry Introduction - Part 1

Lecture 22 - Green Chemistry Terminologies and strategies in green chemistry - Part 2 (Continued...)

Lecture 23 - Approches to Less Polluting Reactions - Part 3

Lecture 24 - Biocatalysis - Part 4

Lecture 25 - Microwave mediated and photochemical reactions and conclusion - Part 5

Lecture 26 - Acknowledgement

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NPTEL : Essentials in Immunolgy (Chemistry and Biochemistry)

Co-ordinators : Prof. Anjali Karande, Dr. Dipankar Nandi, Dr. R. Manjunath

Lecture 1 - Introduction to the immune system

Lecture 2 - Cells and Organs of the immune system - Part 1

Lecture 3 - Cells and Organs of the immune system - Part 2

Lecture 4 - Cells and Organs of the immune system - Part 3

Lecture 5 - Innate immunity - Part 1

Lecture 6 - Innate immunity - Part 2

Lecture 7 - Development and differentiation of B cells - Part 1

Lecture 8 - Signaling in B cells

Lecture 9 - Organization of immunoglobulin genes and Mechanism of immunoglobulin gene rearrangement

Lecture 10 - Generation of antibody diversity

Lecture 11 - Immunoglobulin class switching Regulation of Immunoglobulin gene regulation

Lecture 12 - Structures and functions of Immunoglobulinâ€™s

Lecture 13 - The three complement pathways

Lecture 14 - Hypersensitivity type 1

Lecture 15 - Hypersensitivity types 2, 3 ,4 and Autoimmunity

Lecture 16 - Autoimmunity Autoimmuno-deficiencies f the B cells

Lecture 17 - Autoimmuno-deficiencies f the B cells

Lecture 18 - Cancer

Lecture 19 - The major histocompatibility complex - Part 1

Lecture 20 - The major histocompatibility complex - Part 2

Lecture 21 - The major histocompatibility complex - Part 3

Lecture 22 - The Major Histocompatibility Complex

Lecture 23 - The Major Histocompatibility Complex: MHC class I pathway

Lecture 24 - The Major Histocompatibility Complex: MHC class II pathway

Lecture 25 - T cell receptors

Lecture 26 - T cell Activation

Lecture 27 - T cell Activation / Differentiation

Lecture 28 - T cell synapse, motility and subsets

Lecture 29 - T cell survival

Lecture 30 - Cytokines - Part 1

Lecture 31 - Cytokines - Part 2

Lecture 32 - Autoimmunity

Lecture 33 - Immunodeficiency

Lecture 34 - Host response mechanisms during infectious diseases - Part 1

Lecture 35 - Host response mechanisms during infectious diseases - Part 2

Lecture 36 - Transplantation immunology

Lecture 37 - Vaccines

Lecture 38 - Antigens and Immunogens

Lecture 39 - Synthetic vaccines

Lecture 40 - Evolution of the immune system

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NPTEL : Eukaryotic Gene Expression - basics and benefits (Chemistry and Biochemistry)

Co-ordinators : Prof. P.N. Rangarajan

Lecture 1 - Eukaryotic RNA polymerases and basal transcription factors

Lecture 2 - Diversity in core promoter elements

Lecture 3 - Diversity in general transcription factors

Lecture 4 - Proximal & Distal Promoter Elements, Enhancers and Silencers, Gene-specific Regulators

Lecture 5 - Transcription factors - DNA binding domains

Lecture 6 - Transcription factors - Transcription activation domain

Lecture 7 - Role of chromatin in eukaryotic gene regulation

Lecture 8 - Role of histones in eukaryotic gene regulation

Lecture 9 - Role of DNA methylation in eukaryotic gene regulation

Lecture 10 - Chromatin remodelling & gene regulation

Lecture 11 - mRNA processing - Role of RNA Pol II in mRNA capping and mRNA splicing

Lecture 12 - mRNA processing - Role of RNA Pol II in polyadenylation & mRNA editing

Lecture 13 - Regulation of RNA Pol I transcription

Lecture 14 - Regulation of RNA Pol III transcription

Lecture 15 - Signal Transduction Pathways - Introduction

Lecture 16 - Regulation of gene expression by cyclicAMP

Lecture 17 - Regulation of gene expression by second messengers other than cAMP

Lecture 18 - Regulation of gene expression by Protein Kinase C

Lecture 19 - Regulation of gene expression by Growth factors

Lecture 20 - Regulation of gene expression by cytokines

Lecture 21 - Regulation of gene expression by steroid hormones

Lecture 22 - Regulation of gene expression by type II nuclear receptors

Lecture 23 - Mechanism of transcriptional activation by nuclear receptors

Lecture 24 - Gene Regulation during Drosophila Development

Lecture 25 - Signal transduction pathways involved in embryonic development

Lecture 26 - Homeotic genes

Lecture 27 - Epigenetic regulation of gene expression during development

Lecture 28 - Embryonic stem cells and Transcription factor-mediated epigenetic reprogramming

Lecture 29 - Cloning and Expression vectors

Lecture 30 - Eukaryotic protein expression systems - I

Lecture 31 - Eukaryotic protein expression systems - II

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Lecture 32 - Eukaryotic protein expression systems - III: Gene expression in mammalian cells using viral vectors

Lecture 33 - Human Gene Therapy

Lecture 34 - DNA vaccines

Lecture 35 - Transgenic animals

Lecture 36 - Transgenic plants

Lecture 37 - Knockout mic

Lecture 38 - Regulation of Eukaryotic Gene Expression by Small RNAs (RNA Interference, RNAi)

Lecture 39 - Genomics & Proteomics

Lecture 40 - Metabolic Engineering & Synthetic Biology

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NPTEL : Introductory Quantum Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. K.L. Sebastian

Lecture 1 - Wave Paticle Duality

Lecture 2 - Standing Waves

Lecture 3 - Path Integrals and Schrodinger Equation

Lecture 4 - Postulates - Part 1

Lecture 5 - Postulates - Part 2

Lecture 6 - Postulates - Part 3

Lecture 7 - Separting Variables and Particle in a Box - Part 1

Lecture 8 - Particle in a box - Part 2

Lecture 9 - Particle in a box - Part 3

Lecture 10 - Particle in a box-time dependent states-Expectations values and time dependent states

Lecture 11 - Particle in a 3 dimensional box

Lecture 12 - Particle in a well of finite depth

Lecture 13 - Finite well, Delta and Step Functions

Lecture 14 - Finite well (Continued...)

Lecture 15 - Tunneling - Part 1

Lecture 16 - Tunneling - Part 2

Lecture 17 - Schrodinger equation for Harmonic Oscillator

Lecture 18 - Harmonic Oscillator - The Series Solution

Lecture 19 - Harmonic Oscillator - Generating function

Lecture 20 - Harmonic Oscillator - Orthogonality of Eigenfunctions

Lecture 21 - Hydrogen Atom: Separating centre of mass motion and integral motion

Lecture 22 - Hydrogen Atom: Polar Co-ordinates

Lecture 23 - Hydrogen atom continued : Separation of variables

Lecture 24 - Hydrogen atom : Finding the functions Î˜ (Î¸) and Î¦(Ï†)

Lecture 25 - Finding R(r)

Lecture 26 - Atomic Orbitals - Part 1

Lecture 27 - Atomic Orbitals - Part 2

Lecture 28 - Atomic Orbitals - Part 3

Lecture 29 - Atomic Orbitals - Part 4 and Hermitian Operators

Lecture 30 - Measurement, Uncertainty Principle

Lecture 31 - Generalized Uncertainty Principle

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Lecture 32 - Generalized Uncertainty Principle (Continued...)

Lecture 33 - Angular Momentum

Lecture 34 - Angular Momentum (Continued...)

Lecture 35 - Angular Momentum (Continued...) and Spin

Lecture 36 - Pertubation Theory

Lecture 37 - Pertubation Theory (Continued...)

Lecture 38 - Variation Method - Introduction

Lecture 39 - Variation Method - Proof and Illustration

Lecture 40 - He atom wave function with spin included - Paulis principle

Lecture 41 - Hydrogen Molecular ion - Linear variation method

Lecture 42 - Hydrogen Molecular ion (Continued...)

Lecture 43 - Hydrogen Molecular ion (Continued...)

Lecture 44 - Molecuar Orbitals The Hydrogen Molecule

Lecture 45 - MO and VB theory

Lecture 46 - MO theory of diatoms

Lecture 47 - Di-atomics (Continued...)

Lecture 48 - Hybridization Huckel theory

Lecture 49 - Huckel MO Theory (Continued...)

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NPTEL : Introduction to Organometallic Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. A.G. Samuelson

Lecture 1 - Introduction to Organometallic chemistry

Lecture 2 - Metal carbonyl complexes

Lecture 3 - Metal carbonyls - Part II

Lecture 4 - Ligand substitution reactions

Lecture 5 - Substitutes for carbonyl ligands

Lecture 6 - Carbene complexes

Lecture 7 - Carbene complexes (Continued...)

Lecture 8 - Non-Carbon Ancillary ligands

Lecture 9 - Non-Carbon Ancillary ligands (Continued...)

Lecture 10 - Metal alkyl complexes

Lecture 11 - Ligand Insertion Reactions

Lecture 12 - Metal alkene complexes

Lecture 13 - Alkynes ?2 bonding

Lecture 14 - Metal dihydrogen and hydrides

Lecture 15 - Migratory Insertion reaction with alkynes

Lecture 16 - Î·m (m=4 dienes and m=2n,polyenes)

Lecture 17 - Oxidative addition & Vaskas complex mechanism

Lecture 18 - Reductive elimination

Lecture 19 - Reductive Elimination mechanism

Lecture 20 - Oxidative coupling with C-C bond formation

Lecture 21 - Metathesis reactions

Lecture 22 - Metal-allyls - ? 3 complexes-synthesis, bonding

Lecture 23 - Metal-allyls - Î· 3 complexes-fluxionality, reactivity

Lecture 24 - C-C single bond forming reactions

Lecture 25 - ? 5 Cyclopentadienyl - complexes

Lecture 26 - Î·6 arene Metal complexes

Lecture 27 - Half sandwich complexes

Lecture 28 - Reactivity changes in coordinated ligands

Lecture 29 - The isolobal analogy

Lecture 30 - Fluxional Properties of Organometallics

Lecture 31 - Quantifying Steric and electronic factors

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Lecture 32 - Hydrogenation reactions

Lecture 33 - Addition of HX to olefins

Lecture 34 - Reactions with CO insertion

Lecture 35 - Organometallics promoted C-X coupling

Lecture 36 - Organometallic polymerization

Lecture 37 - C-H activation

Lecture 38 - Asymmetric Catalysis

Lecture 39 - Medicinal applications of organometallic complexes

Lecture 40 - Special Properties and Applications

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NPTEL : NOC:Principles and Applications of NMR Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. Hanudatta S. Atreya

Lecture 1 - Introduction to NMR spectroscopy

Lecture 2 - The alignment of nuclear spins in presence of magnetic field

Lecture 3 - Introduction to rotating frame

Lecture 4 - Free induction decay and Fourier transformation of FID

Lecture 5 - NMR Hardware

Lecture 6 - The concept of chemical shift

Lecture 7 - Factors that affect chemical shifts

Lecture 8 - Chemical shift referencing

Lecture 9 - J-coupling

Lecture 10 - Recap of basics

Lecture 11 - Introduction to general one dimensional NMR experiment

Lecture 12 - Practical aspects of recording a 1D NMR experiment - I

Lecture 13 - Practical aspects of recording a 1D NMR experiment - II

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

Lecture 15 - NMR Data processing

Lecture 16 - Basic aspects of 1D proton NMR analysis

Lecture 17 - Analysis of an example 1D proton spectrum

Lecture 18 - Analysis of 1D 1H NMR spectra of molecules - I

Lecture 19 - Analysis of 1D 1H NMR spectra of molecules - II

Lecture 20 - 1D 13C NMR

Lecture 21 - Why do we need 2D NMR

Lecture 22 - A qualitative explanation of how 2D NMR experiment works

Lecture 23 - Principles of 2D COSY and Total correlation spectroscopy (2D TOCSY)

Lecture 24 - 2D NOE-spectroscopy

Lecture 25 - 2D NOESY and 2D ROESY

Lecture 26 - What is heteronuclear correlation NMR spectroscopy

Lecture 27 - Sensitivity enhancement of heternuclei via polarization transfer

Lecture 28 - Heteronucler multiple quantum NMR spectroscopy (2D HMQC) and Heteronuclear single quantum NMR spectroscopy (2D HSQC)

Lecture 29 - Practical aspects of recording and processing 2D HMQC or HSQC

Lecture 30 - HMBC and its utility

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Lecture 31 - 2D HSQC TOCSY and its analysis with examples

Lecture 32 - Structure determination of molecules by NMR

Lecture 33 - Structure determination of peptides - I

Lecture 34 - Structure determination of peptides - II

Lecture 35 - Structure determination of peptides - III

Lecture 36 - Chemical exchange

Lecture 37 - Hydrogen or deuterium exchange

Lecture 38 - Diffusion ordered spectroscopy DOSY I

Lecture 39 - DOSY II

Lecture 40 - STD NMR for drug target interactions

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NPTEL : NOC:Multidimensional NMR Spectroscopy for Structural Studies of Biomolecules (Chemistry and Biochemistry)

Co-ordinators : Prof. Hanudatta S. Atreya

Lecture 1 - Introduction to NMR spectroscopy

Lecture 2 - Energy levels in NMR spectroscopy: Quantum mechanical model and Vector model

Lecture 3 - Observing the NMR signal

Lecture 4 - Basic concepts in 1D NMR: Chemical shift and Spin-spin coupling

Lecture 5 - Basic concepts in 1D NMR: Nuclear Spin Relaxation, 1H NMR and 13C NMR

Lecture 6 - Basic concepts in 2D NMR spectroscopy

Lecture 7 - Principles of 2D correlation spectroscopy COSY

Lecture 8 - Principles of 2D Total correlation spectroscopy (TOCSY)

Lecture 9 - 2D Nuclear Overhauser Effect Spectroscopy (NOESY)

Lecture 10 - 2D NOESY and 2D ROESY

Lecture 11 - Principles of 2D Heteronuclear NMR

Lecture 12 - 2D Heteronuclear NMR: HSQC

Lecture 13 - Heteronuclear multiple quantum coherence (HMQC) and single quantum coherence (HSQC) - Part I

Lecture 14 - Heteronuclear multiple quantum coherence (HMQC) and single quantum coherence (HSQC) - Part II

Lecture 15 - 2D HSQC-TOCSY

Lecture 16 - 3D NMR Spectroscopy - Part I

Lecture 17 - 3D NMR Spectroscopy - Part II

Lecture 18 - 3D HNCA and 3D HNCO

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

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

Lecture 21 - Basic concepts of protein structure

Lecture 22 - Introduction to Structure Determination of Bio-Molecules by NMR

Lecture 23 - Over-expression of proteins in Bacteria

Lecture 24 - Isotope labeling of proteins for NMR studies - Part I

Lecture 25 - Isotope labeling of proteins for NMR studies - Part II

Lecture 26 - Isotope labeling of proteins for NMR studies - Part III

Lecture 27 - Isotope labeling of proteins for NMR studies - Part IV

Lecture 28 - Resonance assignments of Proteins - Part I

Lecture 29 - Resonance assignments of Proteins - Part II

Lecture 30 - Resonance assignments of Proteins - Part III

Lecture 31 - Determination of protein secondary structure from NMR data: CSI method

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Lecture 32 - Determination of protein secondary structure from NMR data: J coupling based method

Lecture 33 - Determination of protein tertiary structure from NMR data - Part I

Lecture 34 - 3D NOESY HSQC

Lecture 35 - Determination of protein tertiary structure from NMR data - Part II

Lecture 36 - Understanding Protein ligand interaction by NMR : Chemical shift perturbation

Lecture 37 - Understanding Protein ligand interaction by NMR : Chemical exchange

Lecture 38 - Understanding Protein ligand interaction by NMR : T2 Filter

Lecture 39 - Understanding Protein ligand interaction by NMR : STD NMR

Lecture 40 - Understanding Protein ligand interaction by NMR : Transfer NOE NMR

Lecture 41 - Understanding Protein ligand interaction by NMR : Diffusion ordered Spectroscopy (DOSY) - Part I

Lecture 42 - Understanding Protein ligand interaction by NMR : Diffusion ordered Spectroscopy (DOSY) - Part II

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NPTEL : NOC:Symmetry and Structure in the Solid State (Chemistry and Biochemistry)

Co-ordinators : Prof. T. N. Guru Row

Lecture 1 - Symmetry in 3D World

Lecture 2 - Two Fold Axis Representation with the Help of Esher Diagrams

Lecture 3 - Pure Rotation Axes

Lecture 4 - Properties of Crystal

Lecture 5 - Point Group Generation

Lecture 6 - Combination ofSymmetry Elements

Lecture 7 - Arrangement of Symmetry Equivalent Objects

Lecture 8 - Introduction to Plane Lattices

Lecture 9 - Bravais Lattices

Lecture 10 - Details of Stereographic Projections

Lecture 11 - Stereographic Projections (Continued)

Lecture 12 - Point Group and Crystal Systems - 1

Lecture 13 - Point Group and Crystal Systems - 2

Lecture 14 - Point Groups to Space Groups

Lecture 15 - Translation componentsin Monoclinic System

Lecture 16 - Additional Symmetry Elements

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

Lecture 18 - Space Groups - 1

Lecture 19 - Space Groups - 2

Lecture 20 - Space Groups - 3

Lecture 21 - Space Groups - 4

Lecture 22 - Additional Information on Space Groups

Lecture 23 - Details of Space Groups - 1

Lecture 24 - Details of Space Groups - 2

Lecture 25 - Details of Space Groups - 3

Lecture 26 - Details of Space Groups - 4

Lecture 27 - Crystal Structure of Calcium Carbonate

Lecture 28 - Crystal Structure of Some Minerals

Lecture 29 - Atoms in the Crystal: Positions and Relevant Properties

Lecture 30 - Crystallographic Directions and Planes

Lecture 31 - Interference of Waves

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Lecture 32 - X Ray Scattering ; optical Analogy

Lecture 33 - X Ray Scattering ; Fourier transforms

Lecture 34 - X Ray Scattering ; Deriving Laue Conditions from scattering theory

Lecture 35 - X Ray Scattering ; Laue conditions to Bragg Ã¢â‚¬Ëœs Law, Introduction to Reciprocal lattice

Lecture 36 - Bragg's Law in Reciprocal Space - 1

Lecture 37 - Bragg's Law in Reciprocal Space - 2

Lecture 38 - Calculation of Intensities - 1

Lecture 39 - Calculation of Intensities - 2

Lecture 40 - Conversion from Direct to reciprocal space, the inverse relations

Lecture 41 - Diffraction and Reciprocal Space (Continued...)

Lecture 42 - Limits of Resolution

Lecture 43 - Concept of Structure Factors

Lecture 44 - Systematic Absences - 1

Lecture 45 - Systematic Absences - 2

Lecture 46 - Systematic Absences - 3

Lecture 47 - Friedel's Law and Laue classes

Lecture 48 - Experimental Aspects of Data Collection

Lecture 49 - Structure Determination - 1

Lecture 50 - Structure Determination - 2

Lecture 51 - Data Reduction

Lecture 52 - Fourier Syntheses

Lecture 53 - Patterson Method - 1

Lecture 54 - Patterson Method - 2

Lecture 55 - Direct Method

Lecture 56 - Powder Diffraction - 1

Lecture 57 - Powder Diffraction - 2

Lecture 58 - Powder Diffraction - 3

Lecture 59 - Quantum Crystallography - 1

Lecture 60 - Quantum Crystallography - 2

Lecture 61 - Intermolecular Interactions

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NPTEL : NOC:Ultrafast Optics and Spectroscopy (Chemistry and Biochemistry)

Co-ordinators : Prof. Atanu Bhattacharya

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8 - Nonlinear Effects

Lecture 9 - Nonlinear Effects (Continued...)

Lecture 10 - Nonlinear Effects (Continued...)

Lecture 11 - Nonlinear Effects (Continued...)

Lecture 12 - Nonlinear Effects (Continued...)

Lecture 13 - Nonlinear Effects (Continued...)

Lecture 14 - Nonlinear Effects (Continued...)

Lecture 15 - Dispersion Effects

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

Lecture 17 - Nonlinear and Dispersion Effects (Continued...)

Lecture 18 - Transverse Electromagnetic Mode

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

Lecture 20 - Construction of Ultrafast Laser

Lecture 21 - Construction of Ultrafast Laser (Continued...)

Lecture 22 - Construction of Ultrafast Laser (Continued...)

Lecture 23 - Measurement of Ultrafast Pulse

Lecture 24 - Measurement of Ultrafast Pulse (Continued...)

Lecture 25 - Measurement Techniques in Ultrafast Spectroscopy

Lecture 26 - Kinetic Model of Ultrafast Spectroscopy

Lecture 27 - Kinetic Model of Ultrafast Spectroscopy (Continued...)

Lecture 28 - Quantum Mechanical Model of Ultrafast Spectroscopy

Lecture 29 - Ultrafast Physical Chemistry: Photophysics and Photochemistry

Lecture 30 - Ultrafast Physical Chemistry: Solid State

Lecture 31 - Ultrafast Physical Chemistry: Transition Metal Complexes and Biomolecules

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Lecture 32 - Maxwellâ€™s Equations

Lecture 33 - Maxwellâ€™s Equations (Continued...)

Lecture 34 - Ab Initio Molecular Dynamics - 1

Lecture 35 - Ab Initio Molecular Dynamics - 2

Lecture 36 - Ab Initio Molecular Dynamics - 3

Lecture 37 - Ab Initio Molecular Dynamics - 4

Lecture 38 - Attosecond Chemical Dynamics - 1

Lecture 39 - Attosecond Chemical Dynamics - 2

Lecture 40 - Attosecond Chemical Dynamics - 3

Lecture 41 - Attosecond Chemical Dynamics - 4

Lecture 42 - Femtochemistry of Nanocatalysis - 1

Lecture 43 - Femtochemistry of Nanocatalysis - 2

NPTEL : NOC:One and two dimensional NMR Spectroscopy for Chemists (Chemistry and Biochemistry)

Co-ordinators : Prof. N. Suryaprakash

Lecture 1 - NMR an historical perspective and NMR active nuclei

Lecture 2 - Spin Angular Momentum and Magnetic moment

Lecture 3 - Interaction of Spins with the magnetic field

Lecture 4 - Larmor Precession and Energy of interaction

Lecture 5 - NMR detection and sensitivity

Lecture 6 - Inducing Resonance and Bulk Magnetization

Lecture 7 - Signal detection and Rotating Frame Concept

Lecture 8 - Pulse phase and signal phase

Lecture 9 - FID and Fourier Transformation

Lecture 10 - Selection rules and transitions

Lecture 11 - External and Internal interactions in NMR

Lecture 12 - Chemical Shifts

Lecture 13 - NMR Spectrum and chemical equivalence

Lecture 14 - Conversion of frequency and ppm

Lecture 15 - Field dependence and factors affecting chemical shift

Lecture 16 - Factors contributing to chemical shifts - 1

Lecture 17 - Factors contributing to chemical shifts - 2

Lecture 18 - Scalar Couplings - 1

Lecture 19 - Scalar Couplings - 2

Lecture 20 - Energy levels of coupled spins

Lecture 21 - Spin system classification and multiplicity

Lecture 22 - Multiplicity pattern of coupled spins

Lecture 23 - Active and passive coupling

Lecture 24 - Coupling among equivalent spins - 1

Lecture 25 - Coupling among equivalent spins - 2

Lecture 26 - Coupling among non-equivalent spins

Lecture 27 - Geminal and Vicinal couplings

Lecture 28 - Spin system Nomenclature

Lecture 29 - Isotope effect

Lecture 30 - Analysis of Strongly coupled spin systems

Lecture 31 - Eigen values of A2 and AMX spin systems

Lecture 32 - Analysis of Three spin coupled systems

Lecture 33 - Analysis of Proton NMR spectra - 1

Lecture 34 - Analysis of Proton NMR spectra - 2

Lecture 35 - Analysis of Proton NMR spectra - 3

Lecture 36 - Basics of 13C-NMR

Lecture 37 - Coupled and Decoupled 13C-Spectra

Lecture 38 - Broadband decoupling in 13C-NMR

Lecture 39 - Analysis of 13C 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 65 - Relaxation processes - 2

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NPTEL : NOC:Time Dependent Quantum Chemistry (Chemistry and Biochemistry)

Co-ordinators : Prof. Atanu Bhattacharya

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 - Introdution 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 - Fourer 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)

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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 Adiabat

Lecture 40 - Geometric Phase and Dynamical Phase

Lecture 41 - Nonradiative Transition - Part 1

Lecture 42 - Nonradiative Transition - Part 2

Lecture 43 - Nonradiative Transition

Lecture 44 - Quantum Dissipative Dynamics

Lecture 45 - Quantum Dissipative Dynamics

Lecture 46 - Formal Derivation of Dissipative Quantum Dynamics

Lecture 47 - Classical Description of Light

Lecture 48 - Vector and Scalar Potential

Lecture 49 - Vector and Scalar Potential

Lecture 50 - Master Equation of Light

Lecture 51 - Hamiltonian for Light-Atom Interaction

Lecture 52 - Hamiltonian for Light-Atom Interaction

Lecture 53 - Absorption and Stimulated Emission

Lecture 54 - Absorption and Stimulated Emission

Lecture 55 - Time Correlation Function

Lecture 56 - Fourier Transform of Time Correlation Function

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NPTEL : NOC:One and Two Dimensional NMR Spectroscopy: Concepts and Spectral Analysis (Chemistry and Biochemistry)

Co-ordinators : Prof. N. Suryaprakash

Lecture 1 - Nuclear Spin

Lecture 2 - NMR spin physics - I

Lecture 3 - NMR spin physics - II

Lecture 4 - Energy levels and allowed transitions

Lecture 5 - Transitions in coupled spin systems

Lecture 6 - Interaction parameters

Lecture 7 - Chemical Shifts

Lecture 8 - Shielding and deshielding, ppm and frequency scales

Lecture 9 - Factors affecting the chemical shifts

Lecture 10 - Scalar couplings

Lecture 11 - Scalar couplings

Lecture 12 - Coupling mechanism

Lecture 13 - Splitting patterns

Lecture 14 - Multiplicity patterns

Lecture 15 - Analysis of multiplicity patterns

Lecture 16 - Coupled spin system

Lecture 17 - Nomenclature for coupled spins

Lecture 18 - Energy levels of two and three coupled spins

Lecture 19 - Analysis of 1H NMR spectra - I

Lecture 20 - Analysis of 1H NMR spectra - II

Lecture 21 - Analysis of 1H NMR spectra - III

Lecture 22 - Coupling of 1H with other nuclei - I

Lecture 23 - Coupling of 1H with other nuclei - II

Lecture 24 - 13C-NMR - I

Lecture 25 - 13C-NMR - II

Lecture 26 - 13C-NMR - III

Lecture 27 - 13C-NMR - IV

Lecture 28 - Analysis of 19F spectra

Lecture 29 - 31P NMR

Lecture 30 - Analysis of spectra of Heteronuclei

Lecture 31 - Heteronuclear spectral analysis

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Lecture 32 - Spin Echoes - I

Lecture 33 - Spin Echoes - II

Lecture 34 - Sensitivity enhancement

Lecture 35 - Polarization transfer

Lecture 36 - INEPT

Lecture 37 - 2D NMR - I

Lecture 38 - 2D NMR - II

Lecture 39 - 2D-COSY - I

Lecture 40 - 2D COSY - II

Lecture 41 - Types of COSY spectra

Lecture 42 - TOCSY

Lecture 43 - HSQC - I

Lecture 44 - HSQC - II

Lecture 45 - me-HSQC

Lecture 46 - HSQC and HMBC

Lecture 47 - HMBC - II

Lecture 48 - 2D INADEQUATE

Lecture 49 - 2D-INADEQUATE and 2D J-Resolved

Lecture 50 - Homo and Heteronuclear J-resolved

Lecture 51 - Conceptual understanding of NOE

Lecture 52 - Positive and negative NOE

Lecture 53 - NOE and correlation times

Lecture 54 - Complications in NOE, Steady state NOE

Lecture 55 - ROESY and Tr NOE

Lecture 56 - Combined utility of COSY, TOCSY, HSQC, NOESY

Lecture 57 - Steady State NOE

Lecture 58 - 1D NOE, 1D TOCSY

Lecture 59 - 1D-TOCSY, PURESHIFT

Lecture 60 - PURSHIFT NMR