

SEMESTER-VI

Program: B.Sc. (Sem-VI)	Type: Theory
Subject: DSC-11-Organic Chemistry-4: Study of Spectral Techniques and Industrial Products	
Credit: : 04 (T) + 02 (P)	Total learning hours: 60
Course description: This course will give an introduction to modern spectroscopic techniques including UV, IR, NMR. It also includes insights of photochemistry, pericyclic reaction and supramolecular chemistry.	
Student learning outcome: Student will learn following : <ul style="list-style-type: none">• UV – Visible, IR, NMR Spectroscopy• Supramolecular chemistry, Photo Chemistry• Pericyclic reactions(PCR)• Drug and synthetic dyes• Organic Ploymers	

Unit-1 UV - Visible Spectroscopy (04 Hrs)

- 1.1 Introduction
- 1.2 Chromophores and auxochromes
- 1.3 Blue shift and red shift
- 1.4 Graphical representation of spectra of 1,3-butadiene, benzene and lycopene
- 1.5 Influence of conjugation on UV absorption
- 1.6 Comparison of UV spectra of acetone and methyl vinyl ketone

Unit-2 IR Spectroscopy (08 Hrs)

- 2.1 Introduction
- 2.2 Fundamental and non fundamental molecular vibrations
- 2.3 IR absorption position of O,N and S containing functional group
- 2.4 Effect of H-bonding, conjugation, resonance, and ring size on IR absorptions
- 2.5 Fingerprint region and its significance
- 2.6 Application in functional group analysis
- 2.7 Stretching frequencies of –OH (free and –H bonded), alkyl – C-H, $C\equiv C$, $C=C$, $C-C$, $C=O$ and C-O groups
- 2.8 Graphical representation of IR spectra of benzoic acid and methyl benzoate

Unit-3 NMR Spectroscopy (08 Hrs)

- 3.1 Basic principle of proton magnetic resonance
- 3.2 Nuclear magnetic spin quantum number I
- 3.3 Influence of the magnetic field on the spin of nuclei, spin population
- 3.4 Chemical shift (δ values), uses of TMS as reference
- 3.5 Nuclear shielding and deshielding effects, equivalent and non equivalent protons
- 3.6 Effect of electronegativity of adjacent atoms on chemical shift values
- 3.7 Spin-spin splitting and spin-spin coupling

Unit-4 Supramolecular Chemistry (05 Hrs)

- 4.1 Introduction

- 4.2** Cation binding host molecule
- 4.3** Selectivity of host molecules
- 4.4** A few synthetic cation binding host molecule
- 4.5** Some uses of cation binding host compound
- 4.6** Anion binding host compounds
- 4.7** Neutral molecule trapping host compounds

Unit-5 Photo Chemistry (10 Hrs)

- 1.1** Basic principle
- 1.2** Different types of electronic transition in organic molecule
- 1.3** The fate of photoexcited molecule
- 1.4** Laws of photo chemistry
- 1.5** Type of photo chemical reactions
- 1.6** Photo chemistry of carbonyl compounds, alkenes
- 1.7** Photo rearrangements
- 1.8** Valence isomerization
- 1.9** Photolysis of diazo compounds
- 1.10** Photo substitution reaction
- 1.11** Photo chemical smog

Unit-6 Pericyclic Reactions (PCR) (05 Hrs)

- 1.1** Molecular orbital theory
- 1.2** Molecular orbitals LCAO method
- 1.3** Bonding and anti bonding orbitals
- 1.4** Electronic configurations of some molecules
- 1.5** Orbital symmetry and the chemical reaction
- 1.6** Electrocyclic reactions
- 1.7** Cycloaddition reactions

Unit-7 Drug and Synthetic Dyes (10 Hrs)

- 1.1** Introduction and classification of drugs
- 1.2** Synthesis and therapeutic uses of Paracetamol, Ibuprofen, Diclofenac, Chloroquine, Chloramphenicol, Ranitidine and Sulphanilamide
- 1.3** Classification of dyes, colour and constitution
- 1.4** Mordent and Vat dyes
- 1.5** Chemistry of dyeing
- 1.6** Synthesis and application of
 - 1.6.1** Azo Dyes – Methyl Orange and Congo Red
 - 1.6.2** Triphenyl Methane Dyes – Malachite Green, Rosaniline and Crystal Violet
 - 1.6.3** Phthalein Dyes – Phenolphthalein and Flourescein
 - 1.6.4** Natural Dyes – Structure Elucidation and synthesis of Alizarin and Indigotin
- 1.7** Edible Dyes with examples

Unit- 8 Organic Polymer (10 Hrs)

- 8.1** Introduction and classification including di-block, Tri-block and amphiphilic Polymers
- 8.2** Number average molecular weight, weight average molecular weight

- 8.3** Degree of polymerization, polydispersity index
- 8.4** Polymerization reactions – Addition and condensation
- 8.5** Mechanism of cationic, anionic and free radical addition polymerization
- 8.6** Ziegler – Natta polymerization of alkenes
- 8.7** Preparation and application of plastics – thermosetting (Phenol – formaldehyde, polyurethanes) and thermosoftening (PVC, Polythene)
- 8.8** Fabrics – Natural and synthetic (Acrylic, Polyamido, Polyester)
- 8.9** Rubbers – Natural and synthetic (Buna-S, Nchloroprene, Neoprene)
- 8.10** Vulcanization, Polymer additives

Reference Books:

- 1.** Spectroscopic Identifications of organic compounds, R.N Silverstein, G.C. Bassler T.C. Morrill, 2000, John Willey & sons
- 2.** Organic Chemistry, Seventh Edition, By R.T.Morrison, R.N.Boyd, S.K. Bhattacharjee 2010, Pearson
- 3.** Organic Chemistry, Volume-1,2, I.L.Finar, 6th Edn., 2002, , Pearson
- 1.** Advance Organic Chemistry, Arun Bahl and B S Bahl, 2012, S.Chand
- 2.** Text Book of Organic Chemistry, P.S. Kalsi, 1999,Macmillan India Limited
- 3.** Advance Organic Chemistry, S.Chand, 1987, S. Chand Publication

Program: B.Sc. (Sem-VI)	Type: Theory
Subject: DSC-12-Inorganic Chemistry-IV	
Credit: 04 (T) + 02 (P)	Total learning hours: 60
Course description: This course provides an overview of advance as well as fundamental topics in inorganic chemistry. This course emphasise on various aspects of metal complexes. Course comprises of information about role of inorganic components in biology, water technology, some novel industrial inorganic compounds.	
Student learning outcome: Upon completion of this course, students will: <ul style="list-style-type: none"> • Have systematic understanding bioinorganic chemistry • Have a deep knowledge regarding theoretical principles applied in inorganic qualitative analysis • Have information regarding catalysis using organometallic compounds • Be able to understand various theories related to coordination compounds • Get exposure to various novel inorganic compounds of importance • Come to know about some fundamentals of inorganic reaction mechanism • Get an idea regarding water impurities, hardness and purification technique 	

Unit-1 Bioinorganic Chemistry-I (08 Hrs)

- 1.1 Metal ions present in biological systems
- 1.2 Essential and trace elements in biological systems with reference to Na⁺, K⁺, Ca²⁺, Fe²⁺, P, Cu, V, Ni
- 1.3 Excess and deficiency of some trace metals
- 1.4 Toxicity of metal ions (Hg, Pb, Cd and As)
- 1.5 Pt and Au complexes as drugs (examples only)
- 1.6 Use of chelating agents in medicine

Unit-2 Bioinorganic Chemistry-II (08Hrs)

- 2.1 Sodium / K-pump
- 2.2 Introduction to metallo-enzymes, carbonic anhydrase and carboxypeptidase
- 2.3 Iron and its application in bio-systems, Haemoglobin and myoglobin
- 2.4 Role of cobalamin (vitamin-B12 coenzyme) in living systems
- 2.5 Role of Ca²⁺ in blood clotting
- 2.6 Nitrogen fixation

Unit-3 Theoretical Principles of Qualitative Analysis (08 Hrs)

- 3.1 Basic principles involved in analysis of cations and anions
- 3.2 Solubility products, common ion effect
- 3.3 Principles involved in separation of cations into groups and choice of group reagents
- 3.4 Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II
- 3.5 Methods of removal
- 3.6 Analysis of insoluble substance

Unit-4 Introduction to inorganic reaction mechanism (12 Hrs)

- 4.1** Introduction to inorganic reaction mechanisms-types of reaction and classification of substitution reaction
- 4.2** Substitution reaction of square planar complexes
- 4.3** Trans effect and its applications, theories of trans-effect (electrostatic polarization and Static π -Bonding Theory)
- 4.4** General mechanism of ligand substitution reactions in octahedral complexes (D, I, Id, Ia)
- 4.5** Electron transfer reactions: Mechanism of outer and inner sphere electron transfer reactions
- 4.6** Theories of electron transfer (in general) and Marcus and Hush model (in detail)

Unit-5 Catalysis by organometallic compounds (08 Hrs)

- 5.1** General principles of catalysis and properties of catalysts
- 5.2** Homogeneous and heterogeneous catalysis (catalytic steps, examples and industrial applications)
- 5.3** Deactivation and regeneration of catalysts
- 5.4** Catalytic poison, promoter
- 5.5** Study of the following industrial processes and their mechanism:
Alkene hydrogenation (Wilkinson's Catalyst)
Synthetic gasoline (Fischer Tropsch reaction)
Polymerisation of ethene using Ziegler-Natta catalyst

Unit-6 Chemistry of new material (07 Hrs)

- 6.1 Conducting polymers:** Introduction, definition and examples-polyaniline, polyacetylene, Mechanism of conduction, Engineering and biological applications.
- 6.2 Super conductors:** Introduction, definition, type1, type 2 and atypical, preparation of high temperature super conductor, general applications of high temperature super conductors
- 6.3 Fullerenes:** Introduction, definition, preparation and isolation of C₆₀, structure and chemical reactions (redox reactions, electrophilic aromatic substitution and bromination) of C₆₀, commercial uses of C₆

Unit-7 Water technology (04 Hrs)

- 7.1** Types of impurities present in water
- 7.2** Causes for the hardness of water
- 7.3** Permissible levels of ions present in water
- 7.4** Treatment of water for domestic and Industrial purposes by
Demineralisation of water by Ion exchange and by reverse Osmosis

Unit-8 Industrial material (05 Hrs)

- 8.1 Paints and Varnishes:** Constituents of oil and emulsion paints and their role, constituents of varnishes
- 8.2 Fuels:** Characteristics, Calorific value and its determination using bomb calorimeter, coal- varieties, gaseous fuels-advantages, constituents and their significance, production of coal gas and composition of LPG, octane number.
- 8.3 Explosives:** Classification, preparation of dynamite and TNT
- 8.4 Propellants:** Characteristics, classification and their applications

Reference books:

1. Advanced Inorganic Chemistry, 6th Edition F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann, John Wiley & Sons
2. Concise Inorganic Chemistry, 5th Edition J. D. Lee, 2001, Blackwell Science,
3. Inorganic Chemistry, 4th Edition J. E. Huhee, E. A. Keiter and R. I. Keiter, , 2000, Pearson Education Asia
4. Inorganic Chemistry, ELBS 2nd Edition D. F. Shriver, P. W. Atkins and C. H. Langford, 2002, Oxford Univ. Press
5. Environmental Chemistry A. K. De, 1999, Wiley Eastern Ltd.,
6. Modern Inorganic Chemistry W. L. Jolly, McGraw Hill Co.
7. Principles of Inorganic Chemistry B. R. Puri and L. R. Sharma, Jauhar S. P, 1998 S. N. Chand & Co.,
8. Inorganic Chemistry, 3rd Edition (ISE) A G Sharpe, 1989, Addison Wesley
9. Basic Inorganic Chemistry, 3rd Edition F. A. Cotton, G. Wilkinson, P. L. Gaus, 1995, John Wiley & Sons
10. Essential Chemistry, International Edition R. Chang, , 1996, McGraw Hill Co
11. University Chemistry, 4th Edition (ISE) B. H. Mahan & R. J. Myers, , 1989, Addison Wesley
12. Essential Trends in Inorganic Chemistry C. M. P. Mingos, , 1998, Oxford Univ Press
13. Chemistry, 3rd Edition P. Atkins & L. Jones, , 1997, W. H. Freeman & Company
14. Modern Chemistry, 4th Edition D. W. Oxidby, H. P. Gills & N. H. Nachtrieb, , 1998 Saunders College Publishing
15. Fundamental Concepts of applied Chemistry, Jayashree Ghosh, S Chand Publications
16. Industrial Chemistry, B. K. Sharma, Goel Publishing House

Program: B.Sc. (Sem-VI)	Type: Theory
Subject: SEC-4-Essential Skills of Computers	
Credit: 04 (T) + 02 (P)	Total learning hours: 60
Course description: This course introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet. Provide hands-on use of Office applications Word, Excel and PowerPoint. Introduce the database concept with SQL in Access	
Student learning outcome: Upon completion of this course, students will able to: <ul style="list-style-type: none">• Understand concepts of computer component• Manage the documents, presentation and gain practical exposure on spreadsheet using office tool.• Create and manage database using database tool.• Use SQL statements to store, modify and retrieve data from tables• gain skills & knowledge to browse and get updated worldwide information	

Unit-1 Introduction of Computers (06Hrs)

1.1 Evolution of computers ,Classification of Computers and components of computer

1.2 Fundamentals of Computers

1.2.1 Software

1.2.2 Hardware

1.2.3 Data and User

1.3 Essential Computer Hardware

1.3.1 Processing device

1.3.2 Memory device-RAM & ROM

1.3.3 Input and Output devices

1.3.4 Storage device-Optical & Magnetic

1.4. Operating System

Unit-2 Operate the Computer System (04Hrs)

2.1. Start Menu

2.1.1. Programs Documents Setting

2.1.2. Taskbar toolbar**2.1.3.** Find and replace utility

2.1.4. Help menu

2.1.5. Shut Down, Restart

2.2 Manage Computer

2.2.1 Files & Folders

2.2.2 Configuring Printers

2.2.3 Installing Programs

2.2.4 Display setting

Unit-3 Document Writer

(10Hrs)

- 3.1. Components of Word Writer**
 - 3.1.1** Creating Document Typing Text
 - 3.1.2** Saving and Closing Opening an Existing
 - 3.1.3** Password Protection
 - 3.1.4** Printing & Previewing Documents
 - 3.1.5** Switch between Multiple Documents
 - 3.1.6** Save to PDF
- 3.2. Familiar Formatting Tools**
 - 3.2.1.** Working with Text boxes & frame
 - 3.2.2.** Working with Pictures & Objects
 - 3.2.3.** Inserting Place Comments
 - 3.2.4.** Working with Tables
 - 3.2.5.** Spell Check utility
 - 3.2.6.** Use of hyperlink
- 3.3. Other features**
 - 3.3.1.** Document templates
 - 3.3.2.** Insert and edit images
 - 3.3.3.** Add custom charts and manage charts
 - 3.3.4.** Add and manage table
 - 3.3.5.** View multiple documents
 - 3.3.6.** Mail merge

Unit-4 WPS Presentation

(10Hrs)

- 4.1.** Introduction of presentation , toolbar and files
- 4.2.** Familiar Formatting Tools
 - 4.2.1.** WordArt text effects
 - 4.2.2.** Built-in slide styles
 - 4.2.3.** Use of templates.
- 4.3.** Advanced Animation
 - 4.3.1.** Multimedia: using audio and video -Audio and video formats -Inserting audio and video objects
 - 4.3.2.** Animations -Set and customize animation effects -Set text animations - Animate the elements of a chart
- 4.4.** Extended Desktop
 - 4.4.1.** Organizing and publishing a presentation
 - 4.4.2.** Custom slide shows -Managing transitions
 - 4.4.3.** Graphic objects formatting -Editing of graphic objects, Visual communication: using graphics and images
 - 4.4.4.** Insert shapes, SmartArts, Charts and Diagrams
 - 4.4.5.** Other tools: equations
- 4.5.** Use of Hypertext links
 - 4.5.1.** Action buttons
 - 4.5.2.** Import slides from other presentations
 - 4.5.3.** Export slides as graphics object

Unit-5 WPS Spreadsheet

(10Hrs)

- 5.1. Introduction to workbook ,worksheet and manage worksheet
- 5.2. Introduction to toolbars, add and view toolbar
- 5.3. Formulas toolbar
- 5.4. Built in functions, types of functions
- 5.5. Table Formatting , Pivot Tables
- 5.6. Insert Built-in Charts & customize charts
- 5.7. View Multiple Documents

Unit-6 Database Management System

(04Hrs)

- 6.1. Database system applications.
- 6.2. Purpose of Database system.
- 6.3. View of Data-Data abstraction, Instance and schema, Data model.
- 6.4. Database language-DDL, DML
- 6.5. Database Architecture-Two tier Architecture, Three tier Architecture.

Unit-7 Practical Approach for Database

(10Hrs)

- 7.1. Introduction to tables, data types and field properties
- 7.2. Create a table and add fields ,Guidelines for naming fields, controls, and objects
- 7.3. Set the field size , Combine fields using the Calculated data type
- 7.4. Add or change a table's primary key
- 7.5. Create and use an index to improve performance
- 7.6. SQL Queries: CREATE, INSERT, UPDATE, DELETE and SELECT with WHERE clause, ORDER BY etc.

Unit-8 Awareness of Internet

(06Hrs)

- 8.1. Introduction of Internet and browser
- 8.2. Surfing Internet
- 8.3. Using of Search engine browser
- 8.4. Mail Utility

Reference Books:

1. Fundamentals of Computers” Rajaraman V and Adabala N., 2014, Prentice Hall India Learning Private Limited
2. “Fundamentals of computers”, E Balagurusamy, 2009, McGraw Hill Education
3. WPS Office - Free Office Suite for Word,PDF,Excel ,WPS SOFTWARE PTE. LTD.[Available on google play store]
4. MS Office in a Nutshell, Sanjay Saxena, 2009, VikasPublishing House
5. Wps office 2016 writer eBook , by Lalit Mali, Kindle Edition
6. The Internet Book, Douglas E. Comer, 2006, Pearson
7. Advanced Microsoft Access: Learn Techniques of Ms Access for Database Management Systems by Blerton Abazi, 2017, CreateSpace Independent Publishing Platform

Chemistry Lab-Semester-VI

1. Organic Preparation (Two Step):
 - 1) Preparation of p-bromoaniline from acetanilide.
 - 2) Preparation of p-nitroaniline from acetanilide.
 - 3) Preparation of methyl orange/methyl red by diazotization and coupling
2. Organic Separation of binary mixture (**Minimum five**):
 - 1) A+P
 - 2) A+B
 - 3) P+B
 - 4) B+N
 - 5) N+N
3. Create a different subject pages and use of index with hyperlink and references on that pages.
4. Create a different subject pages and use of index with hyperlink and references on that pages.
5. Use of spreadsheet which use of utility of fill, format and use of built-in functions
6. Make a various chart with any specify table.

Reference Books:

1. Vogel, A.I. Quantitative Organic Analysis, Part 3, ,2012, Pearson
2. Practical Organic Chemistry, Mann, F.G. & Saunders, B.C., 2009, Pearson Education