

M.Sc. CHEMISTRY

Human life is inextricably interwoven with ever increasing applications in chemistry. The field of chemistry has rendered yeoman service to mankind. Beginning from the stone age through the metal age and up to the silicon age chemistry has been contributing to the mankind. In the changing scenario of global competition, innovative scientific discoveries in chemistry would provide the cutting edge to our corporate sector and in turn will enrich the lives of mankind. Further, it seeks to reduce and prevent pollution at its source. These boons are the hard work of the chemists or scientists who had a thorough understanding of chemistry principles. To note a few recent developments like green chemistry and nano chemistry shall pave the way for newer developments by the young minds with these recent aspects of chemistry curriculum. Also chemistry is industrial and research oriented field of Science. So people always choose to study chemistry to occupy themselves in the field of pharmaceutical, chemical, polymer, cement, agro chemical, sugar, paper and food industries and research laboratories.

I. SCOPE OF THE PROGRAMME

The uniqueness of the M.Sc. (Chemistry) program is its content and topic coverage, the teaching methodology and the faculty. The program expects a serious commitment of the student to take up challenging study schedules and assignments. The program involves a blend of theoretical education and practical training which run concurrently for a period of two years and equips a student with knowledge, ability, skills and other qualities.

The teaching methodologies include classroom lectures, industrial visits, orientation, internship, case study and research work. Focus is also on developing soft skills of the students.

The new syllabus may help the students to understand the newer aspects of chemistry and apply the same to the real life situations. Thus, the students turn more relevant and resourceful to the society. It may enable the young minds think differently. It forms a link between old ideas and new ideas in chemistry and gives a comprehensive approach to the very learning process and the learners.

II. SALIENT FEATURES

- ✓ Course is specially designed for a higher level career placement.
- ✓ Special guest lectures from Industrialists will be arranged.
- ✓ Exclusively caters to students interested in pursuing higher studies.
- ✓ Special industry orientations and training are parts of the degree course.
- ✓ Project work is included in the syllabus to enhance conceptual, analytical and deductive skills.

III. OBJECTIVES OF THE PROGRAMME

The new syllabus throws light on the recent and emerging areas of chemistry.

- ✓ Enable the students to understand chemistry and make them more relevant to the society.
- ✓ Develop the analytical ability in students so that they are become objective in solving problems.
- ✓ Help the students learn practical skills in a better way.
- ✓ Inculcate research aptitude in students.
- ✓ Enable the students to go to higher levels of learning chemistry.
- ✓ Improve the employability of the students.
- ✓ To inspire the students to apply their knowledge gained for the development of society in general.

IV. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the first year PG Degree course (M.Sc. chemistry) shall be required to have passed B.Sc., (Chemistry) B.Sc., (Applied chemistry) and B.Sc., (Industrial chemistry).

V. DURATION OF THE PROGRAMME

- The course shall extend over a period of two academic years consisting of four semesters. Each academic year will be divided into two semesters. The first semester will consist of the period from July to November and the second semester from December to March.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.
- Each subject will have 5 and/or 4 hours of lecture per week apart from practical training at the end of academic year.

VI. CONTINUOUS INTERNAL ASSESSMENT

The performance of the students will be assessed continuously and the

Internal Assessment Marks will be as under:

1. Average of two Tests - 15 Marks
 2. Seminar / Assignment - 5 Marks
 3. Attendance - 5 Marks
-
Total = 25 Marks
.....

PASSING MINIMUM EXTERNAL

In the University Examinations, the passing minimum shall be 50 % out of 75 Marks for theory (38 marks) and 50% out of 60 marks for practical (30 Marks).

VII. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on earning 75% of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed by the college.

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses and elective courses and securing marks

- a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the programme at first appearance itself.
- b) 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
- c) 50% and above but below 60% shall be declared to have passed the examinations in second class.
- d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
- e) Candidates who pass all the examinations prescribed for the programme at the first appearance itself and within a period of two consecutive academic years from the year of admission only will be eligible for University rank.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than two academic years comprising of four semesters and passed the examinations prescribed and fulfilled such conditions have been prescribed.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the end semester examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2011-12 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2011-12 and thereafter.

XII. COURSE PATTERN - PG

Sem	Paper Code	Course	Title of the papers	Hrs/week	Credit	Int. Mark	Ext. Mark	Total Marks
I	14P1CH01	Core-I	Organic Chemistry-I	5	5	25	75	100
	14P1CH02	Core-II	Inorganic Chemistry-I	5	5	25	75	100
	14P1CH03	Core-III	Physical Chemistry-I	5	5	25	75	100
	14P1CHE01	Elective-I	Nano chemistry	5	4	25	75	100
	14P2CHP01	Core Practical-I	Organic Chemistry Practical-I	3	-	-	-	-
	14P2CHP02	Core Practical-II	Inorganic Chemistry-Practical-I	3	-	-	-	-
	14P2CHP03	Core Practical-III	Physical Chemistry-Practical-I	4	-	-	-	-
Total				30	19	100	300	400
II	14P2CH04	Core-IV	Organic Chemistry-II	5	5	25	75	100
	14P2CH05	Core-V	Inorganic Chemistry-II	5	5	25	75	100
	14P2CHE02	Elective-II	Electrochemistry and Photochemistry	5	4	25	75	100
	14P2CHP01	Core Practical-I	Organic Chemistry Practical-I	5	4	40	60	100
	14P2CHP02	Core Practical-II	Inorganic Chemistry-Practical-I	5	4	40	60	100
	14P2CHP03	Core Practical-III	Physical Chemistry-Practical-I	5	4	40	60	100
Total				30	26	195	405	600
III	14P3CH06	Core-VI	Organic Chemistry-III	5	5	25	75	100
	14P3CH07	Core-VII	Inorganic Chemistry-III	5	5	25	75	100
	14P3CH08	Core- VIII	Physical Chemistry-II	5	5	25	75	100
	14P3CHE03	Elective-III	Spectral and Analytical Techniques	5	4	25	75	100
	14P3PHED01	EDC	Solar Energy	4	4	25	75	100
	14P4CHP04	Core Practical-IV	Organic Chemistry Practical-II	3	-	-	-	-
	14P4CHP05	Core Practical-V	Inorganic Chemistry-Practical-II	3	-	-	-	-
	14C3HR01		Human Rights	1	1	25	75	100
Total				31	24	150	450	600
IV	14P4CH09	Core-IX	Physical Chemistry-III	5	4	25	75	100
	14P4CHE04	Elective-IV	Environmental Chemistry	5	4	25	75	100
	14P4CHP04	Core Practical-IV	Organic Chemistry Practical-II	5	4	40	60	100
	14P4CHP05	Core Practical-V	Inorganic Chemistry-Practical-II	5	4	40	60	100
	14P4PR01	Project Work	Project	10	6	50	150	200
Total				30	22	170	330	500
Grand Total				121	91	615	1485	2200

QUESTION PATTERN (PG)

M.Sc (Chemistry)

Time: 3 Hours

Max.Marks:75

PART A (5x5=25Marks)

Answer ALL the Questions

- Either..Or... Type
- Two Questions from each unit.

PART B (5x10=50Marks)

Answer ALL the Questions

- Either... Or... Type
- Two Questions from each unit.

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**SEMESTER –I
14PICH01**

**TOTAL HRS: 75
CREDIT: 5**

ORGANIC CHEMISTRY –I

UNIT-I: Basic Concepts and Mechanistic Studies (15)

Electronic effects: Inductive effect- field effect-resonance- hyperconjugation effect on the dissociation of organic acid and bases- stability of carbocations and carbenes. Kinetic and nonkinetic methods of study of reaction mechanisms - Kinetic methods primary and secondary kinetic isotopic effects, non-kinetic methods - study of reaction mechanism — study of intermediates, isotopic labeling, stereo chemical studies and cross over experiments. Hammond's postulate, Microscopic reversibility, Kinetic and thermodynamic control, Linear free energy relationship — Hammett equation — Taft equation- limitations and its applications.

UNIT-II: Substitution reactions-I (15)

Aliphatic nucleophilic substitution reactions- S_N1 , S_N2 , S_Ni mechanisms. Factors affecting nucleophilic substitution reaction – nature of the substrate, solvent, nucleophile and leaving group. Neighbouring group participation, Ambident nucleophiles and ambient substrates. Stereochemistry of nucleophilic substitution reactions. Substitution at vinyl carbon allylic carbon and bridge head carbon. Typical substitution reactions such as Von Braun reaction, Claisen condensation and hydrolysis of esters.

Aliphatic electrophilic substitution reactions- S_E1 and S_E2 reactions - mechanisms and reactivity - typical reactions involving migration of double bond - keto-enol tautomerism - halogenations of carbonyl compounds - Stork Enamine reactions - decarboxylation of aliphatic acids - Friedel Crafts acylation of olefinic carbon.

UNIT-III : Aromaticity (15)

Concept of aromaticity- aromatic character of benzene and heterocyclic compounds-benzene, pyrrole and pyridine. Effect of aromaticity on bond length, resonance energy and induced ring currents. Huckels rule- concept of homoaromaticity and antiaromaticity. Nonbenzenoid aromatic compounds- cyclopropenium cation, cyclopentadienyl anion, ferrocene, diazocyclopentadiene, sydnonones, azulene, tropolone ion, tropylium ion and annulenes- their structures and aromaticity.

UNIT-IV: Stereochemistry (15)

Homotopic, enantiotopic, diastereotopic H atoms, groups in organic molecules. Fischer, Newman and Sawhorse projections and their interconversion. Optical activity in the absence of chiral

carbon – biphenyls, allenes and spiranes – R and S notations. Chirality due to helical shape, trans cyclooctene. E – Z isomerism of olefins containing one double bond and more than one double bond. Stereospecific and stereoselective synthesis with suitable examples, asymmetric synthesis – Cram's rule.

UNIT-V: Heterocyclic Compounds

(15)

Synthesis and properties of indole, imidazole, oxazole and thiazole- synthesis, properties and structural elucidation of flavones, isoflavones and Xanthocyanins- synthesis of pyrimidines- synthesis and structural elucidation of purines (uric acid and caffeine)

TEXT BOOKS

1. Jerry March, Advanced organic chemistry - Reactions mechanism and structure, McGraw Hill Kogakusha Ltd., (1977).
2. I.L. Finar, Organic chemistry, Vol. I and Vol. II. Pearson Education (P) Ltd (2011).
3. P. S. Kalsi, Stereochemistry- Conformation And Mechanism, 6th Edition, New Age International Publishers (2005).
4. Jerry March, Advanced organic chemistry - Reactions mechanism and structure, McGraw Hill Kogakusha Ltd., (1977).

REFERENCE BOOKS

1. Lowry and Richardson, Mechanism and theory in organic chemistry, Harper & Row Publishers, New York (1981).
2. S.H. Mukargee and S. P. Singh, Reaction mechanisms in organic chemistry, Mc Millan (1976).
3. Raj K.Bansal, Organic Chemistry Reaction mechanisms, Hill Publishing Company Ltd (2006).
4. Ernest L. Eliel, Stereochemistry of Carbon Compounds, T.M.H Edition, Tata Mc Graw-Hill Publication Companies (1975).

(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS

SEMESTER –I
14PICH02

TOTAL HRS: 75
CREDIT: 5

INORGANIC CHEMISTRY-I

Unit –I: Chemical Bonds

(15)

Covalent bond: Heitler-London theory-VB theory-application of VBT to heteronuclear diatomic molecules-hybridisation- calculation of s and p characters- Bent's rule- MO theory: LCAO approximation- symmetry of MO's – application of MOT to heteronuclear diatomic molecules like NO and CO and polyatomic molecules like CH₄ and NH₃. Comparison between molecules like diborane and metal alkyls- structure of covalent molecules- VSEPR theory.

Unit II : Periodic Properties of Lanthanides and Actinides:

(15)

Periodic properties of elements like ionization potential – electron affinity- atomic and ionic radii-electro negativity-various scales- spectral terms – ground and higher states –Symmetry elements and symmetry operations – Point groups – identification and representation of groups – comparison of Molecular symmetry with Crystallographic symmetry – Reducible and irreducible representation – Direct product representation – Great orthogonality theorem and its consequences – Character Table and their uses.

Unit-III: Metal Complexes

(15)

Stability of complexes: Step wise and overall stability constants-determination factors affecting the stability of complexes –stabilization of unusual valence state –VBT ;qualitative treatment for bonding in co- ordination compounds-CFT: splitting of d-orbital in various environments of ligands- factors affecting the magnitude of $10 Dq$ - CFSE in octahedral and tetrahedral symmetries-site selection in spinels-spectrochemical series-nephelauxetic effect-LFT: evidence for covalent nature of M-L bonds-MOT: construction of M.O diagram for σ and π bonded O_h complexes.

Unit IV: Solid state chemistry

(15)

Crystal systems- elements of symmetry-space lattice-unit cell- Miller indices- crystal analysis- rotating crystal method- powder method-packing of atoms and ions in solids- Electrical properties of solids – Band Theory, semiconductors, super conductors, solid state electrolytes; Magnetic properties – dia, para, ferro, antiferro and ferrimagnetism; hysteresis; Optical properties – solid – state lasers and Inorganic phosphors.

Reactions in solid state and phase transitions – diffusion coefficient, diffusion mechanism, vacancy and interstitial diffusions, formation of spinels; solid solutions, order-disorder transformations and super structure

Unit V: Co-ordination Chemistry

(15)

Lability-inertness-ligands displacement reactions in square planar complexes- factors affecting the reactivity of square planar complexes- trans effect-trans effect in synthesis- mechanism of the trans effect- trans influence-kinetics and reaction rates of octahedral substitution reaction without the cleavage of M-L bond- mechanisms- electron transfer reactions-outer sphere mechanism-inner sphere mechanism-complementary and non-complementary reaction.

TEXT BOOKS

1. W.U. Malik, G.D. Tuli and R.D. Madan, Selected topics in Inorganic Chemistry, 6th edition S.Chand & company Ltd., (2005)
2. B.R.Puri, L.R. Sharma and K.C. Kalia., Principles of Inorganic Chemistry, S. Chand & Co (2004)
3. Samuel Glasstone, Source book of Atomic Energy, 3rd edition, East west Press (reprint 2000)
4. R.D. Madan, Modern Inorganic Chemistry, S. Chand publishers (2004).
5. C.N. Banwell, Fundamentals of Molecular Spectroscopy, Mc Graw Hill, Newyork (2001).

REFERENCE BOOKS

1. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry, 4th edition, Pearson education (2006).
2. Gurudeep Raj, Advanced Inorganic Chemistry Vol. I & Vol. II, 6th edition, Goel publishing house (1999)
3. G.S. Manku, Theoretical Principles of Inorganic Chemistry, Tata McGraw –Hill Publishing Company ltd., (reprint 2001)
4. Raymond chang, Basic principles of Spectroscopy, McGraw Hill Ltd., New York, (1971).

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**SEMESTER -I
14P1CH03**

**TOTAL HRS: 75
CREDIT: 5**

PHYSICAL CHEMISTRY-I

Unit I: Thermodynamics

(15)

II Law -Definition of entropy -entropy changes -Car not efficiency. Helmholtz and Gibb's functions, Criteria of equilibrium and the Maxwell relations. Partial molar properties -Chemical potential- variation of chemical potential with temperature and pressure. Fugacity -Definition determination of fugacity of gases by graphical method and from equations of state -variation of fugacity with temperature and pressure. Third Law -Need for III law, Nernst' Heat Theorem and other statements of III law.

Unit II: Surface Chemistry

(15)

Adsorption -Types of adsorption, difference between physical and chemical adsorptions. adsorption isotherm-Freundlich's adsorption isotherm, Langmuir's adsorption isotherm and its limitations, B.E.T.- multilayer adsorption isotherm and its application. Heat of adsorption. Estimation of surface areas -solids from solution adsorption studies. Chemisorptions -its kinetics and thermodynamics. Surface reactions and their mechanisms.

Unit III: Chemical Kinetics

(15)

Reactions in solution: Comparison between gas-phase and solution reactions. The influence of the solvent- reactions between ions. Influence of ionic strength on rates of reactions in solution - Primary salt effect. Influence of pressure on rates of reactions in solution Significance of volume and entropy of activations.

Study of Fast reactions: Flow methods, pulse methods, relaxation methods, Chain reaction – stationary and non stationary chain-explosion and explosion limits- H_2O_2 reaction of explosive reaction.

UnitIV: Quantum Chemistry

(15)

Postulates of quantum Mechanics. Linear and Hermitian operators. Methods of getting quantum mechanical operators, eigen functions, eigen values and degeneracy. Expansion theorem orthogonally and normalization of wave functions, eigen function of commuting operators, and uncertainty principle, Schrodinger time independent wave equation. Application of quantum mechanics to Particle moving in one dimensional box with $V=0$ inside and $V = \mu$ outside. Particle moving in 3 dimensional cubic box with $V=0$ inside and $V = \mu$ Outside Rigid rotator Simple Harmonic Oscillator. Schrodinger equation-Hydrogen and Hydrogen like atoms.

UnitV: Group Theory

(15)

Introduction -symmetry elements and-symmetry operations - sub group and classes. Group multiplication table, Molecular point groups, Flow sheet for the identification of point groups. Introduction of matrices, Matrix representation of symmetry operations –Reducible and Irreducible representation. Properties of irreducible representation. Orthogonal theorem. Construction of character table for point groups (C_{2v} , C_{3v} , C_{2d} , D_{2h} , and D_{4h}), direct product representations.

Chemical applications of group theory: Mutual Exclusion Principle. Selection rules for electronic transitions-Electronic spectra of formaldehyde.

TEXT BOOKS

1. Raman .K.V., Group Theory, Tata McGraw - Hill Education (2004).
2. R.K.Prasad., Quantum Chemistry, Viva Books Private Limited (2013).
3. Laidler. K.J., Chemical Kinetics, Pearson (2009).

REFERENCE BOOKS

1. S. Glasstone, Thermodynamics for Chemists, East West Press (2010).
2. Mc Quarrie, Simon J.D., Physical Chemistry a molecular approach, Viva Books Private Limited (2008).
3. Donal Mc Quarrie., Quantum Chemistry, Viva Books Private Limited (2013).

(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS

SEMESTER -I
14P1CHE01

TOTALHRS: 75
CREDIT: 5

ELECTIVE – I
NANOCHEMISTRY

Unit I: Introduction and Types of Nanochemistry (15)

Introduction - Importance and Characterization of Nano materials - stability of nanoparticles in solutions. Different types of nanomaterials - Nanotubes: Single and Multiwalled carbon nanotubes- nanowires, nanorods & nanofibres.

Unit II: Synthesis of metal nanomaterials (15)

Physical methods –Laser Ablation, Physical Vapour Deposition (PVD) – Evaporation, sputtering and Solvated Metal Atom Dispersion (SMAD).

Chemical methods –Thermolysis - sonochemical approach, reduction of metal ions- reduction by hydrogen, reduction by sodium citrate, and reduction by hydrazine - borohydride reduction –alkali metal reduction - phase transfer processes in nanomaterials synthesis - Biosynthesis of nanoparticles.

Unit III: Synthesis of Semiconductor Nanomaterials (15)

Precipitation methods -Thermal decomposition of complex precursors - synthesis of ceramic nanoparticles - Physical methods - Gas Condensation Method, sand, Laser Methods –Chemical method - Sol-gel synthesis - Properties of Nanostructured materials - size effects – optical & electrical properties - magnetic properties.

Unit IV: Characterizations of nanomaterials (15)

Electron Microscopy: Transmission Electron Microscopy (TEM), Photo Electron Spectroscopy (xps), Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Thermal gravimetric analysis TGA /Differential Scanning Calorimetry DSC –UV spectroscopy.

Unit V: Nanosciences of biological materials (15)

Introduction: Biological building blocks - size of building blocks and nanostructures - protien nanoparticles. Nucleic Acids - DNA Double Nanowire, Genetic code and protein synthesis - Biological nanostructures - Multilayer films.

TEXT BOOKS

1. K.L.Choy, Process principles and applications of novel and cost- effective ESAVD based methods, World Scientific Publishing, Singapore, (2002).
2. G.Schmid (Eds), Nanoparticles, Wiley-VCH, (2004).
3. P.Ajayan, L.S.Schadler, P.V.Brawn, Nanocomposite Science and Technology, Wiley-VCH, (2003).
4. G.Hodes(Eds.), Electrochemistry of Nanomaterials , Wiley-VCH, (2001).

REFERENCE BOOKS

1. A.Jones and M.Mitchell, Nanotechnology-Commercial Opportunity, Evolution Capital Ltd. London, (2001).
2. Nishit Mathur ,Nanochemistry RBSA publishers 340,Chaura rasta ,Jaipur (2010).
3. M.Kohler, W.Fritzsche, Nanotechnology , Wiley-VCH, (2004).
- . Charles P.Poole, Jr., Frank J.Owens, Introduction to Nanotechnology, Wiley (reprint 2012).

**DEPARTMENT OF CHEMISTRY
SYLLABUS**

**SEMESTER –II
14P2CH04**

**TOTAL HRS: 75
CREDIT: 5**

ORGANIC CHEMISTRY –II

UNIT-I: Substitution reactions-II (15)

Aromatic electrophilic substitution reactions – Introduction - Mechanism of electrophilic substitution. reactions such as halogenation, nitration, sulphonation and Friedel – Crafts alkylation's and acylation reactions. Orientation and reactivity-Electrophilic substitution on monosubstituted and disubstituted benzenes. Typical reactions such as Gattermann reaction, Gattermann Koch reaction, Reimer – Tiemann reaction, Kolbe reaction, Hofmann- Martius and Jacobson's reactions.

Aromatic nucleophilic substitution reactions - S_N^1 , S_N^2 , S_N^{AR} and benzyne mechanisms. Ziegler alkylation - Chichibabin reaction - Cine substitution - diazonium group as leaving group.

UNIT-II: Elimination Reactions (15)

Elimination Reactions: Mechanisms; E_1, E_2 , E_1CB – Stereochemistry of elimination, Hofmann and Saytzeff rules – Competition between elimination and substitution - Pyrolytic cis elimination, Chugaev reaction – Examples such as dehydration, dehydrohalogenation, Hofmann degradation, Cope elimination – Bredt's rule with examples.

UNIT-III: Addition Reactions (15)

Addition across C-C multiple bonds- Electrophilic, Nucleophilic and Free radical addition to double bond and triple bonds, orientation and reactivity- Epoxidation, Michael addition, Hydroboration and Birch reduction. Addition reactions to Carbonyl compounds- Mechanism of Nucleophilic addition – Mannich reaction, Grignard, Stobbe, Thorpe and Benzoin reactions.

UNIT-IV: Conformational Analysis (15)

Conformational analysis of simple cyclic (chair and boat cyclohexanes) and acyclic (n-butane) systems, conformation of simple 1,2 disubstituted derivatives – (ethylene chlorohydrin and ethylene glycol), conformational analysis and stereochemical features of disubstituted cyclohexanes (1,2-, 1,3- and 1,4-dialkyl cyclohexanes), conformation and stereochemistry of decalins, Effects of conformation on reactivity in acyclic and cyclohexanes, oxidation and acylation of cyclohexanols, reduction of cyclohexanones, esterification and hydrolysis of cyclohexane carboxylic acid derivatives.

UNIT-V: Reagents in Organic Synthesis (15)

Reduction: Catalytic hydrogenation – Wilkinson Catalyst, dehydrogenation, reduction with LAH, NaBH₄, tertiarybutoxy aluminum hydride, NaCNBH₃, tributyltin hydride, alkali metals for reduction, reductions involving hydrazine (wolff kishner reduction).

Oxidation: osmium tetroxide, chromyl chloride, ozone, DDQ, dioxiranes, lead tetra acetate, selenium dioxide, DMSO with either Ac₂O or oxalyl chloride, DCC, synthesis involving phase transfer catalysis (PTC), use of crown ethers.

TEXT BOOKS

1. S.H. Mukherjee and S. P. Singh, Reaction mechanisms in organic chemistry, McMillan (1976).
2. I.L. Finar, Organic chemistry, Vol. I and Vol. II. Pearson Education (P) Ltd (2011).
3. Ernest L. Eliel, Stereochemistry of Carbon Compounds, T.M.H Edition, Tata McGraw - Hill Publication Companies (1975).
4. P. S. Kalsi, Stereochemistry- Conformation And Mechanism, 6th Edition, New Age International Publishers (2005).

REFERENCE BOOKS

1. Jerry March, Advanced organic chemistry - Reactions mechanism and structure, McGraw Hill Kogakusha Ltd., (1977).
2. Lowry and Richardson, Mechanism and theory in organic chemistry, Harper & Row Publishers, New York (1981).
3. Raj K.Bansal, Organic Chemistry Reaction mechanisms, Hill Publishing Company Ltd (2006).

SYLLABUS

SEMESTER II
14P2CH05

TOTAL HRS: 75
CREDIT: 5

INORGANIC CHEMISTRY II

UNIT I: Stereo Chemistry Of Complexes (15)

Geometrical and optical isomerism of octahedral and square planar complexes. Electronic spectra of complexes -interpretation including charge transfer spectra- Orgel diagrams -Tanabe - Sugano diagram.

Metal Carbonyls –Binuclear and tri nuclear carbonyls of iron, cobalt and manganese - Preparation, properties, uses. Nature of M-CO bond in carbonyls. Metallic Nitrosyls - Nitrosyl carbonyls, Metal Nitrosyl hydroxide, metal nitrosyl thio compound - Nature of M - NO bonding - structure of $\text{Fe}(\text{NO})_4$, $\text{Fe}_2(\text{NO})_4$, $\text{Fe}(\text{NO})_3\text{Cl}$, $\text{Fe}(\text{NO})_2(\text{CO})_2$. Organo metallic compounds of transition elements -classification, Pi olefinic complexes Pi sandwich complexes-Ferrocene, -Preparation, Properties and structure –MO theory and 18 electron rule.

UNIT II: Nuclear and radiation chemistry (15)

Nuclear structure-mass and charge- Nuclear moments- Binding energy- Semi empirical mass equation- Stability rules- Magic numbers- Nuclear models- Shell, Liquid drop, Fermi gas, Collective and optical models- Equation of radio active decay and growth- half life and average life. Radio active equilibrium- Transient and secular equilibrium- Determination of half lives- Nuclear reactions- Energetic of nuclear reaction- Types of nuclear reactions- Spontaneous and reduced fission- Neutron capture cross section and critical size- Principle and working of GM, Proportional, Ionization and Scintillation counters.

UNIT III: AAS, PES and Crystal Studies (15)

Atomic absorption spectroscopy and flame emission spectroscopy: Basic principles- flame characteristics - atomizers and burners- interference instrumentation and applications of AAS and FES.PES –theory of XPES,UV PES-evaluation of ionization potential-chemical identification of elements-ESCA-Koop Mann's theorem-chemical shift-UPES,XPES of N_2 , O_2 , and HCL-evaluation of vibration constants from UPES-spin orbit coupling. X-ray diffraction and neutron diffraction.

A brief account of the principles of molecular structure-single crystal method -Neutron diffraction-application of molecular structure determination-advantages of X-ray diffraction studies.

UNIT IV: Bio-Inorganic Chemistry: (15)

Porphyrin ring system-Metalloporphyrins-Hemoglobin and Myoglobin-structures and work functions –synthetic oxygen carriers –Cytochromes-structure and work functions in respiration – chlorophyll, structure photo synthetic sequence-iron –Sulphur proteins-(Non –Haemo-Iron protein)-Copper oxidizes- bluecarbon proteins, carboxyl peptidase A –structure, function-carbonic Anhydrase-Inhibition and poisoning –Corin ring system- vitamin B_{12} , co-enzymes-in vivo and in vitro nitrogen fixation- essential and trace elements in biological systems-metal ion ,toxicity and

detoxifications-molecular mechanism of ion transport across the membrane-Na and K ions pumps-
Chelate therapy-Cis plating.

UNIT V: Non-aqueous solvents

(15)

Reactions in non aqueous solvents- Solute-Solvent interactions- Reactions in liquid ammonia- Solutions of metals in liquid ammonia- Reactions in anhydrous Sulphuric acid, liquid Sulphur dioxide, liquid HF and liquid Dinitrogen Tetroxide. Distribution law, Extraction process, liquid - liquid Extraction, Extractants, Factors Effecting Extraction, Technique for solvent Extraction, Completion of analysis, Quantitative Treatment of solvent Extraction Equilibria, Classification of solvent extraction Systems, Types of extraction systems, types of inorganic extraction systems, Transition of a substance from an aqueous phase.

TEXT BOOKS

1. W.U. Malik, G.D. Tuli and R.D. Madan, Selected topics in Inorganic Chemistry, 6th edition S.Chand & company Ltd., (2005).
2. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry, 4th edition, Pearson education (2006).
3. Gurudeep Raj, Advanced Inorganic Chemistry Vol. I & Vol. II, 6th edition, Goel publishing house (1998).
4. B.R.Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, S.Chand & company Ltd., (2004).
5. G.S. Manku, Theoretical Principles of Inorganic Chemistry, Tata McGraw –Hill Company Publishing ltd., (1999).

REFERENCE BOOKS

1. Gurudeep Raj, Ajay Bhagi and Vinod Jain, Group theory and symmetry in Chemistry, Krishna Prakashan Media (p) Ltd, Meerut, (2002).
2. M.S.Gopinathan and V. Ramakrishnan, Group theory in Chemistry, Vishal Publishing & Co (2000).
3. K.V. Raman. Group theory and its applications to chemistry, Tata McGraw-Hill, (1990).
4. Cotton and Wilkinson, Advanced Inorganic Chemistry, Wiley Inter science Publications (2000).
5. B.K.Sharma, Instrumental Methods of Chemical Analysis, Krishna Prakashan Media, (2000).

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

ELECTROCHEMISTRY AND PHOTOCHEMISTRY
(ELECTIVE-II)**UNIT – I: Electro Chemistry - I****(15)**

Introduction to electrochemical cells-Types-Chemical cells with and without transferences-Concentration cells- types- electrode concentration cells-electrolytic concentration cells- with and without transferences-Liquid liquid junction-Diffusion potential-derivation-salt bridge-Electrokinetic phenomena: Electrical double layer, theories of double layer, electro-capillary phenomena, electro-capillary curve. Electro-osmosis electrophoreses. Streaming and Sedimentation potentials.

UNIT-II: Electro Chemistry - II**(15)**

Debye - Huckel theory of inter-ionic attraction, ionic atmosphere, time of relaxation, relaxation and -phoretic effects, Debye-Huckel-Onsagar equation and its validity for dilute solutions at appreciably concentrated solutions. Debye-Falkenhagen and Wein effects. Abnormal ionic conductance of hydroxyl and hydrogen ions. Activity coefficients: forms of activity coefficients and their interrelationship. Debye-Huckel limiting law, applications of concentrated solutions. Debye-electro Huckel Bronsted equations. Quantitative and qualitative verification of Debye- Huckel limiting law, ion association and Bjerrum theory

UNIT-III: Photochemistry – I**(15)**

Absorption of light and nature of electronic spectra, electronic transition, Frank- Condon principle, selection rules, photodissociation, predissociation, photochemical reactions: photoreduction, photo-oxidation, photodimerization, photochemical substitution, photoisomerization, photochemistry of environment: Green house effect. Photo physical phenomena: Electronic structure of molecules, molecular orbital,electronically excited singlet states, designation based on multiplicity rule, life time of electronically excited state, construction of Jablonski diagram.

UNIT-IV Photochemistry – II**(15)**

Electronic transitions and intensity of absorption bands, photophysical pathways of excited molecular system (radioactive and non-radioactive), prompt fluorescence, delayed fluorescence, and phosphorescence, fluorescence quenching: concentration quenching, quenching by excimer and exciplex emission, fluorescence resonance energy transfer between photo excited donor and acceptor systems. Stern-Volmer relation, critical energy transfer distances, energy transfer efficiency, examples and analytical significance, bimolecular collisional quenching and Stern-Volmer equation.

UNIT-V: Photochemistry in nature & Applied Photochemistry**(15)**

Photochemistry reaction in the atmosphere-oxygen and ozone- nitrogen oxide-chlorofluoro carbons-organic compounds- chemistry of vision-photography-photosensitisers-ultraviolet screening

agents-optical bleach-photochromism-photoimaging-photochemistry of polymers-
Photopolymerization: imaging,curing-photodegradation and photostabilization.

TEXT BOOKS

1. K. K. Rohatgi - Mukharjii, Wiley Eastern., Fundamentals of Photochemistry, New age international.,(P)., Ltd., New Delhi (2011) .
2. S. Glasstone, D. Van Nostrand., An introduction to Electrochemistry., Affiliated East west press Pvt., Ltd., New Delhi, (2004).
3. Jagdamba singh, Jaya singh, Photochemisty & Pericyclic Reaction, New age international publishers (2012).

REFERENCE BOOKS

- 1.. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing House ., (1999).
2. M.S Yadav Electrochemistry- Anmol Publication Pvt Ltd. New Delhi, (2011).
3. J.G.Calverts & J.N.Pitts - An introduction to Photochemistry, New age international (p) Ltd., New Delhi
4. Wells, Introduction to Photochemistry, New age international (P) Ltd., (2010).

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

ORGANIC CHEMISTRY PRACTICAL -1

1. QUALITATIVE ANALYSIS OF BINARY MIXTURE OF ORGANIC COMPOUNDS : (45)

Preliminary pilot analysis, pilot report, bulk separation, systematic analysis of each component inclusive of preliminary identification, confirmatory tests, derivative preparation and recording melting point/boiling point of components.

2. ORGANIC PREPARATIONS: (30)

Single stage preparation of organic compounds involving synthetic methods like oxidation, acylation, nitration, sulphonation, Bromination, Esterification, hydrolysis and condensation (six preparations).

REFERENCE BOOKS

1. Antony J. Hannaford, Austin R. Tatchell, Brian S. Furniss, Peter W.G. Smith , Vogel's Text Book of practical organic chemistry, Pearson Education (2006).
2. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).

INORGANIC CHEMISTRY PRACTICAL - I

1. Colorimetric estimation & Complexometric titrations: (30)

Colorimetric estimation of copper, Nickel and Iron etc.,
Complexometric titrations of estimation of calcium, copper, Mg, Ni & Zn.

2. Qualitative Analysis: (45)

Qualitative analysis employing semi micro methods and spot tests - mixtures of common cations and ions of the following less familiar elements Molybdenum, tungsten, selenium, tellurium, cerium, thorium, titanium, zirconium, vanadium, uranium and lithium.

REFERENCE BOOKS

1. V.V. Ramanujam, Inorganic semi micro qualitative analysis, The National Publishing Co., Ltd., Madras (2002).
2. Vogel, Inorganic quantitative analysis, Pearson Education (2001).

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS

PHYSICAL CHEMISTRY PRACTICAL**1. Chemical Kinetics**

- i) Rate constant of the hydrolysis of methyl acetate catalysed by N/2 HCl
 - a) Comparison of strength of two acids- at room temperatures
 - b) Determination of temperature coefficient and Arrhenius parameter

2. Chemical Kinetics II –Second order reaction

- i) Saponification of ethyl acetate by NaOH
- ii) Determination of rate constant for the kinetics of the reaction between potassium persulphate and potassium iodide

3. Phase rule studies

- i) Two component systems-Simple Eutectic formation
- ii) Determination of CST of Phenol –water system. Effect of electrolyte KCl or succinic acid on CST of Phenol –water system

4. Conductometric experiments

- i) Conductometric titrations
 - a) HCl vs NaOH
 - b) CH₃COOH vs NaOH
 - c) HCl, CH₃COOH vs NaOH
- ii) Application:
 - a) Verification of DHO equation
 - b) Verification of Ostwalds' dilution law
 - c) Solubility of a sparingly soluble salt

5. Potentiometric Experiments

- i) Potentiometric titrations
 - a) HCl vs NaOH
 - b) CH₃COOH vs NaOH
 - c) KCl vs AgNO₃

REFERENCE BOOKS

1. A .O. Thomas , Practical Chemistry, Scientific Book Centre , Cannanore (2003).
2. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).
3. *B Viswanathan, P S Raghavan, Practical Physical Chemistry*, Viva Books Private Limited, (2005).

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS

Semester- III
Paper Code: 14P3CH06

Total Hrs: 75
Credit: 5

CORE PAPER - VI
ORGANIC CHEMISTRY - III

UNIT – I Terpenoids and Alkaloids (15)

Terpenoids: Structural elucidation, medicinal values and synthesis of α -pinene, camphor and Zingiberene- Biosynthesis of Terpenoids.

Alkaloids: Structural elucidation, medicinal values and synthesis of Reserpine, Morphine, Cinchonine and Papaverine- Biosynthesis of Alkaloids.

UNIT – II Steroids and Vitamins (15)

Steroids: Classification – Structural elucidation of Cholesterol (synthesis not required) – structural elucidation and synthesis of Vitamin-D – Estrone, progesterone, Stigmasterol, Equilenin, Conformation of steroids - Biosynthesis of Cholesterol.

Vitamins: Physiological importance, Structural elucidation of B₆, B₁₂, and K.

UNIT – III Pericyclic reactions (15)

Concerted reactions-Stereochemistry-orbital symmetry and correlation diagram – Frontier Molecular Orbital approach – Woodward and Hoffman rules – Electrocyclic reactions – cycloaddition- selection rule-sigmatropic rearrangements- selection rules with simple examples – 1,3 and 1,5 –hydrogen shifts – Cope and Claisen rearrangement.

UNIT – IV Organic Photochemistry (15)

Fundamental concepts, Jablonski diagram- energy transfer- Photooxidation reaction (Formation of Peroxy compounds) – Photoreduction of ketones and enones, Norrish type I and II reactions-Photochemistry of Alkenes, Dienes and Aromatic compounds- Photoisomerisation – Cis and Trans isomerization - Photoaddition reaction-Paterno-Buchi reaction- Photo rearrangements - Photo-Fries rearrangement and photorearrangement of 2,5-Cyclohexadienones.

UNIT – V Green chemistry (15)

Basic principles of Green chemistry-Prevention of waste-Maximum incorporation of the reactants-Prevention of hazardous products-Polymer supported green reagents-PNBS-Polystyrene wittig reagent- Polymer supported green catalyst-polystyrene aluminium chloride-Photosensitizers.

Microwave induced Green synthesis: Introduction- Reaction vessel-Reaction Medium-Advantages-Limitations, Precautions-Applications-Reaction in water- reaction in organic solvents.

TEXT BOOKS

1. I.L. Finar organic Chemistry, Vol. II, 5th Edition ELBS 1975
2. O.P.Agarwal, Chemistry of Organic Natural products,Goel publication vol I & II
3. B.B. Grill, M. R. Willis, Pericyclic reactions, Champan & Hall 1974.
4. M.G. Arora, Organic Photochemistry and Pericyclic reaction,2008

REFERENCE BOOKS

1. C.H.Depuy ,O.SChampman Molecular reactions and Photo-chemistry, Prentice Hall, 1975
2. Singh and Mukherjee, Organic reaction mechanism,2005.
3. V.K.Ahluwalia,M.Kidwai,New trends in green chemistry,Second Edition,2007.

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**Semester- III
Paper Code: 14P3CH07**

**Total Hrs: 75
Credit: 5**

CORE PAPER - VII

INORGANIC CHEMISTRY – III

UNIT I: Theories of Acid-Base Concept (15)

Lewis concept of acids and bases – classification of acids and bases – solvolysis reaction, formation of metal complexes- The solvent system concept of acids and bases – Usanovich concept – strength of hydracids, strength of oxyacids - Pauling rule – Hard and Soft acids and bases (HSAB) – Pearson's principle – applications of HSAB -principle – symbiosis – theoretical basis of Hardness and Softness – Electronegativity of Hardness and Softness.

UNIT II: Nuclear Chemistry – II (15)

Different type of nuclear reactions with natural and accelerated particles - transmutation - stripping and pick-up - spallation – fragmentation – reaction cross section, Q value, threshold energy – nuclear fission - characteristics of fission reaction - product distribution and theories of fission - fissile and fertile isotopes - U^{235} , U^{238} , Th^{232} and Pu^{239} - atom bomb - nuclear fusion - stellar energy - synthesis of trans uranium elements - principles underlying the usage of radioisotopes in analysis - agriculture - industry and medicine - uses of radioisotopes in analytical chemistry - isotopic dilution analysis - neutron activation analysis and dating methods.

UNIT III: Chains, Rings And Cages (15)

Chain catenation – Heterocatenation: Silicate minerals, one dimensional conductors. Rings: Borazines – Phosphazenes and its polymers – Homocyclic inorganic systems. Cages: Introduction – boranes: closo, nido and arachno boranes – Carboranes. Poly acids – Isopolyacids of V, Cr, Mo and W, Heteropoly acids of Mo and W.

UNIT IV Organometallic Compounds (15)

Definition of organometallic compounds – classification of organometallic compounds – The metal carbon bond types – ionic bond, sigma covalent bond, electron deficient bond – delocalized bond and dative bond. Metal alkyl complexes – stability and structure – synthesis by alkylation of metal halides, by oxidative addition, by nucleophilic attack on coordination ligands – metal alkyls and 18 electron rule – reactivity of metal alkyls – M-C bond cleavage reactions – insertion of CO to M-C bonds – double carbonylation. Metallocene: Structure and bonding of Ferrocene.

UNIT V Organometallic Compounds In Catalysis – II (15)

Alkene complexes - synthesis of alkene complexes by ligand substitution, by reduction, by metal atom synthesis - bonding of alkenes to transition metals - bonding in diene complexes - reactivity of alkene complexes - ligand substitution with nucleophiles - olefin hydrogenation (Wilkinson's catalyst) – hydrosilation – Wacker's process - Zeigler-Natta polymerization of olefins - reactions involving carbon monoxide such as hydrocarbonylation of olefins (Oxo reactions) using Co and Rh catalysts – cyclooligomerisation of acetylene using Ni catalyst (Reppe's catalyst).

TEXT BOOKS

1. B.R.Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic ,Shoban Naginchand & Co,(2004)

2. R.D. Madan S. Chand, Modern Inorganic Chemistry publishers 2004.
3. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry 4th edition Pearson education (2006).
4. G.S. Manku, Theoretical Principles of Inorganic Chemistry, Tata McGraw – Hill Publishing Company ltd., (reprint 2001)

REFERENCE BOOKS

1. H.J. Arnika, Essentials of Nuclear chemistry .
2. Cotton and Wilkinson 5th A Wiley, Advanced Inorganic Chemistry Interscience Publications (2000).
3. W.U. Malik, G.D. Tuli and R.D. Madan, Selected topics in Inorganic Chemistry ,6th edition S.Chand & company Ltd., (2005)
4. Gurudeep Raj, Advanced Inorganic Chemistry Vol. I & Vol. II 6th edition Goel publishing house (1999)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS

Semester- III
Paper Code: 14P3CH08

Total Hrs: 75
Credit: 5

CORE PAPER – VIII
PHYSICAL CHEMISTRY – II

UNIT - I Spectroscopy-I (15)

Introduction: Electromagnetic radiation, Interaction of light with matter, mechanism of absorption & emission of radiation. Rotational, vibrational, and electronic energy levels and transitions in molecules; regions and representation of spectra.

Micro wave Spectroscopy: Diatomic molecules as rigid rotors: rotational energy levels, intensity of spectral lines, selection rules, effect of isotopic substitution. Diatomic molecules as non-rigid rotors. Rotational spectra of polyatomic molecules.

UNIT - II Spectroscopy-II (15)

Vibrational Spectroscopy: Vibrating diatomic molecule: energy of diatomic molecules as simple harmonic and Unharmonic oscillator - energy levels, vibrational transitions, selection rules; Diatomic vibrating rotator: Born-Oppenheimer approximation, vibration-rotational spectra, selection rules; P, Q, R branches. Vibrations of polyatomic molecules: fundamental vibrations and its symmetry, normal modes of vibration, overtones and combination of bands.

Raman Effect: Rayleigh and Raman scattering, Stokes and anti-Stokes lines, molecular polarizability, Raman selection rules. Raman spectra: rotational Raman spectra- linear molecules, symmetric top and spherical top molecules; vibrational Raman spectra-symmetry and Raman active vibrations, rule of mutual exclusion.

UNIT – III Quantum Chemistry-II (15)

Quantum theory : Approximation methods -Perturbation and Variation methods-application to hydrogen and helium atom- self consistent approximation- Hartree and Hartree-Fock's SCF - Discussion of the wave functions-radical distribution function- orbital and orbital diagrams- their significance-VB and MO theory-application to hydrogen molecule- Eigen value calculations for Hydrogen based on analytical functions

UNIT – IV Chemical Kinetics-II (15)

Explosion reaction – H_2-O_2 mechanism - Rice Herzfeld mechanism- Kinetics of H_2-Cl_2 and H_2-Br_2 – Decomposition of Acetaldehyde. Theories of reaction rates: Arrhenius theory, Hard - sphere collision theory of gas – phase reactions. Activated complex theory of reaction rates, Eyring equation. Rice-Ramberger , Kassel – Marcus theory, Reaction in molecular beams. Relation between activated - complex theory and hard - sphere collision theory. Thermodynamic formulations of activated complex theory - kinetic isotopic effects.

UNIT-V GROUP THEORY-II (15)

Applications to Vibrations and Raman Scattering –Fundamental Procedures and Determination of representation of vibrational modes in non-linear molecules such as H_2O , CH_4 , XeF_4 , SF_6 and NH_3 – Fundamental Procedures and Symmetry of Hybrid orbitals in non-linear molecule Such as BF_3 , CH_4 , XeF_4 , PCl_5 and SF_6 .

TEXT BOOKS

1. R.K.Prasad, Text book of Quantum Chemistry, New Age International Publishers, New Delhi. 2000.
2. Arun Bahl, B.S.Bahl, G.D.Tuli, Essentials of Physical Chemistry, Multicolour Revised Edition, S.Chand and Company Ltd, 2008.
3. Thermodynamics for Chemists – S. Glasstone, East-west Press Pvt.Ltd,2002.
4. K.J.Laidler, Chemical Kinetics, Third Edition, Pearson Education Pvt.Ltd, 2004.
5. K.V.Raman, Group Theory and its applications to Chemistry, Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS

1. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2010.
2. G.Aruldas, Molecular Structure and Spectroscopy, Prentice-Hall of India Pvt.Ltd, 2005.
3. R.K. Prasad, Quantum Chemistry through problems and Solutions, New Age International Publishers, New Delhi, 2001.
4. Charles M Quinn, Computational Quantum Chemistry, Elsevier India Pvd.Ltd, 2008.
5. J.Rajaram, JC. Kuriacose , Kinetics and Mechanisms of Chemical Transformations, Macmillan Publishers India Ltd,2011.
6. Mool Chand Gupta, Atomic and Molecular Spectroscopy, New Age International Publishers, New Delhi. 2010.

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN (AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

Semester- III
Paper Code: 14P3CHE03

Total Hrs: 75
Credit: 5

ELECTIVE PAPER – III
SPECTRAL AND ANALYTICAL TECHNIQUES

UNIT – I UV-VIS Spectra and ORD-CD (15)

UV – VIS: Theory –Instrumentation and Sampling- Solvent effect – Applications of Electronic Spectroscopy -Woodward – Fieser rules for dienes, trienes and unsaturated carbonyl compounds.

ORD – CD: Definition, deduction of absolute configuration, octant rule for ketones, Cotton effect – axial haloketone rule.

UNIT – II IR and Raman Spectra (15)

Principle of IR – Molecular Vibration – Vibrational frequency – Fundamental vibration – Factors influencing vibrational frequencies – Sampling techniques – Characteristics functional group frequencies of organic molecules – Interpretation of IR Spectra of organic molecules.

Theory of Raman spectra – Characteristics Parameters of Raman lines – Applications of Raman spectra – Comparison of IR and Raman Spectra.

UNIT – III ESR and NMR Spectra (^1H , ^{13}C and ^{19}F) (15)

ESR Spectra : Principle of ESR Spectra – Zero field splitting and Kramer's degeneracy – Factors influencing 'g' value – Isotropic and anisotropic hyperfine coupling constant – Applications of ESR Spectra.

NMR Spectra (^1H , ^{13}C and ^{19}F): Chemical Shift – Shielding and Deshielding effects – Factors influencing chemical shift - Solvents – Splitting of signal - Spin spin coupling – Coupling Constant – Types of couplings – Double resonance – Nuclear overhauser effect – Applications of NMR Spectra. Introduction - ^{13}C NMR and ^{19}F NMR

UNIT – IV Mass Spectroscopy and Mossbauer Spectroscopy (15)

Mass Spectroscopy : Theory – Instrumentation – fragmentation pattern - McLabattery rearrangement– Nitrogen rule and ring rule – Fragmentation of organic compounds with respect to their structural determination.

Mossbauer Spectroscopy : Principle – Instrumentation – Theoretical aspects –chemical isomer shift –quatrople splitting- Nuclear Zeeman Splitting – applications of Theory.

UNIT – V Analytical Techniques (15)

Principles and applications of Fluorimetry, turbidimetry and Nephelometry. Flame Photometry – Theory – Instrumentation – Applications of X RF, CV- Atomic fluorescence.

TEXT BOOKS

1. R.Chatwal Sham K. Anand ,Instrumental Methods of Chemical Analysis, , Himalaya Publishing House. Reprint 2011
2. D.A.Skoog and D.M. West Fundamentals of Analytical Chemistry, Holt Rinehart and Winston Publications, IV Edn,2004.
3. Jag Mohan ,Organic Spectroscopy principles and Applications, second edition ,Narosa publications House, Pvt .Ltd. Reprint 2011
4. Willard, Merit, Dean and Settle, Instrumental Methods of Analysis, CBS Publishers and Distributors, IV Edn, 1986.

REFERENCE BOOKS

1. William Kemp, Organic Spectroscopy, ELBS, II.Edition. Spectroscopy of organic compounds.1993.
2. Y.R.Sharma, Elementary Organic Spectroscopy, I Edition,S.Chand & Company Ltd, New Delhi, 1980.
3. J.Dyer, Application of absorption Spectroscopy of organic compounds, Prentice Hall of India Pvt.Ltd., New Delhi, 2005.
4. W.Kemp, NMR in Chemistry, MacMillan Ltd., 1986.

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**Semester- III
Paper Code: 14P3CHED01**

**Total Hrs: 75
Credit: 4**

EDC- APPLIED POLYMER CHEMISTRY

UNIT – I: Chemistry of Polymerisation (15)

Monomers and Polymers: Definition – Classification – Chemistry of Polymerisation: Chain Polymerisation: Free radical, Ionic, Coordination - Step Polymerisation: Polycondensation, Polyaddition – Ring Opening Polymerisation – Copolymerisation: Free radical, Ionic, Co-Polycondensation.

UNIT – II: Chemical Structure and Polymer Properties (15)

Fabrication methods – Mechanical Properties – Thermal Stability – Flammability & Flame Resistance – Chemical Resistance – Degradability – Electrical Conductivity – Nonlinear Optical Properties.

UNIT – III: Molecular Weight Determination (15)

Average Molecular Weight: Number Average Concept and Weight Average Concept – Measurement of Number Average Molecular Weight: End Group Analysis, Membrane Osmometry - Measurement of Weight Average Molecular Weight: Light Scattering, Viscometry.

Glass Transition Temperature: Glass Transition Temperature: Factors influencing the Glass Transition Temperature – Glass Transition Temperature and Molecular Weight – Importance of Glass Transition Temperature.

UNIT – IV: Commercially Important Polymers (15)

Synthesis and Uses of Polyethylene – Polypropylene – Polyacrylonitrile – Polymethylmethacrylate – Polyesters – Polyamides – Polyurethanes – Polyvinylchloride – Polytetrafluoroethylene

UNIT – V: Resins and Natural Polymers (15)

Synthesis and Uses of Phenol-Formaldehyde Resins – Urea-Formaldehyde Resins – Melamine-Formaldehyde Resins

Natural Polymers Rubber – Structure of Cellulose and Starch – Synthesis of Polypeptides – Protein Structure

TEXT BOOKS

1. Dr. M. S. Bhatnagar, A Textbook of Polymer Chemistry, New Delhi, S. Chand & Co., (2012).
2. V. R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, Polymer Science, New Delhi, Newage International Publishers, (2012).

REFERENCE BOOKS

1. Malcolm. P. Stevens, Polymer Chemistry, Oxford University Press (2008).
2. G. S. Misra, Introductory Polymer Chemistry, New Delhi, Newage International Publishers, (2005).

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**Semester- IV
Paper Code: 14P4CH09**

**Total Hrs: 75
Credit: 5**

**CORE PAPER – IX
PHYSICAL CHEMISTRY – III**

UNIT-I :Quantum Chemistry-III

(15)

Huckel Molecular orbital theory for conjugated π -system-Applications to simple system-Ethylene, Butadiene, Benzene .Concept of hybridization- Explanation of sp , sp^2 , sp^3 hybridisation. Spin-Orbit Interactions-L-S Coupling- J-J Coupling-Term symbols and spectroscopic states. Ground state term symbols for simple atoms. Slater type orbitals-Calculation of screening constant, effective nuclear charge-Slater rule-Examples, Calculations using Slater Orbitals on analytical Functions.

UNIT-II : Non-Equilibrium Thermodynamics

(15)

Local equilibrium-its postulates- Entropy production-Entropy production in heat flow and matter flow. Forces and fluxes-Flows and coupled flows-Linear laws- Phenomenological law-Onsager reciprocal relation-Proof by Microscopic reversibility-Verification by Electro-kinetic phenomenon-Diffusion.Non-Equilibrium stationary states-Applications of non-equilibrium thermodynamics.

UNIT-III :Spectroscopy-III

(15)

NMR Spectroscopy-principle-nuclear zeeman effect-chemical shift-spin-spin coupling-NMR of simple AX and AMX type molecules-Brief discussion on FT- NMR, Calculation of coupling constant.

ESR spectroscopy-principle-hyperfine interactions-Spin densities- McConnell relationship - selection rules in ESR-‘g’ value and coupling constant.

Mossbauer spectroscopy-line width- isomer shift-quadrupole interaction-magnetic interactions- structural elucidation of iron and tin complexes.

UNIT – IV :Statistical Thermodynamics

(15)

Objectives of Statistical thermodynamics – concept of thermodynamically and mathematical probabilities – Distribution of distinguishable and non – distinguishable particles. Maxwell – Boltzmann, Bose – Einstein and Fermi – Dirac statistics Law – comparison and its applications. Partition Function – evolution of Translational, Vibrational, Rotational and Electronic partition Functions – Thermodynamic Functions in terms of partition Function – Statistical expression for equilibrium constant – Calculation of Equilibrium constant from partition Function – (isotopic exchange equilibria and dissociation of diatomic molecules)

UNIT – V :Kinetics of Catalysis

(15)

Acid – base catalysis – Definitions and mechanism –Bronsted catalysis law – The rate of reaction catalysis by enzymes-Michaelis-menten equation- Rate of enzyme catalysed reaction – Factors affecting substrate, concentration, pH and temperature on enzyme catalysed reaction – inhibition of enzyme catalyzed reaction. Linear free energy relation – Hammett and Taft equation – QSAR – Hansch equation.

TEXT BOOKS

1. Arun Bahl, B.S.Bahl, G.D.Tuli, Essentials of Physical Chemistry, Multicolour Revised Edition, S.Chand and Company Ltd, 2008.
2. R.K.Prasad, Textbook of Quantum Chemistry, New age International Publishers, New Delhi. 2000.Charles M Quinn, Computational Quantum Chemistry, Elsevier India Pvd.Ltd, 2008.
3. M.C.Gupta, Statistical Thermodynamics, New Age International Pvt.Ltd, 2010.
4. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2010.

REFERENCE BOOKS

1. G.Aruldas, Molecular Structure and Spectroscopy, Prentice-Hall of India Pvt.Ltd, 2005.
2. Vimal Kumar Jain, Introduction to Atomic and Molecular Spectroscopy, Narosa Publishing House Pvt.Ltd, 2007
3. Thermodynamics for Chemists – S. Glasstone, East-west Press Pvt.Ltd,2002.
4. J.Rajaram, Jc. Kuriacose , Kinetics and Mechanisms of Chemical Transformations, Macmillan Publishers India Ltd,2011.
5. R.P.Rastogi, R.R.Misra, An introduction to Chemical Thermodynamics, Sixth Edition, Vikas Publishing House Pvt.Ltd, 2005

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

Semester- IV

Paper Code: 14P4CHE04

Total Hrs: 75

Credit: 4

ENVIRONMENTAL CHEMISTRY

UNIT -I : FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY

(15)

Fundamentals of Environmental Chemistry- Chemical potential, chemical equilibria, acid base reactions and carbonate system, sampling techniques for air, water, and soil.

UNIT- II :WATER CHEMISTRY

(15)

Water chemistry- properties of water, nature of metal ions in water, solubility of gases in water, occurrence of chelating agents in water; Redox potential, Significance of redox equilibria in natural and waste water; microorganisms; The catalyst of aquatic chemical reactions, water pollution and its effects, eutrophication concept of DO, BOD, COD, Sedimentation. Coagulation and filtration.

UNIT -III : POLLUTANTS FROM INDUSTRY

(15)

Polymers and Plastics: – The classification – The characteristics – Environmental Implications of polymers and plastics – abatement procedures for polymers and plastics pollution.
Asbestos: Structural characteristics of Asbestos – applications of asbestos – sources of asbestos in the environment – analysis of asbestos – effects of asbestos pollution – Mitigation of asbestos pollution.

Polychlorinated Biphenyls: The need – Fate of poly chlorinated Biphenyls in the Environment – Environmental Implications of Polychlorinated Biphenyls – Abatement procedures for poly chlorinated Biphenyls pollution.

UNIT- IV : POLLUTANTS FROM AGRICULTURE

(15)

Fertilizers: The classification – Environmental implications of fertilizers – Abatement procedures for fertilizers pollution – Eutrophication.

Insecticides: The classification – The characteristics –Environmental implications of insecticides – Abatement procedures for insecticides pollution – Bhopal Episode.

Fungicides and Herbicides: The need – The classification – The characteristics – Environmental Implications of Fungicides and Herbicides – Abatement procedures for fungicides and Herbicides pollution.

UNIT- V : WASTE MANAGEMENT AND RECYCLING

(15)

Wastemanagement – Land filling – Incineration – Disposal of medicinal waste – New technique to treat industrial and farm effluents – Reduce,reuse and recycle – Wealth from waste (recycling) – Recycling technique – Utilizing agricultural waste – Waste into energy – Municipal waste into road making – Electricity from tannery waste – Plastic recycling techniques – Waste water and its treatment(recycling of sewage) – Removal of hazardous wastes from contaminated metals.

TEXT BOOKS

1. B.K.Sharma, Environmental Chemistry, Goel publishing house, Meerut, Seventh Revised, 2003
2. S.K. Banerji, Environmental Chemistry, Prentice Hall of India, New Delhi, 2003.
3. De, A.K., Environmental Chemistry, New Age International Publishers Private Ltd., New Delhi, Fifth Edition, 2008.
4. Dara, S.S., Environmental Pollution and Control, S.Chand & Co., New Delhi, First Edition, 1993.

REFERENCE BOOKS

1. Sharma and Kaur, Environmental Chemistry, Krishna Publishers, New Delhi, 2000.
2. Sodhi, G.S., Fundamantal Concepts of Environmental Chemistry, Narosa Publishing House Pvt. Ltd., New Delhi, Third Edition, 2009.
3. J.Rose Gordon and Breach (Ed.), Environmental Toxicology, Science Publication, New York, 1993.
4. S.Ladsberger and Creatchman (Ed.), Elemental Analysis of Airborne Particles, Gordon and Breach Science Publication New York, 1998.
5. S.E Manahan, Environmental Chemistry, Lewis Publishers, London, 2001.
6. S.M. Khopkar, Environmental Pollution analysis, Wiley Eastern, New Delhi, 1994.

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**Semester- III & IV
Paper Code: 14P4CHP04**

**Total Hrs: 75
Credit: 4**

**CORE PRACTICAL – IV
ORGANIC CHEMISTRY PRACTICAL– II**

**[Organic Qualitative Analysis &
Organic Compound Preparations (Double stages) & Rearrangements]**

(a) Organic Estimations:

- (01) Estimation of phenols
- (02) Estimation of aniline
- (03) Estimation of methyl ketone
- (04) Estimation of glucose
- (05) Saponification value of an oil
- (06) Iodine value of an oil

(b) Organic Compounds Preparation (Double stages) & Rearrangements:

- (01) sym-Tribromobenzene from aniline (Bromination + Hydrolysis)
- (02) *p*-nitroaniline from acetanilide (Nitration + Hydrolysis)
- (03) Benylic acid from benzoin (Rearrangement)
- (04) Benzanilide from benzophenone (Rearrangement)
- (05) *m*-nitroaniline from nitrobenzene (Nitration + Reduction)
- (06) *p*-Bromoaniline from acetanilide (Bromination + Hydrolysis)

DISTRIBUTION OF MARKS

- Quantitative analysis -30
- Preparation -15
- Viva-voce -10
- Record -05
- Total -60

REFERENCE BOOKS

- (1) Dr. N.S Gnanapragasam , Organic chemistry Lab manual
- (2) Raj .K. Bansal, Laboratory Manual of Organic chemistry, 3rd Edition, New Age Internal Publication
- (3) B.S. Furniss, A.J.Hannaford, P.W.D Smith and A.R. Tatchell, Vogel's Practical Organic chemistry, 5th Edition. ELBS

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
SYLLABUS**

**Semester- III & IV
Paper Code: 14P4CHP05**

**Total Hrs: 75
Credit: 4**

**CORE PRACTICAL – V
INORGANIC CHEMISTRY PRACTICAL– II
[Quantitative Analysis & Inorganic Complexes preparations]**

(a) Quantitative analysis of the following mixture

- 1. Iron and Magnesium
- 2. Iron and Nickel

3. Copper and Nickel
4. Copper and Zinc

(b) Preparations of the following complexes

1. Tris(thiourea)copper(I) chloride
2. Bis(acetylacetonato) copper(II)
3. Hexamminecobalt(III) chloride
4. Sodium hexanitrocobaltate(III)
5. Potassium trioxalatoaluminate(III) trihydrate
6. Chloropentamminecobalt(III) chloride
7. Hexamminenickel(II) chloride

DISTRIBUTION OF MARKS

• Quantitative analysis	- 30
• Preparation	- 15
• Viva-voce	- 10
• Record	- 05
• Total	- 60

REFERENCE BOOKS

1. J. Mendham, R.C. Denney, J.D. Barnes, M.J.K. Thomas, Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson Education (2001).
2. V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).

14P1CH01

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

**DEPARTMENT OF CHEMISTRY
M.Sc DEGREE EXAMINATION –I SEMESTER
MODEL QUESTION- ORGANIC CHEMISTRY-I**

Time:3 Hrs

Max Marks: 75

PART-A

Answer all the questions.

5x5=25

1. (a) Write a note on Inductive effect on the strength of acids and bases. (OR)
(b) Give an account of kinetic isotopic effects.
2. (a) Write the short notes on Aliphatic S_N1 substitution reaction. (OR)
(b) Explain the nucleophilic substitution at allylic carbon using addition-elimination mechanism .
3. (a) Write the basic criteria's for aromaticity of compounds. (OR)
(b) Write a note on aromaticity of Tropylium ion.
4. (a) Write the short notes on Stereospecific and stereoselective reaction in

- Stereochemistry. (OR)
- (b) Write a note on Cram's rule with examples.
5. (a) Discuss the synthesis of Flavones. (OR)
- (b) Explain the preparation and properties of Oxazole.

PART-B

Answer all the questions

10 x 5 = 50

6. (a) Discuss the Hammett equation for linear free energy relationship. (OR)
- (b) Write a note on non-kinetic methods for the study of reaction mechanism
7. (a) Explain the hydrolysis of esters using A_{AC}^2 , B_{AC}^2 , A_{AC}'' and B_{AL}'' mechanism. (OR)
- (b) Explain the neighbouring group participation in C=C systems of norbornyl systems
8. (a) i) Write the criteria's for antiaromaticity (5)
- ii) Give an account of homoaromaticity (5). (OR)
- (b) Write a note on aromaticity of any two nonbenzenoid aromatic compounds
9. (a) Write a note on asymmetric synthesis. (OR)
- (b) Explain in detail i) Allenes (5) ii) Spiranes (5)
10. (a) Discuss the synthesis and properties of Isoflavones. (OR)
- (b) Elucidate the structure of Uric acid

14P1CH02

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF CHEMISTRY

M.Sc DEGREE EXAMINATION –I SEMESTER

MODEL QUESTION- INORGANIC CHEMISTRY-I

Time: 3 Hrs

Max Marks: 75

PART-A

Answer all the questions.

5x5=25

1. (a) Discuss the heteronuclear diatomic molecules like NO and CO. (OR)
- (b) Explain the Comparison between molecules like diborane and metal alkyls
2. (a) Discuss the symmetry elements in group theory in detail. (OR)
- (b) Explain the term symbols for symmetry.
3. (a) Illustrate the CFT: splitting of d-orbital in various environments of ligands. (OR)
- (b) How will you determine the factors affecting the stability of complexes
4. (a) Explain the high temperature super conductors. (OR)
- (b) Write a note on ionic structure crystals, such Zinc blend, Calcite.
5. (a) Explain the ligand displacement reactions in square planar complexes. (OR)
- (b) Illustrate the complementary and non-complementary reaction.

PART-B
Answer all the questions.

10x5=50

6. (a) What do you mean Bent's rule and VSEPR theory. (OR)
(b) Discuss the symmetry of polyatomic molecules like CH₄ and NH₃.
7. (a) Derive the various symmetry of elements (OR)
(b) Explain the formation of symmetry elements
8. (a) Discuss the construction of M.O diagram for σ and π bonded O_h complexes. (OR)
(b) Illustrate the CFSE in octahedral and tetrahedral symmetries
9. (a) Explain the structure of covalent crystals and mention its defects. (OR)
(b) Illustrate the semiconductors, super conductors and high temperature
10. (a) Explain the ligands displacement reactions in square planar complexes. (OR)
(b) Discuss the kinetics and reaction rates of octahedral substitution reaction without the cleavage of M-L bond.

14P1CH03

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
M.Sc DEGREE EXAMINATION –I SEMESTER
MODEL QUESTION- PHYSICAL CHEMISTRY - I

Time:3 Hrs

Max Marks: 75

PART-A
Answer all the questions.

5x5=25

1. (a) Discuss the variation of chemical potential with temperature. (OR)
(b) Explain the Nernst heat theorem.
2. (a) Differentiate between chemical & physical adsorption. (OR)
(b) Explain the surface reactions & their mechanisms.
3. (a) Write about the comparison between gas phase & solution reaction. (OR)
(b) Explain the explosive reaction of H₂O₂.
4. (a) Write the postulates of quantum mechanics. (OR)
(b) Explain the Schrodinger time independent wave equation.

5. (a) Write the properties of irreducible representation. (OR)
(b) Write the selection rules for electronic transitions.

PART-B

Answer all the questions.

10x5=50

6. (a) Derive Maxwell relation. (OR)
(b) How will you determine fugacity of gases by graphical method & from equation of states?
7. (a) Derive the multilayer adsorption isotherm of BET equation. (OR)
(b) Explain the estimations of surface area.
8. (a) Explain the influence of solvent & ionic strength on reaction rate of reactions in solution. (OR)
(b) Explain any two methods of study of fast reactions.
9. (a) Derive Schrodinger equation for particle moving in three dimensional cubic box. (OR)
(b) Explain Schrodinger equation of hydrogen atom.
10. (a) Construct the character table for point group C_{3v} , D_{4h} . (OR)
(b) Explain mutual exclusion principle & electronic spectra of formaldehyde.

14P1CHE01

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF CHEMISTRY

M.Sc DEGREE EXAMINATION –I SEMESTER

MODEL QUESTION- NANOCHEMISTRY

Time:3 Hrs

Max Marks: 75

PART-A

Answer all the questions.

5x5=25

1. (a) Discuss the characterization of nano materials. (OR)
(b) Explain the types of nano materials.
2. (a) Explain the synthesis of metal nano materials by laser ablation method. (OR)
(b) Explain the synthesis of metal nano materials by sputtering method.
3. (a) Explain the synthesis of semi conductor nano materials by precipitation method. (OR)
(b) Explain the synthesis of ceramic nano materials by gas condensation method.
4. (a) Explain the characterization of nano materials by TEM. (OR)
(b) Explain the characterization of nano materials by XRD.
5. (a) Explain the poly peptide nano wire. (OR)

(b) Explain nano materials of protein synthesis.

PART-B

Answer all the questions.

10x5=50

6. (a) Explain the CNT. (OR)
(b) Explain the nano wires
- 7.(a) Explain the synthesis of metal nano materials by solvated metal dispersion method. (OR)
(b) Explain the synthesis of metal nano materials by bio synthesis method.
8. (a) Explain the synthesis of ceramic nano materials by sol gel method. (OR)
(b) Explain the optical & magnetic properties of nano materials.
9. (a) Explain the characterization of nano materials by SEM. (OR)
(b) Explain the characterization of nano materials by DSC.
10. (a) Explain the size of building blocks & nano structures of biological materials. (OR)
(b) Explain the genetic code & protein synthesis in biological materials.

14P2CH04

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF CHEMISTRY

**M. Sc DEGREE EXAMINATION –II SEMESTER
MODEL QUESTION- ORGANIC CHEMISTRY-II**

Time: 3 Hrs

Max Marks: 75

PART-A

Answer all the questions.

5x5=25

1. (a) Write a note on Aromatic electrophilic substitution. (OR)
(b) Explain the mechanism of Friedel – Crafts alkylation's and acylation reactions
2. (a) What is E1CB reaction? Give an example? (OR)
(b) Erythro-1-bromo-1,2 phenylpropane on HBr elimination gives cis olefins while its threo isomer gives trans olefins why?
3. (a) Write a notes on Michael addition reaction. (OR)
(b) Write a note on mannich reaction
4. (a) Explain the Conformational analysis of simple cyclic chair and boat cyclohexanes. (OR)
(b) Write a note on conformation and stereochemistry of cis and trans decalins
5. (a) Explain the synthetic application of LAH. (OR)

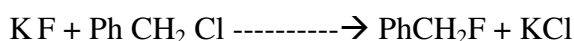
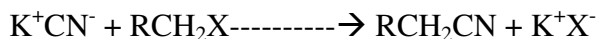
(b) Illustrate the application of Phase Transfer Catalyst by writing equation for the reaction between NaCN and n-C₈H₁₇Cl with the catalyst n-Bu₄N⁺Cl⁻.

PART-B

Answer all the questions

10x 5 =50

6. (a) Discuss the Aromatic nucleophilic substitution reactions. (OR)
(b) Write a note on Chichibabin reaction with mechanism
7. (a) (i) Discuss E₂ mechanism of Dehydrohalogenation of Alkyl halide? Give an evidence of this mechanism?
(ii) Prove any one evidence E₁ reaction followed carbocation mechanism? (OR)
(b) (i) Why Anti-elimination is highly favourable in six member cyclic compounds?
(ii) Neomenthyl Chloride Under E₁ Condition what?
8. (a) Write the notes on stobbe and Thorpe reaction mechanism. (OR)
(b) Write a note on Addition reactions to carbonyl compounds
9. (a) Write a note on reduction of cyclohexanones by conformational analysis. (OR)
(b) Explain in detail esterification and hydrolysis of cyclohexane carboxylic acid derivatives
10. (a) (i) Give in detail the role of OsO₄ as an oxidation hydroxylation reaction of Alkene? Give the mechanism of mechanism of reaction? (OR)
(b) (i) What is Phase transfer catalyst? Give example with role that such a catalyst plays?
(ii) Why the nucleophilic reactions of the following reactions?



14P2CH05

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF CHEMISTRY

M.Sc DEGREE EXAMINATION –II SEMESTER

MODEL QUESTION- INORGANIC CHEMISTRY-II

Time:3 Hrs

Max Marks: 75

PART-A

Answer all the questions.

5x5=25

1. (a) Discuss the Nitrosyl carbonyls, Metal Nitrosyl hydroxide, metal nitrosyl thio compound. (OR)
(b) Explain the MO theory and 18 electron rule.
2. (a) Discuss the equation of radio active decay and growth- half life and average life. (OR)
(b) Define the term nuclear reactions and explain Spontaneous and reduced fission.
3. (a) Illustrate the X-ray diffraction and neutron diffraction. (OR)
(b) Explain the Basic principles of flame emission spectroscopy its characteristics, atomizers and burners.
4. (a) Explain the molecular mechanism of ion transport across the membrane Na and K ions

- pumps. (OR)
- (b) Explain the hemoglobin and myoglobin-structures and work functions.
5. (a) Explain the reactions in non aqueous solvents. (OR)
- (b) Illustrate the reaction of liquid dinitrogen tetroxide.

PART-B

Answer all the questions.

10x5=50

6. (a) What is metal Carbonyls and explain the tri nuclear carbonyls of iron. (OR)
- (b) Discuss the nature of M - NO bonding -structure of $\text{Fe}(\text{NO})_4$, $\text{Fe}_2(\text{NO})_4$, $\text{Fe}(\text{NO})_3\text{Cl}$.
7. (a) Derive the equation of radio active decay and growth- half life and average life. (OR)
- (b) Explain the Principle and working of GM.
8. (a) Discuss the interference instrumentation and applications of AAS. (OR)
- (b) Illustrate the ESCA-Koop Mann's theorem, chemical shift-UPES
9. (a) Explain the structure and work functions in respiration of chlorophyll. (OR)
- (b) Illustrate the co-enzymes-in vivo and in vitro nitrogen fixation- essential and trace elements in biological systems .
10. (a) Explain the liquid liquid extraction process in detail. (OR)
- (b) Discuss the reactions in transition of a substance –aqueous phase.

14P2CHE02

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF CHEMISTRY

M.Sc DEGREE EXAMINATION –II SEMESTER

MODEL QUESTION- ELECTROCHEMISTRY AND PHOTOCHEMISTRY

Time:3 Hrs

Max Marks: 75

PART-A

Answer all the questions.

5x5=25

1. (a) Discuss the Chemical cells with and without transferences. (OR)
- (b) Explain the Streaming and Sedimentation potentials.
2. (a) What do you mean by Debye-Falkenhagen and Wein effects. (OR)
- (b) Explain the Quantitative and qualitative verification of Debye- Huckel limiting law.
3. (a) Illustrate the photochemistry reaction that takes place in the atmosphere. (OR)
- (b) Explain ultraviolet screening agents in detail.

4. (a) Explain the construction of Jablonski diagram. (OR)
(b) Write a note on Frank- Condon principle and its selection rules.
5. (a) How will you explain the photophysical pathways of excited molecular system. (OR)
(b) Illustrate the quenching by excimer and exciplex emission.

PART-B

Answer all the questions.

10x5=50

6. (a) What do you mean by salt bridge explain its construction and its purpose. (OR)
(b) Discuss the electro-capillary phenomena and electro-capillary curve in detail.
7. (a) Derive the Debye - Huckel theory of inter-ionic attraction and ionic atmosphere. (OR)
(b) Explain the forms of activity coefficients and their interrelationship.
8. (a) Discuss chlorofluoro carbons-organic compounds and nitrogen oxide. (OR)
(b) Define the term photosensitisers and explain photochromism and photo imaging
9. (a) What is mean by photochemical reactions and explain photo reduction and oxidation, Photodimerization. (OR)
(b) Illustrate the photochemistry of environment and give a detail study about green house effect.
10. (a) Explain the prompt fluorescence, delayed fluorescence, and phosphorescence. (OR)
(b) Discuss the bimolecular collisional quenching and Stern-Volmer equation

14P3CH06

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN

(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION - III SEMESTER

MODEL QUESTION – ORGANIC CHEMISTRY – III

Time: 3 hrs

Max Marks: 75

PART - A

Answer all the questions.

5 X 5=25

1. (a) Explain the structural elucidation and synthesis of alpha-pinene. (OR)
(b) Explain the synthesis of papaverine and its medicinal value.
2. (a) How will you synthesis progesterone. (OR)
(b) Write the structural elucidation of vitamin K.
3. (a) Explain selection rule and sigmatropic rearrangements with Examples. (OR)
(b) Explain Cope and Claisen rearrangement.

4. (a) Explain Norrish I and II reactions. (OR)
(b) Explain Photorearrangement of 2,5 cyclohexadienone.
5. (a) Write a note on Polymer supporting green reagents. (OR)
(b) Explain the microwave reaction vessel, Give its advantages.

PART - B
Answer all the questions.

10 X 5 = 50

6. (a) Illustrate the biosynthesis of Terpenoids. (OR)
(b) Explain the structural elucidation of Zingiberene and Cinchonine.
7. (a) Discuss the synthesis of Stigmasterol and Estrone. (OR)
(b) Explain the structural elucidation of Cholesterol.
8. (a) Explain the approach of Woodward Hoffmann rules. (OR)
(b) Explain concerted reaction in detail.
9. (a) Explain Jablonski diagram and energy transfer character in detail. (OR)
(b) Explain Photoreduction of ketones and enones in detail.
10. (a) Illustrate polymer supported green catalysts in detail. (OR)
(b) Mention the advantages and applications of microwave method induced reaction.

14P3CH07

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION - III SEMESTER

MODEL QUESTION – INORGANIC CHEMISTRY – III

Time: 3 hrs

Max Marks: 75

PART - A
Answer all the questions.

5 X 5=25

1. (a) Explain Symbiosis. (OR)
(b) Explain Lewis and Usanovich concept of acids and bases.
2. (a) Explain nuclear fission. (OR)
(b) Explain the uses of radioactive isotopes.
3. (a) Explain one dimensional conductors. (OR)
(b) Write a note on borazines.

4. (a) Explain any three methods of synthesis of metal alkyls. (OR)
(b) Explain double carbonylation.
5. (a) Explain olefin hydrogenation using Wilkinson's catalyst.. (OR)
(b) Explain hydrocarbonylation of olefins using oxo process.

PART - B
Answer all the questions.

10 X 5 = 50

6. (a) Explain HSAB principle and its applications. (OR)
(b) Explain the strength of hydracids and oxyacids.
7. (a) Explain isotopic analysis and neutron activation analysis. (OR)
(b) Explain the types of nuclear reactions.
8. (a) Explain the types of silicates. (OR)
(b) Write a note on isopoly acids.
9. (a) Explain the classification of organometallic compounds. (OR)
(b) Explain the reactivity of metal alkyls.
10. (a) Explain zeigler natta polymerization of olefins. (OR)
(b) Explain bonding of alkenes to transition metals.

14P3CH08

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY
M.Sc. DEGREE EXAMINATION - III SEMESTER
MODEL QUESTION – PHYSICAL CHEMISTRY – II

Time: 3 hrs

Max Marks: 75

PART - A
Answer all the questions.

5 X 5=25

1. (a) Write short note on energy levels. (OR)
(b) Write short account on the effect of isotopic substitution of CO molecule.
2. (a) Give a short account on Born-Oppenheimer approximation. (OR)
(b) Discuss the differences between Rayleigh and Raman scattering.
3. (a) Write about approximation method in the application of Helium atom. (OR)
(b) Write short note on Graphical Representation of Wave function of H-atom
4. (a) Explain the Arrhenius theory of gas. (OR)

- (b) Write note on Kassel – Marcus theory.
5. (a) Determine the vibrational modes of H_2O . (OR)
- (b) Evaluate the symmetry of Hybrid orbitals in BF_3 .

PART - B
Answer all the questions. **10 X 5 = 50**

6. (a) Explain rotational spectra of diatomic molecules as rigid rotors. (OR)
- (b) Discuss the rotational spectra of polyatomic molecules
7. (a) Explain rotational Raman spectra of symmetric top and spherical top molecules. (OR)
- (b) Explain the following i) vibration-rotational spectra ii) selection rules
iii) P, Q, R branches.
8. (a) Explain Hartree and Hartree-Fock's SCF. (OR)
- (b) Write detailed account on MO theory of hydrogen molecule.
9. (a) Give relation between activated complex theory & hard sphere collision theory. (OR)
- (b) Discuss in detail about kinetic of isotopic effect.
10. (a) Explain the vibrational modes of XeF_4 and NH_3 . (OR)
- (b) Discuss about the symmetry of Hybrid orbital in SF_6 .

14P3CHE03

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
M.Sc. DEGREE EXAMINATION - III SEMESTER
MODEL QUESTION –SPECTRAL AND ANALYTICAL TECHNIQUES – III

Time: Three hours

Maximum: 75 Marks

PART - A
Answer all the questions. **5 X 5=25**

1. (a) What is Blue shift in UV and Visible spectra? Give examples. (OR)
- (b) Discuss the Octant rule with example.
2. (a) Give a short account on Fermi Resonance in Infra red Spectroscopy. (OR)
- (b) How do you differentiate Raman and IR Spectra.
3. (a) Write note on Shielding and deshielding effects. (OR)
- (b) Give short account on "g" value.
4. (a) Give some important features of Mass spectra 1° , 2° and 3° alcohols. (OR)
- (b) Explain the quadruple Splitting.

5. (a) Discuss the applications (any two) of Fluorimetry as an analytical tool. (OR)
(b) Explain the atomic fluorescence

PART - B
Answer all the questions.

10 X 5 = 50

6. (a)i) What is B-band of Absorption? Give examples
ii) Explain about Cotton effect. (OR)
(b) i) How do the solvents bring their effect on UV and Visible spectra
ii) State and explain Axial Halo ketone rule.
7. (a) Explain the importance of i) Electronic effect ii) Hydrogen bonding in IR spectra. (OR)
(b) Discuss the characteristics functional frequencies in IR spectra.
8. (a) Write a brief note on i) Nuclear Overhauser effect ii) spin-spin coupling (OR)
(b) Discuss Hyperfine splitting of methyl radical and deuterium.
9. (a) Write in detail the general fragmentation modes in mass spectroscopy. (OR)
(b) i) What do you understand by chemical isomer shift?
ii) Explain Nuclear Zeeman Splitting.
10. (a) (i) Explain the theory of flame photometry
(ii) Discuss the theory and applications of Nephelometry (OR)
(b) Briefly explain the XRF and CV

14P3CHED01

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION - III SEMESTER

MODEL QUESTION – EDC – APPLIED POLYMER CHEMISTRY

Time: 3 hrs

Max Marks: 75

PART - A
Answer all the questions.

5 X 5 = 25

1. (a) Explain the mechanism of free radical chain polymerisation. (OR)
(b) Explain briefly about ring opening polymerisation.
2. (a) Write a note on optical isomerism in polymers. (OR)
(b) Explain the methods of fabrication of polymers.
3. (a) How do you measure number average molecular weight by end group analysis? (OR)
(b) Write the importance of glass transition temperature.
4. (a) Explain the synthesis & uses of polyurethanes. (OR)
(b) Explain the synthesis & uses of Polyacrylonitrile.

5. (a) Explain the synthesis & uses of Melamine – Formaldehyde resins (OR)
(b) Write a note on structure of cellulose.

PART - B

Answer all the questions.

10 X 5 = 50

6. (a) Explain Zeigler – Natta Polymerisation in detail. (OR)
(b) Explain the classification of polymers.
7. (a) Explain in detail about Isotactic, Syndiotactic & Atactic polymers. (OR)
(b) Explain the mechanical properties & thermal stability of polymers.
8. (a) How do you measure weight average molecular weight by Viscometry? (OR)
(b) What are the factors that affect the glass transition temperature?
9. (a) Explain the synthesis & uses of polyamides (OR)
(b) Explain the synthesis & uses of polyesters.
10. (a) Explain the synthesis & uses of Phenol – Formaldehyde resins. (OR)
(b) Discuss the structure of proteins.

14P4CH09

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)**

**DEPARTMENT OF CHEMISTRY
M.Sc. DEGREE EXAMINATION - IV SEMESTER
MODEL QUESTION – PHYSICAL CHEMISTRY – III**

Time: 3 hrs

Max Marks: 75

PART - A

Answer all the questions.

5 X 5=25

1. (a) Give notes on LS and JJ Coupling (OR)
(b) Calculate the last electron of Nitrogen atom by using Screening Effect
2. (a) Outline the Postulates of Local Equilibrium (OR)
(b) Write about Non-Equilibrium Stationary states
3. (a) Explain selection rules in ESR Spectroscopy (OR)
(b) Write notes on Isomer Shift.
4. (a) Outline about distinguishable and non distinguishable particles (OR)

- (b) Explain any 2 Calculation of equilibrium constant from Partition Function
5. (a) Write about the Mechanism of Acid-Base Catalysis. (OR)
- (b) Give notes on Hammett and Taft Equations

PART - B
Answer all the questions. 5 X10=50

6. (a) How to apply HMO theory of conjugated π -system in Benzene (OR)
- (b) Derive the schrodinger equation for SP^3 Hybridisation.
7. (a) Discuss about the Entropy production in Heat Flow and Matter Flow (OR)
- (b) Derive Onsager reciprocal Relation.
8. (a) Briefly explain FT-NMR (OR)
- (b) How to calculate g-value and Coupling constant
9. (a) Derive Bose – Einstein Distribution Law (OR)
- (b) Explain the Evaluation of Translational Partition function
10. (a) Explain the Followings (i) Bronsted Catalysis Law (ii) LFER (OR)
- (b) Derive and explain Michaelis – Menton equation

14P4CHE04

VIVEKANANDHA COLLEGE OF ARTS & SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF CHEMISTRY
M.Sc. DEGREE EXAMINATION - IV SEMESTER
MODEL QUESTION – ENVIRONMENTAL CHEMISTRY

Time: 3 hrs

Max Marks: 75

PART - A
Answer all the questions. 5 X 5=25

1. (a) Write short notes on Fundamentals of Environmental Chemistry (OR)
- (b) Explain the terms of Chemical potential and chemical equilibria in environmental concept.
2. (a) Explain redox potential in water chemistry (OR)
- (b) Explain eutrophication concept of DO.
3. (a) Write the notes on Environmental Implications of polymers and plastics (OR)
- (b) Write a note on sources of asbestos in the environment.
4. (a) Explain the Environmental implications of fertilizers (OR)

(b) Write the short notes on Environmental Implications of Fungicides and Herbicides.

5. (a) Write notes on Disposal of medicinal waste. (OR)
(b) Explain the Waste water and its treatment.

PART - B

Answer all the questions.

10 X 5 = 50

6. (a) Write notes on sampling techniques for air, water and soil in Environmental chemistry (OR)
(b) Explain the acid base reactions and carbonate in environmental chemistry.
- 7.(a) What is BOD and COD ? Explain with suitable method to calculate. (OR)
b) Write notes on water pollution and its effects.
8. (a) Explain the analysis of asbestos and effects of asbestos pollution (OR)
(b) Write a note on abatement procedures for poly chlorinated Biphenyls pollution.
9. (a) Explain the abatement procedures for insecticides pollution. (OR)
(b) Explain the Abatement procedures for fungicides and Herbicides pollution.
10. (a) Write the notes on the followings (i) Wealth from waste (ii) Utilizing agricultural waste (OR)
(b) Write the notes on Removal of hazardous wastes from contaminated metals.