VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN [AUTONOMOUS]

An ISO 9001:2008 Certified Institution, Affiliated to Periyar University, Salem,
(Approved by AICTE and Re-Accredited with 'A' Grade by NAAC,
Recognized Under 2(f) and 12(b) of UGC Act, 1956).
Elayampalayam, Tiruchengode - 637 205, Namakkal Dt., Tamilnadu, INDIA.

DEPARTMENT OF CHEMISTRY

MASTER OF SCIENCE (M.Sc.)

CHEMISTRY

M.Sc., CHEMISTRY
REGULATIONS AND SYLLABUS

**[FOR CANDIDATES ADMITTED FROM 2017-18 ONWARDS
UNDER AUTONOMOUS & CBCS PATTERN]**

SPONSORED BY
ANGAMMAL EDUCATIONAL TRUST
Elayampalayam – 637 205, Tiruchengode Tk., Namakkal Dt., Tamil Nadu.
Veerachipalayam - 637 303, Sankari Tk., Salem Dt., Tamil Nadu.
Tel. : 04288 234670 (4 lines), Mobile : 64437 34670, Fax : 04288 234894
Website : www.vivekanandha.ac.in email : vivekaadmission@gmail.com

S. No.	TOPICS	P. No.

About the College

Vivekanandha College of Arts and Sciences for Women (Autonomous) was established and hailed into Women's Educational Service in the Year 1995. Angammal Educational Trust Chaired by the great Educationalist 'Vidhya Rathna' Prof. Dr. M. KARUNANITHI, B.Pharm., M.S., Ph.D., D.Litt., sponsors this college and other institutions under the name of the great Saint Vivekanandha. Our institutions are situated on either side of Tiruchengode-Namakkal Main Road at Elayampalayam, 6 kms away from Tiruchengode. This is biggest women's college in India with more than 7500 girl students and more than 18 departments. The strength of the college was just 65 at the time of its establishment. With the dedication, work, sacrifice and long vision of the chairman, this institution has grown into a Himalaya stage. As a result of which UGC, New Delhi, awarded 2f and 12b, extended Autonomous status for second cycle. The National Assessment and Accreditation Council reaccredited with grade 'A' for its successful performance.

As an Autonomous Institution, academic professionals of the college framed Curriculum and Syllabi in consultation with all its stakeholders to cater the needs of the young women to fulfill the women empowerment and present Industrial needs to the local benefits. The students are empowering with confidence and required skills to face the society.

Quality Policy

To provide professional training by establishing a high level center of learning that provides quality education at par with the international standards and Provide excellence education with well equipped infrastructure to all the rural women.

Our Vision

To be an academic institution exclusively for women, in dynamic equilibrium with the social and economic environment, strive continuously for excellence in education, research and technological service to the nation.

Our Mission

The mission of our institution is to discover, teach and apply knowledge for the intellectual, cultural, ethical, social and economic growth of women students.

REGULATIONS

I. SCOPE OF THE COURSE

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

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

III. OBJECTIVES

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

1. Enable the students to understand chemistry and make them more relevant to the society.
2. Develop the analytical ability in students so that they prepared themselves in solving problems.
3. Help the students to learn practical skills in a better way.
4. Inculcate research aptitude in students.
5. Enable the students to go to higher levels of learning chemistry.
6. Improve the employability of the students.
7. 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 COURSE

1. 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 April.
2. 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.

3. Each subject will have 5 and/or 4 hours of lecture per week apart from practical training at the end of academic year.

VI ASSESSMENT

Assessment of the students would be made through Continuous Internal Assessment (CIA) and External Assessment (EA) for passing each subject both theory and practical papers.

A candidate would be permitted to appear for the External 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.

A. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

1. Average of two CIA test and Model exam - 10 Marks
2. Seminar - 05 Marks
3. Assignment - 05 Marks
3. Attendance - 05 Marks

Total =25 Marks

Distribution of attendance mark

S. No.	Percentage	Marks	
		Theory	Practical
1	76-80	1	2
2	81-85	2	4
3	86-90	3	6
4	91-95	4	8
5	96-100	5	10

1. EXTERNAL ASSESSMENT (EA)

The performance of the students would be assessed by examination at the end of each semester with a written test for theory for three hours and practical examination at the end of even semesters for six hours. Question papers would be set by the selected external examiners in the prescribed format and valuated by the external examiners with the help of the teacher concern.

The pattern of assessment is as follows:

Distribution Of Final Assesment Marks (Theory-75, Practicals-60)

Section	Activity (Theory)	Marks (75)	Activity (Practicals)	Marks (60)
A	Five marks- (Either/or)	25	Record work	5
B	Ten marks- (Either/or)	50	Viva Voce	10
-	-	-	Experimental Performance	45
Total		75	Total	60

VII. PASSING MINIMUM

INTERNAL

There is no passing minimum for CIA

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).

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 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) 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 fulfiled 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 2017-18 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2017-18 and thereafter.

XII. COURSE PATTERN (OBE)

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS)

SYLLABUS FRAME WORK

Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks	Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks
YEAR I													
Semester I							**Semester II**						
Organic Chemistry-I	4	5	3	25	75	100	Organic Chemistry-II	5	5	3	25	75	100
Inorganic Chemistry-I	4	5	3	25	75	100	Inorganic Chemistry-II	5	5	3	25	75	100
Physical Chemistry-I	4	5	3	25	75	100	Electrochemistry and Photochemistry	5	4	3	25	75	100
Nano chemistry	4	4	3	25	75	100	Organic Chemistry Practical-I	5	4	6	40	60	100
Organic Chemistry Practical-I	4	-	6	-	-	-	Inorganic Chemistry-Practical-I	5	4	6	40	60	100
Inorganic Chemistry-Practical-I	5	-	6	-	-	-	Physical Chemistry-Practical-I	4	4	6	40	60	100
Physical Chemistry-Practical-I	4	-	6	-	-	-	Library	1	-	-	-	-	-
Library	1	-	-	-	-	-		-	-	-	-	-	-
Total	**30**	**19**	**12**	**100**	**300**	**400**	**Total**	**30**	**26**	**21**	**195**	**405**	**600**
							I YEAR TOTAL	**45**	**33**		**295**	**705**	**1000**
YEAR II													
Semester III							**Semester IV**						
Organic Chemistry-III	5	5	3	25	75	100	Physical Chemistry-III	5	5	3	25	75	100
Inorganic Chemistry-III	5	5	3	25	75	100	Environmental chemistry	5	4	3	25	75	100
Physical Chemistry-II	5	5	3	25	75	100	Organic Chemistry Practical-II	5	4	6	40	60	100
Solar Energy	4	4	3	25	75	100	Inorganic Chemistry-Practical-II	5	4	6	40	60	100
Organic Chemistry Practical-II	5	-	-	-	-	-	Library	1	-	-	-	-	-
Inorganic Chemistry-Practical-II	5	-	-	-	-	-	Project Work	8	9	3	60	140	200
Human Rights	1	1	3	25	75	100							
Total	**30**	**20**	**15**	**125**	**375**	**500**	**Total**	**30**	**26**	**21**	**190**	**410**	**600**
							II YEAR TOTAL	**46**	**36**		**315**	**785**	**1100**
TOTAL CREDIT FOR THE COURSE								**91**	**69**		**610**	**1490**	**2100**

Distribution Of Duration And Credit Under Different Papers

Part	Paper	Hours/Week	Weeks/Semester	Hour/Paper	No. of Papers	Credit/Paper	Total Hours	Total credit
I	**Core paper**	5	15	75	9	5	675	45
I	**Core practical**	5	15	150	5	4	750	20
II	**Elective**	4	15	60	3	4	180	12
II	**EDC**	4	15	60	1	4	60	4
-	**Human Rights**	1	15	15	1	1	15	1
-	**Project Work**	1	15	15	1	9	15	9
TOTAL CREDIT								**91**

ORGANIC CHEMISTRY – I

SUBJECT CODE: 17P1CH01		
SEMESTER – I	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

To enable the students to learn about the chemistry of organic compounds and to enrich the knowledge in various organic reactions.

Learning Outcome

Students will be known to name the organic compounds systematically and they will be able to asses the physical and chemical properties of organic compounds.

Students can able to understand the formation of intermediates in organic reactions and the students can able to determine the mechanism of new organic reactions.

Students can able to predict the aromaticity of any organic compounds.

Knoweldge of studens will be enriched with steriochemistry and various types of substitution reactions which wil help the students to carry out the research in future.

Unit–I: Basics of organic chemistry (15 Hours)

Nomenclature of aromatic heterocyclic compounds (containing one or two hetero atoms) – Nomenclature of alicyclic, bicyclic and tricyclic compounds.

Electron displacement effect – Inductive and field effect – Delocalised bonds – Rules of resonance – steric inhibition and steric enhancement of resonance, Hyperconjucation – hydrogen bonding – intra and inter molecular hydrogen bonding – effect of hydrogen bonding and hyperconjucation on physical and chemical properties.

Unit–II: Reactive intermediates and methods of determining reaction mechanism (15 Hours)

Structure, Stability, Generation and Reactions of Carbocation (Classical and Nonclassical), carbanions, carbenes, nitrenes and free radicals. Ylides – Generation, types and reactions. Enamines - Generation and reactions.

Thermodynamic and kinetic control – methods of determination of reaction mechanisms – product analysis – determination of the presence of intermediate, isolation, detection, trapping – cross of experiments – isotopic labeling - isotopic effect – stereo chemical evidence – kinetic evidence. Microscopic reversibility – Hammond Postulate - Linear free energy relationship – Hammette equation – Taft equation - Limitations, application and deviations.

Unit–III: Aromaticity (15 Hours)

Concept of Aromaticity – aromatic character of benzene and heterocyclic compounds – benzene, pyrole 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, ferrocence, diazocyclopentadiene, sydnones, azoulene, tropolone ion, tropylium ion and annulenes – their structures and aromaticity.

Unit–IV: Substitution reactions (15 Hours)

Aliphatic Nucleophilic substitution reactions: S_N1, S_N2, S_Ni mechanism – factors affecting nucleophiclic substitution - Neighbouring group participation, Ambident nucleophilies and ambient substrates. Substitution at vinyl carbon, allylic carbon and bridge head carbon. Von Braun reaction, Claisen condensation and Hydrolysis of ester. Aliphatic Electrophilic substitution reactions: S_E1 and S_E2 reactions – Mechanism and reactivity. Reaction involving the migration of double bond – Halogenation of carbonyl compounds – Stork Enamine reactions – decarboxylation of aliphatic acids. Friedel craft acylation of olifinic carbon.

Aromatic Electrophilic substitution reactions: Introduction – Mechanism of Electrophilic substitutions with examples. Orientatin and reactivity – Electrophilic substitution on monosubstituted and disubstituted benzenes. Aromatic Nucleophilic substitution reactions: S_N1, S_N2 and S_N^{AR} mechanism. Typhical reactions such as Gattermann reaction, Gattermann Koch reaction, Reimer – Tiemann reaction, Koble reaction. Ziegler alkylation – Chichibabin reaction – Cine substitutions.

Unit–V: Stereochemistry (15 Hours)

Principles of symmetry- concept of chirality, Molecualr symmetry and chirality, Newmann, Sawhorse, Fischer and Wedge representations and interconversions. Types of molecules exhibiting optical activity. Configurational nomenclature of acyclic and cyclic molecules: *cis-trans*, *E* & *Z*, *D* & *L*, (+ or –), *d* & *l*, *R* & *S*, erythro and threo; *syn* & *anti*. Stereospecific, Chemo, Regio, Enantio and stereo - selective organic tranformations, asymmetric synthesis – Crams rule.

Conformational analysis – 1,2-disubstitutd ethane derivatives – disubstituted cyclohexanes and their stereochemical features. Conformation and reactivity of substituted cyclohexanols (oxidation and acylation) cyclohexanones (reduction) and cyclohexane carboxylic acid derivatives (esterification and hydrolysis).

CONTENT BEYOND THE SYLLABUS

1. Name a tetracyclic compound with appropriate IUPAC regulations.
2. Select any one name reactions and identify the nature of intermediate involves in that reaction.
3. Design a molecule in your own and mention its aromatic nature.
4. What is the influence on SN1 mechanism when a substituent present on the β-carbon atom.
5. Write about conformation and reactivity on oxidation of substituted cyclohexanones.

TEXT BOOKS

1. Mukargee S.H., and Singh S.P., Reaction mechanisms in organic chemistry, McMillan (1976).
2. Raj K. Bansal, Organic Chemistry Reaction mechanisms, Hill Publishing Company Ltd (2006).

3. Ernest L. Eliel, Stereochemistry of Carbon Compounds, T.M.H Edition, Tata Mc Graw-Hill Publication Companies (1975).
4. Kalsi P.S., Stereochemistry- Conformation And Mechanism, 6th Edn., 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. Finar I.L., Organic chemistry, Vol. I and Vol. II. Pearson Education (P) Ltd (2011).

ONLINE SOURCES

1. https://www.masterorganicchemistry.com/2017/02/23/rules-for-aromaticity/
2. https://chem.libretexts.org/Textbook_Maps/Organic_Chemistry_Textbook_Maps/Map%3A_Organic_Chemistry_(McMurry)/Chapter_15%3A_Benzene_and_Aromaticity/15.03_Aromaticity_and_the_Huckel_4n___2_Rule
3. www.introorganicchemistry.com
4. http://www.chem.ucalgary.ca/courses/351/Carey5th/Ch08/ch8-0.html

INORGANIC CHEMISTRY - I

SUBJECT CODE: 17P1CH02		
SEMESTER – I	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

1. To gain knowledge on physical and chemical properties of transition and inner transition elements.
2. To give elaborate insight into the field of nuclear chemistry.

Learning Outcome

Students will learn the metallurgy and general properties of transition, and inner transition elements.

Students will be introduced to the basic principles of nuclear chemistry. In future, it will help the students to explore constructive application of nuclear chemistry.

Students will know the present national and international status in nuclear mission.

Unit–I: Transition Elements (15 Hours)

Position in the periodic table - Electronic configuration - General characteristics - Atomic radii - Ionic radii - Variation along the period and group - Variable valency - Colour - Magnetic properties - Catalytic property - Non-stoichiometry - Stabilization of unusual oxidation states - Structure (only) of d-block elements - $[Nb_6Cl_{12}]^{2+}$ - $[Re_2Cl_8]^{2-}$ - $[Mo_6Br_8]^{4+}$ - $[Ni_2(dmg)_2]$.

Unit–II: Inner Transition Elements (15 Hours)

Position in the periodic table - Electronic configuration - Oxidation state - Solubility - Magnetic properties - Colour and Spectra - Separation of lanthanides - Lanthanide contraction - Cause and consequences - Gadalonium break - Shift reagents - Extraction of Thorium and Uranium - Comparison of lanthanides and actinides.

Unit–III: Fundamentals of Nuclear Chemistry (15 Hours)

Nuclear structure-mass and charge - Nuclear moments - Binding energy - Semi empirical mass equation - Stability rules - Magic numbers - - *n/p* ratio - Nuclear forces - Modes of radioactive decay - Alpha decay - range - Ionizing power - Energy spectrum - Geiger-Nutta's rule, Theories of alpha decay - Tunnel effect - Beta decay - β^+ and β^- decay - Electron capture - Absorption - Range and Energy - Gamma ray - radioactive de-excitation - decay constant - Nuclear isomerism - Internal conversion - Auger effect.

Unit–IV: Nuclear Reactions and Instrumental Techniques (15 Hours)

Bethe's notation - Q value - Reaction cross section - Threshold energy - Columbic barrier - Excitation function - Various types of nuclear reactions - Scattering - evaporation - photonuclear - Spallation - Fragmentation - Fission - Fusion - Stripping - Pick-up reactions - Detection and measurement of radioactivity - Proportional counter - Geiger-Muller counter - Scintillation counter - Semiconductor detector - Cloud chamber - Charged particle accelerator - Linear accelerator - Cyclotron - Beatron - Synchroton.

Unit–V: Nuclear Energy and Trace Elements (15 Hours)

Nuclear fission and Nuclear reactors - Four factor formula - Characteristics of fission reactions - Product distribution of fission, Theories of fission - Fissile and fertile isotopes - Nuclear fusion and stellar energy - Fusion bomb - synthetic elements - Nuclear wastes - nuclear reprocessing - radiation hazards and prevention. Applications of isotopes - neutron activation analysis - isotopic dilution analysis - Uses of tracers in structural and mechanistic

studies, agriculture, medicine and industry - Radio carbon dating - hot atom chemistry - Atomic Power Projects in India.

CONTENT BEYOND THE SYLLABUS

1. Identify the complex used in the field of medicine.
2. List out the application of inner transition elements and their complexes in the field of medicine.
3. How to measure the radiation level in the atmosphere.
4. Mention the sub-atomic particles and their applications.
5. Write a note on Boson's particle.

TEXT BOOKS

1. 1. H.J. Arnikar, Essentials of Nuclear Chemistry, 4th Edn., New Age International (2005).
2. U.N. Dash, Nuclear Chemistry, (1971).
3. J.E.Huheey, E.A. Keiter, and R.L. Keiter, Inorganic Chemistry Principles of Structure and Reactivity, 4th Edn., Harper Collins College Publishers, New York (1993).
4. J.D. Lee, Concise Inorganic Chemistry, 6th Edn., ELBS, London (1998).
5. Samuel Glasstone, Source book of Atomic Energy, 3rd Edn., East west Press (Reprint 2000).
6. G. Choppin, J. Liljenzin, J. Rydberg, and Ekberg C., Radiochemistry and Nuclear Chemistry, 4th Edn., Elsevier, Amsterdam (2013).

REFERENCE BOOKS

1. D. Shriver, M. Weller, T. Overton, J. Rourke, and F. Armstrong, Inorganic Chemistry, 6th Edn., WH Freeman and Company, New York (2014).
2. G.L. Miessler, P.J. Fischer, and D.A. Tarr, Inorganic Chemistry, 5th Edn., Pearson Education, Inc., New York (2014).
3. C.E. Housecroft, and A.G. Sharpe, Inorganic Chemistry, 4th Edn., Pearson Education Limited, Essex (2012).

ONLINE SOURCES

1. https://chem.libretexts.org/Textbook_Maps/General_Chemistry_Textbook_Maps/Map%3A_General_Chemistry_(Petrucci_et_al.)/23%3A_The_Transition_Elements/23.1%3A_General_Properties_of_Transition_Metals
2. http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch23/history.php

PHYSICAL CHEMISTRY - I

SUBJECT CODE: 17P1CH03		
SEMESTER – I	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

1. To impart knowledge of classifying the molecules based on symmetry and acquire knowledge in identifying the point group of the given compounds.
2. Understand the concept of kinetics and catalysis.

Learning Outcome

Students will be able to identify point groups using symmetry elements and recognise symmetry operations.

Students will learn to integrate knowledge to make rational answers in solving chemical problems.

Students can measure the rate of a chemical reaction.

Students will learn to evaluate the effect of catalyst, temperature on the rate of a chemical reaction and determine the activation energy.

Students will learn and understand the importance, applications and basic aspects of surface chemistry.

Unit–I: Group Theory-I **(15Hours)**

Principles of group theory - Symmetry elements - Symmetry operations - Properties of group - abelian, non abelian and cyclic groups - Group multiplication tables - Classes – Subgroups - Molecular point groups - Introduction of matrices - Matrix representation of symmetry elements - Reducible and irreducible representations - Properties of irreducible representation - Great orthogonality theorem and its consequences - Construction of character table for point groups (C_{2v}, C_{3V} and C_2h).

Unit–II: Group Theory-II (15 Hours)

Applications of Group theory - Standard reduction formula relating reducible and irreducible representations - Hybridization schemes for atoms in molecules of different geometry - AB_4 tetrahedral, AB_3 triangular planar. Symmetries of vibrational modes in non-linear molecules (H_2O, NH_3 and BF_3) - Integration method - Selection rules in spectroscopy – IR & Raman active – Vibrational modes -Mutual exclusion rule - Symmetry in crystals - Hermann - Mauguin symbols- . Space groups of crystals -Translational elements of symmetry – Comparision of crystal symmetry with molecular symmetry

Unit–III: Chemical Kinetics (15 Hours)

Reactions in solution: Comparison between gas phase and liquid phase reactions - Effect of dielectric constant and ionic strength on reactions in solutions - 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 reactions - Stationary and non stationary chain - explosion and explosion limits - Explosive reaction of H_2O_2. Linear free energy relation - Hammett and Taft equation.

Unit–IV: Kinetics and Catalysis (15 Hours)

Acid-base catalysis – Definitions - vant Hoff and Arrhenius intermediates - Mechanism - protolytic and prototropic catalysis laws - Bronsted catalysis law – Enzyme catalysis - Michaelis-Menten equation - Rate of enzyme catalysed reaction - Factors affecting substrate, concentration, pH and temperature on enzyme catalysed reaction - Inhibition of enzyme catalyzed reaction.

Unit–V: Surface Chemistry (15 Hours)

Adsorption - Types of adsorption - Difference between physical and chemical adsorptions - Adsorption isotherm: Freundlich's adsorption isotherm - Langmuir's adsorption isotherm and its limitations - Brunauer-Emmett-Teller (BET) adsorption isotherm and its applications - Heat of adsorption - Estimation of surface areas – B.E.T method, Titration

method – Acetic acid, Nitrophenol method - Solids from solution adsorption studies - Chemisorptions: kinetics and thermodynamics - surface reactions and their mechanisms.

CONTENT BEYOND THE SYLLABUS

1. Hybridization of aromatic organic molecules using group theory.
2. Role of Slater determinants in arriving hybridization of molecules.
3. Role of bio-organic catalyst in organic synthesis.
4. Different types of organic reactions and their kinetic studies.
5. Show the predominance of nanoparticles in the field of catalysis.

TEXT BOOKS

1. K.V. Raman., Group Theory, Tata McGraw - Hill Education (2004).
2. V.Ramakrishnan and M.S.Gopinathan, Group theory in chemistry, Vishal Publications, 1988.
3. A.S. Kunju, G. Krishnan., Group Theory and Its Applications in Chemistry, 2nd Edn, PHI learning private Ltd (2015).
4. B.R. Puri, L. R. Sharma, M. S. Pathania., Principles of Physical Chemistry, Vishal Publishing Co. (2016).
5. J. Rajaram and J.C.K. Kuriakose., Kinetics and mechanism of chemical transformations, Macmillan India Ltd (1993).
6. K.J. Laidler., Chemical Kinetics, Pearson (2009).
7. M.S. Gopinathan and V. Ramakrishnan., Group Theory in Chemistry, Vishal Publishers, (1988).
8. K.Veera Reddy., Symmetry and Spectroscopy of Molecules, New age international (2009).
9. Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).

REFERENCE BOOKS

1. F.A. Cotton., Chemical Applications of Group Theory 2nd Edn, Wiley Eastern Ltd (1989).
2. Capellos and B.H.J. Bielski, Kinetic systems, Willey interscience, Newyork, 1968.
3. P.W. Atkins., Physical Chemistry, 6th Edn, Oxford University Press, (1998).

4. Alan Vincent, Molecular Symmetry and Group theory – Programmed Introduction to chemical applications, Wiley, Newyork, 1977.

ONLINE SOURCES

1. http://vlab.amrita.edu/?sub=2&brch=193&sim=1013&cnt=1

2. http://unicorn.mcmaster.ca/teaching/4PB3/SymmetryLectureNotes2009-Vallance-Oxford-level2.pdf

3. http://cbc.arizona.edu/~salzmanr/480a/480ants/kinintro/kinintro.html

4. http://nptel.ac.in/courses/122101001

ELECTIVE PAPER– I

NANOCHEMISTRY

SUBJECT CODE: 17P1CHE01		
SEMESTER – I	**CREDIT : 4**	**HOURS : 60**

OBJECTIVES

1. To introduce the students to the world of nanotechnology.
2. To enrich the knowledge of students in novel synthetic methods to prepare nanoparticles.
3. To acquire knowledge about advanced experimental methods, to predict the chemical structure, properties, and reactivities of unique nanostructures.
4. To understand the applications of nanotechnology in diverse field.

Learning Outcome

Students will acquire knowledge on various synthetic methods of nanoparticles and techniques to characterize them.

Students will be able to understand various types of nanoparticles and their properties.

Students learn about the promising applications of nanotechnology.

Unit–I: Introduction to Nanoscience (12 Hours)

Definition, classification, a historical perspective, nanoparticles, nanocrystal, quantum dot, nanometer, new properties of nanomaterials, nanomaterials in medicine, information storage, sensors, new electronic devices, environmental remediation, clean

catalyst. Metal nanoparticles, chemical bonding and properties of bulk metals as well as metal nano particles. Gas phase and chemical synthetic methods to metal nanoparticles, nanoelectrons, conductivity of nanoelectrons.

Unit–II: Synthesis of Nanomaterials (12 Hours)

Physical methods –Laser Ablation, Physical Vapour Deposition (PVD) – Evaporation, sputerring 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. Precipitation methods -Thermal decomposition of complex precursors - synthesis of ceramic nanoparticles - Physical methods - Gas Condensation Method, sand, Laser Methods –Chemical method - Sol-gel synthesis

Unit–III: Characterizations of nanomaterials (12 Hours)

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–IV: Properties and Applications of Nanaoparticles (12 Hours)

Nanotubes(CNT), nanocrystal shape, sequestration of gases, destructive adsorption of environmental toxins, optical properties and magnetic properties of nanoscale materials. Size dependent properties such as coercivity (magnetic memory) and saturation magnetization, nanoparticles in polymers, ink, fluids, dyes and catalysis. Nanoparticles as colorants, ultraviolet absorbers, electronics and in biomedical applications.

Unit–V: Nanosciences of biological materials (12 Hours)

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.

CONTENT BEYOND THE SYLLABUS

1. Discuss the green synthesis of nanoparticles and its advantages.
2. Application of microwave in the synthesis of nanomaterials.
3. Application of BET in characterization of nanomaterial.
4. Application of nanoparticles in renewable energy generation.
5. Nanomaterials as superconductors.

TEXT BOOKS

1. Kenneth.klabunde, Nanoscale Materials in Chemistry, John Wiley & Sons, Inc.2002
2. Mark Ratner,Daniel Ratner, Nanotechnolgy, Pearson Education,Inc.2007
3. Nishit Mathur, Nanochemistry RBSA publishers 340, Chaura rasta ,Jaipur (2010).
4. G.Schmid (Eds),Nanoparticles, Wiley-VCH, (2004).
5. G.Hodes(Eds.), Electrochemistry of Nanomaterials , Wiley-VCH, (2001).
6. M.Kohler, W.Fritzsche, Nanotechnology, Wiley-VCH, (2004).
7. P.Ajayan, L.S.Schadler, P.V.Brawn, Nanocomposite Science and Technology, Wiley-VCH, (2003).

REFERENCE BOOKS

1. K.L.Choy, Process principles and applications of novel and cost- effective ESAVD based methods, World Scientific Publishing, Singapore, (2002).
2. A.Jones and M.Mitchell, Nanotechnology-Commercial Opportunity, Evolution Capital Ltd. London, (2001).
3. Mick Wilson, Kannangara,Geoff Smith,Michelle simmons and Burkhard Raguse, Nanotechnology basic science and emerging technologies, overseas press.
4. Charles P.Poole, Jr., Frank J.Owens, Introduction to Nanotechnology, Wiley (reprint 2012)

ONLINE SOURCES

1. nptel.ac.in/courses/103103033/module9/lecture1.pdf
2. http://folk.ntnu.no/fredrol/Nanomaterials%20and%20Nanochemistry.pdf
3. https://www.ceitec.eu/nanoparticles-for-biomedical-applications/f33079
4. https://chem.libretexts.org/

CORE PAPER - IV

ORGANIC CHEMISTRY –II

SUBJECT CODE: 17P2CH04		
SEMESTER – II	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

1. To enrich the students knowledge in the field of reactions and reagents involved organic chemistry.
2. To impart knowledge in understanding the reaction conditions to arrive required product.
3. To understand the mechanism with which a reaction takes place.
4. To understand the various factors influencing a reaction.

Learning Outcome

Students will learn the addition and elimination reactions taking place in the organic molecules.

Students acquire deep understanding on diverse molecular rearrangements.

Students will learn about the reagents used in organic synthesis

Unit I: Addition reactions (15 Hours)

Addition across C-C multiple bonds – Electrophillic, Nucleophillic, Free radicals, orientation and reactivity – Addition of halogen and nitrosyl chloride to olefin. Hydration of olefins and acetylenes. Epoxidation, Hydroboroation, Hydroxylation, Michael addition and Brich reduction. Diels Alder reaction, 1,3-dipolar additions. Carbenes, Nitrenes and their addition to double bond. Simmon-Smith reaction, Mannich, Stobbe, Darzen, Wittig, Wittig-Horner, Grignard, Thope and Benzoin condensation.

Unit II: Elimination reactions (15 Hours)

Elimination reactions – Mechanism of E_1, E_2 and E_1CB – stereochemistry of elimination, Hofmann and Saytzeff rules – competition between Elimination and substitution – Pyrolytic –

Cis elimination, Chugaev reaction – Typical reactions such as Dehydration, dehydrohalogenation, Hofmann degradation, Cope elimination – Bredt's rule.

Unit III: Molecular rearrangements (15 Hours)

A detailed study of the mechanism of the following rearrangements. Wagner – Meerwin, Demyanov, Dienone–Phenol, Favorski, Baeyer – Villiger, Wolff, Stevens, Von – Richter, Beckmann, Kornblum–DeLaMare, Smiles, Jacobsen, Neber, Fries, Ireland-Claisen, Hofmann–Martius rearrangements.

Unit IV: Organic naming reactions and applications (15 Hours)

A detailed study of the following naming reactions **-** Biginelli reaction, Hoeben – Hoesch reaction, Vilsmeyer formylation, Bucherer reaction, Pauson – Khand reaction, Heck reaction, Suzzuki, Stille, Sonogashira, Negishi, Cadiot–Chodkiewicz coupling reactions. Huigens synthesis. Baylis-Hillman, Luche, Yamaguchi.

Unit V: Reagents for Organic synthesis (15 Hours)

Aluminium chloride, Alumnium isopropoxide, N-Bromosuccinimide, OsO_4, DCC, N-Chlorosuccinimide, Diazomethane, Fenton's reagent, Hydrogen peroxide, Lead tetraacetate, Lithium aluminium hydride, Perbenzoic acid, Periodic acid, Seleniun dioxide, Sodium borohydride, $NaCNBH_3$, DDQ, Wilkinson catalyst, Wolff Kishner reagent, Wittig reagent.

CONTENT BEYOND THE SYLLABUS

1. Discuss the addition of nitrenes and carbenes upon triple bond and their stability parameters.
2. List out organic reactions performed in aqueous medium.
3. Identify the advantages of aqueous medium organic synthesis.
4. Identify the disadvantages of aqueous medium organic synthesis and find a solution to overcome the problem.
5. Write a synthetic route for the synthesis of thiazolidones, tetrazoles and oxindoles with reference to the biological applications.

TEXT BOOKS

1. Jerry March, Advanced organic chemistry - Reactions mechanism and structure, McGraw Hill Kogakusha Ltd., (1977).
2. S.H. Mukhergee and S.P. Singh, Reaction mechanisms in organic chemistry, McMillan (1976).

3. Raj K.Bansal, Organic Chemistry Reaction mechanisms, Hill Publishing Company Ltd (2006).
4. I.L. Finar, Organic chemistry, Vol. II. Pearson Education (P) Ltd (2011).

REFERENCE BOOKS

1. S. N. Sanyal, Reactions, Rearrangements and Reagents, Bharati Bhavan Publishers & Distributor (2013)
2. V.K. Ahluwalia, Rakesh Kumar Parashar and R. K. Parashar, Organic Reaction Mechanisms
Narosa Publishing House (2002).

ONLINE SOURCES

1. http://www.name-reaction.com/list
2. http://www.synarchive.com/named-reactions
3. https://chem.libretexts.org/
4. http://www.chem.ucalgary.ca/courses/351/Carey5th/Carey.html

CORE PAPER - V

INORGANIC CHEMISTRY II

SUBJECT CODE: 17P2CH05		
SEMESTER – II	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

1. To impart the knowledge on types of bonding in simple and complex molecules.
2. To understand the concept of HOMO and LUMO, and their influence in bond formation.
3. To acquire knowledge about formation of complexes and their stability parameters with appropriate mechanisms.
4. To acquire knowledge about LS coupling, terms, levels, states and term symbol parity.

Learning Outcome

Students will acquire sound knowledge on bonding in inorganic molecules.

Students will learn the theories, mechanism of complex formation and the electronic spectra of coordination complexes.

Students will acquire knowledge about term symbols and its applications.

Unit I: Ionic Bonding (15 Hours)

Ionic bonding – Lattice energy – Born equation – Born-Haber cycle - Radius ratio rule – Born Meger equation – Kapustinskii modification – energetics of the dissolution of ionic compounds in polar solvents - polarization- Fajan's rule – results of polarization. Electronegativity – determination – methods of estimating charges, electronegativity equalization – Types of chemical forces – effects of chemical forces - melting and boiling points, solubility and hardness.

Unit II: Covalent Bonding and Molecular Structure (15 Hours)

Covalent bonding: Formal charges - Limitations of octet rule- Hybridisation and geometry - VSEPR model: CH_4, NH_3, H_2O, PCl_3F_2 - Bent's rule: SF_4, BrF_3, $[ICl_2]^-$, $[ICl_4]^-$, XeF_4, $XeOF_4$, XeO_4, XeO_3, XeF_6, XeF_2 - Bond angle - *s*, *p* character relationship - Failures of VBT - MO theory: LCAO method - Molecular orbitals in homo nuclear diatomic molecules: O_2, Be_2, N_2 and C_2 - hetero nuclear diatomic molecules: HCl, NO and CO - HOMO and LUMO concepts in bonding.

Unit III: Coordination Theories (15 Hours)

CFT: Splitting pattern of d-orbital in various environments of ligands (octahedral, tetrahedral, square-planar) - CFSE - Factors affecting the magnitude of CFSE - Weak and strong fields - Pairing energy – Jahn Teller distortion - Nephlauxetic effect - Limitations of CFT - LFT: Evidence for covalent nature of metal-ligand bonds - pi-bonding theory - Construction of MO diagram for σ and π bonded O_h complexes.

Unit IV: Reaction Mechanism in Coordination Complexes (15 Hours)

Stability of complexes, Thermodynamic and kinetic stability – stability constants - Substitution reactions: General mechanism - Schemes of octahedral, tetrahedral and square planar complexes - Trans effect - Theories of trans effect - pi-bonding theory and polarisation theory - Applications of trans effect - Catalysis by transition metal complexes: Hydrogenation of alkene (Wilkinson's catalyst), Hydroformylation (Oxo process), Wacker process and Zieglar-Natta catalysis.

Unit V: Electronic Spectra and Organometallics (15 Hours)

Spectroscopic term symbols for d^n ions – derivation of term symbols and ground state term symbols – Energy level diagrams. Electronic spectra of complexes - Orgel diagram - interpretation of electronic spectra of d^1 to d^9 - Tanabe-Sugano diagrams - charge transfer spectra - Carbonyls: Binuclear and tri nuclear carbonyls of iron, cobalt and manganese - preparation, properties, uses - Nature of M-CO bond in carbonyls - Nitrosyls - Nitrosyl carbonyls - Metal nitrosyl hydroxide - Metal nitrosyl thio compound - Nature of M-NO bonding - structure of $[Fe(NO)_4]$, $[Fe_2(NO)_4]$, $[Fe(NO)_3Cl]$, $[Fe(NO)_2(CO)_2]$ - Metallocenes: Ferrocene, Cobaltocene - Preparation, Properties and structure.

CONTENT BEYOND THE SYLLABUS

1. Discuss the applications of organic metallics in catalysis.
2. The role of organic metallic compounds in biological systems.
3. The function of coordination compounds as homogeneous and heterogeneous catalyst.
4. Discuss on stability parameters of various metal-nitrosyl compounds.

TEXT BOOKS

1. J. E. Huheey, E. A. Keiter and R. L. Keiter., Inorganic Chemistry, 4th Edn, Pearson education (2006).
2. F. A. Cotton, G. Wilkinson., Advanced Inorganic Chemistry, 3rd Edn, John Wiley & Sons, Inc (1972).
3. W. U. Malik, G. D. Tuli and R. D. Madan., Selected topics in Inorganic Chemistry, 6th Edn S. Chand & company Ltd., (2005).
4. B. R. Puri, L. R. Sharma and K. C. Kalia., Principles of Inorganic Chemistry, S. Chand & Co (2004).
5. R. D. Madan., Modern Inorganic Chemistry, Chand Publishers (2004).

REFERENCE BOOKS

1. C. N. Banwell., Fundamentals of Molecular Spectroscopy, Mc Graw Hill, Newyork (2001).

2. G. Raj., Advanced Inorganic Chemistry Vol. I & Vol. II, 6th Edn, Goel publishing house (1999).
3. G. S. Manku., Theoretical Principles of Inorganic Chemistry, Tata McGraw –Hill Publishing Company Ltd., (Reprint 2001)
4. R. Chang., Basic principles of Spectroscopy, McGraw Hill Ltd., New York, (1971).

ONLINE SOURCES

1. http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch8/vsepr.html
2. https://chem.libretexts.org/Core/Inorganic_Chemistry/Crystal_Field_Theory/Orgel_diagrams
3. http://www.chem.iitb.ac.in/people/Faculty/prof/pdfs/L5.pdf

ELECTIVE PAPAER-II

ELECTROCHEMISTRY AND PHOTOCHEMISTRY

SUBJECT CODE: 17P2CHE02		
SEMESTER – II	**CREDIT : 4**	**HOURS : 60**

OBJECTIVES

1. To impart the basic concepts electrochemistry.
2. To understand the application of electrochemistry and electrochemical cells.
3. To acquire knowledge about electrochemical reactions.
4. To enrich the students knowledge with the basic principles and application of photochemistry.
5. To study various types of photochemical reactions.

Learning Outcome

Students will understand the basic principles of electrochemistry and different types of electrochemical cells.

Students will learn about the basic concepts of photochemistry and their importance in various fields.

UNIT – I: Electro chemistry – I (12 Hours)

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 junction - salt bridge - derivation-Electrical double layer, theories of double layer - Electrokinetic phenomena: Electroosmosis – electrophoresis - Diffusion, Streaming and Sedimentation potentials - electro-capillary phenomena, electro-capillary curve.

UNIT – II: Electro chemistry - II (12 Hours)

Debye - Huckel theory of inter-ionic attraction, ionic atmosphere, time of relaxation, relaxation and - phoretic effects, Derivation of Debye-Huckel-Onsagar equation and its validity for dilute solutions at appreciably concentrated solutions. Debye-Falkenhagen and Wein effects. Mean ionic activity coefficients and their determination. Debye - Huckel Bronsted equations - Derivation of Debye-Huckel limiting law, Quantitative and qualitative verification, ion association and Bjerrum theory.

UNIT – III: Photochemistry (12 Hours)

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. Stern-Volmer equation, critical energy transfer distances, energy transfer efficiency, examples and analytical significance, bimolecular collisional quenching.

UNIT – IV Organic Photochemistry (12 Hours)

Fundamental concepts - 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: Applied Photochemistry (12 Hours)

Photochemistry reaction in the atmosphere - oxygen and ozone - nitrogen oxide - chlorofluoro carbons - organic compounds - chemistry of vision – photography - photosensitisers-ultraviolet screening agents - optical bleach – photochronism - photoimaging - photochemistry of polymers - Photo polymerization: imaging, curing - photodegradation and photostabilization.

CONTENT BEYOND THE SYLLABUS

1. Various types of batteries which are used in day-to-day life.
2. Electroplating and prevention of corrosion.
3. Recent advances in batteries and fuel cells.
4. Photooxidtion and photoreduction process in various chemical reactions.

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., Affilated East west press Pvt., Ltd., New Delhi, (2004).

3. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing House. (1999).
4. Jagdamba singh, Jaya singh, Photochemisty & Pericyclic Reaction, New age international publishers (2012).

REFERENCE BOOKS

1. M.S Yadav Electrochemistry- Anmol Publication Pvt Ltd. New Delhi, (2011).
2. J.G.Calverts & J.N.Pitts - An introduction to Photochemistry, New age international (p) Ltd., New Delhi. Wells, Introduction to Photochemistry, New age international (P) Ltd., (2010).

ONLINE SOURCES

1. http://www.engr.uconn.edu/~jmfent/CHEG320_electrochemistry%20lectures.pdff33079
2. https://chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry
3. https://web.stanford.edu/group/burnslab/meetings/13_01_24_QOphotochemistry.pdf.

CORE PRACTICAL - I

ORGANIC CHEMISTRY PRACTICAL -I

SUBJECT CODE: 17P2CHP01		
SEMESTER – II	**CREDIT : 4**	**HOURS : 150**

OBJECTIVES

1. The objective of this lab is to provide hands-on opportunities to apply the knowledge of chemical reaction in functional group analysis.

2. It also gives hands-on training to synthesize organic compounds via a variety of organic reactions.
3. To promote the students towards research activity and job opportunities.

Learning Outcome

Students can able to investigate and report an unknown compound systematically.

Students will be known to synthesize, recrystallize and finding melting point of an organic compound. It will help them to carry out their research in future.

1. QUALITATIVE ANALYSIS OF BINARY MIXTURE OF ORGANIC COMPOUNDS :

(120 HOURS)

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 HOURS)**

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

CONTENT BEYOND THE SYLLABUS

1. Carry out any one name reaction in your laboratory and characterize the product using functional group analysis and melting point.
2. Find a method to separate unusual compositions of organic mixtures.

TEXT 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).

REFERENCE BOOKS

1. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).

ONLINE SOURCES

1. http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt25.html
2. http://vlab.amrita.edu/?sub=2&brch=191&sim=345&cnt=1
3. http://amrita.olabs.edu.in/?sub=73&brch=8&sim=116&cnt=1

CORE PRACTICAL - II

INORGANIC CHEMISTRY PRACTICAL -I

SUBJECT CODE: 17P2CHP02		
SEMESTER – II	**CREDIT : 4**	**HOURS : 150**

OBJECTIVES

1. To acquire training in microscale experimental techniques.
2. To acquire knowledge on the properties of ions and their compounds.
3. To educate the students about the complex formation reaction, influence of pH, stability of complexes and application of complex formation reaction in analytical chemistry.

4. To impart knowledge about variation in the chemical behavior of elements in the same group.
5. To promote the students towards research activity and job opportunities.

Learning Outcome

Students will learn how to conduct a process systematically and precisely.

The qualitative analysis gives a type of mental training and develops a power of reasoning not equal to any other course in chemistry.

The students will learn the nature, significance, and influence of errors and how they may best be avoided or minimized during qualitative and quantitative examination of a chemical compound.

1. Complexometric titrations: (25 HOURS)

Estimations of Ca, Cu, Mg, Ni & Zn using complexometric titration.

2. **Qualitative Analysis: (125 HOURS)**

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.

CONTENT BEYOND THE SYLLABUS

1. Estimate the hardness of water using EDTA.
2. Analyze the given cation using different qualitative methods.

TEXT BOOKS

1. V.V. Ramanujam, Inorganic semi micro qualitative analysis, The National Publishing Co., Ltd., Madras (2002).

REFERENCE BOOKS

1. Vogel, Inorganic quantitative analysis, Pearson Education (2001).

ONLINE SOURCES

1. http://lib.hku.hk/Press/9622092128.pdf
2. http://www.kvsunjuwan.com
3. http://science-blogs.ucoz.com/resources/notes/msc/pract1/CationGuide.pdf

CORE PRACTICAL - III

PHYSICAL CHEMISTRY PRACTICAL-I

SUBJECT CODE: 17P2CHP03		
SEMESTER – III	**CREDIT : 4**	**HOURS : 150**

OBJECTIVES

1. To understand the interconnection between experimental foundation and underlying theoretical principles and to appreciate the limitations inherent in both theoretical treatments and experimental measurements.
2. To apply the principles of chemical kinetics, phase rule, electrochemistry and adsorption in the analysis of the physical and chemical properties of the given compounds.

3. To develop laboratory skills and the ability to work with instruments independently.
4. To promote the students towards research activity and job opportunities.

Learning Outcome

Students will understand the breadth and concepts of physical chemistry.

Students will develop skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry

Students will plan, conduct, review and report the experiment.

1. Chemical Kinetics - I

Rate constant of the hydrolysis of methyl acetate catalysed by N/2 HCl

1. Comparison of strength of two acids- at room temperatures
2. Determination of temperature coefficient and Arrhenius parameter

2. Chemical Kinetics II – Second order reaction

1. Saponification of ethyl acetate by NaOH

3. Phase rule studies

1. Two component systems-Simple Eutectic formation
2. Phase diagram of a two-component system forming compound (with congruent melting point).

4. Heat of solution of benzoic acid in water.

5. Verification of Freundlich adsorption isotherm (Adsorption of oxalic acid on Charcoal).

6. Conductometric titrations

a) CH_3COOH vs NaOH

b) HCl, CH_3COOH vs NaOH

Application :

a) Verification of DHO equation

b) Verification of Ostwalds' dilution law

c) Estimation of mixture of halides.

7. Potentiometric titrations

a) CH_3COOH vs NaOH

b) HCl, CH_3COOH vs NaOH

b) KCl vs $AgNO_3$

c) Estimation of mixture of halides.

d) Determination of E^0,Zn^{2+}/Zn and estimation of Zn^{2+}.

CONTENT BEYOND THE SYLLABUS

1. Apply the principle of conductometric method for a precipitation titrations.
2. Apply principles of second derivative graphical method for potentiometric titrations.
3. Construct a cell using different electrolytes an calculate their E_{cell} value and single electrode values.
4. To study the time consumption of various reactions.

TEXT 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).

REFERENCES

1. B Viswanathan, P.S. Raghavan, Practical Physical Chemistry, Viva Books Private Limited, (2005).

ONLINE SOURCES

1. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Material Science
2. http://qu.edu.iq/el/pluginfile.php/69663/mod_resource/content/1/lect%2023_Conductometric%20Titrations.pdf
3. http://www.cffet.net/sia-e/2_Pot_titr.pdf

17P1CH01

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. **5 X 5=25**

1. a) Write the name of the following compounds. **(OR)**

   b) (i) Chloroacetic acid more acidic than acetic acid. Why?

   (ii) Why phenol is more acidic the ethanol?

2. a) Give the order of stability of following carbocations.

   (i) tropylium ion (ii) Benzyl cation (iii) t-butyl carbocation

(iv) Isopropyl carbocation (v) di-t- butyl carbocation

(OR)

b) Explain the microscopic reversibility with example?

3. a) Predict the aromatic, non-aromatic and anti aromatic nature in the following compounds.

(i) cycloheptatriene (ii) cyclobutadiene (iii) cyclooctatetrane

(iv) cyclopentadienyl anion (v) pyridine

(OR)

b) Define Homoaromaticity and Anti aromaticity.

4. a) Show that nucleophilic substitution influence by neighbouring group . **(OR)**

b) Explain the concept of orientation and reactivity using disubstituted benzene.

5. a) Give an example for regioseletive organic transformation. **(OR)**

b) Analyse the conformations of di-substituted cyclohexane .

PART - B

Answer all the questions. 5 X 10 = 50

6. a) Explain the effect of hydrogen bonding and hyper conjugation on physical and chemical properties of the molecule? **(OR)**

b) (i) Show that steric inhibition alter the rate of SN2 reaction .

(ii) Explain why esterification O,O-disubstituted benzoic acid is difficult compare to unsubstituted benzoic acid.

7. a) Explain stability, structure and generation of carbenes and nitrenes ? **(OR)**

b) Give the application of Hammette equation and its limitation.

8. a) Explain with example about effect of aromaticity on band length, resonance energy and induced ring current. **(OR)**

b) Explain the structure and aromaticity of the following compounds.

(i) Sydnones (ii) Azoulene (iii) Annulene

9. a) Explain the mechanism of Stork Enamine reaction and Friedal Craft acylation of olifinic carbon. **(OR)**

b)Write the detail mechanism of the following reactions

(i) Gatterman-Koch reaction (ii) Cine substitution .

10. a) Explain the optical inactivity of meso tartaric acid using Fischer, Newmann and Sawhorse projection formulas? **(OR)**

b) Explain the conformation and reactivity of substituted cyclohexanol on oxidation.

17P1CH02

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. **5 X 5=25**

1. a) Explain the variation of atomic and ionic radii along the group and period. **(OR)**
   b) Draw the structure of $[Nb_6Cl_{12}]^{2+}$ and $[Re_2Cl_8]^{2-}$.
2. a) What is meant by lanthanide contraction? Explain its causes and consequences. **(OR)**
   b) How do you relate colour and spectra in inner transition elements?
3. a) What is meant by electron capture reactions? Explain with examples. **(OR)**
   b) Write a note on auger effect.
4. a) Explain the principle and working of Geiger – Muller counter. **(OR)**
   b) Compare Cyclotron, Betatron and Synchrotron.

5. a) What are fissile and fertile isotopes? Explain with examples. **(OR)**

   b) Write a brief note on atomic power projects in India.

PART - B

Answer all the questions. **5 X 10 = 50**

6. a) i) Why transition elements possesses variable oxidation state?

   ii) Write a note on catalytic property of transition elements. **(OR)**

   b) i) Explain a brief note on stabilization of unusual oxidation state.

   ii) Draw the structure of $[Mo_6Br_8]^{4+}$ and $[Ni_2(DMG)_2]$.

7. a) How do you extract lanthanides from monazite sand? **(OR)**

   b) Explain the extraction of thorium from its ore.

8. a) Describe in detail about Shell and Liquid drop model. **(OR)**

   b) Write a note on theories of alpha and beta decay.

9. a) Explain the various types of nuclear reactions with example. **(OR)**

   b) Explain the principle and working of Scintillation and proportional counter.

10. a) How do you prevent nuclear wastes? **(OR)**

    b) Write a note on neutron activation and isotopic analysis techniques.

17P1CH03

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. **5 X 5=25**

1. (a) Discuss symmetry elements and symmetry operations in a molecule. **(OR)**

   (b) Explain group multiplication table.

2. (a) Explain hybridisation schemes for AB_4 tetrahedral. **(OR)**

   (b) Explain Mutual exclusion principle.

3. (a) Write a note on Primary salt effect with proper example **(OR)**

   (b) Define fast reaction. Explain Flow method.

4. (a) Discuss Vonthoff intermediates. **(OR)**

   (b) Write a note on Bronsted catalysis law.

5. (a) Write a note on Freundlich adsorption Isotherm. **(OR)**

(b) How will you differentiate physical and chemical adsorption isotherm.

PART - B

Answer all the questions. 5 X 10 = 50

6. a) What is a character table? How will you construct the character table for C_2v point group. **(OR)**

(b) Explain Great orthogonality theorem

7. (a) Discuss the symmetry selection rule and raman spectra. **(OR)**

(b) Comparecrystal symmetry and molecular symmetry.

8. (a) Explain hammet equation and Taft equaton.Explain what are the factors affecting it.

(OR)

(b) Explain the explosive reaction of H_2O_2.

9. (a) Briefly explain Michaelis-Menton equation of enzyme catalysed reactions **(OR)**

(b) Explain factors affecting enzyme catalysed reaction

10. (a) Derive the Langmure adsorption isotherm. What are its limitations. **(OR)**

(b) Derive BET theory of multi layer adsorption.

17P1CHE01

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION

MODEL QUESTION- NANO CHEMISTRY

Time: 3 hrs **Max Marks: 75**

PART - A

Answer all the questions 5 X 5 = 25

1. a) Explain the application of nanoparticles for environmetal remediation. **(OR)**

(b) Write a note on nanosensors.

2. (a) Write a note on hydrazine and borohydride reduction. **(OR)**

(b) Explain the sol gel synthesis.

3. (a) Explain the principle and working of X-ray photoelectron spectroscopy. **(OR)**

(b) Explain the instrumentation and working for UV spectroscopy.

4. (a) Write a note on nanocatalysis. **(OR)**

(b) Write short note on biomedical applications.

5. (a) Explain the protein synthesis. **(OR)**

(b) Explain the multilayer films.

PART – B

Answer all the questions. 5 X 10 = 50

6. (a)Explain the nanoelectronics.**(OR)**
   (b) Write a note on medicinal applications of nanoparticles.
7. (a)Explain the pulse laser deposition. **(OR)**
   (b) Write any four reduction method.
8. (a) Explain the Thermal Gravimetric Analysis(TGA). **(OR)**
   (b) Write a note on Scanning Electron Microscopy.
9. (a) Briefly explain the prroperties and applications of nanotubes(CNT). **(OR)**
   (b) Write note on magnetic properties.
10. (a) Briefly explain the biological nanostructures. **(OR)**
    (b) Explain the size of building blocks.

17P2CH04

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION

MODEL QUESTION- ORGANIC CHEMISTRY - II

Time: 3 hrs **Max Marks: 75**

PART - A

Answer all the questions. 5 X 5 = 25

1. (a) Addition reaction of alkens leads trans product. Why? **(OR)**
   (b) Write a nots on addition derivatives of ammonia to carbonyl compounds
2. (a) Discuss E1CB mechanism **(OR)**
   (b) State and explain Hoffman and Saytzeff rule.
3. (a) Write a notes on DeLa mare rearrangement **(OR)**
   (b) Discuss the Neber rearrangement .
4. (a) Explain 1,3-diploar addition in Biginelli. **(OR)**
   (b) Write a notes on Pauson-Khand reaction
5. (a) Explain the role of $AlCl_3$ in Friedal Craft's reaction and Fries rearragement

(OR)

(b) Write the application of DDQ

PART – B

Answer all the questions. **5 X 10 = 50**

6. (a) Explain the following addition reaction with mechanism

(i) Simmon-smith reaction (ii) Wittig-Horner reaction

(OR)

(b) Explain the Epoxidation and Hydroboration reaction mechanisms

7. (a) Give the mechanism of Cope elimination and Hoffmann degradation **(OR)**

(b)(i) Discuss the stereochemistry of E2 elimination. (7)

(ii) Given example for a reaction following Bredt's rule (3)

8. (a) Explain Demyanov and Smiles rearragement **(OR)**

(b) Give the mechanism of Hofmann-Martius and Kornblum rearrangement

9. (a) Explain the mechanism of Luche and Suzzuki reactions **(OR)**

(b) Write the mechanism of Huigens and Yamaguchi reactions

10. (a) Explain the application of OsO_4 and $Pb(COOMe)_4$ in organic synthesis

(OR)

(b) Write a note on Wilkinson catalyst and Wolff Krishner reagent

17P2CH05

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

M.Sc. DEGREE EXAMINATION

MODEL QUESTION- INORGANIC CHEMISTRY - II

Time: 3 hrs **Max Marks: 75**

PART - A

Answer all the questions. **5 X 5 = 25**

1. (a) State and explain Fajan's rule with an example. **(OR)**

   (b) Describe radius ratio rule.

2. (a) Explain hybridization and geometry of NH_3. **(OR)**

   (b) What are the failures of VBT.

3. (a) State and explain John Teller distortion with an example. **(OR)**

   (b) Describe splitting of d-ordbitals in square planar geometry.

4. (a) Write a note on trans effect with an example. **(OR)**

   (b) Discuss hydrogenation of alkene using wilkinson's catalyst.

5. (a) (i) What is ground term for d^2 system.

   (ii) Give selection rule for electronic spectra. **(OR)**

   (b) Draw and explain Orgel diagram of d^3 system.

PART – B

Answer all the questions. **5 X 10 = 50**

6. (a) Write note on (i) Lattice energy (ii) Born-Haber cycle. **(OR)**

   (b) What are the methods to determine Electronegativity? Explain.

7. (a) Explain LCAO method for molecular orbitals in O_2. **(OR)**

   (b) (i) What are the limitation of octet rule.

   (ii) Explain bond angle and s,p character relationship of XeF_6.

8. (a) Illustrate splitting of d-orbitals in octahedral and Tetrahedral geometry. **(OR)**

   (b) (i) What are the factors affecting CFSE?

   (ii) Describe Nephlauxefic effect.

9. (a) (i) Differentiate thermodynamic and kinetic stability.

   (ii) Write notes on stability constant. **(OR)**

   (b) Explain wacker process.

10. (a) (i) Derive term symbol for d^4 system.

   (ii) Explain charge transfer spectra with an example. **(OR)**

   (b) (i) Write a note on Tanabe-Sugano diagrams.

   (ii) Explain preparation, properties and structure of Ferrocene.

17P2CHE02

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) Explain the construction of Jablonski diagram. **(OR)**
   (b) Write a note on Frank- Condon principle and its selection rules.
4. (a) Explain the formation of peroxy compoounds. **(OR)**
   (b) Write a note on photo – fries rearrangement.
5. (a) How will you explain the photosensitisers and chemistry of vision. **(OR)**
   (b) Explain photodegredation and photo stabilisation.

PART-B

Answer all the questions. **10x5=50**

6. (a) Explain the theories of double layer. **(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 Mean ionic activity coefficients and their determination..

8. (a) What is mean by photochemical reactions and explain photo reduction and oxidation, Photodimerization. **(OR)**

   (b) Discuss the bimolecular collisional quenching and Stern-Volmer equation

9. (a) Explain the Norish type I and norish type II with examples. **(OR)**

   (b) Discuss the Cis and Trans isomerization and Paterno-Buchi reaction.

10. (a) Explain theultraviolet screening agents , optical bleach and photochronism **(OR)**

    (b)Explain the photochemistry of polymers and Photo polymerization

ORGANIC CHEMISTRY – III

SUBJECT CODE: 17P3CH06		
SEMESTER –III	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

To enable student to learn about the chemistry of natural compounds and to enrich knowledge in the field of green synthesis of organic molecules.

Learning Outcome

Students know chemical properties and structure of plant derived organic compounds like trrpenoids, alkaloids, steroids and flavones etc.

Students can able to understand isolation, characterisation and laboratory synthesis of natural products of biological importance.

To understand the concept of HOMO and LUMO, and their influence in bond formation.

Students can able to understand the nature of double bonded compounds and the possible isomer arrived upon their rearrangement.

Knowledge of student will be enriched with green chemistry and various types of eco-friendly reactions could be conducted on their own.

UNIT – I Terpenoids and Alkaloids **(15 Hours)**

Terpenoids: Clasification-General structural elucidation. Structural elucidation and synthesis of α-Pinene, Camphor, Zingiberene and Juvenile hormone.

Alkaloids: Clasification-General structural elucidation. Structural elucidation and synthesis of Reserpine, Morphine, Quinine, Cinchonine and Papaverine.

UNIT – II Steroids, Flavones and Vitamins (15 Hours)

Steroids: Classification – structural elucidation and synthesis of Cholesterol, Estrone, progesterone, Stigmasterol.

Flavones: Introduction- Baker-Venkataraman rearrangement-Kostanecki synthesis of flavones-Flavonol; Synthesis of Quercetin-Isoflavones; Daidzein.

Vitamins: Physiological importance, Structural elucidation of B_6, B_{12}, and K.

UNIT – III Pericyclic reactions (15 Hours)

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 Anthocyanins, Purines and Nucleic acids (15 Hours)

Introduction to anthocyanins – Synthesis of anthocyanins. Structure and biological applications - Uric acid, Purine derivatives and Xanthine bases.

Nucleic acids – Synthesis of Nucleosides (Purines-Adenine, Guanine; Pyrimidines-Uracil, Thymine, Cytosine). Synthesis of Nucleotides – adenosine-5'-phosphate.

UNIT – V Green synthesis (15 Hours)

Principles of Green chemistry, Synthesis in water-Pericyclic reaction-Wittig-Horner reaction, Strecker synthesis-Synthesis in super critical Carbondioxide-Freidal crafts reaction, Hydroformylation reaction. Types and preparation of ionic liquids, synthesis using ionic liquids-Claisen-Schmidt Condensation-Polymer supported green reagent-PNBS, Synthesis using PTC-mechanism, types, advantages and applications of PTC, Microwave induced Green synthesis-Comparison of reactions in water and organic solvents.

CONTENT BEYOND THE SYLLABUS

3. Classification and medicinal applications of terpenoids and alkaloids.
4. Synthetic route of a molecule of your choice.
5. Elucidate structure of a molecule of your choice.
6. Influence of 1,3 and 1,5 –hydrogen shifts in sigmatropic rearrangements.

7. Identify green reactions and their advantages.

REFERENCES

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. M.G. Arora, Organic Photochemistry and Pericyclic reaction,2008
4. C.H.Depuy ,O.SChampman Molecular reactions and Photo-chemistry, Prentice Hall, 1975
5. B.B. Grill, M. R. Willis, Pericyclic reactions, Champan & Hall 1974.
6. Singh and Mukherjee, Organic reaction mechanism,2005.

TEXT BOOKS

1. V.K.Ahluwalia,M.Kidwai,New trends in green chemistry,Second Edition,2007.
2. Arun Bahl and B.S.Bahl,Advaced organic chemistry,S.Chand and company,2009.
3. T.W.Graham salomons, Carig B.Fryhle,Organic chemistry,9th edition,Wiley.2011.

ONLINE SOURCES

4. https://articles.mercola.com/sites/articles/archive/2017/08/28/terpenoids.aspx
5. https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/pericycl.htm
6. https://lpi.oregonstate.edu/mic/dietary-factors/phytochemicals/flavonoids
7. www.essentialchemicalindustry.org/processes/green-chemistry.html

INORGANIC CHEMISTRY - III

SUBJECT CODE: 17P3CH07		
SEMESTER – III	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

8. To gain knowledge on non aqueous solvents, cages ,chains and clusters.
9. To give elaborate insight into the field of solid state and bio-inorganic chemistry.
10. To understand the working and application of various analytical tools to deduce ctystal structure of solids.

Learning Outcome

Students will learn the application and properties of non aqueous solvents general properties and formation of liquid and gaseous molecules.

Students will be introduced to variety of inorganic molecule of commercial application. In future, it will help the students to explore constructive application of silicates , Zeolites,Ultramarine silicones.

Students are enable to understand the basic of crystal structure, application of the analytical tools like XRD,AAS and PES tools in elucidating three dimentional structure of the inorganic molecules.

Unit – I: Non-aqueous solvents (15 Hours)

Classification of non aqueous solvents- Solute-Solvent interactions- Reactions in liquid ammonia- 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 affecting extraction, technique for solvent extraction, quantitative treatment of solvent extraction equilibria, Classification of solvent extraction systems, Transition of a substance from an aqueous phase.

Unit – II: Inorganic chains, rings, cages and clusters (15 Hours)

Silicate minerals – ortho-, pyro-, and meta-silicates – pyroxene, amphiboles – two-dimensional silicates – talc, mica and three dimensional aluminosilicates, zeolites. Silicones-preparation, properties and uses - Iso and hetero-polyacids - Structures of $[TeMo_6O_{24}]^{6-}$ and $[Mo_7O_{24}]^{6-}$ ions and $[PMo_{12}O_{40}]^{3-}$ ion – Polymeric sulphur nitride – borazines, phosphonitrilic compounds-trimers and tetramers - homocyclic inorganic ring systems – Concept of multi-centered bond – structure of B_2H_6, B_4H_{10}, $[B_{12}H_{12}]^{2-}$, B_6H_{10}, Wade's rules, closo, nido, arachno boranes and carboranes and "styx" code.

Unit – III: Solid State Chemistry (15 Hours)

Space lattice - unit cell- crystal systems- elements of symmetry- space groups-Miller indices- crystal analysis- XRD - rotating crystal method- powder method - packing of atoms and ions in solids- Electrical properties of solids – Band theory, semiconductors, super conductors, theory of super conductivity – defects in solids - solid state electrolytes; magnetic properties of solids – dia, para, ferro, antiferro and ferrimagnetism; hysterisis; 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 and inverse spinels; solid solutions.

Unit – IV: Atomic absorption, emission spectroscopy and Crystal Studies (15 Hours)

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 XPS, UPES-evaluation of ionization potential-chemical identification of elements – ESCA - Koopmann's theorem-chemical shift - UPES, XPS of N_2, O_2, and HCl-evaluation of vibration constants from UPES-spin orbit coupling.

UNIT – V: Bio-inorganic Chemistry (15 Hours)

Porphyrin ring system - Metalloporphyrins - Haemoglobin and Myoglobin-structures and work functions - other oxygen carriers - Cytochromes: Structure and work functions in respiration - Chlorophyll, structure - photo synthetic sequence - Sulphur proteins - (Non - Haemo iron protein) - Copper oxidizes - Blue copper proteins - Carboxyl peptidase A:

Structure, function - Carbonic anhydrase: Inhibition and Poisoning - Corrin ring system - Vitamin B_{12}, In vivo and in vitro nitrogen fixation - Molecular mechanism of ion transport across the membrane - Na and K ion pumps-Chelate therapy-cis-platin

CONTENT BEYOND THE SYLLABUS

11. Nonaqueous solvent as a medium to conduct organic reactions.
12. Application of silicates, silicones and zeolites ,felspar,aluminosilicates in the field of medicine.
13. Minerals present in the human body.
14. Applications of different MEMBRANES USED IN AAS.
15. Solid state chemistry in human welfare.

REFERENCES

16. J. E. Huheey, E. A. Keiter and R. L. Keiter., Inorganic Chemistry, 4th Edn, Pearson education (2006).
17. F. A. Cotton, G. Wilkinson., Advanced Inorganic Chemistry, 3rd Edn, John Wiley & Sons, Inc (1972).
18. G. Raj., Advanced Inorganic Chemistry Vol. I & Vol. II, 6th Edn, Goel publishing house (1999).
19. G. S. Manku., Theoretical Principles of Inorganic Chemistry, Tata McGraw –Hill Publishing Company Ltd., (Reprint 2001).
20. R. Chang., Basic principles of Spectroscopy, McGraw Hill Ltd., New York, (1971).

TEXT BOOKS

1 . U. Malik, G. D. Tuli and R. D. Madan., Selected topics in Inorganic Chemistry, 6th EdnS. Chand & company Ltd., (2005).

2. B. R. Puri, L. R. Sharma and K. C. Kalia., Principles of Inorganic Chemistry, S. Chand & Co (2004).

3.R. D. Madan., Modern Inorganic Chemistry, Chand Publishers (2004).

ONLINE SOURCES

21. global.oup.com/ushe/product/non-aqueous-solvents-9780198502593
22. https://www.nature.com › subjects
23. https://www.chemie.uni-hamburg.de/ac/rehder/Lund_BioinorgChem_08.pdf

PHYSICAL CHEMISTRY - II

SUBJECT CODE: 17P3CH08		
SEMESTER – III	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

24. To impart knowledge in the field of Quantum chemistry, Thermodynamics and Spectroscopy.
25. To impart knowledge in the field of spectroscopy to understand the spectroscopic result in the application

Learning Outcome

Students will be able to identify wave functions using operators and recognize functions and values.

Students will learn applications of quantum mechanics to resolve difference in the behavior of micro and macro systems.

Students enable to understand the application of rotational. vibrational and electronic spectroscopy.

Unit I: Quantum Chemistry-I (15Hours)

Quantum theory: Inadequacy of classical mechanics - Black body radiation - Born's interpretation of wave function - Operators: Commutator - Linear operators and Hermitian operator- Eigen functions and Eigen values - Hamiltonian operator - Postulates of quantum mechanics - Schrodinger equation and its solution to the problem to a particle moving in one dimensional box and three dimensional box - Rigid rotor - Simple harmonic oscillator - Schrodinger equation for the H-atom.

UNIT-II: Quantum Chemistry-II (15 Hours)

Approximation methods : Perturbation and variation methods - application to ground state energy of hydrogen and helium atom - self consistent field approximation - Hartree and Hartree-Fock's SCF method - VB and MO theory-application to hydrogen molecule – Huckel's MO theory – Application to ethylene and benzene.

Unit-III: Thermodynamics -I (15 Hours)

Thermodynamics of non-ideal systems - Concept of chemical potential - Gibbs-Duhem equation - Variation of chemical potential with temperature and pressure - Concept of fugacity of gases - Determination by graphical method and from equation of state - Variation of fugacity with temperature and pressure - Fugacity coefficient - Activity and activity coefficient - Variation of activity of a gas with pressure and temperature. Determination of solvent activity by vapour pressure method and Cryoscopic method.

Unit-IV: Microwave spectra (15 Hours)

Introduction: Electromagnetic radiation, Interaction of light with matter, mechanism of absorption & emission of radiation. Rotational, vibrational, and electronic 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-V: Vibrational Spectra (15 Hours)

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.

CONTENT BEYOND THE SYLLABUS

26. Superiority of Quantum chemistry over classical mechanics.
27. Approximation methods in arriving hybridization of smaller molecules.

28. Non-ideal systems in pressure and temperature dependant reactions.
29. Electromagnetic radiations- application and associated physical events..
30. Complementary role of Raman spectra to IR spectra.

REFERENCES

31. R. K. Prasad., Quantum Chemistry, Viva Books Private Ltd (2013).
32. D. McQuarrie., Quantum Chemistry, Viva Books Private Limited (2013).
33. A. K. Chandra., Introductory Quantum Chemistry, Tata McGraw Hill (1994).
34. W. J. Moore., Physical Chemistry, Longmann's (1975).
35. C. N. Banwell and E. M. McCash., Fundamentals of Molecular Spectroscopy, 4th Edn, Tata McGraw Hill, (2010).
36. I. N. Levine, Quantum Chemistry, 4th Edn., Prentice Hall India, (1994).
37. B. K. Sen., Quantum Chemistry Including Spectroscopy, Kalyani publishers (2004).
38. S. Glasstone., Thermodynamics for Chemists - East-west Press Pvt.Ltd, (2002).
39. Jag Mohan., Organic Spectroscopy - Principles and Applications, CRC press (2004).

TEXT BOOKS

1. Arun Bahl, B. S.Bahl, G. D.Tuli., Essentials of Physical Chemistry, Multicolour Revised Edn, S.Chand and Company Ltd, (2008).
2. Y. R. Sharma., Elementary Organic Spectroscopy, Chand Publications (2007).
3. R. Chang., Basic principles of Spectroscopy, McGraw-Hill Inc.,US (1971).
4. Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).

ONLINE SOURCES

5. www.chemistryexplained.com
6. http://unicorn.mcmaster.ca/teaching/4PB3/SymmetryLectureNotes2009-Vallance-Oxford-level2.pdf
7. http://cbc.arizona.edu/~salzmanr/480a/480ants/kinintro/kinintro.html
8. http://nptel.ac.in/courses/122101001

ELECTIVE PAPER - III

EDC – APPLIED POLYMER CHEMISTRY

SUBJECT CODE: 17P3CHED01		
SEMESTER – III	**CREDIT : 4**	**HOURS : 75**

OBJECTIVES

9. To impart the knowledge in the field of polymer chemistry.
10. To acquire knowledge in the preparation methods of addition polymers.
11. To impart knowledge in the preparation of syndiotactic, atactic and isotactic polymers using Zeiler-Natta catalyst.

    To impart understanding in the field of processing of polymers.
12. To explore the applications of various synthetic polymers.

Learning Outcome

Students enable to understand polymer preparation methods.

Acquire knowledge in polymer types and processing techniques.

Students enable to understand importance of polymers used for commercial applications.

UNIT I: Basic Concepts (15 Hours)

Monomers, degree of polymerization, Linear, branched and network Polymers. Addition polymerization: Mechanism of Free radical, cationic and anionic polymerization. Condensation Polymerization in homogeneous and heterogeneous systems.

UNIT II: Co-ordination and co-polymerization (15 Hours)

Kinetics, mono and bimetallic mechanism of co-ordination polymers. Advantages of Zeigler-Natta catalyst. Co-polymerization: Block and graft co-polymers, kinetics of

copolymerization. Types of co-polymerization. Reactivity ratio. Cross-linked polymers and their applications.

UNIT III: Molecular Weight and Properties (15 Hours)

Polydispersion–average molecular weight concept, number, weight and viscosity average molecular weights. Measurement of molecular weights. Viscosity, lPight scattering, osmotic and ultracentrifugation methods. Polymer structure and physical properties–crystalline melting point T_m. Glass transition temperature (T_g), Determination of T_g. Relationship between T_m and T_g.

UNIT IV: Polymer Processing (15 Hours)

Plastics, elastomers and fibres. Compounding, processing techniques: calendering, die casting, rotational casting, film casting, injection moulding, blow moulding extrusion, moulding, thermoforming, foaming, reinforcing and fibre spinning.

UNIT V: Preparation and applications of Commercial Polymers (15 Hours)

Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers, Fire retarding polymers and electrically conducting polymers. Biomedical polymers–contact lens, dental polymers, artificial heart, kidney, skin and blood cells.

CONTENT BEYOND THE SYLLABUS

13. Cross linked polymers and their commercial applications.
14. Green polymer processing techniques.
15. Biodegradable polymers in the place of artificial polymers.

REFERENCES

1. F.W. Billmeyer, Text Book of Polymer Science, 3rd Edition, J.Wiley, (2003).
2. H.R. Alcock and F.W. Lamber, Contemporary Polymer Chemistry, Prentice Hall, (1981).
3. P.J. Flory, Principles of Polymer Chemistry, Cornell University press, New York, (1953).
4. G. Odian, Principles of Polymerization, 2nd Edition, John Wiley & Sons, New York, (1981).

TEXT BOOKS

1. V. R. Gowariker, N.V. Viswanathan and J. Sreedhar, Polymer Science, New Age Int., (1986).

ONLINE SOURCES

2. http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch8/vsepr.html
3. https://chem.libretexts.org
4. http://www.chem.iitb.ac.in/people/Faculty/prof/pdfs/L5.pdf

PHYSICAL CHEMISTRY-III

SUBJECT CODE: 17P4CH09		
SEMESTER – IV	**CREDIT : 5**	**HOURS : 75**

OBJECTIVES

5. To enable the students to acquire knowledge on statistical thermodynamics.
6. To understand the difference between classical and statistical thermodynamics.
7. To acquire knowledge in the field of UV-Vis spectroscopy and its application to organic molecules.
8. To impart knowledge in the field of various spectroscopic techniques like NMR,NQR, MASS, EPR and ESR and their applications in the characterisation of molecules.

Learning Outcome

Students eable to calculate theoretical (λ_{max} and ε_{max}) values.

Students enable to imply the spectral results to resolve the structure of organic and inorganic molecules.

Students enable to select the appropriate spectral technique for their requirement in characterisation of of molecules.

Unit-I: Statistical Thermodynamics (15 Hours)

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. Heat capacities of solids - Einstein's and Debye's theories of heat capacities of solids.

Unit-II: Non-Equilibrium Thermodynamics (15 Hours)

Non-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: UV and fluorescence Spectroscopy (15 Hours)

UV-spectroscopy: Theory - Instrumentation-Beer-Lamberts Law - bands in UV-VIS spectrum - Possible electronic transitions - Types of electronic transitions based on selection rules - Characteristic absorption (λmax and εmax) of carbonyl - Isolated double bond - Conjugated double bond systems and aryl groups - Factors influencing the absorption - Spectroscopic terms: Chromophore - Auxochrome - Bathochromic shift - Hypsochromic shift - Hypochromic shift - Hyperchromic shift – applications.

Fluorescence Spectroscopy: Primciples, Instrumentation and applications.

Unit-IV: NMR and ESR Spectroscopy (15 Hours)

NMR Spectra: Theory of nuclear resonance - Instrumentation - Chemical shift - Factors influencing chemical shift - Shielding and deshielding mechanisms - Spin-spin coupling - Coupling constant - Nuclear overhauser effect - Applications of NMR spectra to simple organic molecules - Introduction to13C NMR, 19F NMR, 31P NMR.

ESR Spectroscopy: Theory - derivative curves - 'g' values - Hyperfine splitting - Isotropic and anisotropic systems - Applications of ESR.

Unit-V: Mass and Mossbauer Spectroscopy (15 Hours)

Mass Spectroscopy: Theory - Instrumentation - Types of ions: Molecular ion - Fragment ion rearrangement ion - Metastable ion - odd & even ions - Molecular ion peak - Base peak - Metastable ion peak - Determination of molecular formula - Nitrogen rule and ring rule - Isotopic abundance analysis - Fragmentation process: Retro Diels-Alder rearrangement - Mclattery rearrangement - Double bond and ring equivalence - Fragmentation of organic compounds with respect to their structural determination (alcohol, hydrocarbon, carbonyl compounds and nitro compounds).

Mossbauer Spectroscopy: Line width - Isomer shift - Quadrupole interactions - Magnetic interactions - Mossbauer emission spectroscopy - Structural elucidation of iron and tin complexes.

CONTENT BEYOND THE SYLLABUS

1.Application of distribution law and approximations

2.Classical and Statistical thermodynamics advantages.

3.Application of spectroscopic techniques.

REFERENCES

1. S. Glasstone, Thermodynamics for Chemistry, Read Books (2007).
2. P.W. Atkins., Physical Chemistry, 6th Edn, Oxford University Press, (1998).
3. M.C. Gupta., Statistical Thermodynamics, Wiley Eastern Limited (1990).
4. B.R. Puri, L. R. Sharma, M. S. Pathania., Principles of Physical Chemistry, Vishal Publishing Co. (2016).
5. P. S. Kalsi., Spectroscopy of Organic Compounds, New Age International (2007).

TEXT BOOKS

1. Y. R. Sharma., Elementary Organic Spectroscopy, Chand Publications (2007).
2. Gurudeep Raj, Advanced Physical Chemistry, Goel Publishing House, (2014).
3. L. K. Nash., Chemical Thermodynamics, 2nd Edn, Addision Wesley Publishing (1976).
4. Jag Mohan., Organic Spectroscopy - Principles and Applications, CRC press (2004).
5. D.N. Sathyanarayana., Introduction to Magnetic resonance Spectroscopy, IK International Publishing House Pvt. Ltd., (2013).

ONLINE SOURCES

9. nptel.ac.in/courses/103103033/module9/lecture1.pdf
10. http://folk.ntnu.no/fredrol/Nanomaterials%20and%20Nanochemistry.pdf
11. https://www.ceitec.eu/nanoparticles-for-biomedical-applications/f33079
12. https://chem.libretexts.org/

ELECTIVE PAPER - IV

ENVIRONMENTAL CHEMISTRY

SUBJECT CODE: 17P4CHE04		
SEMESTER – IV	**CREDIT : 4**	**HOURS : 75**

OBJECTIVES

1. To impart knowledge in the field environment and pollution.
2. To acquire knowledge on the structure of atmosphere.
3. To impart knowledge on water quality and water treatment.
4. To impart knowledge in the field of industrial and agricultural pollutants and waste management.

UNIT -I : FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY (15 Hours)

Concept of environmental chemistry, Composition of atmosphere, vertical temperature and vertical structure of the atmosphere, Hydrological cycle, carbon and nitrogen cycle, Environmental pollution, air, water and soil pollution. Prevention and control of pollutions. Biogeochemical cycles in environment, Biological control of chemical factors in the environment.

UNIT- II : WATER CHEMISTRY (15 Hours)

Characteristics of water, Quality of natural water, quality requirements of portable water,organic, humic and colloidal material in water, chemical composition of water bodies, Commercial water purification method- reverse osmosis method-disinfection of water-purification method of water for industrial purpose (lime-soda process, ion exchange process, zeolite process). Water pollution and its environmental impact, eutrophication, concept of TDS, DO, BOD, COD.

UNIT -III : POLLUTANTS FROM INDUSTRY (15 Hours)

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 Hours)

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 Hours)

Waste management – 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.

REFERENCES

1. De, A.K., Environmental Chemistry, New Age International Publishers Private Ltd., New Delhi, Fifth Edition, 2008.
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.M. Khopkar, Environmental Pollution analysis, Wiley Eastern, New Delhi, 1994.

TEXT BOOKS

1. Sharma and Kaur, Environmental Chemistry, Krishna Publishers, New Delhi, 2000.
2. Dara, S.S., Environmental Pollution and Control, S.Chand & Co., New Delhi, First Edition, 1993.

3. S.E Manahan, Environmental Chemistry, Lewis Publishers, London, 2001.
4. S.K. Banerji, Environmental Chemistry, Prentice Hall of India, New Delhi, 2003.
5. B.K.Sharma, Environmental Chemistry, Goel publishing house, Meerut, Seventh Revised, 2003

CORE PRACTICAL – IV

ORGANIC CHEMISTRY PRACTICAL– II

Organic Quantitative Analysis &

Two stage organic preparations and Rearrangements

SUBJECT CODE: 17P4CHP04		
SEMESTER – IV	**CREDIT : 4**	**HOURS : 75**

OBJECTIVES

6. The objective of this lab is to provide hands-on training to estimate organic compounds.
7. It also gives an idea to sort out a suitable method to estimate organic compounds of their interest.
8. To train the students to conduct two stage preparations.

Learning Outcome

Students can able to estimate quantitatively the give organic compound.

Students will be knowing to synthesize, re-crystallize and finding melting point of an organic compound.

It will help them to carry out their research in future.

(a) Organic Estimation:

9. Estimation of phenol
10. Estimation of aniline
11. Estimation of methyl ketone
12. Estimation of glucose
13. Estimation of Ascorbic acid
14. Determination of saponification value of an oil

(b) Two stage organic preparations and Rearrangements:

1. sym-Tribromobenzene from aniline (Bromination + Hydrolysis)
2. p-nitroaniline from acetanilide (Nitration + Hydrolysis)
3. Benzanilide from benzophenone (Rearrangement)
4. m-nitroaniline from nitrobenzene (Nitration + Reduction)
5. p-Bromoaniline from acetanilide (Bromination + Hydrolysis)

CONTENT BEYOND THE SYLLABUS

6. Developing a novel method to estimate a compound with medicinal value.

Develop a novel method to synthesis a compound.

REFERENCES

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

ONLINE SOURCES

4. http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt25.html
5. http://vlab.amrita.edu/?sub=2&brch=191&sim=345&cnt=1
6. http://amrita.olabs.edu.in/?sub=73&brch=8&sim=116&cnt=1

CORE PRACTICAL – V

INORGANIC CHEMISTRY PRACTICAL– II

[Quantitative Analysis & Inorganic Complexes preparations]

SUBJECT CODE: 17P4CHP05		
SEMESTER – IV	**CREDIT : 4**	**HOURS : 75**

OBJECTIVES

7. To acquire training in micro scale experimental techniques.
8. To acquire knowledge on the properties of ions and their compounds.
9. To educate the students about the complex formation reaction, influence of pH, stability of complexes and application of complex formation reaction in analytical chemistry.
10. To impart knowledge about variation in the chemical behavior of elements in the same group.
11. To promote the students towards research activity and job opportunities.

Learning Outcome

Students will learn how to conduct a process systematically and precisely.

The qualitative analysis gives a type of mental training and develops a power of reasoning not equal to any other course in chemistry.

The students will learn the nature, significance, and influence of errors and how they may best be avoided or minimized during qualitative and quantitative examination of a chemical compound.

(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(acetylacetanato) copper(II)
3. Hexamminecobalt(III) chloride
4. Sodium hexanitrocobaltate(III)
5. Potasium trioxalatoaluminate(III) trihydrate
6. Chloropentamminecobalt(III) chloride
7. Hexamminenickel(II) chloride

CONTENT BEYOND THE SYLLABUS

12. Estimate the hardness of water using EDTA.
13. Analyze the given cation using different qualitative methods.

REFERENCES

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).

ONLINE SOURCES

14. http://lib.hku.hk/Press/9622092128.pdf

15. http://www.kvsunjuwan.com

16. http://science-blogs.ucoz.com/resources/notes/msc/pract1/CationGuide.pdf

17P3CH06

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 Clasien rearrangement.

4. a) Explain the structure and biological applications of uric acid. (OR)

b) Explain the synthesis of adenosine-5'-phosphate.

5. a) Write a note on Polymer supporting green reagents. (OR)

b) Write note on microwave assisted green synthesis.

PART - B

Answer all the questions. 10 X 5 = 50

6. a) Illustrate the general structural elucidation 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 Structure and biological applications Purine derivatives. (OR)

b) Structure and biological applications Xanthine bases.

10. a) Write down the 12 principles of green chemistry. (OR)

b) Explain the types, preparation and applications of ionic liquids.

17P3CH07

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 the physical properties chemical reactions in liquid ammonia. (OR)

b) Write note on the chemical reactions in anhydrous sulphuric acid.

2. a) Explain one dimensional conductors. (OR)

   b) Write a note on borazines.

3. a) Explain the magnetic properties of solids. (OR)

   b) Write note on different types of crystal systems.

4. a) Explain the principle and applications of Flame Emission Spectroscopy. (OR)

   b) Write note on instrumentation of AAS.

5. a) Explain the structure of chlorophyll. (OR)

   b) Write note on blue copper proteins.

PART - B

Answer all the questions. **10 X 5 = 50**

6. a) . Write note on the techniques involved in solvent extraction (OR)

   b) Explain the reactions in liq. N_2O_4 and in liq. HF.

7. a) Explain the types of silicates. (OR)

   b) Write a note on Wade's rules with examples.

8. a) Explain the terms unit cell, elements of symmetry and space groups . (OR)

   b) Explain the different types of defects in solids.

9. a) Explain the principle and applications of Atomic Absorption Spectroscopy. (OR)

   b). Explain the XPS of N_2 and O_2.

10.a) Write an essay about Metalloporphyrins. (OR)

   b) Explain Structure and function of Carbonic anhydrase.

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 the postulates of quantum mecahnics. (OR)

   (b) Explain the Schrodinger time independent wave equation.

2. (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

3. (a) Discuss the variation of chemical potential with temperature. (OR)
(b) Explain the Nernst heat theorem.

4. (a)Write short note on energy levels. (OR)
(b)Write short account on the effect of isotopic substitution of co molecule.

5. (a) Given a short account on Born-Oppenheimer approximation. (OR)
(b) Discuss the differences between Rayleigh and Raman scattering.

PART - B

Answer all the questions. 10 X 5 = 50

6. (a) Derive Schrodinger equation for particle moving in three dimensional cubic box. (OR)
(b) Explain Schrodinger equation of hydrogen atom.

7. (a) Explain Hartree and Hartree-Fock's SCF. (OR)
(b) Write detailed account on MO theory of hydrogen molecule.

8. (a) Derive Maxwell relation. (OR)
(b) How will you determine fugacity of gases by graphical method & from equation of states?

9. (a) Explain rotational spectra of diatomic molecules as rigid rotors. (OR)
(b)Discuss the rotational spectra of polyatomic molecules

10. (a) Explain rotational Raman spectra of symmetric top and spherical top molecules. (OR)
(b) Explain i) vibration-rotational spectra ii) selection rules iii) P, Q, R branches

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) Wirte 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.

17P4CH09

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

Time: 3 hrs **Max Marks: 75**

PART - A

Answer all the questions. **5 X 5=25**

1. (a) Outline about distinguishable and non distinguishable particles (OR)
   (b) Explain any 2 Calculation of equilibrium constant from Partition Function
2. (a) Outline the Postulates of Local Equlibrium (OR)
   (b) Write about Non-Equlibrium Stationary states

3. (a) What is Blue shift in UV and Visible spectra? Give examples. (OR)
(b) Discuss the Octant rule with example.

4. (a) Give notes on LS and JJ Coupling (OR)
(b) Write notes on Isomer Shift.

5. (a) Give some important features of Mass spectra 1^{o},2^{o} and 3^{o}alcohols. (OR)
(b) Explain the quadruple Splitting.

PART - B

Answer all the questions. 5 X10=50

6. (a) Derive Bose – Einstein Distribution Law (OR)
(b) Explain the Evaluation of Translational Partition function

7. (a) Discuss about the Entropy production in Heat Flow and Matter Flow (OR)
(b) Derive Onsager reciprocal Relation.

8. (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.

9. (a) Briefly explain FT-NMR (OR)
(b) How to calculate g-value and Coupling constant

10. (a) Write a brief note on i)Nuclear over Hauser effect ii)spin-spin coupling (OR)
(b) Discuss Hyperfine splitting of methyl radical and deuterium.

17P4CHE04

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 pollutio (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.