Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Rules and Regulations of Master of Science (M.Sc)
(Theory and Dissertation)

O.M.Sc.T.D.:1

Any person who has taken the Degree of Bachelor of Science of this University or the degree of any other any University recognized as equivalent there to and who is employed for a minimum period of three years as prerequisite to, in Non teaching staff of Solapur university or affiliated Sr. Colleges/ Research Institute of Solapur University or Jr. College or High School /recognized Govt. educational Institute within the Solapur University area, be admitted to the examination for the degree of Master of Science (Theory and Dissertation) in any of the Science subject under faculty of Science & Technology.

The Principal subject a student has offered at the B.Sc. will be the subject in which he will be held eligible for admission to the M.Sc.(Theory and Dissertation) course . The Specialisation for M.Sc (T&D) will be the same as available at University and affiliated Colleges. He will also be held eligible for admission to the M.Sc.(Theory and Dissertation) in the subject which he has offered as a subsidiary Interdisciplinary / Applied / Allied subject at the B.Sc. provided he has obtained at least 55% of marks in the said subjects .

R.M.Sc.T.D. 1(i)

A candidate registered for the course shall be exempted from regular attendance and keeping the terms at the University. He/She shall be required to complete the study of papers under the supervision of P.G. recognized teachers. If a collages proposes to start M.Sc.(T.D.) course in any of the science subjects, the college will have to make necessary provision of recognized teachers for teaching the theory papers at P.G. level.

Candidate registered for this course may be allowed to attend the theory lectures of M.Sc. in the University Departments subject to a condition that they shall pay half tuition fee plus additional fees prescribed for the M.Sc.(except laboratory fee) irrespective of the number of papers or the period of time for which they attend the lectures.

As for those whose service Institutions are not aided by Govt. or affiliated to Solapur university the students may be asked to give full details of the institution, such as the date of establishment, registration No.etc.

R. M.Sc. T.D.1 (ii)

"A candidate admitted to the course shall have to do research work under the guidance of a teacher recognized by the University for the purpose for a minimum period of four terms in a laboratory of the University Department or college recognized by the University. He shall be eligible to submit his dissertation after completion of this period and only after he/ she passes in the theory papers. The candidate shall complete his/ her theory papers and dissertation within a period of 4 years."

Allocation of students :

1. University Teachers	2 Students
2. College Teachers	1 Students

R.M.Sc. T.D. : 1(iii).

Applications for admission to the examination shall have to be made in the prescribed form through his/her guide on or before the date prescribed by the Registrar of the Solapur University.

R.M.Sc. T.D. : 1(iv)

The students shall be admitted , this course in June/ July every year.

R. M.Sc. T.D. 2:

The medium of instruction and examination for the courses leading to M.Sc. (Theory and Dissertation) shall be English.

R. M.Sc. T.D. 3 :

1) There should be uniform , common structure of 2500 marks.

The scheme of the marks is as under.

a) Theory	**- Part I - 800 marks + Part II - 800 marks = 1600 marks (16 papers of 100 marks each)**
b) Dissertation	**- 600 marks to be submitted at the end of IInd Year**
c) Oral	**- 100 marks based on dissertation.**
d) Seminars	**- 200 marks Four Seminars of 50 Marks each (2 Seminars per part)**
Total	**- 2500 marks**

This scheme of marks is applicable to all subject

2) a. The examination will be the same as per regular M.Sc. Course , there will be semester pattern of four papers per term.

b. Theory Examination shall be as per regular 70 Marks examination and then marks will be converted vide proportionate conversion factor.

3) The duration of the course of will be two years and it will be extendable for two year.

4) Nature of Question paper – As decided by University time to time

R. M.Sc. T. D. 4 :

The fees for admission to the M.Sc. theory examination shall be as per regular M.Sc. Course.

R. M.Sc. T. D. 5(i) :

Three months before the submission of the dissertation, the candidate shall forward to the Registrar through his / her research guide and the Head of the Institution /College where he/she is working five copies of the statement giving the title and synopsis of the dissertation.

R. M. Sc. TD. 5(ii)

A candidate shall submit four copies of the dissertation along with the fee of Rs. 1000/- as a dissertation fee after the completion of four terms after admission and only after the candidate passes the theory papers. No candidate shall be allowed to submit the dissertation after a period of four years from the date of admission unless extension is granted for submitting the dissertation by the University authorities.

R.M.Sc. T. D. 6: Procedure for evaluation of Dissertation.

1. There will be a M.Sc.(Theory and Dissertation) committee in all subjects comprising
   - i.) The Dean of the Faculty
   - ii.) Director of Schools of the University & Head of the Department running M.Sc. (Theory and Dissertation) Course in affiliated colleges/ institutions.
   - iii.) All Professors in the respective School.
   - iv.) Two M.Sc. (Theory and Dissertation) Supervisors to be nominated by the Pro-vice Chancellor.
2. This committee shall prepare an exhaustive panel of examiners for approval of the B.O.D / Academic Council.

i) After the approval of the exhaustive by the B.O.D / Academic Council the Director of School in consultation with the guide/Supervisor of the center where M.Sc. student is working shall recommend three names from the list to the Pro-vice Chancellor for appointing one person as the referee for a dissertation.

(ii) a) In case where the Guide and Director / HOD of the College/ University Department are one and the same the other senior recognized teacher in the concerned Department shall suggest three names in consultation with the guide.

b) Where the guide and Director / HOD of the college are one and the same, the other senior recognized teacher in the college/ Department shall suggest three names in consultation with the guide.

c) In case where the guide and Director / HOD of the College are one and the same and where there is no other recognized teacher available in the colleges, the HOD university Department shall suggest three names in consultation with the guide.

iii) The Pro-vice Chancellor shall nominate one person out of the three as the referee for the dissertation.

NB : The question of appointing referees will be taken in hand only after receipt of the dissertation.

R.M.Sc. TD 7 :

Seminar will be conducted regularly and evaluated by the guide under, whose guidance the
candidate has registered, and he shall submit the seminar marks to the Director Board of Examination & Evaluation through the Head of the Department/ Principal of the College/ Director of the recognized research Institute, where the student is registered.

R.M.Sc. TD. 8 :

The viva will be conducted by the guide and two members of teaching staff in the University Department or the affiliated Colleges who are specialized in the subject matter of dissertation. The names of these two members will be decided by the Pro-vice Chancellor from the list submitted by the guide. The viva will be conducted in the Solapur University campus.

O.M.Sc. T.D. 2 : Standard of passing :

1. Each theory paper, four seminars together, dissertation and viva will be separate heads of passing.
2. A candidate will have to secure minimum 40% marks in each head of passing separately.
3. If a candidate fails to get minimum 40% marks in any head of passing, he / she may reappear in those heads only. If a candidate fails to get 40% marks in the dissertation total, he/ she may resubmit the dissertation after due revision. If he/ she fails to get minimum 40% marks in seminar total, he / she will have to give fresh seminars. If a candidates fails to get minimum 40% marks in the Viva , he / she may reappear for Viva after better preparation.

The standard of declaring class of the passing of M.Sc. (Theory and Dissertation) will be same as regular M.Sc.

R.M.Sc. T. D. 9 :

The M.Sc. (Theory & Dissertation) can be offered in all Science subjects.

RM.Sc. TD 10 :

The syllabi and that of recommended books in the papers in various science subjects shall be prepared by the respective Boards of studies. These syllabi shall be subject to such amendments or modifications as may be made by the Academic Council on the recommendation of the Board of Studies from time to time.

The rates of fees charged for the course are as per the regular course

10. Tuition Fees per term : as per regular course

The University authorities have also decided that the students admitted for this Course and desires to attend regular lectures of the M.Sc. Course shall be charged additional fee of Rs. 200/- per paper per year.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।
NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Theory & Dissertation

Name of the Course: M.Sc. I (Sem.– I & II)

(Syllabus to be implemented from w.e.f. June 2019)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M. Sc. I Chemistry (Theory & Dissertation)

(w.e.f. June 2019-2020)

1. **M.Sc. (Polymer Chemistry)**
2. **M.Sc. (Industrial Chemistry)**
3. **M.Sc. (Organic Chemistry)**

Following P.G. courses are offered at the colleges affiliated to Solapur University, Solapur

4. **M.Sc. (Physical Chemistry & Pharmaceutical Chemistry**), DBF Dayanand College of Arts and Science, Solapur
5. **M.Sc. (Analytical Chemistry**), KBP College, Pandharpur
6. **M.Sc. (Inorganic Chemistry**), Walchand College of Arts and Science, Solapur
7. **M.Sc. (Analytical Chemistry),** Shri Shivaji College, Barshi

The above courses are of two year duration consisting of four Semesters (First year : Semester I and II, second year: Semester III and IV). **First year is common to all above referred to courses (1 to 7).**

Course structure of first year

Semester I

Paper (HCT1.1): Inorganic Chemistry I

Paper(HCT1.2): Organic Chemistry I

Paper (HCT1.3): Physical Chemistry I

Paper (SCT1.1): Analytical I Chemistry I

Semester II

Paper (HCT2.1): Inorganic Chemistry II

Paper (HCT2.2): Organic Chemistry II

Paper (SCT2.1): Physical Chemistry II

Paper (OET2.1): Instrumental Methods of Analysis

Syllabus

The syllabus has been prepared taking into consideration the present and near future needs of the industries and academic institutes, SET, NET, UGC guidelines, and syllabi of other universities and as per the national needs. The students will be exposed to the basic as well as advanced and upto date knowledge of the subject.

M. Sc. Part-I (Semester-I)
Inorganic Chemistry– I
Paper- (HCT1.1)

Unit-I: Wave Mechanics **(15)**

Origin of quantum theory, black body radiation, atomic spectra, photoelectric effect, matter waves, wave nature of the electron, the wave equation, the particle in one dimensional box, the particle in three dimentional box, the hydrogen atom, transformations of coordinates, separation of variables and their significance, the Φ equation, the Θ equation and the Radial equation.

Unit-II: Chemistry of Transition Elements **(15)**

General characteristic properties of transition elements, co-ordination chemistry oftransition metal ions, ligand field theory, ligand field energy parameters(Racahparameters B and C, Slater Condon Parameters, Slater Condon Shortley Parameters), splitting of d orbitals in low symmetry environment, Janh-Teller effect, interpretationof electronic spectra including charge transfer spectra, spectrochemical series, nephelauxetic effect and nephelauxetic series. Dia-para-ferro and antiferromagnetism, quenching of orbital angular moments, spin orbit coupling, metal clusters, metal carbonyls.

Unit-III: A) Stereochemistry and Bonding **(08)**

VSEPR theory, Walsh diagrams (tri and penta-atomic molecules) dπ – pπ bonds, Bent`s rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Unit-III: B) Inorganic Materials, **(07)**

Insulators and semiconductors, electronic structure of solids, band theory, intrinsic and extrinsic semiconductors, doping of semiconductors and conduction mechanism, semiconductor devices, rectifiers, transistors, photoconductors, photovoltaic cell.

Unit-IV: Nuclear Chemistry **(15)**

Radioactive decay and equilibrium, Nuclear reactions, Q values, cross sections, types of reactions. Chemical effects of nuclear transformations, fission and fusion, fission products and fission yields. Radio active techniques, tracer techniques, neutron activation analysis, counting techniques such as G.M., ionization and proportional counters.

RECOMMENDED BOOKS

1. A. F. Wells, Structural Inorganic Chemistry – 5th Edition (1984), Oxford Science Publication
2. James H. Huheey, Inorganic Chemistry- Principle, Structure and Reactivity,
3. J. D. Lee, Concise Inorganic Chemistry, ELBS with Chapman and Hall, London
4. A.R. West, Solid State Chemistry and its applications, Plenum-John Wiley and Sons
5. N.B. Hanny, Solid State Physics
6. H.V. Keer, Solid State Chemistry
7. S.O. Pillai, Solid State Physics, New Age International Publication
8. W.D. Callister, Material Science and Engineering: An Introduction, John Wiley and Sons
9. R. Raghwan, First Course in Material Science
10. R.W. Cahan, The coming of Material Science
11. A.R. West, Basic Solid State Chemistry, 2nd Edition, John Wiley and Sons
12. U. Schubest and H. Husing, Synthesis of Inorganic Materials, Wiley VCH (2000)
13. M.C. Day and Selbin, Theoretical Inorganic Chemistry, Reinhold, EWAP
14. A.H. Hanny, Solid State Chemistry, A.H. Publication
15. John Wullf, The Structure and Properties of Materials, Vol. 4, Electronic properties, Willey Estern
16. L.V. Azoroff and J.J. Brophy, Elecronic Processes in Materials, Mc Graw Hill –I
17. Prakash G. More, Comprehensive Industrial Chemistry, Pragati Prakashan,Meerut
18. F.A. Cotton and R.G. Wilkinson, Advanced Inorganic Chemistry, Wiley Students Edition
19. Williams and L. Jooly, Modern Inorganic Chemistry, McGraw-Hill International Edition
20. Manas Chanda, Atomic Structure and Bonding, TMH Publication
21. N.N. Greenwood and A. Earnshaw, Chemistry of Elements, Pergamon
22. Chakrabarty, Solid State Chemistry, New Age International Publication
23. J.J. Lipard, Progress in Inorganic Chemistry, Vol 18 and 38, Wiley
24. E. Konig, Structure and Bonding, Vol 9, 1971, 175
25. H.J. Arnikar, Essentials of Nuclear Chemistry, New Age International Publication
26. Friendlander, Kennedy and Miller, Nuclear and Radiochemistry, Wiley and Sons

M. Sc.-I (Semester-I)
Organic Chemistry-I
Paper (HCT1.2)

Unit –I

(a) Reaction mechanism: Structure and reactivity (7)

Types of reactions, strength of acids and bases. Generation, structure, stability and reactivity of reaction intermediates: Carbocations, carbanions, free radicals, carbenes, nitrenes, benzynes and ylides. Effect of structure on reactivity: resonance, steric, hyperconjugation effects

(b) Aliphatic Nucleophilic substitutions: (8)

The SN_2, SN_1 and SN^i with respect to mechanism and stereochemistry. Nucleophilic substitutions at an allylic, aliphatic trigonal, benzylic, aryl and vinylic carbons. Reactivity effect of substrate structure, effect of attacking nucleophiles, leaving groups and reaction medium. SN reactions at bridged head carbon, competition between SN^1 and SN^2, ambident nucleophiles, Neighbouring Group Participation.

Unit - II

(a) Aromatic Electrophilic Substitutions: (8)

Introduction, the arenium ion mechanism, orientation and reactivity in Nitration, Sulphonation, Friedel-Crafts and Halogenation in monosubstituted aromatic systems, energy profile diagrams. The ortho / para ratio, ipso attack, orientation in other ring systems (naphthalene, anthracene, 5 and 6 membered aromatic heterocyclic compounds). Diazo-coupling, Vilsmeir reaction, Gatterman-Koch reaction. Nucleophilic aromatic substitution reactions SN_1 ,SN_2 and Arynes.

(b) Addition to Carbon–Carbon Multiple Bonds (7)

Mechanism and stereochemical aspects of the addition reactions involving electrophiles, nucleophiles and free radicals, regio-and chemo – selectivity, orientation and reactivity. Hydrogenation of double, triple bonds and aromatic rings. Michael reaction. Sharpless asymmetric epoxidation.

Unit - III

(a) Elimination Reactions: (8)

The E1, E2 and E1cB mechanisms. Orientation in Elimination reactions. Hofman versus Saytzeff elimination. Reactivity: effects of substrate structures , attacking base, the leaving group, the nature of medium on elimination reactions, competition between substitution and elimination reactions, pyrolytic elimination reactions.

(b) Rearrangements: **(7)**

Study of following rearrangements with mechanism and stereochemistry**:** Beckman, Fries, Hoffman, Schmidt, Curtius , Lossen, Claisen, Benzilic acid, Wolff, Steven's & Sommelet-Hauser**.**

Unit – IV

Stereochemistry: **(15)**

Isomerism, classification of isomers (constitutional and stereoisomers). Concept of Chirality: Recognition of symmetry elements and chiral structures, Prochiral relationship. Racemic modifications and their resolution. R and S nomenclature. Geometrical isomerism E and Z omenclature., Erythro and Threo nomenclature, Conformational analysis of mono and isubstituted cyclohexanes (stability and reactivity), representation of conformational isomers.

RECOMMENDED BOOKS

1) A guide book to mechanism in Organic Chemistry (Orient-Longmens)- Peter Sykes
2) Organic reaction mechanism (Benjamin) R. Breslow
3) Mechanism and structure in Organic Chemistry (Holt Reinh.)B. S. Gould.
4) Organic chemistry (McGraw-Hill) Hendrickson, Cram and Hammond.
5) Basic principles of Organic Chemistry (Benjamin) J. D.Roberts and M. C. Caserio.
6) Reactive Intermediates in Organic Chemistry (John Wiley) N. S. Issacs.
7) Stereochemistry of Carbon compounds. (McGraw-Hill)E.L.Eliel
8) Organic Stereochemistry (McGraw-Hill) by Hallas.
9) Organic reaction mechanism (McGraw-Hill) R. K. Bansal.
10) Organic Chemistry- R. T. Morrison and R. N. Boyd,(Prentice Hall.)
11) Modern organic reactions (Benjumin) H. O. House.
12) Principle of organic synthesis- R.O.C. Norman and J. M. Coxon.(ELBS)
13) Reaction mechanism in Organic Chemistry- S. M. Mukharji and S. P. Singh.
14) Stereochemistry of Organic Compounds) D. Nasipuri.
15) Advanced Organic Chemistry (McGraw-Hill) J. March.
16) Introduction to Stereochemistry (Benjumin) K. Mislow.
17) Stereochemistry by P. S. Kalsi (New Age International)

M. Sc.-I (Semester-I)
Physical Chemistry-I
Paper- (HCT 1.3)

Unit-1: Chemical Thermodynamics [15]

Review of Thermodynamics laws, Derivations of Maxwells Relations, Thermodynamic equation of state, Entropy and Third law of thermodynamics, residual entropy. Concept of fugacity and determination of fugacity, Activity and activity coefficients of solute and solvent, their determination by freezing point depression and vapour pressure measurement, criteria for equilibrium between phases, Derivation of phase rule, application of phase rule to three component system.

Unit-2A: Thermodynamics of Solutions [5]

Thermodynamics of ideal solutions, Raoult's and Henrey's law, Excess and mixing thermodynamic properties of Non- ideal solutions and their determination.

Unit-2B: Fast Reactions: [10]

Study of kinetics by stop-flow technique, relaxation method, flash photolysis and magnetic resonance method, pressure jump method.

(More stress should be given in solving the numerical problems).

Unit-3: Statistical Thermodynamics: [15]

Weights and configurations, the most probable configuration, thermodynamic probability and entropy: Boltzmann – Planck equation. Ensembles, ensemble average and time average of property. Maxwell-Boltzmann (MB) distribution law and its application to viscosity and diffusion of gases. Physical significance of distribution Law.

Unit-4: Colloids and macromolecules [15]

Colloids : Types of colloids, preparation and properties of colloids, surfactant: classification, micelle formation, critical micelle concentration, structure of micelle.

Macromolecules: Polymerization, mechanism and kinetics of Free radical polymerization, Step growth polymerization (Polycondensation), and ionic (cationic and anionic) chain polymerizations. Molecular weight of polymer, Number average, weight average, Viscosity average molecular weight, numerical problems on molecular weights. Degree of polymerization and molecular weight, methods of determination of molecular weights: Osmometry, Viscometry, Light scattering.

RECOMMENDED BOOKS

1. Physical Chemistry- P.W. Atkins
2. Text book of physical chemistry- S.Glasstone
3. Principles of Physical Chemistry – Marron and Prutton
4. Physical Chemistry- G.M.Barrow
5. Thermodynamics for chemists – S.Glasstone
6. Thermodynamics – Lewis and Randall, revised by Pitzer
7. Physical Chemistry of macromolecules –D D.Deshpande
8. Polymer Chemistry – F.Billimeyer
9. Kinetics and Mechanism – Frost and Pearson
10. Chemical and Kinetics by K. J. Laidler
11. An Introduction to Statistical Thermodynamics – T.L. Hill, Addison-Wesley. 1960.
12. Statistical Mechanics – Donald A. McQuarrie, 2000.
13. Elements of statistical thermodynamics - L. K. Nash, 2nd Ed. Addison Wesley. 1974.
14. Introduction to Colloid and Surface Chemistry – D. Shaw, Butterworth Heinemann, 1992.

M. Sc.- I (Semester-I)
Analytical Chemistry-I
Paper-(SCT 1.1)

Unit-1: Statistical data analysis **(15)**

Errors, Types of Errors: Determinate, constant, proportional and indeterminate; Significant figures and computation rules, Accuracy and precision, Distribution of random errors, Average deviation and Standard deviation, Variance and Confidence Limit, Least Square method.

Methods of Sampling, Sample Size, Techniques of Sampling gases and Solids.

Unit-2: Chromatographic Methods **(15)**

General principles, Classification of Chromatographic methods. Nature of partition forces, Chromatographic behavior of solutes, coloumn efficiency and resolution. Gas Chromatography: Theory and Instrumentation, column types, solid-liquid stationary phases, column switching techniques, basic and specialized detectors.

High Performance Liquid Chromatography: Theory and instrumentation, adsorption and applications.

Unit-3: Electroanalytical Techniques: **(15)**

Polarography: - Introduction, Instrumentation, Ilkovic equation and its application in quantitative analysis. Half wave potential. Derivation of wave equation, Determination of half wave potential, qualitative and quantitative applications Amperometry: - Principles, instrumentation, nature of titration curves, analytical applications.

Unit-4: Computer for Chemists: **(15)**

Introduction: Software: Overview of the key elements of basic programme structure, loops, arrays, mathematical functions. User defined functions, Conditional statements, strings, Applications, Data representation, Computerized instrument systems, Microcomputer interfacing.

Linear regression, X-Y plots, numerical integration and differentiation, operating with softwares such as PCMODEL, WINMOPAC, word processing, use of MSWORD, powerpoint and EXCEL in chemistry, use of internet.

RECOMMENDED BOOKS

1. Analytical Chemistry (J.W.)-G. D. Christian.
2. Introduction to Chromatography.1) Bobbit,2) Srivastva.
3. Instrumental Methods of Analysis (CBS)-H. H. Willard, L. L. Merrit, J. A. Dean & F. A. Settle.
4. Instrumental Methods of Analysis: Chatwal and Anand.
5. Instrumental Methods of Inorganic Analysis(ELBS):A. I. Vogel.
6. Chemical Instrumentation: A. Systematic approach-H. A. Strobel.
7. Physical Chemistry-P. W. Atkins.
8. Principles of Instrumental Analysis- D. Skoog and D. West.
9. Treatise on Analytical Chemistry: Vol. I to Vol. II-I .M. Kolthoff.
10. Computer, Fundamentals-P. K. Sinha.
11. Programming in BASIC-E. Balaguruswamy.
12. Computer programming made simple: J. Maynard.
13. The principles of ion selective electrodes and membrane transport.-W.E Mort
14. Computational Chemistry- G. Grant and W. Richards, Oxford University Press.
15. Computer for chemists by S. K. Pundir and A. Ban

M. Sc.-I (Semester-II)
Inorganic Chemistry – II
Paper-(HCT 2.1)

Unit-I: Chemistry of Non- transition Elements (15)

General discussion of the properties of non- transition elements, special features of the individual elements, synthesis, properties and structure of their halides and oxides, polymorphism of carbon, phosphorous, sulphur. Synthesis, structure and properties of boranes, carboranes, borazines, silicates, carbides, silicones, phosphazenes, sulphur nitrogen compounds, oxyacids of nitrogen, phosphorous, sulphur and halogen, interhalogens, pseudohalides and noble gas compounds.

Unit-II: Organometallic Chemistry of Transition Elements (15)

Synthesis, structure and bonding, organometallic reagents in organic synthesis and in homogenous catalytic reactions (hydrogenation, hydroformylation, isomerization,Monsanto acetic acid process, synthesis gas, Wacker Process), Ziegler and Natta catalysis, pi-metal complexes, activation of small molecules by coordination.

Unit-III: A) Metal- Ligand Equillibria in Solution (07)

Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the metal ion and ligand, chelate effect and its thermodynamic origin, determination of formation constants by pH-metry and spectrophotometry.

Unit-III: B) Chemistry of Lanthanides and Actinides (08)

Lanthanides: Introduction, spectral and magnetic properties. Classical methods of separation of lanthanides: (i) precipitation (ii) thermal reaction, (iii) fractional crystallization, (iv) complex formation, (v) solvent extraction and (vi) ion exchange. Use of lanthide compounds as shift reagent. Applications of lanthanides.

Actinides: Introduction, spectral and magnetic properties. Methods of separation of actinides. Preparation of trans-uranic elements. Applications of actinides. Further extension of periodic table.

Unit-IV: A) Metallurgy (08)

Occurance, extraction, properties and applications of copper, silver, gold, zinc, tin and lead.

Unit-IV: B) Bioinorganic Chemistry (07)

Role of metal ions in biological processes, molecular mechanism of ion transport across membranes, ionophores, photosynthesis PS I and PS II, nitrogen fixation, oxygen uptake proteins, cytochromes and ferrodoxines.

RECOMMENDED BOOKS

1. A. F. Wells, Structural Inorganic Chemistry – 5th Edition (1984), Oxford Science Edition
2. James H. Huheey, Inorganic Chemistry- Principle, Structure and Reactivity, Harper and Row Publisher Inc., New York
3. J. D. Lee, Concise Inorganic Chemistry, ELBS with Chapman and Hall, London
4. M.C. Day and Selbin, Theoretical Inorganic Chemistry, Reinhold, EWAP
5. Jones, Elementary Coordination Chemistry
6. Morttel, Coordination Chemistry
7. T.S. Swain and D.S.T. Black, Organometallic Chemistry
8. Prakash G. More, Comprehensive Industrial Chemistry, Pragati Prakashan, Meerut
9. John Wullf, The Structure and Properties of Materials, Vol. 4, Electronic properties, Willey Eastern
10. L.V. Azoroff and J.J. Brophy, Elecronic Processes in Materials, McGraw Hill –I
11. F.A. Cotton and R.G. Wilkinson, Advanced Inorganic Chemistry, Wiley Student Edition
12. Williams and L. Jooly, Modern Inorganic Chemistry, McGraw Hill International Edition
13. Manas Chanda, Atomic Structure and Bonding,TMH Publication
14. P.L. Pausan, Organometallic Chemistry
15. Cullen, Dolphin and James, Biological Aspects of Inorganic Chemistry
16. Williams, An Introduction to Bioinorganic Chemistry
17. M.N. Hughes, Inorganic Chemistry of Biological Processes
18. Ochi, Bioinorganic Chemistry
19. O.A. Phiops, Metals and Metabolism
20. S.J. Lipard and J.M. Berg, Principles of Bioinorganic Chemistry, University Science Books
21. G.L. Eichhron, Inorganic Bichemistry, Vol I and II, Elsevier

M. Sc. - I (Semester-II)
Organic Chemistry-II
Paper (HCT 2.2)

Unit-I

(a) Study of following reactions with mechanism: (7)

Dieckmann, Benzoin, Favorskii reaction, Reimer-Tieman, Stobbe, Diels-Alder, Robinson annulation, Chichibabin, Simon- Smith, Ulhmann, Mc. Murry and Dakin.

(b) Reagents in organic syntheses: (8)

Complex metal hydrides, LDA, dicyclohexylcarbodiimide(DCC), PTC, crown ethers, Merrifield resin, Peterson's synthesis, 1,3-dithiane, diazomethane, DDQ.

Unit – II

(a) Reduction: (7)

Study of following reductions: Catalytic hydrogenation using homogeneous and heterogeneous catalysts. Study of following reactions: Wolff-Kishner, Meerwein Pondorff Verley, Birch, Clemmensen, Sodium borohydride, Lithium Aluminium hydride (LAH) and Sodium in alcohol.

(b) Oxidation: **(8)**

Application of following oxidizing agents: $KMnO_4$, chromium trioxide (Jone's reagent, PCC, PDC), Manganese dioxide, Osmium tetraoxide, Oppenauer oxidation and Lead tetra-acetate., Hydrogen peroxide, Baeyer-Villiger oxidation, Prevost-Woodward hydroxylation by silver oxide.

Unit – III

(a) Study of Organometallic compounds: **(8)**

Organo-magnesium, Organo-zinc, Organo-lithium, organo-copper and organo-tin reagents. Addition reactions: Additions to carbonyl and unsaturated carbonyl compounds, Witting reaction.

(b) Methodologies in organic synthesis: (7)

Ideas of synthons and retrones, functional group transformation and interconversions of Simple functionalities.

Unit – IV

(a) Hydroboration: Mechanism and synthetic applications **(5)**

(b) Enamines :Formation and reactivity of enamines **(5)**

(c) Protection of functional group: Principle of protection of alcohol, amine, carbonyl and carboxyl group**.** **(5)**

RECOMMONDED BOOKS

1. Modern synthetic reactions-(Benjamin) H. O. House.
2. Reagents in organic synthesis-(John Wiley) Fieser and Fieser
3. Principles of Organic synthesis-(Methuen) R. O. C. Norman
4. Hydroboration- S. C. Brown.
5. Advances in Organometallic Chemistry- (A.P.)F. C. A. Stone and R. West.
6. Organic Chemistry (Longman)Vol. I & Vol. II- Finar
7. Oxidation by-(Marcel Dekker) Augustin
8. Advanced Organic Chemistry 2nd Ed. R R. Carey and R. J. Sundburg.
9. Tetrahedron reports in Organic Chemistry- Vol.1, No. 8.
10. Organic Synthesis-(Prentice Hall)R. E. Ireland.
11. Homogeneous Hydrogenation-(J. K.) B. R. James.
12. Comprehensive Organic Chemistry- (Pargamon) Barton and Ollis.
13. Organic reactions- various volumes- R. Adams.
14. Some modern methods of Organic synthesis-(Cambridge) W. Carruthares.
15. Advanced Organic Chemistry – J. March
16. Lehninger's Principles of Biochemistry,(4th Ed.) David L. Nelson, Michael M. Cox
17.Organic synthesis – Jagdamba singh and L. D. S. Yadav

M.Sc.- I (Semester-II)
Physical Chemistry-II
Paper-(SCT 2.1)

Unit-1: Photochemistry-I **[15]**

Introduction, Absorption of light and nature of absorption spectra, electronic transitions, Franck–Condon principle, electronic excitation, photodissociation and Predissocition, photoreduction, photooxidation, photochemistry in environment (Green house effect, ozone depletion).

Unit-2: Photochemistry-II **[15]**

Photophysical phenomenon. Jablonski digram. Kasha's rule, fluorescence, phosphorescence, delayed fluorescence, differences between phosphorescence and delayed fluorescence. Inter & intra molecular excitation energy transfer (EET) processes. Quenching of fluorescence and kinetics of biomolecluar quenching processes, Stern-Volmer equation, formation of photodimer, (with suitable examples) excimer and exciplex.

Unit-3A: Electrochemistry **[9]**

Electrical double layer and its significance (Helmholtz, Gouy-Chapmann and Stern model), evaluation of mean activity coefficients of ions from e.m.f. data, determination of dissociation constant of monobasic acid by e.m.f. method. Debye Huckel theory (without derivation) and limiting law. Storage batteries: acid and alkali storage cells.

Unit-3B: Bio-Physical Chemistry **[6]**

Introduction to Biophysical chemistry, structure and functions of proteins, folding and defolding phenomena, Nucleic acids (DNA and RNA). Bioenergetics: Standard free energy change in biochemical reactions, exergonic and enderogonic, synthesis of ATP.

Unit-4: Chemical Kinetics **[15]**

Rate determining step, steady state approximation. fractional order kinetics, Higher order kinetics and their examples.

Reaction mechanism: Thermal decomposition of acetaldehyde, ethane, reaction between hydrogen and halogens, reaction between NO_2 and F_2, Decomposition of Ozone. Ionic reactions: Primary and secondary salt effect, Effect of ionic strength and dielectric constant of medium on the rate of ionic reactions in solution.

RECOMMENDED BOOKS

1. Photo chemistry- J.G.Calverts & J.N.Pits
2. Fundamentals of Photochemistry- K.K.Rohatgi, Mukharji
3. Photochemistry of Solutions – C. A. Parker
4. Chemical Kinetics – K.J.Laidler
5. Kinetics and Machanism - R. A. Frost and R. G. Pearson
6. Electrochemistry – S.Glasstone
7. Modern electrochemistry – Bockris & Reddy
8. Physical Chemistry – P. W. Atkins
9. Physical Chemistry – G. M. Barrow
10. Principles of Biochemistry – A. L. Lehninger
11. Biochemistry - L. Stryer, W. H. Freeman
12. Biochemistry – J. David Rawn
13. Physical Chemistry: A molecular Approach – Donald A. McQuarrie and John D. Simon, Viva Books, New Delhi, 1998.
14. Introduction to Photochemistry-Wells
15. Electrolytic Solutions by R. A. Robinson and R. H. Strokes, 1959
16. Basic chemical Kinetics- G. L. Agarwal, Tata-McGraw Hill

M.

M.Sc.-I (Semester-II)
Instrumental Methods of Analysis
Paper (OET 2.1)

Unit-1: A) Ultraviolet and visible Spectrophotometry (8)

Introduction, Beer Lambert's law. Instrumentation, calculation of absorption maxima of dienes, dienones and polyenes, Qualitative and Quantitative applications .

Unit-1: B) Infra-red spectroscopy (7)

Introduction, instrutnentation, sampling technique, selection rules, types of bonds, absorption of common functional groups. Factors affecting frequencies, applications.

Unit-2: Nuclear Magnetic Resonance (15)

NMR: Introduction, principle, magnetic and nonmagnetic nucler , processional motion, Larmor frequency, absorption of radio frequency, Instrumentation (FT-NMR). Sample preparation, shielding and deshielding effects, chemical shift, internal standards, factor influencing chemical shifts, solvent used, peak area and proton ratio, anisotropic effect, spin-spin coupling, coupling constant and application to simple structure problem.

Unit-3: A) Mass spectroscopy (8)

Principle, working of mass spectrometer (double beam). Formation of different types of ions, Mc Lafferty rearrangements, fragmentation of alkanes, alkyl aromatics, alcohols and ketones in brief simple applications.

Unit-3: B) Simple structural problems based on IR,UV, NMR and MS. **(7)**

Unit-4: A) Atomic Absorption Spectroscopy (8)

Introduction, principle, difference between AAS and FES. Advantages of AAS over FES, Disadvantages of AAS, Instrumentation, Single and double beam AAS, Detection limits and sensitivity, Interference, Applications.

Unit-4: B) Inductively Coupled Plasma Spectroscopy (7)

Introduction, nebulization, torch, plasma, instrumentation, interferences, Applications.

RECOMMENDED BOOKS

1. Instrumental Methods of Analysis (CBS, Delhi)-Willard, Merritt, Dean & Settle.
2. Spectroscopic identification of Organic Compound (J.W.)R. M. Silverstein and G. C. Bassler.
3. Spectroscopic methods in Organic Chemistry (T. M .Hill)-D .H.Williams and I.Fleming.
4. Absorption Spectroscopy of Organic molecules (Addison-Wesley) V.M.Parikh.
5. Applications of Spectroscopy techniques in Organic Chemistry – (Wiley Eastern)- P.S.Kalsi.
6. Physical methods in Inorganic chemistry (DWAR)- R.Drago
7. Chemical Spectroscopy (Elsevier) Dudd.
8. Instrumental methods of analysis – Chatwal & Anand
9. Introduction to EPR (Hilger)- Assenliein.
10. Fundamentals of Analytical Chemistry by D.A. Skoog & D. M. West (Holt Rinehart & Winston Inc).

1) There should be uniform , common structure of 2500 marks.

The scheme of the marks is as under.

a) Theory - Part I - 800 marks + Part II - 800 marks = 1600 marks
(16 papers of 100 marks each)

b) Dissertation - 600 marks to be submitted at the end of IInd Year

c) Oral - 100 marks based on dissertation.

d) Seminars - 200 marks Four Seminars of 50 Marks each
(2 Seminars per part)

Total - 2500 marks

This scheme of marks is applicable to all subject

2) a. The examination will be the same as per regular M.Sc. Course ,there will be semester pattern of four papers per term.

b. Theory Examination shall be as per regular 70 Marks and then marks will be converted vide proportionate conversion factor to 100.

A candidate shall submit four copies of the dissertation along with the fee of Rs. 1000/- as a dissertation fee after the completion of four terms after admission and only after the candidate passes the theory papers. No candidate shall be allowed to submit the dissertation after a period of four years from the date of admission unless extension is granted for submitting the dissertation by the University authorities.

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