DEPARTMENTOFCHEMISTRY

GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON (C.G.)

SYLLABUS

M.Sc. Chemistry
(Approved by Board of Study for 2025-26)
First and Second Semester

Third and Fourth Semester

2025-26

DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON

ApprovedsyllabusforM.Sc.ChemistrybythemembersofBoardofStudiesforthe Session2025-26

The syllabus with the paper combinations is as under

Semester I:

Paper I: CO-ORDINATION CHEMISTRY	**Paper II: BASICS OF ORGANIC CHEMISTRY, STEREOCHEMISTRY& REACTION MECHANISM**
Paper III: MATHEMATICS FOR CHEMISTS, QUANTUM CHEMISTRY AND CHEMICAL DYNAMICS	**Paper IV: GROUP THEORY, PRINCIPLES OF SPECTROSCOPY AND COMPUTER FOR CHEMISTS**
Lab Course I : PHYSICAL CHEMISTRY & COMPUTERS PRACTICAL	**Lab Course II : INORGANIC CHEMISTRY PRACTICAL**

Semester II:

Paper I: TRANSITION METAL COMPLEXES AND DIFFRACTION METHODS	**Paper II: REACTION MECHANISM, REARRENGMENTS & REAGENTS**
Paper III: THERMODYNAMICS, ELECTROCHEMISTRY AND SURFACE CHEMISTRY	**Paper IV: SPECTROSCOPY**
Lab Course I : ORGANIC CHEMISTRY PRACTICAL	**Lab Course II: ANALYTICAL CHEMISTRY**

Semester III:

Paper I : CHROMATOGRAPHIC TECHNIQUES AND APPLICATIONS OF SPECTROSCOPY	**Paper II: BIO-CHEMISTRY& BIOMOLECULES**
Paper III: ORGANOTRANSITION METAL COMPLEXES	**Paper IV : PHOTOINORGANIC AND ANALYTICAL CHEMISTRY**
Lab Course I : ANALYTICAL CHEMISTRY PRACTICALS	**Lab Course II: PROJECT**

Semester IV:

Paper I: PHOTOCHEMISTRY AND SOLID STATE CHEMISTRY	**Paper II: ENVIRONMENTAL CHEMISTRY**
Paper III: BIOINORGANIC AND SUPRAMOLECULAR CHEMISTRY	**Paper IV: Elective – A CHEMISTRY OF MATERIAL AND RADIOCHEMISTRY Elective - B POLYMER CHEMISTRY**
Lab Course I: PROJECT	**Lab Course II: ANALYTICAL CHEMISTRY PRACTICAL**

The syllabus for M.Sc. Chemistry is hereby approved for the session 2025-26

12/7/2025

(Dr. A.K. Sharma)

(Dr. DKV)

GENERAL INSTRUCTIONS FOR STUDENTS

1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessmentseparately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semesterexamination.
3. The internal assessment shall include class test, home assignment and seminar presentation.
4. a. In internal assessment, the marks will be taken into consideration (i.e. the class test and the home assignment) for each paper and shall beof 20 marks each.

   b. The seminar shall be in lieu of class test and home assignment combined and shall be of 20marks.

   c. There shall be one seminar in each semester. Paper I will be dedicated to seminar in first semester, similarly paper II in second semester, paper III in third semester and paper IV in fourth semester respectively for the purpose of Internal assessment. The marking of seminar shall be in terms of hard copy submission (10 marks) and presentation and open discussion (10marks).

   d. The students will plant a tree for each paper in first semester (total 4 trees). They will protect and take care of the plants for the next two years. For this they will be awarded 5 marks in each paper for each protected plant during IV semester as assignmententitledas"enhancementofoxygenlevelforprotectionofenvironment"
5. The grading system shall be implemented from the session 2015-2016 onwards for the students admitted in the first semester of all PG programmes.

DIRECTIVES FOR STUDENTS, FACULTY AND EXAMINERS

1 There shall be three sections (Section A, B and C) in each theorypaper.

2 Section A shall contain very short answer type questions (Maximum three lines answer) or objective type questions (fill in the blank) **(no multiple choice questions)**.

3 Section B shall contain short answer type questions with the maximum limit of 150 words.

4 Section C shall contain long answer/ descriptive type questions. The students are required to answer precisely with maximum limit of 500 words.

5 The students are required to study the content mentioned in the curriculum exhaustively.

EVALUATION PATTERN

Theory 80 marks = 04 Credits

1. ***Very short answer type questions*** – Altogether 04 questions are to be set from the entire syllabus, and shall be compulsory. (03 x 04 =12)

2. ***Short answer type question*** – Altogether 08 questions are to be set i.e. two from each unit with the internal choice. The candidates are required to solve one from each unit. (05 x 04 =20)

3. ***Long answer type question*** – Altogether 08 questions are to be set i.e. two from each unit with the internal choice. The candidates are required to solve one from each unit. (12 x 04 =48)

Internal Assessment 20 marks = 01 credit

- ***Unit test*** – One class test in each theory paper comprising 20 markscontaining
  - ➢ one very short answer type question of 03marks,
  - ➢ one short answer type question of 05 marks with optionand
  - ➢ one long answer type questions of 12 marks withoption).
- ***Home assignments*** – Two long answer type questions from each theory paper containing 10 marks each. The answer should be prepared with the help of standard reference books. (The titles of those books, authors, year of publication and publishers details should be mentioned in an appropriate way, at the end of each assignment).
- ***Seminar presentations (Power point)*** – Comprising 20marks.

  Powerpoint presentations from the syllabus shall be prepared by the students for the purpose of Internal Assessment. The marking of seminar shall be in terms of presentation and open discussion (10 marks) and hard copy submission (10 marks).

Practical/Project work in lieu of practical of 100 marks = 04 credits

For Practical work (Semester I, II, III & IV) :

One Major experiment	= 1 x 30 = 30Marks
Two Minor experiments	= 2 x 15 = 30Marks
Sessional	= 20Marks
Viva	= 20Marks
Total	**= 100Marks**

For Project work (Semester III&IV) = 100Marks

CREDIT ALLOTMENTS

- TheoryPaper = 04 credits (04)
- Practical = 02 credits

TOTAL CREDITS/ SEMESTER

- 04 theory papers (100 each) and two practicals (100 each) in Semester- I &II : **16 + 04 = 20credits**
- 04 theory papers (100 each) and one practical and one project in lieu of one practical (100 each) in Semester- III &IV : **16 + 04 = 20credits**

TOTAL CREDITS / PROGRAMME

- 16 Theory + 08 (Practical + Project work) – 64 + 16 = **80credits**

DEPARTMENT OF CHEMISTRY

GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON (C.G.)

M.Sc. Chemistry

First Semester

2025-26

Syllabus and Marking Scheme for First Semester

Session 2025-26

PAPER NO.	TITLE OF THE PAPER	MARKS ALLOTTED IN THEORY		MARKS ALLOTTED IN INTERNAL ASSESSMENT		CREDITS
		MAX	MIN	MAX.	MIN.	
I	CO-ORDINATION CHEMISTRY	80	16	20	04	04
II	BASICS OF ORGANIC CHEMISTRY AND REACTION MECHANISM	80	16	20	04	04
III	MATHEMATICS FOR CHEMISTS, QUANTUM CHEMISTRY AND CHEMICAL DYNAMICS	80	16	20	04	04
IV	GROUP THEORY, PRINCIPLES OF SPECTROSCOPY AND COMPUTER FOR CHEMISTS	80	16	20	04	04
V	Lab Course I PHYSICAL CHEMISTRY PRACTICAL	100	36	------	-----	02
IV	Lab Course II INORGANIC CHEMISTRY PRACTICAL	100	36	-----	-----	02
	Total	**520**	**----**	**80**	**-----**	**20**

04 Theory papers	**-**	**320**
04 Internal Assessments	**-**	**80**
02 Practical	**-**	**200**
Total Marks	**-**	**600**

Note: 25 marks = 01 credit in Theory Papers and 50 Marks = 01 Credit in Practical.

DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON
M.Sc. CHEMISTRY

SEMESTER - I

2025-26

PAPER- I

CO-ORDINATION CHEMISTRY

Max. Marks: 80

Min. Marks: 16

Unit - I Theories of Chemical Bonding in Co-ordination Chemistry

Basic knowledge of VBT, CFT, VSEPR, Walsh diagrams (tri- and penta-atomic molecules), dπ – pπ bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bondedmolecules.

Jahn-Teller distortion, causes of distortion

Metal π-Ligand Bonding

Limitation of and applications of valence bond theory, crystal field theory, ligand field theory, molecular orbital theory, octahedral, tetrahedral and square planar complexes, π- bonding and molecular orbitaltheory.

Unit –II Metal π -Complexes

π-acceptor ligands, 18 e^- rule, Hepaticity, Sandwich compounds, Preparation and chemical properties of Metal carbonyls, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding, structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine asligand.

Unit –III Metal Ligand Equilibria in Solution

Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by pH metry and spectrophotometry. Energy profile of a reaction, reactivity of metal complexes, inert and labile complexes, kinetic application of valence bond and crystal fieldtheories.

Unit –IV Reaction Mechanism of Transition Metal Complexes

Kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anation reactions, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the substitution reaction. Redox reactions, electron transfer reactions, mechanism of one electron transfer reactions, outer sphere type reaction, cross reactions and Marcus-Hush theory, inner sphere typereactions.

LIST OF REFERENCE BOOKS:

1. Advanced inorganic Chemistry, F.A. Cotton and Wilkinson, JohnWiley.
2. Inorganic Chemistry, J.E. Huhey, Harpes & Row.
3. Chemistry of the Elements, N.N. Greenwood and A. Earnshow, Pergamon.
4. Inorganic Electronic Spectrosocopy, A.B.P. Lever,Elsevier.
5. Magnetochemistry, R.L. Carlim, SpringerVerlag.
6. Comprehensive Coordination Chemistry eds., G. Wilkinson, R.D. Gillars and J.A. McCleverty, Pergamon.
7. Modern spectroscopy, J. M. Hollas, JohnWiley.
8. Applied electron spectroscopy for chemical analysis Ed. H.WindawiandF.L.Ho,WileyInterscience.
9. Mechanisms of Inorganic Reactions, Fred Basalo and Ralph G.Pearson,Wiley Eastern PrivateLt

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DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON
M.Sc. CHEMISTRY
SEMESTER-I

2025-26

PAPER- II

BASICS OF ORGANIC CHEMISTRY, STEREOCHEMISTRY&REACTION MECHANISM

Max. Marks : 80

Min. Marks : 16

Unit-I: Fundamental concepts of organic reactions

Electronic effects in organic molecules; inductive effective, electrometric effect, hyperconjucation, resonance, mesomeric/resonating effect, tautomerism, Conjugation in organic compounds, bonding in Fullerenes, bonds weaker than covalent, addition compounds.

Stereochemistry

Elements of symmetry, chirality, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis. Asymmetric synthesis using chiral reagent, chiral catalysts, chiral auxiliary and chiral substrates (*Felkin-Anh*model and *Cram's* rule), Optical activity in the absence of chiral carbon (biphenyls, allenes and spiranes),chirality due to helical shape.Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

Conformational analysis

Conformational analysis of cycloalkanes, decalins, effect of conformation on reactivity, conformation of sugars, steric strain due to unavoidable crowding.

Unit-II: Reaction Intermediates

Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, nitrenes, benzyne and ylides

Reaction Mechanism: Structure and Reactivity

Types of organic reactions, kinetic and thermodynamic control reactions and stabilty, Effect of structure on reactivity- resonance, steric effects and quantitative treatment. The Hammett equation and linear free energy relationship, substituent and reaction constants (σ constant).

Unit – III:Addition to carbon – carbon multiple bonds

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regioselectivity and chemoselectivity, orientation and reactivity.Hydrogenation of aromatic rings, hydrogenation of double and triple bonds, markonikov and anti-markonikov rules.

Addition to Carbon-Hetero multiple bonds

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl

compounds. Acids, esters and nitriles. Addition of Grignard reagent, organozinc and organo-lithium reagents to carbonyl and unsaturated carbonyl compounds,Wittig reaction. Mechanism of condensation reaction involving enolates – Claisen, Mannich, Benzoin, Perkin and Stobbereactions.

Unit-IVSubstitution reactions

Aliphatic Nucleophilic Substitution

The S_N1, S_N2, mixed S_N1 and S_N2 and SET mechanisms, regioselectivity; retention and inversion of configuration, racemization, the neighboring group mechanism, neighboring group participation by; acetoxy group, π bonds, σ bonds, phenonium ions, norbornyl system, common carbocation rearrangements. The S_Ni mechanism, Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon, Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium.

Aromatic Nucleophilic substitution

Addition elimination (Activated complex mechanism) and elimination-addition (benzyne mechanism) reactions, Reactivity- effect of substrate structure, leaving group and attacking nucleophile, The von Richter, Sommelet - Hauser and Smilesrearrangements.

Elimination Reactions

The E1, E2 and E1cB mechanisms, orientation of the double bond, reactivity -effects of substrate structures, attacking base, the leaving group, temperature, and the medium, mechanism and orientation in pyrolyticelimination (Ei), Elimination versus substitution reaction

LIST OF REFERENCE BOOKS:

1. Advanced Organic Chemistry – Reaction Mechanism and Structure, Jerry March JohnWiley.
2. Handbook of Organic Name Reactions: Reagents, Mechanism and Applications, 1st Edition - August 14, 2023, Authors: Dakeshwar Kumar Verma, Y. Dewangan and CB Verma, ISBN: 9780323959483, Elsevier, Netherland
3. Structure and Mechanism in Organic Chemistry, C.K.Ingold, Cornell University Press.
4. Organic Chemistry, R.T .Morrison and R.N. Boyd, Prentic Hall.
5. Modern organic Reactions. H.O. House Benjamin
6. Principles of Organic Synthesis, R.O.C. Normon and J.M. Coxon, Blackie, Academic & Professional.
7. Organic Reactions and their mechanism,.S. Kalsi, New Age International.
8. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan
9. Stereo Chemistry of Organic Compounds, D. Nasipuri, New Age International.

	Departmental members	
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DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON
M.Sc. CHEMISTRY

SEMESTER- I

2025-26

PAPER- III

MATHEMATICS FOR CHEMISTS, QUANTUM CHEMISTRY AND CHEMICAL DYNAMICS

Max. Marks: 80

Min. Marks : 16

Unit-I **Vectors, Matrix Algebra andProbability**

Vectors , dot, cross and triple products etc. The gradient, divergence and curl.Addition and multiplication, inverse, adjoint and transpose of matrices, special matrices (symmetric, Skew-symmeric, Hermitian, Skew- Hermitian, unit, diagonal, unitary, etc) and their properties.Introduction to determinants, Permutations and combinations and probability.

Differentiation and Integration

Rules for differentiation, applications of differential calculus including maxima and minima partial differentiation. Exact first-order differential equations, homogeneous, exact and linear equations, Basic rules for integration, integration by algebraic simplification, integration by parts, partial fraction and substitution.

Unit-II Quantum Chemistry

Time-independent Schrodinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrodinger equation to some model systems viz. particle in one dimensional and three dimensional box, concept of degeneracy, the harmonic oscillator, the rigid rotor, the hydrogenatom.

Angular Momentum

Ordinary angular momentum, eigen functions and eigen values of angular momentum, ladder operator, concept of spin, antisymmetry and Pauli's exclusionprinciple.

Unit-III Approximate Methods

The variation theorem and perturbation theory (first order and non degenerate).Applications of variation method and perturbation theory to hydrogen and helium atom.

Electronic Structure of Atoms

Russell-Saunders terms and coupling schemes.Atomic states, atomic terms and termsymbols.

Molecular Orbital Theory

Huckel theory of conjugated systems, Applications to ethylene, butadiene and cyclobutadiene.

Unit–IV **Chemical Dynamics**

Method of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation and the activated complex theory, ionic reaction, kinetic salt effects, steady state kinetics. Photochemical reaction (hydrogen-bromine and hydrogen-chlorine reactions). Homogeneous catalysis, kinetics of enzyme reaction, general features of fast reaction, study of fast reaction by flow method, relaxation method, flash photolysis and the nuclear magnetic resonancemethod.

Dynamics of unimolecular reaction, Lindmann-Hinshelwood and Rice– Ramsperger–Kassel–Marcus (RRKM) theories of unimolecular reaction.

LIST OF REFERENCE BOOKS:

1. Physical Chemistry, P.W. Atkins,ELBS
2. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGrawHill
3. Quantum Chemistry, Ira N. Levine, Prentice Hall
4. Coulsons Valence R. Mc. Weeny, ELBS
5. Chemical Kinetics, K.J. Laidler, McGraw-Hill
6. Kinetics and Mechanism of Chemical Transformation, J. Rajaraman and J. Kuriacose, McMillan.
7. Mathematical Preparation for Physical Chemistry, F. Daniels, McGrawHill.
8. Mathematics for Chemists, Bhupendra Singh

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DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON
M.Sc. CHEMISTRY

SEMESTER - I

2025-26

PAPER- IV

GROUP THEORY, PRINCIPLES OF SPECTROSCOPY AND COMPUTER FOR CHEMISTS

Max. Marks : 80

Min. Marks : 16

Unit I **Symmetry and Group Theory in Chemistry**

Symmetry elements and symmetry operation, definition of group, subgroup, relation between order of a finite group and its subgroup.Conjugacyrelation and classes. point symmetry group. Schonflies symbols, representations of groups by matrices (representation for the Cn, Cnv, Cnh, Dnh etc. groups to be worked out explicitly). Character of arepresentation.The great orthogonality theorem (without proof) and its importance.Character tables and their uses inspectroscopy.

Unit –II Unifying Principles

Electromagnetic radiation, interaction of electromagnetic radiation with matter absorption, emission, transmission, reflection, refraction, dispersion, polarization and scattering. Uncertainty relation and natural line width and natural line broadening, transition probability, results of the time dependent perturbation theory, transmission moment, selection rules, intensity of spectral lines. Born-Oppenheimer approximation, rotational, vibrational and electronic energylevels.

Unit –III Introduction to Computers and Computing

Basic structure and functioning of computers with a PC as an illustrative example.OS with DOS as an example, Introduction to UNIX and WINDOWS data processing, principals of programming, Algorithms and flow- charts. Elements of computer language C, Constant and variables, Operations and symbols,, Expression,Arthimetic assignment statements.

Unit – IV Atomic Absorption Spectroscopy

Principle and instrumentation, flame atomization, hollow cathode lamps, interference in AAS, applications of AAS in qualitative and quantitative analysis. The Techniques of Atomic Absorption Spectrometry, The Individual Elements for Arsenic (As), Cadmium (Cd), Calcium (Ca), Magnesium (Mg), Manganese (Mn), Iron (Fe), Lead (Pb), Zinc (Zn).

Flame photometric methods: Basic principle and instrumentation, interference in flame photometry, applications in quantitative analysis.

Nephhelometric method: Principle and instrumentation, applications in analysis

LIST OF REFERENCE BOOKS:

1. Computers and Common Sense, R. Hunt and J. Shelley, PrenticeHall.
2. Computers Chemistry, A.C.Norris.
3. Microcomputer Quantum Mechanics, Killingbeck, AdamHilger.
4. Computer Programing in Fortran IV, V. Rajaraman, PrenticeHall.
5. An Introduction to Digital Computer Design, V. Rajaraman and T. Radhakrishnan, PrenticeHall.
6. Physical Methods in Chemistry, R.S. Drago, SaundersCollege.
7. Chemical Applications of Group Theory, F.A.Cotton.
8. Group Theory and its Chemical Applications, P.K. Bhattacharya, Himalya Publishing House.
9. Instrumental Methods of Analysis, B.K. Sharma, Krishna Publication.
10. AtomicAbsorption Spectrometry, Bern hard We1z, MichaelSperling, WILEY-VCH.

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DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON
M.Sc. Chemistry
[First Semester]
Laboratory Course I
Physical Chemistry & Computers Practical
2025-26

Max. Marks : 100

Number of hours for eachexperiment: 3-4 hours

A list of experiments under different headings is given below. Typical experiments are to be selected from each type.

MAJOR EXPERIMENTS

Adsorption

1. To study surface tension – concentration relationship for solution (Gibb's equation).
2. To study the adsorption of oxalic acid on charcoal and to verify Freundlich adsorption isotherm.

Chemical Kinetics

1. Determination of the effect of (a) Change of temperature (b) Change of concentration of reactants and catalyst and (c) ionic strength of the media on the velocity constant of hydrolysis of an ester/ionicreactions.
2. Determination of the rate constant for the oxidation of iodide ions by hydrogen peroxide studying the kinetics as an iodine clockreaction.

Polarimetry

1. Determine the specific and molecular rotation of optically activesubstance.
2. Determination of rate constant for hydrolysis/inversion of sugar using a polarimeter.

MINOR EXPERIMENTS

Phase Equilibria

1. Determination of congruent composition and temperature of a binary system (e.g. diphenylamine-benzophenone system.)
2. Determination of glass transition temperature of a given salt (e.g.,$CaCl_2$)

3. To construct the phase diagram for three component system (e.g., chloroform – acetic acid-water).

Solutions

1. Determination of molecular weight of non-electrolyte/electrolyte by cryoscopic method and to determine the activity coefficient of anelectrolyte.
2. Determination of molecular weight of non-volatile substances by Landsberger's method.

Conductometry

1. To determine the basicity of an organicacid.
2. Determination of solubility and solubility product of sparingly soluble salts (e.g. $PbSO_4$, $BaSO_4$)conductometrically.
3. Determination of the strength of strong and weak acids in a given mixture conductometrically.
4. Determination of pK_a of acetic acid and verification of Ostwald Dilutionlaw

Potentiometry/pH metry

1. Determination of the strength of strong and weak acids in a given mixture using a potentiometer /pHmeter.
2. Determination of temperature dependence of EMF of acell.
3. To determine pK_a of the given monobasic acid by pHmetrictitration.
4. Determination of the dissociation constant of monobasic/dibasic acid by Albert-Serjeantmethod.

Use of Computer Programs

The students will learn how to operate a PC and how to run standard Programs with data preferably from physical Chemistry laboratory. Further, the student will operate Word Processing software such as MS-WORD, MS-Excel, MS-Powerpoint. Introduction to structure drawing, spread sheet and chemistry related softwares chem draw, chem sketch, origin pro.

LIST OF REFERENCE BOOKS:

1. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.
2. Findley's Practical Physical Chemistry, B.Plevitt,Longman.
3. Experimental Physical Chemistry ,R.C.Das and B. Behra, Tata McGrawHill.

DEPARTMENT OF CHEMISTRY
GOVT. DIGVIJAY PG AUTONOMOUS COLLEGE, RAJNANDGAON
M.Sc. Chemistry
[First Semester]
Laboratory Course II
Inorganic Chemistry
2025-26

Max. Marks : 100

MAJOR EXPERIMENTS

Qualitative analysis

Qualitative analysis of mixture containing eight radicals including two less common metals from among the following by semi micro method.

Basic Radicals:
Ag, Pb, Hg Bi, Cu, Cd, As, Sb, Sn, Fe, Al, Cr, Zn, Mn, Co, Ni, Ba, Sr, Ca, Mg, Na, K, Ce, Th, Zr, W, Te, Ti, Mo, U, V, Be, Li, Au, Pt.

Acidic Radicals :
Carbonate, Sulphite, Sulphide, Nitrite, Nitrate, Acetate, Fluoride, Chloride, Bromide, Iodide, Sulphate, Borate, Oxalate, Phosphate, Silicate, Thiosulphate, Ferricyanide, Sulphocyanide, Chromate, Arsinate and Permanganate.

Quantitative Analysis

Separation and determination of two metal ions in ores, alloys, or mixtures in solution, one by volumetric and the other by gravimetricmethods.

MINOR EXPERIMENTS

Estimations
(a) Phosphoric acid in commercial orthophosphoric acid.
(b) Boric acid inborax.
(c) Ammonia in an ammonium salt.
(d) Manganese dioxide in pyrolusite.
(e) Available chlorine in bleaching powder.
(f) Hydrogen peroxide in a commercial sample.

Preparations

Preparation of selected inorganic compounds and their study by I.R.Electronic spectra, Mossbauer, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds. Theoretical study of structure and their identification of some preparations by spectralanalysis

1. $VO(acac)_2$
2. $TiO(C_9H_8NO)_2 2H_2O$
3. $Cis\text{-}K[Cr(C_2O_4)_2(H_2O)_2]$
4. $Na[Cr(NH_3)_2(SCN)_4]$
5. $Mn(acac)_3$
6. $K_3[Fe(C_2O_4)_3]$
7. Prussian Blue, Turnbull's Blue.
8. $[Co(NH_3)_6][Co(NO_2)_6]$
9. $Cis\text{-}[Co(trien)(NO_2)_2]Cl.H_2O$
10. $Hg[Co(SCN)_4]$
11. $[Co(Py)_2Cl_2]$
12. $[Ni(NH_3)_6]Cl_2$
13. $Ni(DMG)_2$
14. $[Cu(NH_3)_4]SO_4.H_2O$

LIST OF REFERENCE BOOKS:

1. Vogel's Text Book of Qualitative Analysis, revised, J. Bassett, R.C.Denney, G.H. Jeffery and J. Mendham, ELBS.
2. Synthesis and Characterization of Inorganic Compounds, W.L.Jolly, Prentice Hall.

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