Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

Three Year Bachelor of Science (Hons.) in Chemistry Programme

B.Sc. (Hons.) Chemistry Semester-III

(Effective from the session: 2022-23)

Shri Rawatpura Sarkar University

Raipur, Chhattisgarh

Department of Chemistry

Faculty of Science,

Three Year Bachelor of Science (Hons.) in Chemistry Programme

B.Sc. (Hons.) Chemistry Semester-III

Scheme of Teaching and Examination

Outcome Based Education (OBC) and Choice Based Credit System (CBCS)

(Effective from the session: 2022-2023)

S. No.	Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuation Evaluation	Semester End Examination	Total	
1	SSH02301T	Inorganic Chemistry-II	4	-	-	4	30	70	100	3.0
2	SSH02302T	Physical Chemistry-II	4	-	-	4	30	70	100	3.0
3	SSH02302T	Analytical Clinical Biochemistry and Pharmaceutical Chemistry	4	-	-	4	30	70	100	3.0
4	SSH02353T	Generic Elective-III	4	-	-	4	30	70	100	3.0
5	SSH02313T	Research Methodology	4	-	-	4	30	70	100	3.0
6	SSH02381P	Chemistry Lab Course: V	-	-	4	2	15	35	50	5.0
7	SSH02382P	Chemistry Lab Course: VI	-	-	4	2	15	35	50	5.0
8	SSH02383P	Generic Elective Lab Course: III	-	-	4	2	15	35	50	5.0
	Total teaching hrs/week: 32		**Total Credits**			**24**	**Total Marks**		**650**	

Generic Electives (Semester I to IV): Zoology, Bioscience, Maths and Physics

Semester:	Semester I	Semester II	Semester III	Semester IV
Subject:	Zoology I	Zoology II	Bioscience I	Bioscience II
	Maths I	Maths II	Physics I	Physics II

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Course Title	**Inorganic Chemistry-II**				
Course Code	**SSH02301T**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**Inorganic Chemistry-I**				
Course Objectives	• **To understand the basics of inorganic chemistry**				
Course Contents	**UNIT I** **General Principles of Metallurgy:** Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy. Methods of purification of metals: Electrolytic Kroll process, Parting process, van Arkel-de Boer process and Mond's process, Zone refining, **Acids and Bases:** Brönsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle. **UNIT II** **Chemistry of s and p Block Elements:** Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. Allotropy and catenation. Complex formation tendency of s and p block elements. Hydrides and their classification ionic, covalent and interstitial. Basic beryllium acetate and nitrate. **UNIT III** Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses, Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudohalogens and basic properties of halogens. **UNIT IV** **Noble Gases:** Occurrence and uses, rationalization of inertness of noble gases, Clathrates; preparation and properties of XeF_2, XeF_4 and XeF_6; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF_2). Molecular shapes of noble gas compounds (VSEPR theory). **UNIT V**				

	Inorganic Polymers: Types of inorganicpolymers,comparison with organicpolymers, synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and phosphazenes, and polysulphates.
Course Outcomes	On the completion of this course successfully student will be able to CO 1 : Understand the Principles of Metallurgy CO 2 : Gain the knowledge of Chemistry of s and p Block Elements CO 3 : preparation, properties and uses of Oxides and oxoacids of nitrogen, Phosphorus and chlorine CO 4 : Preparation and properties of noble gases. CO 5 : understand the preparation of Inorganic Polymers and its application
Text Books	1. Lee, J.D. Concise Inorganic Chemistry, ELBS,1991. 2. Douglas, B.E; Mc Daniel, D.H. & Alexander, J.J. Concepts & Models of Inorganic Chemistry 3rd Ed., John Wiley Sons, N.Y.1994. 3. Greenwood,N.N.&Earnshaw.ChemistryoftheElements,Butterworth- Heinemann.1997.
Reference Books	1. Cotton,F.A.&Wilkinson,G.AdvancedInorganicChemistry,Wiley,VCH,1999. 2. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition,2002. 3. Miessler, G. L. & Donald, A. Tarr. Inorganic Chemistry 4th Ed., Pearson,2010. 4. Atkin, P. Shriver & Atkins' Inorganic Chemistry 5th Ed. Oxford University Press (2010).

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Course Title	**Physical Chemistry-II**				
Course Code	**SSH02302T**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**Physical Chemistry-I**				
Course Objectives	• **To understand the importance of laws of thermodynamics and chemical equilibrium**				
Course Contents	**UNIT I** Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics, First law: Concept of heat, q, work, w, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of q, w, U and H for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions, Thermochemistry: Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions. Adiabatic flame temperature, explosion temperature. **UNIT II** **Second Law:** Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes, **Third Law:** Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. **UNIT III** **Free Energy Functions:**Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state, Systems of Variable Composition:Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs- Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases **UNIT IV** **Chemical Equilibrium:** Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Coupling of exoergic and endoergic reactions.				

	Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants K_p, $K_c$andK_x. Le Chatelier principle (quantitative treatment); equilibrium between ideal gases and a pure condensed phase **UNIT V** **Solutions and Colligative Properties:**Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Excess thermodynamic functions.Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.
Course Outcomes	• On the completion of this course successfully student will be able to CO 1 : Understand the first law of thermodynamics CO 2 : Gain the knowledge of second and third law of thermodynamics CO 3 : know the Free Energy Functions CO 4 : understand the Chemical Equilibrium CO 5 : Learn about the Solutions and Colligative Properties
Text Books	1. Peter,A.&Paula,J.de.PhysicalChemistry10th Ed.,OxfordUniversityPress(2014). 2. Castellan, G. W. Physical Chemistry 4th Ed., Narosa(2004). 3. Engel,T.&Reid,P.PhysicalChemistry3rd Ed.,Prentice-Hall(2012). 4. McQuarrie,D.A.&Simon,J.D.MolecularThermodynamicsVivaBooksPvt.Ltd.: New Delhi(2004).
Reference Books	1. Assael,M.J.;Goodwin,A.R.H.;Stamatoudis,M.;Wakeham,W.A.&Will,S. Commonly Asked Questions in Thermodynamics. CRC Press: NY (2011). 2. Levine, I .N. Physical Chemistry 6th Ed., Tata McGraw Hill(2010). 3. Metz, C.R. 2000 solved problems in chemistry, SchaumSeries(2006).

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Course Title	**Analytical Clinical Biochemistry and Pharmaceutical Chemistry**				
Course Code	**SSH02302T**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**Basic Knowledge of Bio chemistry se pharmaceutical chemistry.**				
Course Objectives	• **Upon completion of the course the student shall be able toanalytical clinical biochemistry and pharmaceutical chemistry**				
Course Contents	**UNIT I** Carbohydrates: Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle. Isolation and characterization of polysachharides, Proteins: Classification, biological importance; Primary and secondary and tertiary structures of proteins: α-helix and β- pleated sheets, Isolation, characterization, denaturation of proteins, Lipids: Classification. Biological importance of triglycerides and phosphoglycerides and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications. **UNIT II** Enzymes: Nomenclature, Characteristics (mention of Ribozymes), Classification; Active site, Mechanism of enzyme action, Stereospecificity of enzymes, Coenzymes and cofactors, Enzyme inhibitors, Introduction to Biocatalysis: Importance in "Green Chemistry" and Chemical Industry,Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy. **UNIT III** Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin,Urine: Collection and preservation of samples. 6. Formation of urine. Composition and estimation of constituents of normal and pathological urine. **UNIT IV** Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti- inflammatory agents (Aspirin, paracetamol, lbuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital,				

	Diazepam),Cardiovascular (Glyceryltrinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine). **UNIT V** Fermentation: Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.
Course Outcomes	On the completion of this course successfully student will be able to CO 1 : Understand importance of carbohydrates and proteins CO 2 : Gain the knowledge enzymes and its types CO 3 : Learn the Composition and functions of blood CO 4 : Study on Drug discovery, design and development CO 5 : Understand the Fermentation and antibiotics
Text Books	1. Cooper, T.G. Tool of Biochemistry. Wiley-Blackwell(1977). 2. Wilson,K.&Walker,J.PracticalBiochemistry.CambridgeUniversityPress(2009). 3. Varley,H.,Gowenlock,A.H&Bell,M.:PracticalClinicalBiochemistry,Heinemann, London(1980). 4. Devlin,T.M.,TextbookofBiochemistrywithClinicalCorrelations,JohnWiley & Sons,2010. 5. Berg,J.M.,Tymoczko,J.L.&Stryer,L.Biochemistry,W.H.Freeman,2002. 6. Talwar, G.P. &Srivastava, M. Textbook of Biochemistry and Human Biology, 3rd Ed. PHILearning.
Reference Books	1. Nelson,D.L.&Cox,M.M.LehningerPrinciplesofBiochemistry,W.H.Freeman, 2013. 2. O.Mikes,R.A.Chalmers:LaboratoryHandbookofChromatographicMethods,D. Van Nostrand& Co.,1961. 3. Patrick, G. L. Introduction to Medicinal Chemistry, Oxford University Press, UK, 2013. 4. Singh, H. &Kapoor, V.K. Medicinal and Pharmaceutical Chemistry, VallabhPrakashan, Pitampura, New Delhi,2012. 5. Foye, W.O., Lemke, T.L. & William, D.A.: Principles of Medicinal Chemistry, 4thed., B.I. Waverly Pvt. Ltd. NewDelhi.

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Course Title	**Bioscience I: Plant Anatomy and Embryology**				
Course Code	**SSH02353T**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**Knowledge of basic plant biology**				
Course Objectives	• To impart basic knowledge of plant diversity. • To train the students to become familiar with general microbes				
Course Contents	**UNIT I** **Meristematic and permanent tissues:** Root and shoot apical meristems; Simple and complex tissues. **Organ:** Structure of dicot and monocot root stem and leaf. **UNIT II** **Secondary Growth** Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood). **UNIT III** **Adaptive and protective systems:** Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes. **UNIT IV** **Structural organization of flower:** Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac. **UNIT V** **Pollination and fertilization:** Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms. Endosperm types, structure and functions				
Course Outcomes	• On the completion of this course successfully student will be able to CO 1 : To gain knowledge of plant cells, tissues and their functions. CO 2 : Understand the normal and anomalous secondary growth in plants and their causes. CO 3 : Describe the adaptive and protective systems CO 4 : Discuss the Structural organization of flower. CO 5 : Identify the process of pollination and fertilization.				

Text Books	1. Unified Botany by Navbodh publication (2019) 2. Unified Botany by Yugbodh publication (2019) 3. Botany Ist by Singh Pandey Jain (2007) 4. By Shailesh ku Verma Yugbodh publication
Reference Books	5. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition. 2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition. 3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan PublishersPvt. Ltd., Delhi. 4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition. 5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill,Delhi, India. 6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India. 7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India. **8.** Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

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<table>
<tr><td>Course Title</td><td colspan="5">Physics I: THERMODYNAMICS, KINETIC THEORY AND STATISTICAL MECHANICS</td></tr>
<tr><td>Course Code</td><td colspan="5">SSH02354T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Preliminary Knowledge of Physics.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To study Physics in advance and establish foundation to research in the respective domain.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT - I
The laws of thermodynamics: The Zeroth law, concept of path function and point function, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function, reversible and irreversible change, Carnot theorem and the second law of thermodynamics. Different versions of the second law. Clausius theorem inequality. The thermodynamic scale of temperature, its identity with the perfect gas scale. Impossibility of attaining the absolute zero, third law of thermodynamics.

UNIT-II
Thermodynamic relationships: Thermodynamic variables, extensive and intensive, Maxwell's general relationships, application to Joule-Thomson cooling and adiabatic cooling in a general system, Van der Waals gas, Clausius-Clapeyron heat equation. Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables. Blackbody radiation: Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Special distribution of BB radiation, Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment.

UNIT-III
Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and of velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Transport phenomena in gases : Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.</td></tr>
</table>

	UNIT-IV The statistical basis of thermodynamics : Probability and thermodynamic probability, principle of equal a priori probabilities, statistical postulates. Concept of Gibb's ensemble, accessible and inaccessible states. Concept of phase space, canonical phase space, Gamma phase space and mu phase space. Equilibrium before two systems in thermal contact, probability and entropy, Boltzmann entropy relation. Boltzmann canonical distribution law and its applications, law of equipartition of energy. **UNIT-V** Indistinguishability of particles and its consequences, Bose-Einstein & Fermi-Dirac conditions, Concept of partition function, Derivation of Maxwell-Boltzmann, Bose- Einstein and Fermi-Dirac Statistics Through Canonical partition function. Limits of B.E. and F-D statistic to M-B statistics. Application of BE statistics to black body radiation, Application of F-D statistics to free electrons in a metal.
Course Outcomes	• On the completion of this course successfully student will be able to CO 1 : Understand the laws of thermodynamics. CO 2 : Gain the knowledge about the Thermodynamic relationships. CO 3 : know the Maxwellian distribution of speeds in an ideal gas. CO 4 : understand the statistical basis of thermodynamics. CO 5 : Learn about indistinguishability of particles and its consequences.
Text Books	1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981) 2. F. Reif : "Statistical Physics" (Mcgraw-Hill, 1998). 3. K, Haung : "Statatistical Physics" (Wiley Eastern, 1988).
Reference Books	1. Thermal and statistical Physics : R.K. Singh, Y.M. Gupta and S. Sivraman 2. Physics (Part-2) : Editor, Prof : B.P. Chandra, M.P. Hindi Granth Academy.

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Course Title	**RESEARCH METHODOLOGY**				
Course Code	**SSH02313T**				
Course Credit	**L**	**T**	**P**	**TC**	
	2	**-**	**-**	**2**	
Prerequisite	**Students must appears in end semester examination of B.Sc. Chemistry**				
Objective	• **Basic Knowledge of Chemistry.**				
Course Content	**UNIT I** Introduction, Biological data, Collection of data, Processing of data, Primary and Secondary data, Frequency distribution – Discrete and Continuous. Cumulative frequency distributions. **UNIT II** Diagrammatic and graphic representation of data: Advantages, Disadvantages; Types: Line diagram, Bar diagram, Pie Chart, Histogram, Frequency polygon, Frequency Curve. **UNIT III** Central tendency: Mean, Median, and Mode. Measures of dispersion – Standard Error, Standard deviation and Coefficient of Variations. Random Variable: Expectation and variance. **UNIT IV** Research Methodology: Introduction, Meaning, Objectives of Research, Motivation in Research, Types of Research, Significance of Research, Research Methods versus Research Methodology. **UNIT V** Research and Scientific Method, Process of Research, Criteria of Good Research, Limitations of Research, Research Problem: Definition, Selection and Techniques; Interpretation, Technique of Interpretation, Report writing.				
Course Outcome	On the completion of this course successfully student will be able to CO 1: understand the concepts and procedures of sampling, data collection, analysis and reporting. CO2: gain Knowledge about Diagrammatic and graphic representation of data CO3: use the appropriate statistical methods required for a particular research design CO4: understand various steps involved in conducting research. CO5: research design and develop appropriate research hypothesis for a				

	research project
Text Books	1. Research Methodology: Dr. V Upagade and Dr.Arvind Shende
Reference Books	1. Research Methodology: Methods and Techniques: C R Kothari

Course Title	**Chemistry Lab Course: V**				
Course Code	**SSH02381P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisites	**Chemistry lab III**				
Course Objectives	● **To enable the students to develop skills inorganic, physical and organic chemistry.**				

Course Contents

Performed any 10 experiment

Gravimetric Analysis:

1. Estimation of nickel (II) using Dimethylglyoxime (DMG).
2. Estimation of copper as CuSCN
3. Estimation of iron as Fe_2O_3 by precipitating iron as Fe $(OH)_3$.
4. Estimation of Al (III) by precipitating with oxine and weighing as $Al(oxine)_3$ (aluminiumoxinate).

Inorganic Preparations:

1. Tetra ammine copper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$
2. Cis and trans $K[Cr(C_2O_4)_2.(H_2O)_2]$ Potassium dioxalato diaqua chromate (III)
3. Tetra ammine carbonato cobalt (III) ion
4. Potassium tris(oxalate)ferrate(III)

Chromatography of metal ions

Principles involved in chromatographic separations. Paper chromatographic separation of following metal ions:

i. Ni (II) and Co (II)

ii. Fe (III) and Al (III)

Verify the Freundlich and Langmuir isotherms for adsorption

	of acetic acid on activated charcoal. Any other experiment carried out related to inorganic chemistry and physical chemistry.
Course Outcomes	On the completion of this course successfully student will be able to CO 1 : Performed the Gravimetric Analysis of Iron and Nickel CO 2 : Synthesis of Inorganic preparations, Tetra ammine copper (II) sulphate and Potassium tris(oxalate)ferrate(III) CO 3 : Paper chromatographic separation of Ni (II) and Co (II) CO 4 : Practically perform the separation of Fe (III) and Al (III) by Paper chromatography CO 5 : Verify the Freundlich and Langmuir isotherms for adsorption
Text Books	1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G.,Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996. 2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960. 3. Khosla, B. D.; Garg, V. C. &Gulati, A. Senior Practical Physical Chemistry,R. Chand & Co.: New Delhi (2011). 4. Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry, UniversitiesPress.
Reference Books	1. Khosla, B. D.; Garg, V. C. &Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi(2011). 2. Garland,C.W.;Nibler,J.W.&Shoemaker,D.P.ExperimentsinPhysical Chemistry 8th Ed.; McGraw-Hill: New York(2003). 3. Halpern,A.M.&McBane,G.C.ExperimentalPhysicalChemistry3rdEd. ;W.H. Freeman & Co.: New York(2003).

Course Title	**Chemistry Lab Course: VI**				
Course Code	**SSH02382P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisite	**Chemistry Lab IV**				

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Course Objectives	• **To enable the students to develop practical skills on organic chemistry experiments**
Course Contents	**Performed any 10 experiment** 1. Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it. 2. Phase equilibria: Construction of the phase diagram using cooling curves or ignition tube method: a. simple eutectic and b. congruently melting systems. 3. Distribution of acetic/ benzoic acid between water and cyclohexane. 4. Study the equilibrium of at least one of the following reactions by the distribution method: a. $I_2(aq) + I \rightarrow I_3(aq)$ b. $Cu^{2+}(aq) + nNH_2 \rightarrow Cu(NH)_{3n}$ 5. Study the kinetics of the following reactions. a. Initial rate method: Iodide-persulphate reaction b. Integrated rate method: ▪ Acid hydrolysis of methyl acetate with hydrochloric acid. ▪ Saponification of ethylacetate. 6. Compare the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate. 7. Detection of extra elements. 8. Functional group test for nitro, amine and amide groups. 9. Qualitative analysis of unknown organic compounds containing simple functional groups (alcohols, carboxylic acids, phenols and carbonyl compounds) Any other experiment carried out related to organic chemistry and physical chemistry.
Course Outcomes	On the completion of this course successfully student will be able to CO 1 : Perform the Distribution of acetic/ benzoic acid between water and cyclohexane. CO 2 : Study the equilibrium of reactions by the distribution method I2(aq) + I → I3(aq)

	CO 3 : Understand the Initial rate method: Iodide-persulphate reaction CO 4 : Practically perform the Functional group test for nitro, amine and amide groups CO 5 : Qualitative analysis of unknown organic compounds
Text Books	1. Mann,F.G.&Saunders,B.C.PracticalOrganicChemistry,PearsonEducation (2009) 2. Furniss,B.S.;Hannaford,A.J.;Smith,P.W.G.;Tatchell,A.R.PracticalOrganic Chemistry, 5th Ed., Pearson(2012)
Reference Books	1. Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

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Course Title	**Bioscience Lab Course: I**				
Course Code	**SSH02383P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisites	**Theoretical knowledge of Bioscience I**				
Course Objectives	• To impart practical knowledge, • To train the students to pursue further education. • Become familiar with tools. • Gain experience with standard molecular tools				
Course Contents	1. Study of meristems through permanent slides and photographs. 2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs) 3. Stem: Monocot: Zea mays; Dicot: Helianthus; Secondary: Helianthus (onlyPermanent slides). 4. Root: Monocot: Zea mays; Dicot: Helianthus; Secondary: Helianthus (only Permanent slides). 5. Leaf: Dicot and Monocot leaf (only Permanent slides). 6. Adaptive anatomy: Xerophyte (Nerium leaf); Hydrophyte (Hydrilla stem). 7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides). 8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous. 9. Female gametophyte: Polygonum (monosporic) type of Embryo sac Development (Permanent slides/photographs). 10. Dissection of embryo/endosperm from developing seeds.				
Course Outcomes	• On the completion of this course successfully student will be able to CO 1 : Hands on experience of study through microscope, dissections and identification: plant tissue, permanent slide and photograph. CO 2 : Study of anatomy study in stem and root of dicots. CO 3 : Study of morphological and anatomical adaptation in locally available hydrophyte and Xerophyte. CO 4 : Describe technical description of various plants				

	CO 5 : Observe various Embryology slides.
Text Books	1. Unified Botany by Yugbodh publication (2019) 2. Botany Ist by Singh Pandey Jain (2007) 3. By ShaileshkuVermaYugbodh publication
Reference Books	1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2ndedition. 2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition. 3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan PublishersPvt. Ltd., Delhi. **4.** 4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.

Three year Bachelor of Science (Hons) in Chemistry programme
B.Sc. (Hons) Chemistry Semester-III
2022-2023

Course Title	**Physics Lab Course: I**				
Course Code	**SSH02384P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisites	Student must have the knowledge of Physics.				
Course Objectives	• To enable the students to develop skills Physics Practical.				
Course Contents	1. Study of Brownian motion 2. Study of adiabatic expansion or a gas. 3. Study of conversion of mechanical energy into heat. 4. Heating efficiency of electrical kettle with varying voltages. 5. Study of temperature dependence of total radiation. 6. Study of temperature dependence of spectral density of radiation. 7. Resistance thermometry. 9. Conduction of heat through poor conductors of different geometries. 10. Experimental study of probability distribution for a two-option system using a colored dice. 11. Study of statistical distributions on nuclear disintegration data (GM Counter used as a black box) 12. Speed of waves on a stretched string. 13. Studies on torsional waves in a lumped system. 14. Study of interference with two coherent sources of sound. 15. Chladni's figures with varying excitation and loading points. 16. To Verify the Newtons Cooling Law.				
Course Outcomes	On the completion of this course successfully student will be able to CO 1 : Performed the probability distribution for a two-option system using a colored dice. CO 2 : To Verify the Newtons Cooling Law. CO 3 : Study of temperature dependence of total radiation.				

	CO 4 : Study of Resistance thermometry. CO 5 : Study of statistical distributions on nuclear disintegration data
Text Books	1. D.P. Khandelwal : "Optics and Atomic Physics" (Himalaya Publishing House, Bombay 1988) 2. D.P. Khandelwal : "A Laboratory Manual for Undergraduate Classes" (Vani Publishing House, New Delhi)
Reference Books	1. S. Lipschutz and A Poe : "Schaum's Outline of Theory and Problems of Programming with Fortran" (McGraw-Hill Book Company 1986