



Department of Chemistry
Govt M H College of Home Science &
Science Jabalpur

Syllabus
Under Graduate
BSc Part I, BSc Part II, BSc Part III
Academic Session 2023-2024

Department of Chemistry
Govt. M H College of Home Science & Science for Women, Jabalpur
Recommended by Central Board of Studies and approved by Governor of MP
Syllabus: Chemistry Academic Session 2023-2024

SCHEME OF MARKS DISTRIBUTION UG

Semester	Paper Name	CCE	Theory	Practical	Grand Total
BSc Part I	Major Fundamentals of Chemistry (Paper I) Analytical Chemistry (Paper II)	30 30	70 70	100 100	400
	Minor/Elective Analytical Chemistry	30	70	100	200
	Generic Elective - Chemistry in Daily Life	30	70	100	200
BSc Part II	Major Reactions, Reagents and mechanisms in Organic Chemistry (Paper I) Transition Elements, Chemi-energetics, Phase Equilibria (Paper II)	30 30	70 70	100 100	400
	Minor/Elective Transition Elements, Chemi-energetics, Phase Equilibria	30	70	100	200
	Generic Elective - Chemistry for Farmers	30	70	100	200
BSc Part III	Major GROUP A Green and Agriculture Chemistry (Paper I) Laboratory skill, techniques and management (Paper II)	30	70	100	400
	Major GROUP B Instrumental Techniques in Chemistry (Paper I) Bio Physical, Bio Inorganic and Organometallic Chemistry (Paper II)	30	70	100	
	Minor/Elective Pharmaceutical and Medicinal Chemistry	30	70	100	200
	Generic Elective-I Processing of Fats and Oils Generic Elective-II Environmental Toxicology	30 30	70 70	100 100	100 100

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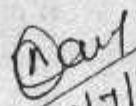
Syllabus
BSc Part I
Academic Session 2023-2024

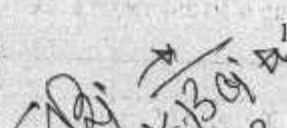
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Syllabus: Chemistry Academic Session 2023- 2024

B.Sc. I Year Chemistry Syllabus
 CBCS Annual Pattern
 From Academic Year 2023- 2024

Part A Introduction		
Program CERTIFICATE	Class-B.Sc.	Year- First
		Session: 2023- 2024
Subject - Chemistry		
Course Code	S I-CHEM I T	
Course Title	Fundamentals of Chemistry (Paper I)	
Course Type	Core Course	
Pre-requisite(if any)	To study this course our students must have had the subject <u>Chemistry</u> in class +2 or equivalent.	
Course Learning Outcomes (CLO)	By the end of this course students will learn the following aspects of Chemistry: <ol style="list-style-type: none"> 1. Ancient Indian chemical techniques. 2. Various theories and principles applied to reveal atomic structure. 3. Significance of quantum numbers. 4. Concept of periodic properties of elements. 5. Theories related to chemical bonding. 6. Acid-base concept, pH, buffer. 7. Factors responsible for reactivity of organic molecules. 8. Basics and mechanism of chemical kinetics. 9. Properties of electrolytes. 	
Credit Value	4	
Total Marks	Maximum Marks: CCE-30, University Exam (UE)- 70	Minimum Passing Marks: 33 35

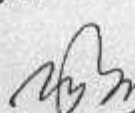
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 27/7/23
 Dr. A. Dave.


 (Dr. S. K. Baidya)
 27/7/23



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 27/7/2023



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Part B- Content of the course		
Total No. of Lectures-Tutorials-Practical (In hours per week): L-T-P:60-0-30		
Unit	Topic	No. of lectures
1	<p>(a) Chemical techniques in ancient India: General Introduction (b) Contribution of ancient Indian scientists in chemistry e.g., metallurgy, dyes, pigments, cosmetics, Ayurveda, CharakSanhita.</p> <p>Atomic Structure:</p> <p>(i) Review of Bohr's theory and its limitations. Atomic spectrum of Hydrogen. Dual nature of particles and waves, de Broglie's equation, Heisenberg's Uncertainty principle and its significance. (ii) Quantum numbers and their significance. Rules for filling electrons in various orbitals, Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations, Variation of orbital energy with atomic number.</p> <p>Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.</p> <p>(i) Keywords/Tags: Metallurgy, Dyes, Cosmetics, CharakSanhita, Hydrogen spectrum, Hund's rule, Aufbau principle</p>	2+4
2	<p>Elementary idea of the following properties of the elements with reference to s & p-block elements in periodic table.</p> <ul style="list-style-type: none"> • Effective nuclear number (EAN), shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. • Atomic radii (van der Waals) Ionic and crystal radii. • Covalent radii (octahedral and tetrahedral) <p>Detailed discussion of the following properties of the elements, with reference to s & p-blocks.</p> <ul style="list-style-type: none"> • Ionization energy- Successive ionization energy and factors affecting ionization energy. Applications of ionization energy. • Electronegativity- Pauling's/ Mulliken's electronegativity scales. Variation of electronegativity with bond order, partial charge, hybridization. <p>Keywords/Tags: EAN, Atomic radii, Ionic Radii, Crystal Radii, Ionization Energy.</p>	6

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3	<p>Chemical Bonding</p> <p>i. Ionic Bonding: General characteristics of ionic bonding.</p> <p>Ionic bonding & Energy: lattice & solvation energies and their importance in the context of stability and solubility of ionic compounds.</p> <p>Statement of Born-Landé equation for calculation of lattice energy, Madelung constant, Born-Haber cycle and its applications. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules.</p> <p>ii. Covalent bonding: Lewis's structure, Valence Bond theory (Heitler-London approach).</p> <p>Hybridization- Concept, types (sp, sp^2, sp^3, dsp^2, sp^3d, sp^3d^2, sp^3d^3) with suitable examples of inorganic and organic molecules</p> <p>Ionic character in covalent compounds- dipole moment and percentage ionic character.</p> <p>Valence shell electron pair repulsion theory (VSEPR) theory: Assumptions, need of theory, application of theory to explain geometries or shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements such as: NH_3, H_2O, SF_4, ClF_3, PCl_5, SF_6, ClF_5, XeF_2, XeF_4, XeF_6</p> <p>Molecular orbital (MO) concept of bonding</p> <p>The approximations of the theory, Linear combination of atomic orbitals (LCAO) (elementary pictorial approach)</p> <p>Rules for the LCAO method, bonding and antibonding MOs. Characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals.</p> <p>MO diagrams of homonuclear diatomic molecules:- H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2 and their ions.</p> <p>Molecular orbitals of heteronuclear diatomic molecules:- CO, NO, CN, HF.</p> <p>Bond parameters: Definition and factors affecting - bond orders, bond lengths, bond angles.</p>	20
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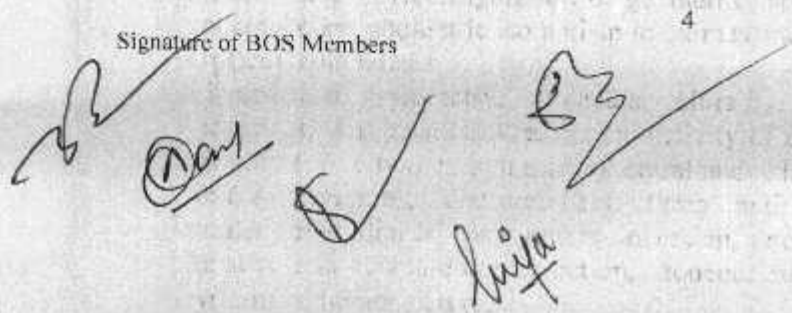
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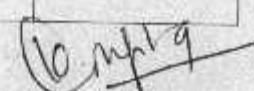
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	<i>Keywords/Tags: Ionic Bonding, Covalent Bonding, Hybridization, VSEPR Theory, LCAO, MO Diagrams, Bond Parameters</i>	
4	<p>Acid-Base concept</p> <p>Arrhenius concept, Bronsted-Lowry's concept, conjugate acids and bases, relative strength of acids, Lewis' sconcept, pH, buffer solutions. Acid-base neutralisation curves, Handerson equation.</p> <p>Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values.</p> <p>Indicator, choice of indicators.</p> <p><i>Keywords/Tags: Acid-Base Concept, Bronsted-Lowry's Concept, Conjugate Acids And Bases, pH, Buffer Solution, Indicator.</i></p>	4
5	<p>(a) Fundamentals of Organic Chemistry</p> <p>Structure, shape and reactivity of organic molecules: Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Reactive Intermediates: Carbocations, Carbanions and free radicals. Nucleophiles and electrophiles.</p> <p>(b) Stereochemistry of Organic compounds:</p> <p>Concept of isomerism. Geometrical isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.</p> <p>Optical isomerism: Elements of symmetry, molecular chirality, enantiomers & their properties, stereogeniccentre, optical activity of enantiomers. Concept of chirality (up to two carbon atoms): chiral and achiral molecules with two stereogeniccentres, diastereomers, threo and erythroisomers, meso isomer, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.</p> <p>Conformations and Conformational analysis Conformations of ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newman, Sawhorse and Fischer representations.</p> <p><i>Keywords/Tags: Electronic Displacements, Nucleophiles, Electrophiles, Isomerism, Molecular Chirality, Enantiomers, Sequence Rules, Conformation</i></p>	12

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6	<p>Chemical Kinetics: Rate of reaction, Definition and difference of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for half-life period. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.</p> <p>Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Solubility and solubility product of sparingly soluble salts — applications of solubility product.</p> <p>Keywords/Tags: <i>Order of Reaction, Molecularity of Reaction, Arrhenius Equation, Activation Energy, Electrolytes, Salt Hydrolysis, Solubility Product.</i></p>	12
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Part C- Learning Resources

Text Books, Reference Books, Other Resources:

Text Books:

1. Lee, J.D., Concise Inorganic Chemistry, ELBS, 1991.
2. Khera, H.C., Gurtu, J.N., Singh, J., Chemistry For B.Sc. 1st Year, PragatiPrakashan.
3. Bariyar, A. &Goyal, S., B.Sc. Chemistry Combined, (In Hindi) Krishna Educational Publishers Year: 2019.
4. Puri, B. R., Pathania, M.S., Sharma, L. R., Principles of Physical Chemistry. Vishal Publishing co. 2020.
5. Gurtu, J. N., GurtuA. , Advanced Physical Chemistry, PragatiPrakashan, Meerut, ISBN: 9789386633347, 9386633345; Edition: IV, 2017
6. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.
7. Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010
8. Kalsi, P. S., Stereochemistry Conformation and Mechanism, New Age International, 2005.
9. Finar, I.L., Organic Chemistry (Vol. I &II), E.L.B.S.
10. Morrison, R.T. & Boyd, R.N., Organic Chemistry, Pearson, 2010.
11. Clayden, J., Greeves, N., Warren, S., Wothers, P., Organic Chemistry, Oxford University Press, 2nd Edition, 2012.
12. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014

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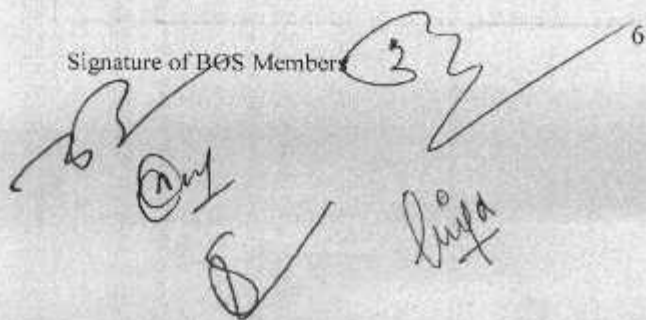
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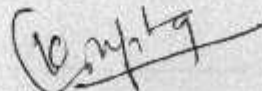
Reference Books:

1. Prakash, S., Founders of Sciences in Ancient India, published by The Research Institute of Ancient Scientific Studies, New Delhi. 1965 (OCoLC)594302452.
2. AcharyaPrafulla Chandra Ray - A Collection of Writings, Volume IIIA: A History of Hindu Chemistry (Volume-I), Editor: Prof. Anil Bhattacharyya, Publisher: University of Calcutta. Online information:
3. <https://www.caluniv.ac.in/news/APCR%20Publication/acharya-prafulla.html>
4. Chemistry in India, in Traditions & Practices of India, Textbook for Class X I, Module 2, Central Board of Secondary Education.
5. Subbarayappa, B.V., Chemistry and Chemical Techniques in India, Centre for Studies in Civilizations, 2004, ISBN 81 8758601 X.
6. Huheey, J.E., Keiter, E.A., Keiter, R.L. &Medhi, O.K., Inorganic
a. Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
7. Douglas, B.E., McDaniel, D.H. & Alexander, J.J., Concepts and Models in InorganicChemistry, John Wiley & Sons, 1994.
8. Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. Organic Chemistry, JohnWiley& Sons, 12th Edition, 2016.
9. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
10. Sykes, P., A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
11. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill (2007)

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Suggested equivalent online courses:

(all URLs accessed in May 2021)

- MOOC: <https://alison.com/course/fundamentals-of-chemistry>
- NPTEL: <https://nptel.ac.in/courses/104/106/104106119/> ; <https://nptel.ac.in/courses/104/101/104101121/>
- MIT: <https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring2005/syllabus/>

Web sources

(all URLs accessed in May 2021)

<https://www.sydneymed.edu.au/science/chemistry/~george/1108/ShapesOfMolecules.pdf>

<https://artsandculture.google.com/exhibit/rasashala-ancient-indian-alchemical-lab-national-council-of-science-museums/KwJCaPIRF0y-KQ?hl=en>

<http://sanskrit.uohyd.ac.in/events-new/Ancient-Indian-chemistry.pdf>

https://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/V0101_1_PRay.pdf

[https://asi.nic.in/Ancient India/Ancient India Volume 9/article 8.pdf](https://asi.nic.in/Ancient%20India/Ancient%20India%20Volume%209/article%208.pdf)

https://ddcutkal.ac.in/Syllabus/MA_history/paper_23.pdf

https://vym.org.in/study_material/ENG%20-%20Indian%20Contributions%20to%20Science.pdf

<https://www.pgurus.com/chemistry-in-ancient-india/>

https://en.wikipedia.org/wiki/History_of_chemistry

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods: Maximum Marks 100

Continuous Comprehensive Evaluation(CCE): 30 marks University Exam(UE): 70 marks

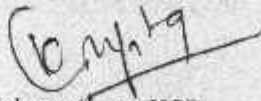
Internal Assessment: Continuous Comprehensive Evaluation(CCE): 30 Marks	Class Test/ Assignment/Presentation		TOTAL 30
	Section A	Objective type question	
External Assessment: University Exam section: 70 Marks Time: 03:00 Hours	Section B	Short question	TOTAL 70
	Section C	Long question	

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PRACTICAL

Program- CERTIFICATE		Class-B.Sc.	Year- First	Session: 2023- 2024
Subject - Chemistry				
Course Code		S1-CHEMIP		
Course Title		Qualitative & Quantitative Chemical analysis (Paper I)		
Course Type		Core Course		
Course Learning Outcomes (CLO)		By the end of this course students will learn the following aspects of Laboratory exercises in Chemistry: 1. Importance of chemical safety and lab safety while performing experiments in laboratory 2. Qualitative inorganic analysis 3. Elemental analysis of organic compounds (non-instrumental) 4. Qualitative identification of functional group of organic compounds 5. Techniques of pH measurements 6. Preparation of buffer solutions		
Credit Value		2		
Total Marks		Maximum Marks: CCE-30, University Exam (UE)- 70		Minimum Passing Marks: 33
		External Assessment		Marks
Unit 1	Experiments to be performed in laboratory			50
1	Qualitative inorganic analysis 20 Marks Identification of simple inorganic mixture (5 radicals) with two/three acidic and two/three basic radicals (including typical combinations), special emphasis on learning theoretical concepts of strong, moderate and weak electrolytes, ionic product, common ion effect. Solubility and solubility product. Qualitative organic analysis 7+8 Marks 1. Detection of hetero-elements (N, S, Cl, Br, I) in organic compounds 2. Functional group tests for alcohol, aldehyde, carboxylic acid, carbohydrate, phenols, nitro, amine and amide. Quantitative analysis of acid, alkali and buffer solutions 15 Marks Ionic Equilibria 1. Measurement of pH of different solutions of acids and alkalis using pH meter (may use aerated drinks, fruit juices, shampoos and soaps) Note-use dilute solutions of soaps and shumpoos to prevent damage to the glass electrode. 2. Measurement of the pH of buffer solutions and comparison of the values with theoretical values. 3. Preparation of buffer solutions and determination of their pH and buffer			2+4

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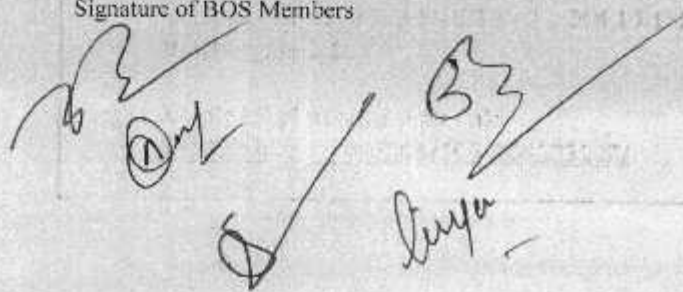
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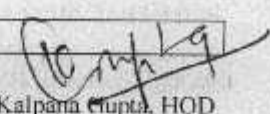
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capacity: (i) Sodium acetate-acetic acid (ii) Ammonium chloride-ammonium hydroxide	
Part C-Learning resources	
Text Books, Reference Books, Other Resources	
Text Books:	
<ol style="list-style-type: none">1. Goswami A.K., Mehta, A., KhanamRehana, O.R.S., UGC Practical Chemistry VOL. I, PragatiPrakashan, 20152. Goyal, S., B.Sc. Chemistry Practical, Krishna Publication, 2017.3. Vogel, A.I., A Textbook of Quantitative Inorganic Analysis, ELBS.4. Svehla, G., Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.5. Mendham, J., Vogel's Quantitative Chemical Analysis, Pearson, 2009.6. 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, 1996.7. Mann, F.G., & Saunders, B.C., Practical Organic Chemistry, Pearson Education (2009).8. Khosla, B. D., Garg, V. C., & Gulati, A., Senior Practical Physical Chemistry, R.Chand & Co.: New Delhi (2011).	
References:	
<ol style="list-style-type: none">9. Mann, F.G. & Saunders, B.C., Practical Organic Chemistry Orient-Longman, 1960.10. Furniss, B.S., Hannaford, A.J., Smith, P.W.G., Tatchell, A.R., Practical Organic Chemistry, 5th Ed., Pearson (2012)11. Ahluwalia, V.K., & Aggarwal, R., Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).12. Prof. Robert H. Hill Jr., David C. Finster, Laboratory Safety for Chemistry Students, 2nd Edition Wiley ISBN: 978-1-119-02766-9 May 201613. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, Updated Version, ISBN 978-0-309-13864-2 DOI 10.17226/12654. The National Academies Press, Washington D.C.	
Suggestive digital platforms web links: https://nptel.ac.in/courses/104/105/104105102/	

Part D – Assessment and Evaluation

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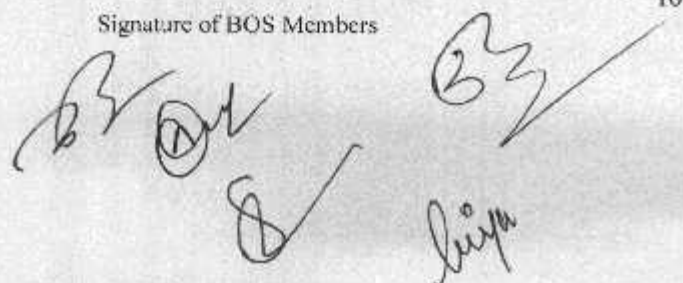
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Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction on – Chemical and Lab Safety <ul style="list-style-type: none"> • Toxicity of the compound used in chemistry laboratory. • Safety symbol on labels of pack of chemicals and its meaning. • What is MSDS sheets? Find out MSDS sheets of some hazardous chemicals ($K_2Cr_2O_7$), Benzene, cadmium nitrate, sodium metal, etc. • Precautions in handling and storage of hazardous substances like concentrated acids. Ammonia, organic solvents, etc. Note: description to be written in practical record.	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	10	Table work / Experiments	50
TOTAL	30		70

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B. Sc. I Year Chemistry Syllabus
 CBCS Annual Pattern
 From Academic Year 2023- 2024
 Paper II

Part A Introduction			
Program CERTIFICATE	Class-B.Sc.	Year- First	Session: 2023- 2024
Subject - Chemistry			
Course Code	S I-CHEM2T		
Course Title	Analytical Chemistry (Paper II)		
Course Type	Core Course/ Minor/ Elective		
Pre-requisite(if any)	To study this course our students must have had the subject Chemistry in class +2 or equivalent.		
Course Learning Outcomes (CLO)	By the end of this course students will learn the following aspects of Chemistry: <ol style="list-style-type: none"> 1. Basic concepts of Mathematics for Chemists. 2. Fundamentals of analytical chemistry and steps involved in analysis. 3. Basic knowledge of Computer for chemists. 4. Basic Concepts of Chemical equilibrium. 5. Principles of Chromatography and chromatographic techniques. 6. Various techniques of Spectroscopic Analysis. 		
Credit Value	4		
Total Marks	Maximum Marks: CCE-30, University Exam (UE)- 70		Minimum Passing Marks: 33

Part B- Content of the course		
Total No. of Lectures-Tutorials-Practical (In hours per week):		
L-T-P: 60-0-30		
Unit	Topic	No. of lectures
1	Mathematics for Chemists Straight line equation, Logarithmic relations, curve sketching, linear graphs & calculation of slopes. Differentiation, differentiation of functions like kx^n , c^x , $\sin x$, $\log x$, maxima & minima, partial differentiation. Integration of some useful relevant functions. Keywords/Tags: Linear graphs, Logarithmic Relation, Differentiation, Integration	10

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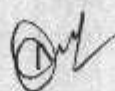
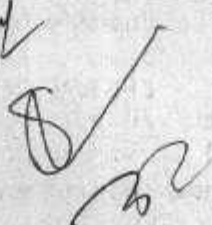
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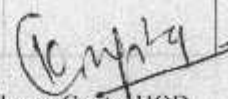
2	<p>Basic Analytical Chemistry: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures, statistical terms: mean, mean deviation, median, standard deviation, Numerical Problems. Calculations used in Analytical Chemistry Some Important units of measurements- SI Units, distinction between mass and weight, mole, milli mole and Numerical Problems. Solution and their concentrations-Concept of Molarity, molality and normality. Expressing the concentration in parts per million (ppm), parts per billion (ppb), Numerical Problems. Chemical Stoichiometry- Empirical and Molecular Formulas, Stoichiometric Calculations, Numerical Problems. Keywords/Tags: Accuracy, Precision, SI units, Units of Concentration, Chemical stoichiometry.</p>	10
3	<p>Computer for Chemists Introduction to computer, Introduction to operating systems like -DOS, Windows, Linux and Ubuntu. Use of computer programs Running of standard programs & packages such as MS-Word, MS-excel, PowerPoint, Execution of linear regression x-y Plot. Use of softwares for drawing structures and molecular formulae. Keywords/Tags: Operating Systems, MS-word, MS-excel, PowerPoint.</p>	10
4	<p>Chemical Equilibrium: Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatelier's principle and its applications. Keywords/Tags: Chemical Equilibrium, Equilibrium constant, Free Energy, Chemical Potential</p>	10
5	<p>Chromatography Introduction, Principle and Classification. Mechanism of separation: adsorption, partition & ion-exchange. Development of chromatograms: frontal, elution and displacement methods. Paper Chromatography (ascending, descending and circular), Thin Layer Chromatography (TLC) and Column Chromatography (CC), Gas Chromatography (GC) and High Pressure Liquid Chromatography (HPLC), types of column and column selection, applications, limitations. Principle and Applications of:</p> <ul style="list-style-type: none"> • Flash chromatography, • Ion-exchange chromatography and 	10

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	<ul style="list-style-type: none"> Chiral chromatography. Keywords/Tags: Chromatogram, Ion Exchange, Column Selection, Adsorption	
6	Spectral techniques of analysis Basics of absorption spectroscopy: Electromagnetic radiation, Spectral range. Absorbance, Absorptivity, Molar Absorptivity, Fundamental Laws of Absorption, Lambert-Beer Law and its limitations. Constitution & working of photometer, spectrometer, colorimeter. Ultraviolet (UV) absorption spectroscopy Presentation and analysis of UV spectra, Types of electronic transitions, Effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, Hyperchromic and hypochromic shifts. UV spectra of conjugated polyenes and enones Infra-red (IR) absorption spectroscopy Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, Measurement of IR spectrum, finger print region, characteristic absorption of various functional groups and Interpretation of IR spectra of simple organic compounds. Keywords/Tags: Hypsochromic, Hypochromic, Absorption, Spectrum	10

Part C-Learning resources

Text Books, Reference Books, Other Resources

Text Books –

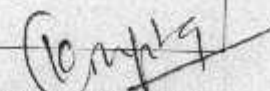
1. Gaur, S., Computer for Chemists, Neel Kamal Prakashan, 2017
2. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009
3. Kaur H, Analytical Chemistry, PragatiPrakashan (2008)
4. Gupta, Alka L, Analytical Chemistry, PragatiPrakashan (2020)
5. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry. S. Chand, 2010.
6. Kaur H, Instrumental Methods of Chemical Analysis, PragatiPrakashan, 2018
7. Sharma B.K., Chromatography. Krishna Prakashan, 2019.
8. Sharma Y.R., Elementary Organic Spectroscopy. S Chand, 2013
9. Singh, DR, Saxena, G., Singh, B., Inorganic Chemicals, Shivlal Aggarwal a Company, Agra
10. Srivastava, S. S., Gehlot, A. S., Chemistry, RatanPrakashan Temple, Indore
11. Soni, PL, Organic Chemistry, Sultan Chand and Sons, Delhi
12. Singh, R.K. P., Modern Chemistry, Sahitya Bhavan, Agra
13. Agnihotri, PK, Sahu, D
14. P., Pillai, A., Sahu, M., Yugbodh Chemistry, Yugbodh Publications, Raipur

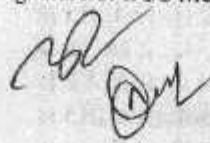
Reference Books:

1. Mitra Surbhi, Handbook of Computer Science & IT, Arihant, 2018

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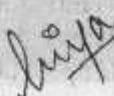
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Syllabus: Chemistry Academic Session 2023– 2024

2. Harris, D. C. Quantitative Chemical Analysis, 6th Ed., Freeman (2007)
3. Christian, Gary D; Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
4. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill (2007)
5. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014
6. Gurtu J.N, Gurtu A., Advanced Physical Chemistry, PragatiPrakashan, Meerut. ISBN: 9789386633347, 9386633345; Edition: IV, 2017
7. Atkins, P.W. & Paula, J. Physical Chemistry, Oxford Press, 2006.
8. Finar, I.I. Organic Chemistry (Vol. I & II), E.L.B.S.
9. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
10. Banwell, Molecular Spectroscopy, 2017.
11. Silverstien Robert, Spectrometric Identification of Organic Compounds, Wiley, 2014
12. Dyer J.R., Applications of Absorption Spectroscopy of Organic Compounds. 2009.

Suggested equivalent online courses:

MOOC : <https://www.edx.org/course/basic-analytical-chemistry>

NPTEL : <https://nptel.ac.in/courses/104/105/104105084/>

Web sources

1. <http://www.freebookcentre.net/Chemistry/Analytical-Chemistry-Books.html>

2. <https://www.springer.com/journal/216>

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods: Maximum Marks 100

Continuous Comprehensive Evaluation(CCE): 30 marks University Exam(UE): 70 marks

Internal Assessment: Continuous Comprehensive Evaluation(CCE): 30 Marks	Class Test/ Assignment/Presentation		TOTAL 30
	Section A	Objective type question	TOTAL 70
External Assessment: University Exam section: 70 Marks Time: 03:00 Hours	Section B	Short question	
	Section C	Long question	

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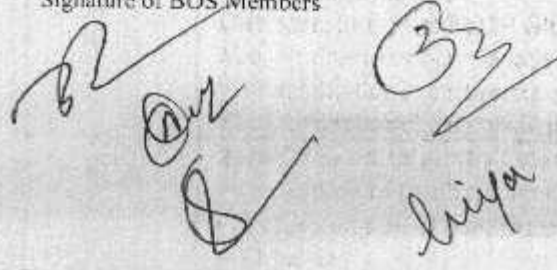
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PRACTICAL

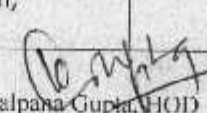
Program- CERTIFICATE	Class-B.Sc.	Year- First	Session: 2023- 2024
Subject - .Chemistry			
Course Code	S1-CHEM2P		
Course Title	Analytical Processes and Techniques(Paper II)		
Course Type	Core Course/ Minor/ Elective		
Course Learning Outcomes (CLO)	By the end of this course students will learn the following aspects of Laboratory exercises in Chemistry: 1. Concepts and analytical methods in Chemistry. 2. Preparation of solutions of different concentrations. 3. Standardization of the solution. 4. Identification of Organic compounds by chromatographic techniques. 5. Analysis by Spectral Techniques.		
Credit Value	2		
Total Marks	Maximum Marks: CCE-30, University Exam (UE)- 70	Minimum Passing Marks: 33	
	External Assessment	Marks	
Unit 1	Experiments to be performed in laboratory	50	
1	Basic analytical exercises • Calibration of different weights and glass apparatus (measuring cylinder, burette, pipette, volumetric flasks). • Preparation of solutions of different molarity/normality by weighing and dilution.	10	
2	Quantitative Analysis • Titrimetric Analysis o Standardization of NaOH with Oxalic acid. o Determination of carbonate and hydroxide present in mixture. o Determination of carbonate and bicarbonate present in a mixture. o Determination of free alkali present in different soaps/detergents.	20	
3	Quantitative Analysis by Colorimetry • Verification of Lambert-Beer Law • Determination of concentration of coloured compounds (e.g., CuSO ₄ . KMnO ₄)	10	
4	Qualitative Analysis • Systematic identification of organic compound by qualitative analysis. • Chromatography: Identification by determination of the R _f values of the given organic/ inorganic compounds by paper / thin layer chromatography. Keywords/Tags: Analytical, Authentication, Molarity Standardization, Colorimetry, Qualitative Analysis / Normality	10	

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Part C-Learning resources

Text Books, Reference Books, Other Resources

References:

1. Skoog, D.A. and Leary, J.J.: Instrumental Methods of Analysis, Saunders College Publications, New York, 1992
2. Vogel's textbook of quantitative chemical analysis, 7th edition.
3. Goswami A.K., Mehta Anita, KhanamRehana, ORS., UGC Practical Chemistry VOL. I, PragatiPrakashan, 2015.
4. GoyalSudha, B.Sc. Chemistry Practical, Krishna Publication, 2017.
5. Tandon, M.N., Unified RasayanVigyan, ShivalalAgarwal& Company, 2018

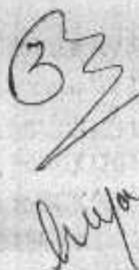
Suggestive digital platforms web links:

1. <https://www.youtube.com/watch?v=OAIMRDzuTh8>
2. <http://amrita.olabs.edu.in/?sub=73&brch=8&sim=133&cnt=1>
3. <http://chemcollective.org/vlabs>
4. <http://mas-iiith.vlabs.ac.in/expo/Quiz.html>
5. [https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/On_line_ChemistryLab_Manual/Chem_9_Experiments/02%3A_Paper_Chromatography_of_Gel_Ink_Pens_\(Experiment\)](https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/On_line_ChemistryLab_Manual/Chem_9_Experiments/02%3A_Paper_Chromatography_of_Gel_Ink_Pens_(Experiment))
6. <https://edu.rsc.org/experiments/leaf-chromatography/389.article>
7. <https://edu.rsc.org/experiments/chromatography-of-sweets/455.article>
8. http://swe.mit.edu/outreach/virtual_resources/paper_chromatography.pdf
9. <http://www.chem.latech.edu/~daddy/chem104/104Standard.htm>
10. https://www.chem.purdue.edu/courses/chm224/Miscellaneous/Model_report_Expt2-revised_2009.pdf
11. <https://www.webpages.uidaho.edu/ifcheng/Chem%20253/labs/Experiment%203.pdf>
12. <http://faculty.ccbcmd.edu/~cyau/122%2007%20Acid%20base%20titration%20AUG%202013.pdf>
13. <https://labbalances.net/blogs/blog/guide-to-calibration-weights>
14. https://cdn2.hubspot.net/hubfs/2203666/Beamex_White_Papers/Beamex%20White%20Paper%20%20Weighing%20scale%20calibration%20ENG.pdf?_hssc=107807261.6.1518193235316&hstc=107807261.e215aeabed7779e95a49b7830c0f9aad.1516987215921.1518111962556.1518193235316.17&hsfp=2102249448&hsCtaTracking=8918cf-fa-b755-4872-b4b1-24c1fa8d1abd%7C12eb2e3f-4b62-43ebbaf0-2da2a5d10266

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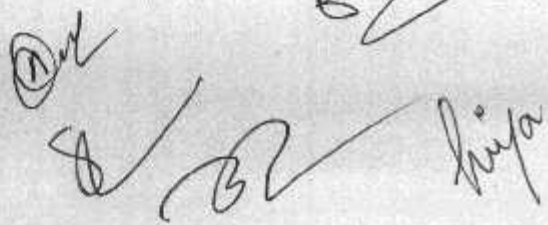
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Syllabus: Chemistry Academic Session 2023– 2024

Part D – Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction on – <ul style="list-style-type: none"> • Common glassware and lab wares for solution preparation and analysis. • Numerical problems related to solution preparation. • Any other discussion. Note: description to be written in practical record.	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	10	Table work / Experiments	50
TOTAL	30		70

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Syllabus: Chemistry Academic Session 2023– 2024

Syllabus of Theory Paper

Part A Introduction			
Program: Certificate		Class : BSc	Year: I
		Session: 2023-24	
Subject: Chemistry			
1	Course Code	S1 CHEM1G	
2	Course Title	Chemistry in Everyday Life	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Elective	
4	Pre-requisite (if any)	To study this course, a student must have had the subject science/arts /commerce in class +2 or equivalent This course can be opted as an elective by the students of following subjects: Open for all	
5	Course Learning outcomes (CLO)	By the end of this course students are expected to- 1. Learn about the chemistry of ancient India, ancient construction materials and discoveries. 2. Gain information about acids, bases and salts involved in our day to day life. 3. Have an idea of food adulteration, its harmful effects, and methods to detect adulteration and the important constituents of our food. 4. Student will be familiar with the chemical nomenclature of the commonly used materials in daily life including toiletries, kitchen and beverages. 5. Have an Elementary idea of disinfectants, pesticides and cleaners.	
6	Credit Value	4	
7	Total Marks	Max. Marks: 25-75	Min. Passing Marks: 33
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week):			
L-T-P:			
Unit	Topics	No. of Lectures	
I	Ancient Chemistry- Chemistry in Ancient India • Alchemy- Construction material in ancient times like Pottery, Bricks, Cement, Minerals. • Discovery and Uses of Glass, cosmetics & perfumes, paper & ink. • Metal extraction in ancient time, fibre cloth and dyeing chemistry in ancient times. Basic introduction of chemistry: Elements (upto atomic number 30), atoms, molecules and compounds. Keywords/Tags: Ancient Chemistry, Alchemy, Glass, Metal extraction, Atoms, molecules.	12	
II	Acids, Bases and Salts in Daily Life -Definition of acids, bases and neutral substances, pH scale. Sources and uses of- • Acids- hydrochloric acid, acetic acid(vinegar), ascorbic acid, carbonic	12	

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Syllabus: Chemistry Academic Session 2023– 2024

	<p>acid, sulfuric acid, tartaric acid, citric acid.</p> <ul style="list-style-type: none"> • Bases- sodium hydroxide, magnesium hydroxide, calcium hydroxide, ammonia. • Salts- sodium fluoride, sodium chloride, sodium carbonate, sodium bicarbonate, copper sulphate, alums, calcium carbonate, ammonium chloride. <p>Keywords/Tags: <i>Acids, Bases, Salts, Neutral Substances, pH</i></p>	
III	<p>Major Components of our Food- Basic idea of vitamins, minerals, fats, carbohydrates, proteins and fibers, their function and sources.</p> <p>Functions and importance: Vitamin B complex, antioxidants, micronutrients like iron, zinc, calcium</p> <p>Food Adulteration- definition, types, harmful effects</p> <ul style="list-style-type: none"> • Common adulterants and their detection in- milk, ghee, mustard oil, sugar, salt, tea, chilli powder, black pepper, turmeric powder, honey. • Harmful effects of food additives- saccharin, monosodium glutamate (Ajinomoto), Sulphur dioxide, preservatives <p>Keywords/Tags: <i>Vitamins, Minerals, Antioxidants, Adulteration, Additives</i></p>	12
IV	<p>Basic Knowledge of important Chemical constituent of materials used in everyday life- (Names and their effects only)-</p> <ul style="list-style-type: none"> • Toothpaste, different types of soaps, detergents and cosmetics, nail polish remover. • Table salt, rock salt, sugar. • Baking soda, caustic soda, baking powder • Coffee and tea, chemicals involved in processing of bakery products. • Onion, garlic, spices like turmeric, chilly • Oil and fats. • Soda drinks, alcohol and tobacco. <p>Keywords/Tags: <i>Toothpaste, Soaps, Salt, Spices, Alcohol.</i></p>	12
V	<p>Elementary idea of disinfectants, pesticides and cleaners-</p> <ul style="list-style-type: none"> • Alcohol based hand sanitizers, sodium hypo chlorite, naphthalene, Antiseptic solutions. • Pesticides and insecticides like DDT, mosquito repellent, boric acid. • Toilet cleaners, Domestic phenyls, Floor cleaner <p>Keywords/Tags: <i>Disinfectants, Pesticides, Cleaners, Mosquito Repellent, Phenyls.</i></p>	12
Part C-Learning Resources		
Text Books, Reference Books, Other resources		
<p>Suggested Readings:</p> <p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. COX H.E.: ANALYSIS OF FOODS 13. 2. COX H.E. AND PEARSON CHEMICAL ANALYSIS OF FOODS. 3. SHAKUNTALA MANY N. AND SWAMY S. FOODS: FACTS AND PRINCIPLES. 4TH ED. NEW AGE INTERNATIONAL. (1998) 4. JAIN AND JAIN, ENGINEERING CHEMISTRY, DHANPATRAI PUBLISHING COMPANY 5. Garforth, F. (1986). Chemistry through the looking glass. In P. E. Childs (ed.), 6. Limerick, Everyday Chemistry (pp 4-45). Tamond College. 		

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7. Bailin, S. (2002). Critical thinking and science education. *Science & Education*, 11, 361-375.
8. Childs, P. E. (1986). What is everyday chemistry? In P. E. Childs (ed.), *Everyday chemistry*. Limerick: Thomond College.
9. *Chemical Education* 60, 1031
10. Hatfield: ASE (1985). *Education through science*
11. Ray Prafulla Chandra *History of Chemistry in ancient and Medieval India: Incorporating the History of Hindu Chemistry* 1 January 2004 Chowkhambha Sanskrit series office

MOOCs, NPTEL, SWAYAM, HE E-Contents-
<https://tamilandvedas.com/2019/11/04/rare-chemistry-alchemy-medicine-books-of-ancient-india-post-no-7178/>
<https://nptel.ac.in/content/storage2/courses/103107082/module1/lecture1/lecture1.pdf>
<https://nptel.ac.in/courses/104/103/104103071/>
<https://ncert.nic.in/textbook/pdf/gesc105.pdf>
https://onlinecourses.swayam2.ac.in/ugc18_bt18/preview

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

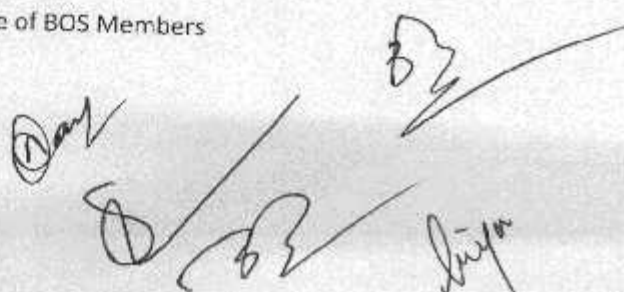
Maximum Marks : 100

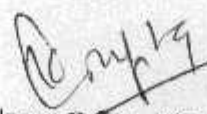
Continuous Comprehensive Evaluation (CCE) : 25marks University Exam (UE) 75 marks

Internal Assessment :	Class Test	15
Continuous Comprehensive Evaluation (CCE):25	Assignment/Presentation	10
External Assessment :	Section(A) : Three Very Short Questions (50 Words Each)	03 x 03 = 09
University Exam Section:	Section (B) : Four Short Questions (200 Words Each)	04 x 09 = 36
75	Section (C) : Two Long Questions (500 Words Each)	02 x 15 = 30 Total 75
Time : 02.00 Hours		

Any remarks/ suggestions:

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Govt. M H College of Home Science & Science for Women, Jabalpur
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 Class – B.Sc. 1st Syllabus: Chemistry Academic Session 2023-2024
 Chemistry in Everyday life

Part-A Introduction

Program: Certificate		Classes B.Sc. I year	Session:2023-2024
Practical		Elective Paper- Chemistry in Everyday life	
Course Title	Chemistry in Everyday life		
Course Code	S1-CHEM1GP		
Course Type	Generic Elective		
Course Learning outcomes (CLO)	By the end of course students will learn the following aspects of Laboratory exercises in Chemistry 1 Concepts and analytical methods in chemistry. 2. Identification of acids, bases and salts involved in our day to day life. 3. Methods to detect adulteration in commonly used food materials. 4. Preparation of Natural indicator.		
Credit value	2		
Totals Marks	Maximum marks 70, CCE – 30	Minimum Passing Marks - 33	
External Assessment			Marks
Experiments to be performed in laboratory			
1	Basic analytical exercises <ul style="list-style-type: none"> • Calibration of different weight and glass apparatus (measuring cylinder , burette, pipette, volumetric flasks) • Preparation of Solution of different normality/molarity by weighing and dilution-1. HCl (V/V) 2. NaOH(W/V) 		10
2	Preparation of natural indicator for pH measurement <ul style="list-style-type: none"> • Preparation of China Rose indicator • Preparation of Turmeric strip 		10
3	Preparation <ul style="list-style-type: none"> • Preparation of toilet cleaner • Preparation of domestic phenyl • Preparation of hand sanitizer • Preparation of Detol 		10
4	Qualitative Analysis Food Adulteration – Testing of Adulterant in Milk , Oil, Turmeric ,Ghee		10

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Syllabus

BSc Part II

Academic Session 2023-2024

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Syllabus: Chemistry Academic Session 2023-2024

B.Sc. II Year Chemistry Syllabus
CBCS Annual Pattern
From Academic Year 2023-2024
Chemistry-NEP (2020)

Part A Introduction			
Program - DIPLOMA	Class-B.Sc.	Year- Second	Session: 2023-2024
Subject - Chemistry			
Course Code	S 2-CHEMIT		
Course Title	Reactions, Reagents and Mechanisms in Organic Chemistry (Paper 1)		
Course Type	Core Course		
Pre-requisite(if any)	To study this course our students must have had the subject Chemistry in 12 th Class.Or Subject Chemistry in Certificate Course of B. Sc.		
Course Learning Outcomes (CLO)	By the end of this course students will acquire the knowledge of following aspects of Chemistry: <ul style="list-style-type: none"> • Various organic reactions, reagents and their mechanisms, which will be helpful in understanding organic synthesis. • Application of the reactions in the various industries. like pharmaceutical, polymer, pesticides, textile, Dyes etc. • Important key reactions used in further study and Research work. 		
Credit Value	4		
Total Marks	Maximum Marks: 100 30 CCE+ 70 University Exam (UE)	Minimum Passing Marks: 35	

Part B- Content of the course		
Total No. of Lectures-Tutorials-Practical (In hours per week): 02L-T-P:60-0-30		
Unit	Topics	No. of lectures
Unit 1	<p>Substitution reactions</p> <p>Aliphatic Nucleophilic Substitution: Introduction, the S_N1, S_N2 and S_Ni mechanisms, neighbouring group participation, effect of substrate, nucleophile, leaving group and reaction medium.</p> <p>Aliphatic Electrophilic Substitution: Elementary treatment.</p> <p>Aromatic Nucleophilic Substitution: the S_NAr, S_Ni and Benzyne mechanisms, effect of substrate, nucleophile, leaving group and Reaction medium.</p> <p>Aromatic Electrophilic Substitution: Arenium ion mechanism, orientation/directive influence (electronic explanation only) and reactivity, diazonium coupling, Vilsmeier reaction.</p> <p>Keywords/Tags: Nucleophilic Substitution, Electrophilic Substitution, Benzyne, S_N1, S_N2, S_Ni, S_NAr.</p>	12

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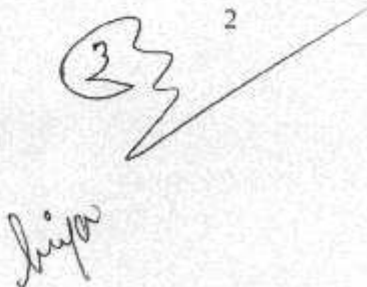
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 Syllabus: Chemistry Academic Session 2023- 2024

Unit 2	<p><u>Addition and Elimination Reactions</u> Addition Reactions: Introduction, reactions involving addition of nucleophile, electrophile and free radicals, regio-selectivity and chemo-selectivity, orientation and reactivity, Markovnikov and AntiMarkovnikov's addition. Elimination Reactions: Introduction, E1, E2 and E1cB mechanisms; effect of substrate, attacking species, leaving group and reaction. medium, orientation- Saytzeff and Hofmann rule. Keywords/Tags: Addition Reactions, Elimination Reactions Saytzeff rule, Markonikov addition, regio-selectivity, chemo-selectivity.</p>	12
Unit 3	<p><u>Reagents, Catalysts and Rearrangements (Mechanisms and Applications)</u> Reagents and Catalysts: Preparation properties and applications of important reagents and catalysts in organic synthesis with mechanistic details: Grignard reagent, N-bromo succinimide (NBS), diazomethane, anhydrous aluminium chloride ($AlCl_3$), sodamide ($NaNH_2$), Ziegler Natta catalyst. Rearrangements (Reaction, Mechanism & Applications): Introduction, Types of Rearrangements, Rearrangement to Electron Deficient Carbon (Pinacol-pinacolone, benzilic acid & Wagner-Meerwein), Rearrangement to Electron Deficient Nitrogen (Hofmann-Lossen-Curtius & Beckmann), Rearrangement to Electron Deficient Oxygen (Baeyer-Villiger & Dakin), Rearrangement to Electron-Rich Carbon (Wittig), Aromatic Rearrangements (Fries & Claisen). Keywords/Tags: Rearrangement, Reagent, catalyst, NBS, sodamide, Grignard.</p>	12

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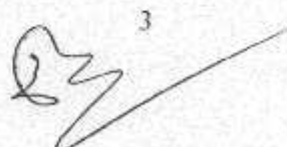

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Unit 4	<p>Oxidation & Reduction Reactions</p> <p>Oxidation Reactions: Introduction, metal based and non-metal based oxidations, oxidation of alcohols to carbonyls (chromium, manganese, and silver based reagents), alkenes to epoxides (peroxides / peracids based, alkenes to diols (manganese and osmium based), alkenes to carbonyls with bond cleavage (manganese and lead based), Oppenauer oxidation.</p> <p>Oxidation of amino groups to nitro groups: oxidation by alkaline $KMnO_4$, oxidation of aliphatic and aromatic amines by peracids, oxidation of primary and secondary amines to hydroxyl amine by hydrogen peroxide.</p> <p>Reduction Reactions:</p> <p>Introduction, Reduction of carbon-carbon multiple bonds, carbonyl groups and nitro compounds: catalytic hydrogenation: heterogeneous (Palladium-carbon & Raney Nickel), homogeneous (Wilkinson's catalyst)</p> <p>Hydride transfer reagents: Sodium borohydride and Lithium aluminium hydride, Metal based reductions: Birch reduction, Clemmensen Reduction.</p> <p>Reduction of nitro compounds by catalytic hydrogenation and Metals (with mechanism).</p> <p>Keywords/Tags: Oxidation, Reduction, hydrogenation, Wilkinson's catalyst, Metal-based reduction.</p>	12
Unit 5	<p>Photochemical and Pericyclic reactions</p> <p>Photochemical reactions:</p> <p>Introduction to photochemistry, excitations, Jablonski diagram, Norrish type I and II reactions and cis-trans isomerization.</p> <p>Pericyclic reactions:</p> <p>Introduction of pericyclic reaction and their classification (Electrocyclic, Sigmatropic rearrangement and cycloadditions), 2+2 and 4+2 cycloaddition, Claisen and Cope rearrangement.</p> <p>Keywords/Tags: Photochemistry, Pericyclic reactions, Norrish reactions, Cycloaddition reactions.</p>	12

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Part C- Learning Resources

Text Books, Reference Books, Other Resources

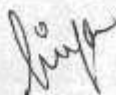
Suggested Readings:

1. Clayden, J., Greeves, Neand Warren, S., "Organic Chemistry", Oxford University Press, India, 2012, Second Edition.
2. March, J. and Smith, MB., "Advanced Organic Chemistry" John Wiley and Sons (Asia), Singapore, 2006, Sixth Edition.
3. Bruckner, R. "Organic Mechanisms: Reactions, Stereochemistry and Synthesis", Springer, Berlin 2010.
4. Kalsi, P. S "Organic Reactions and Their Mechanisms", New Age Science, London, 2010 Third Edition.
5. Finar LL, "Organic Chemistry Vol. 1", Pearson Education India, 2002, Sixth Edition.
6. Mundy, B. P., Ellerd, M. G. and Favaloro Jr., F. G., "Name Reactions and Reagents in Organic Synthesis", John Wiley & Sons, New Jersey, 2005, Second Edition.
7. Li, J. J., "Name Applications", Springer International Publishing Switzerland, 2014, Fifth Edition.
8. Hornback, J. M. "Organic Chemistry" Thomson Learning, Singapore, 2006, Second Edition.
9. Ahluwalia, V. K. and Parashar R. K., "Organic Reaction Mechanisms", Narosa Publication, India, 2010, Fourth Edition.
10. Goswami, C., "Snatkottar Prakash Rasayan evin Thos Avastha Rasayan", Hindi Granth Academy, Bhopal, Madhya Pradesh, 2019.
11. Sharma, K., "Organic Reaction Mechanism", Pragati Prakashan, Meerut, 2015, Second Edition.
12. Singh, J. and Singh, J., "Photochemistry and Pericyclic Reactions", New Academic Science, UK, 2012, Third Edition.
13. Wardle, B., "Principles and Applications of Photochemistry", John Wiley & Sons, UK, 2009.
14. Dhinda, B., "Essentials of Pericyclic and Photochemical Reactions", Springer International Publishing Switzerland, 2017.
15. Books published by M.P. Hindi Granth Academy, Bhopal

Suggestive digital platforms web links:

1. NPTEL, Mechanisms in Organic Chemistry, Prof. Nandita Madhavan, IIT Bombay.
<https://nptel.ac.in/courses/104/101/104101115/>

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2. NPTEL, Reagents in Organic Synthesis, Prof. Subhas Chandra Pan, IIT Guwahati.
<https://nptel.ac.in/courses/104/103/104103111/>
3. NPTEL, Pericyclic reactions and Organic photochemistry, Prof. S. Sankararaman, Madras. <https://nptel.ac.in/courses/104/106/104106077/>
4. <http://www.mphindigranthacademy.org/>

Suggested equivalent online courses:

I. Any other comments/suggestions:

Part D-Assessment and Evaluation

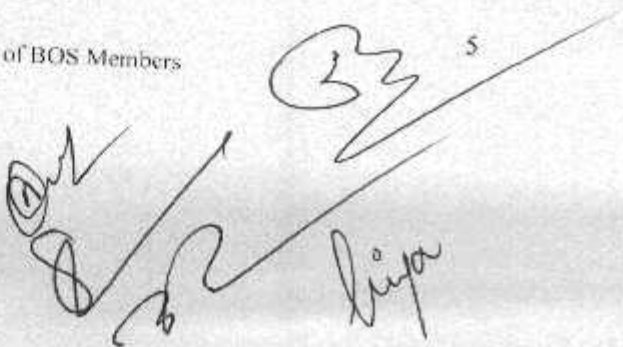
Suggested Continuous Evaluation Methods: Maximum Marks 100

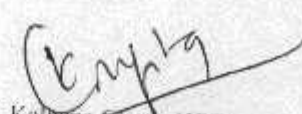
Continuous Comprehensive Evaluation(CCE): 30 marks

University Exam(UE): 70 marks

Internal Assessment: Continuous Comprehensive Evaluation(CCE): 30 Marks	Class Test/ Assignment/Presentation		TOTAL	30
	Section A	Objective type question	TOTAL	70
External Assessment: University Exam section: 70 Marks Time: 03:00 Hours	Section B	Short question		
	Section C	Long question		

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Syllabus of Practical Paper

Program: Diploma		Class: B. Sc.	Year: Second	Session: 2023-2024
Part A Introduction				
Subject: Chemistry				
1.	Course Code	S 2-CHEMIP		
2.	Course Title	Organic Qualitative Analysis, Reactions and synthesis(Paper 1)		
3.	Course Type	Core Course		
4.	Pre-requisite(if any)	To study this course our students must have had the subject Chemistry in 12 th Class.Or Subject Chemistry in Certificate Course of B. Sc.		
5.	Course Learning Outcomes (CLO)	By the end of this course students will acquire the knowledge of following practical aspects of Chemistry: <ul style="list-style-type: none"> To perform various reactions, which will be helpful in Understanding organic synthesis. To use reagents to perform organic reactions. To perform rearrangement reactions. To prepare various organic compounds. To use chromatographic technique to monitor organic reactions. Applications of the reactions in the industries, e.g., pharmaceutical, polymer, pesticides, textile, dyes, etc. industries. These experiments will also be useful in further study and research work. 		
6.	Credit Value	02		
7.	Total Marks	Maximum Marks: 30+ 70	Minimum Passing Marks: 33	
Part B – Content of the Course				
Total No. of Lectures- Tutorials- Practical (in hours per week): 04				
L-T-P: 30-0-30.(Total Hours)				
	Practicals			Marks
Part - A	Qualitative Analysis Separation of binary organic mixture (by solvent and chemical separation methods), systematic identification of separated organic compounds and preparation of their derivatives. Keywords/Tags: Qualitative Analysis, Separation, binary organic mixture, organic derivative			20
Part - B	Organic Reactions and Reagents: Oxidation Reactions: Synthesis, monitoring of the reaction using TLC, purification of product and determination of melting point.			20

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	<p>(i) Oxidation of benzaldehyde to benzoic acid by potassium permanganate. (ii) Oxidation of cyclohexanone to adipic acid by nitric acid. (iii) (a) Hydrolysis of non-reducing sugar to reducing sugars with specific example of sucrose. (iii) (b) Oxidation of Glucose to gluconic acid (using Tollen's reagent- by Reduction of Ag⁺ to metallic Ag) Reduction Reactions: Synthesis, monitoring of the reaction using TLC, purification of product and determination of melting point. (i) Reduction of benzophenone to benzhydrol by sodium borohydride. (ii) Reduction of acetophenone to ethyl benzene (Wolff-> Kishner reduction). Diazotisation Reaction: (a) Reduction of nitrobenzene in acid medium to form aniline (b) Preparation of azodye by diazotisation of aniline and coupling reaction Photochemical and Pericyclic reactions: (i) (4+2) Cycloaddition reaction of anthracene and maleic anhydride (Diels-Alder reaction). (ii) Photochemical synthesis of benzpinacol from benzophenone. Rearrangement Reactions: (i) Pinacol-pinacolone Rearrangement (benzopinacol → benzopinacolone). (ii) Benzil-benzilic acid Rearrangement. Keywords/Tags: Oxidation, Reduction, Rearrangement, TLC, Cycloaddition, Photochemical Reaction, Pericyclic Reaction.</p>	
Part -C	<p>Two Step Organic Preparations, purification of product and determination of melting point. (i) Acetanilide <i>para</i>-bromo acetanilide → <i>para</i> bromo aniline. (ii) Acetanilide - <i>para</i>-nitro acetanilide + <i>para</i> nitroaniline. Keywords/Tags: Organic preparation, Acetanilide, Bromination, Nitration, Hydrolysis.</p>	10

Part C – Learning Resources
 Text Books, Reference Books, Other resources

Suggested Readings:

1. Tatchell A.R., Furnis B.S., Hannaford A.J., Smith P.W.G., "Vogel's Textbook of Practical Organic Chemistry", Pearson Education, India, 2003, Fifth Edition.
2. Ahluwalia V. K., Dhingra S., "Comprehensive Practical Organic Chemistry: Qualitative Analysis", Universities Press, India, 2000.
3. Vogel A. I., "Elementary Practical Organic Chemistry: Small Scale Preparations Part 1", Pearson Education, India, 2010, Second Edition.
4. Vogel A. I., "Elementary Practical Organic Chemistry: Qualitative Organic Analysis Part 2", Pearson Education, India, 2010, Second Edition.
5. Books published by M.P. Hindi Granth Academy, Bhopal

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Suggestive digital platforms web links:

1. Organic Chemistry Virtual Lab (<https://vlab.amrita.edu/index.php?sub=2&brch=191>)
2. <http://www.mphindigranthacademy.org/>

Suggested equivalent online courses:

Part D – Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	10	Table work/ Experiments	50
TOTAL	30		70
Any remarks/ suggestions: Nil			

B. Sc. II Year Chemistry Syllabus

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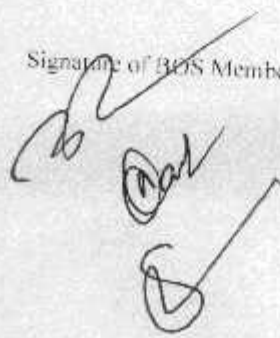
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CBCS Annual Pattern
From Academic Year 2023-2024
Chemistry- NEP (2020)

Part A Introduction		
Program: Diploma	Class: B. Sc.	
Year: Second	Session: 2023-2024	
Subject: Chemistry		
1	Course Code	S2-CHEM2T
2	Course Title	Transition Elements, Chemi-energetics, Phase Equilibria(Paper 2)
3	Course Type	Core Course/Minor/Elective
4	Pre-requisite (if any)	To study this course the students must have had the subject Chemistry in 12 th Class Or Subject Chemistry in Certificate Course of B. Sc.
5	Course Learning Outcomes (CLO)	By the end of this course students will learn the following aspects of Chemistry: <ul style="list-style-type: none"> • Introductory idea about Traditional Indian Chemistry • Chemistry of d- & f-block Elements, Basic Concepts of Coordination Chemistry. • Stereochemistry of Transition Metal Complexes. • Laws of Thermodynamics. • Concepts of Phase Equilibrium with reference to Solid Solution, Liquid Liquid Mixtures, partially Miscible Liquids. • Basic Concepts of Electrochemistry.
6	Credit Value	4 (Theory)
7	Total Marks	Max. Marks: 100 30 CCE+70 UE Min. Passing Marks: 35
Part B- Content of the Course		
Total No. of Lectures-Tutorials-Practical (in hours per week): 2 hours per week (L-T-P: 2-0-0)		
Total No. of Lectures: 60		
Unit	Topics	No. of Lectures
1	Knowledge Tradition of Indian Chemistry Ancient Indian chemists and their works: Nagarjuna, Vagbhata, Govindacharya, Yashodhara, Ramchandra, Somadeva, etc. Introductory idea about rasas Main rasa: Maharas, Uparas, Common Ras, Ratna, Dhatu, Poison, Alkali, Acid, Salt, Lauhabhasma. Maharas: Abram, Vaikrant, Bhasik, Vimala, Shilajatu, Sasak, Chapala, Rasak. Uparas: Gandhak, Garik, Kashis, Suvari, Lalak, Manah, Shila, Anjana, Kankushtha. Common Rasa: Koyla, Gautipashan, Navasara, Varataka, Agnijar, Lajavarta, Giri Sindoor, Hingul, Murdad, Sharngakam.	2

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	<p>Chemistry of d- & f-block elements</p> <p>1. Chemistry of Transition elements: First, Second and Third Transition series. General group trends with special reference to – Electronic Configuration, Coordination Geometry, Colour, Variable Valency, Spectral, Magnetic and Catalytic Properties, Ability to form Complexes.</p> <p>2. Chemistry of Inner Transition elements: Lanthanides and Actinides General group trends with special reference to Electronic Configuration, Oxidation States, Colour, Spectral and Magnetic properties. Lanthanide Contraction. Separation of Lanthanides (Ion-exchange method only).</p> <p>3. Transuranic elements: General Introduction.</p> <p><i>Keywords/Tags: Knowledge Tradition of Indian Chemistry, Transition elements, Spectral Properties, Magnetic Properties, Catalytic Properties, Lanthanide Contraction.</i></p>	10
2	<p>Coordination Chemistry</p> <p>1. Structures, Stereochemistry And Metal-Ligand Bonding In Transition Metal Complexes</p> <p>Werner theory for complexes. Electronic interpretation by Sidwick, Valence Bond Theory (VBT) - Postulates and applications for Tetrahedral, Square planar and Octahedral complexes. Limitations of VBT. Crystal Field Theory (CFT) - Postulates and application: Crystal field splitting of d-orbitals. Crystal field stabilization energy (CFSE) in Tetrahedral, Square planar and Octahedral complexes, CFSE of weak and strong fields. Factors affecting the crystal field parameters. Measurement of $10 Dq (\Delta_o)$ and factors affecting its magnitude. Comparison of octahedral and tetrahedral coordination, Tetragonal distortions from octahedral geometry. Jahn-Teller theorem. Square planar geometry. Limitations of CFT. Qualitative aspect of Ligand field and Molecular Orbital (MO) Theory. Spectrochemical and Nephelauxetic series. Coordination number, coordination geometries of metal ions, types of ligands.</p> <p>2. Isomerism in coordination compounds:</p> <p>Structural isomerism – Ionization, Linkage, Coordination-Ligand Isomerism.</p> <p>Stereo isomerism:</p> <p>Geometrical isomerism: Square planar metal complexes of type-$[MA_2B_2]$, $[MA_2BC]$, $[M(AB)_2]$, $[MABCD]$. Octahedral metal complexes of type- $[MA_4B_2]$, $[M(AA)_2B_2]$, $[MA_3B_3]$.</p> <p>Optical isomerism: Tetrahedral complexes of type- $[MABCD]$, Octahedral complexes of type- $[M(AA)_2B_2]$, $[M(AA)_3]$</p> <p><i>Keywords/Tags: Stereochemistry of complexes, VBT, CFT, CFSE</i></p>	12
3	<p>Thermodynamics</p> <p>1. First law of Thermodynamics</p> <p>Concept of heat (Q), work (W), internal energy (U), Statement of first law, Enthalpy (H), Relation between heat capacities.</p>	12

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	<p>Calculations of Q, W, ΔU and ΔH under isothermal and adiabatic conditions for Reversible, Irreversible and Free (ideal and van der Waals) expansions of gases. Joule Thomson effect and its theory, Inversion temperature.</p> <p>2. Second law of Thermodynamics Carnot cycle, Statement of the Second law of Thermodynamics. Concept of Entropy, Calculation of entropy change for Reversible and irreversible processes, Concept of residual entropy, Free Energy Functions: Gibbs and Helmholtz energy. Variation of entropy (S), Gibbs free energy (G), work function (A) with temperature (T), volume (V) and pressure (P). Free energy change and spontaneity, Gibbs- Helmholtz equation.</p> <p>3. Thirdlaw of Thermodynamics Nerst heat theorem and its significance, Statement of third law, Calculation of absolute entropy of substance.</p> <p>Keywords/Tags: Thermodynamics, laws of Thermodynamics, Carnot cycle, Enthalpy, Free Energy</p>	
4	<p>Electrochemistry</p> <p>1. Electrical Conduction: Conduction in metals and in electrolyte solutions, Specific, equivalent and molar conductivity. Measurement of equivalent conductance. Effect of dilution on conductivity. Migration of ions. Kohlrausch law and its applications.</p> <p>2. Weak and strong electrolytes: Theory of strong electrolytes, Debye-Huckel-Onsager (DHO) theory and equation.</p> <p>3. Transport numbers: Determination of transport numbers by Hittorf method and Moving boundary method.</p> <p>4. Electrode reactions: Nernst equation, Derivation of equation for single electrode potential.</p> <p>5. Electrodes: Reference electrodes, Standard hydrogen electrodes, Quinhydrone electrode, Glass electrode, Calomel electrode.</p> <p>6. Standard electrode potential. Electrochemical series and its applications.</p> <p>7. Electrochemical cells: Nernst equation, calculation of e.m.f. of cell.</p> <p>Keywords/Tags: Electrical transport, Conduction, DHO theory, Transport numbers, Nernst equation, Electrodes, Electrochemical series.</p>	12

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5	<p>Phase equilibrium</p> <ol style="list-style-type: none"> 1. Concept of phases. Components and degrees of freedom. Thermodynamic derivation of Gibbs Phase Rule for reactive and nonreactive systems. 2. Clausius- Clapeyron equation and its applications to Solid-Liquid, Liquid-Vapour and Solid-Vapour equilibria. 3. Phase diagram for one component systems with applications- Water and Sulphur. Phase diagrams for systems of solid-liquid equilibria involving – Eutectic, Congruent and Incongruent melting points. Water and Sulfur system, Ag-Pb and Mg-Zn system, NaCl-H₂O system. 4. Binary solutions: Raoult's Law, Ideal and Non-ideal or Azeotropic mixtures, immiscible liquids, Steam distillation. <p>Keywords/Tags: Phase equilibrium, Gibbs Phase Rule, Clausius- Clapeyron equation, Rault's Law.</p>	12
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Part C – Learning Resources

Text Books, Reference Books, Other Resources

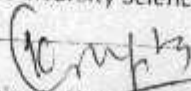
1. Suggested Readings:

Text Books:

1. Bariyar, A. and Goyal S B.Sc. Chemistry Combined, (In Hindi) Krishna Educational Publishers Year: 2019.
2. Lee, J.D., Concise Inorganic Chemistry, Wiley, 2008 Fifth Edition.
3. Kalia K.C Puri B.R., Sharma, .R., Principles of Inorganic Chemistry, Vishal Publishing Co. 2020.
4. Sodhi, G S., Textbook of Inorganic Chemistry Viva Books Private Limited, New Delhi 2013.
5. Singh J, Singh J. and Anandavardhan, S., A Logical Approach to Modern Inorganic Chemistry Anu Books 2019.
6. Gopalan R., and Ramalingam V., Concise Coordination Chemistry, Vikas Publishing House Pvt Ltd New Delhi, 2005. 1st edition.
7. Madan R. L., Chemistry for degree students, B.Sc. II year, S. Chand & Company Ltd., New Delhi, 2011.
8. Prakash, S Tuli, G. D., Basu, S. K., and Madan, R. D., Advanced Inorganic Chemistry, Vol. II, S. Chand & Company Ltd., New Delhi, 2007 19th edition
9. Malik, W. U., Tuli, G. D. and Madan, R. D Selected Topics in Inorganic Chemistry. S. Chand & Company Ltd. Delhi, 2014
10. Puri B R., Pathania M.S Sharma L R Principles of Physical Chemistry. Vishal Publishing Co. 2020
11. Gurtu, J. N., Gurtu A., Advanced Physical Chemistry, Pragati Prakashan, Meerut, 2017, Edition: IV.
12. Day, M.C. and Selbin, J., Theoretical Inorganic Chemistry, ACS Publications 1962.
13. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014.
14. Levine, I. N., Physical Chemistry, 6th Ed, Mcgraw Hill Education, 2011.
15. McQuarrie, A., Simon, J. D., Physical Chemistry: A Molecular Approach, 1st Ed, University Science Books, California (1997).

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16. Books published by M.P. Hindi Granth Academy, Bhopal.

Reference Books:

1. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K., Inorganic Chemistry: Principles of
2. Structure and Reactivity, Pearson Education India, 2006.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J., Concepts and Models in Inorganic Chemistry, John Wiley & Sons, 1994.
4. Barrow, G.M., Physical Chemistry, Tata McGraw-Hill, 2007.
5. Miessler, G.L., Fischer, P.J., and Tarr, D.A., Inorganic Chemistry, 5th edition, Pearson, 2014.
6. Weller, M., Overton, T., Rourke, J., Armstrong, F., Inorganic Chemistry: Seventh
7. International Edition, Oxford, 2018.
8. Glasstone, S., Textbook of Physical Chemistry, Macmillan, 1951.

Suggestive digital platforms web links

(all URLs accessed in April 2022)

1. https://www.fkit.unizg.hr/download/repository/PDF_chemistry_of_transition_element.pdf
2. http://www.t.soka.ac.jp/chem/iwanami/inorg/INO_ch6.pdf
3. https://fns.uniba.sk/fileadmin/prif/chem/kag/Bakalar/vch_noga/GEN_INORG_CHEM15.pdf
4. <http://www.savitapall.com/TransitionMetals/Notes/Transition%20Metal%20Chemistry.pdf>
5. <https://www.chem.tamu.edu/rgroup/marceetta/chem104/lectures/104-l-w02.pdf>
6. https://www.unf.edu/~michael_lufaso/chem2046/2046chapter19.pdf
7. https://users.ensc.concordia.ca/~tmg/images/9/94/Mats_HiierT_Phase_quilibria_and_thermodynamics.pdf
8. https://ocw.mit.edu/courses/materials-science-and-engineering/3-091sc-introduction-to-solid-state-chemistry-fall-2010/syllabus/MIT3_091SCF09_aln10.pdf
9. <https://www.chem.ucr.edu/~lawm/263%206.pdf>
10. https://wikieducator.org/images/c/CO/Phase_Equilibrium.pdf
11. <https://www.you.ac.in/sites/default/files/slm/BSCCH-201.pdf>
12. <https://devwanl.org/ma/289-FATHI-ITET>
13. <https://www.bharatijadhiardar.com/Hirecs-Thu-F-cha-FTA>
14. <https://www.amarujala.com/columns/blog/chemistry-in-ancient-india-know-about-chemist-nagarjuna-and-his-work-about-ras-ratnakar-aar-rasendramangal?pagelid=2>
15. http://vaigyanik-bharat.blogspot.com/2010/06/blog_post_5628.html
16. <https://www.pguris.com/chemistry-ancient-india/>
17. https://bharatdiscovery.org/India/Turn_faşura#gsc.tab=0
18. https://hi.wikipedia.org/wiki/THTTA_FASIT_GT_FFAETH
19. https://hi.wikipedia.org/wiki/orgate_ThrA_FT_SPAETET
20. <http://www.mphindigranthacademy.org/>

E Books

1. <http://faculty.washington.edu/gdrobny/v5-screen.pdf>
2. <https://www.fulviofrisone.com/attachments/article/402/Chemical%20Thermodynamic%20of%20Materials.pdf>
3. <https://www3.nd.edu/~powers/ame.20231/planckcover.pdf>

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Suggested equivalent online courses:

1. https://onlinecourses.uptel.ac.in/noc21_cy31/preview
2. https://onlinecourses.swayam2.ac.in/ccc21_ma16/preview
3. <https://www.classcentral.com/course/physicalchemistry-1456>
4. <https://www.classcentral.com/course/courseera-general-chemistry-concept-development-and-application-3885>
5. <https://www.classcentral.com/course/swayam-thermodynamics-13014>
6. <https://www.classcentral.com/course/swayam-concepts-of-thermodynamics-13015>
7. <https://www.classcentral.com/course/swayam-advanced-chemical-thermodynamics-and-kinetics-17504>
8. <https://www.classcentral.com/course/swayam-advanced-thermodynamics-17507>
9. <https://www.classcentral.com/course/swayam-chemical-principles-11-17911>
10. <https://www.classcentral.com/course/swayam-coordination-chemistry-13964>
11. <https://www.classcentral.com/course/swayam-co-ordination-chemistry-chemistry-of-transition-elements-19821>
12. <https://www.classcentral.com/course/swayam-phase-equilibrium-thermodynamics-14231>
13. <https://ocw.mit.edu/high-school/chemistry/exam-prep/reactions/reactiontypes/electrochemical-cells-and-batteries/>

Any, other comments/suggestions:

Nil

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks: University Exam (UE) 70 marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE): 30	Class Test Assignment/Presentation	Total 30
External Assessment: University Exam Section: 70 Time : 03.00 Hours	Section(A) : Objective Type Questions Section (B) : Short Questions Section (C): Long Questions	Total 70

Signature of BOS Members

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 Dr. Kalpana Gupta, HOD

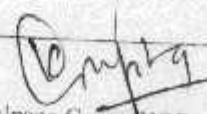
Govt. MH College of Home Science & Science for Women Jabalpur
 As recommended by Central Board of Studies and approved by the Governor of M.P.
 Syllabus: Chemistry Academic Session 2023-2024

Syllabus of Practical Paper

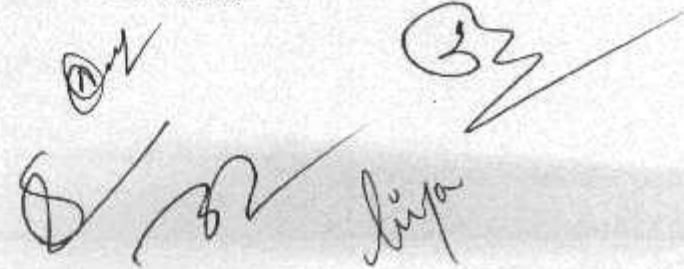
Program: Diploma		Class: B. Sc.		Year: Second		Session: 2023-2024	
				Part A Introduction			
				Subject: Chemistry			
1	Course Code	S2-CHEM2P					
2	Course Title	Metal Complex Preparation, Thermochemical & Phase equilibria experiments (Paper 2)					
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Core Course/ Minor/ Elective					
4	Pre-requisite (if any)	To study this course the students must have had the subject Chemistry in 12 th Class or Subject Chemistry in Certificate Course of B. Sc.					
5	Course Learning Outcomes (CLO)	By the end of this course students will learn the following aspects of laboratory exercises of Chemistry: <ul style="list-style-type: none"> • Preparation of inorganic complexes. • Use of calorimeter for thermochemistry experiments. • Determination of enthalpy of various system and reactions. • Experiments on phase equilibria. • Construction of phase diagrams. • Study of reaction equilibrium. 					
6	Credit Value	2 (Practical)					
7	Total Marks	Max. Marks: 30+70			Min. Passing Marks: 35		
Part B- Content of the Course							
Total No. of Practical- (in hours per week): 02							
L-T-P: 0-0-2 Total Hours 30)							
Unit	Topics						Marks
A	Preparation of Inorganic Complexes: <ul style="list-style-type: none"> ○ Tetraammine copper (II) sulphate ○ Copper (II) acetylacetonate complex ○ Iron (III) acetylacetonate ○ Tetraamininecarbonatocobalt (III) nitrate ○ Potassium tri(oxalato)ferrate(III) ○ Nickel(II) dimethylglyoximate 						10
B	Thermochemistry (a) Determination of heat capacity of a calorimeter using following experiments (i) Change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution of sulphuric acid or enthalpy of neutralization) (ii) Heat gained by cold water is equal to heat lost by hot water. (b) Determination of enthalpy of following: <ul style="list-style-type: none"> ○ Neutralization of hydrochloric acid with sodium hydroxide. ○ Ionization of ethanoic acid. 						15

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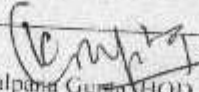


Govt. M H College of Home Science & Science for Women Jabalpur
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Syllabus: Chemistry Academic Session 2023– 2024

	<p>○ Hydration of salt.</p> <p>(c) Determination of enthalpy (endothermic and exothermic) of aqueous solution of salts (KNO_3, NH_4Cl).</p> <p>(d) Determination of basicity of a diprotic acid by the thermochemical method - Calculation of the enthalpy of neutralization of the first step in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base.</p> <p>(e) Study of the solubility of benzoic acid in water and determination of enthalpy change (ΔH).</p> <p>Redox titration</p> <p>Study of complexes: complexometric titration</p>	
C	<p>Study of Complexes: Determination of molecular composition of ferric salicylate complex by Job's method of continuous variation</p> <p>Phase Equilibria:</p> <p>a) Determination of critical solution temperature (CST), composition of the phenol- water system at CST and to study the effect of impurities of sodium chloride and succinic acid on it.</p> <p>b) Construction of the phase diagram using cooling curves or ignition tube method:</p> <p style="margin-left: 20px;">i. Simple eutectic and</p> <p style="margin-left: 20px;">ii. Congruently melting systems.</p> <p>c) Distribution of acetic/ benzoic acid between water and cyclohexane.</p> <p>d) Study of the equilibrium of following reactions by the distribution method:</p> <p style="margin-left: 20px;">i. $I(aq) + I(aq) \rightarrow I_2(aq)$</p> <p style="margin-left: 20px;">ii. $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n^{2+}$</p>	15
D	<p>Purification/ separation of compounds by Fractional distillation/ Steam distillation</p> <p>Any other experiment carried out in the class.</p> <p>Metal ion separation by thin layer chromatography (Green method)</p>	10
<p>Keywords/Tags: Inorganic Complexes, Heat Capacity, Enthalpy, Calorimeter, Critical Solution Temperature, Fractional Distillation, Steam Distillation.</p>		
<p>Part C-Learning Resources</p>		
<p>Text Books, Reference Books, Other resources</p>		
<p>Suggested Readings:</p> <ol style="list-style-type: none"> Goswami A.K., Mehta, A., Khanam Rehana, O.R.S., UGC Practical Chemistry VOL. I, Pragati Prakashan, 2015 Goyal, S., B.Sc. Chemistry Practical, Krishna Publication, 2017. Vogel, A.I., A Textbook of Quantitative Inorganic Analysis, ELBS. Khosla, B. D., Garg, V. C., & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011). 		

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Govt. M II College of Home Science & Science for Women Jabalpur
 As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023– 2024

5. Ratnani, S., Agrawal, S., Mishra, S.K. Practical Chemistry, McGraw Hill India, 2018, 15 Edition.
6. Pandey, O.P., Bajpai, D.N., Giri, S., Practical Chemistry, B.Sc. 1, 2 and 3rd, S. Chand, 2010.
7. गोस्वामी, सी., दीक्षित, पी., प्रायोगिक रसायन विज्ञान – द्वितीय वर्ष (संशोधित आवृत्ति), मध्य प्रदेश हिंदी ग्रंथ अकादमी, भोपाल, 2021.

Reference Books:

1. Gerasimchuk, N., Tyukhtenko, S., Inorganic Synthesis: A Manual for Laboratory, Experiments, Cambridge Scholars Publishing, 2019.
2. Gopalan, R., Inorganic Chemistry for Undergraduates, Universities Press, 2009.

E-Books

<https://books.google.co.in/books?id=10GRECLnwMC&printsec=copyright#v=onepage&q&f=false>

Suggestive digital platforms web links

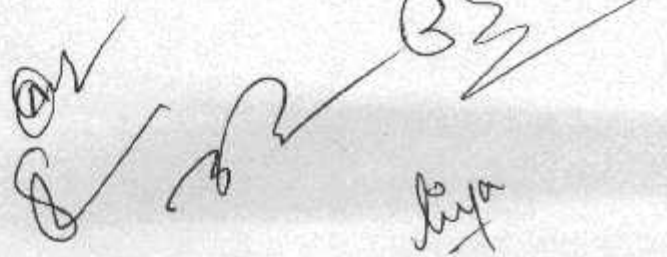
1. <https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=1352&cnt=1>
2. <https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=1546&cnt=1>
3. <http://www.chemguide.co.uk/physical/phaseeqia/immiscible.html>
4. <https://vlab.amrita.edu/index.php?sub=2&brch=191&sim=340&cnt=1>
5. <http://www.mplindigranthacademiy.org/>

Suggested equivalent online courses:

Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Marks	Marks
Class Interaction / Quiz	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignments (Charts/ Model s/ Seminar/ Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey/ Industrial visits)	10	Table work/ Experiments	50
TOTAL	30		70
Any Remarks/ Suggestions:		Nil	

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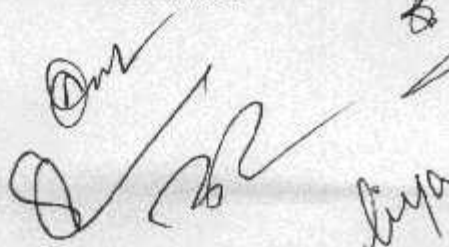
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Govt. M H College of Home Science & Science for Women Jabalpur
As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023– 2024

B.Sc. II Year Chemistry Syllabus
 CBCS Annual Pattern
 From Academic Year 2022-2023
 Chemistry-NEP (2020)

Part A: Introduction			
Program: Diploma	Class: B. Sc.	Year: Second	Session: 2023-24
Subject: Chemistry			
1	Course code	S2-CHEM1G	
2	Course title	Chemistry for Farmers	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Generic Elective	
4	Pre-requisite (if any)	Open for all	
5	Course Learning Outcomes (CLO)	At the end of the program, student will gain knowledge of following aspects of chemistry: <ol style="list-style-type: none"> 1. Crop cultivation, crop improvement, soil and crop management for sustainable organic agricultural production and development. 2. Physical properties of soil and fertilizers, soil types, soil texture and soil structure required for an agricultural field. 3. Analysis and identification of complex agricultural problems and formulating ethical solutions. 4. Innovative processes, products, and technologies to meet the challenges in agriculture and farming practices. 5. Fundamentals of horticulture. 6. Modern farming techniques and organic farming. 	
6	Credit Value	6+0	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B: Content of the course			
Total No. of Lectures (In hours per week): 3 hours per week (L-T-P: 3-0-0) Total No. of Lectures: 90			
Unit	Topic	No. of Lectures	
1	History of Farming and Farm Management- • History of Farming, Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR), Rural development programmes; Community Development Programme,	18	

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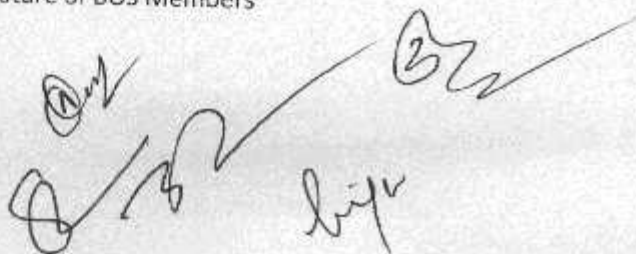



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Govt. M H College of Home Science & Science for Women Jabalpur
As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023– 2024

	<p>Intensive Agricultural District Programme, Special group Area Specific Programme, Integrated Rural Development Programme .</p> <ul style="list-style-type: none"> • Farm Management- Purchase of machinery, land conservation, marketing outputs, purchase inputs, infrastructural development, Acquiring funds, utilizing funds, planning future financial needs, Maintaining production records, financial records, transaction records, Farm management decisions. <p>Keywords/Tags: <i>Food Security, Rural Development, Land Conservation, Farm Management Decisions</i></p>	
2	<p>Soil fertility and nutrition management</p> <ul style="list-style-type: none"> • Soils: - Definition of soil, composition, importance of soil, soil Texture, Soil productivity and fertility. Crop nutrition, nutrients, classification with special reference to M.P. • Nutrient sources- organic manures, fertilizers, bio fertilizers. Nutrient recycling through manures and fertilizers. • Fertilizers and fertilizer use- management of fertilizers. Biological nitrogen fixation. Nitrogenous, phosphoric and potassic fertilizers. Green manure crops and cover crops. Integrated Nutrient Management. Organic Manures: - Classification and importance of organic manures, properties and methods of preparation of bulky manures. • Micro nutrients useful for plants & their general information. Farm yard manure, compost, and oilcake manures. Weeds: - Control of weeds (Mechanical, Agricultural, Biological & Chemical methods). <p>Keywords/Tags: <i>Soils, Bio Fertilizers, Green Manure Crops, Micro Nutrients.</i></p>	18
3	<p>Introduction of Horticulture & fruit preservation</p> <ul style="list-style-type: none"> • Meaning of horticulture, branches & scope of horticulture, plantation methods. Training & pruning. • Ornamental Gardening:- (i) Definition, Importance & Scope, (ii) Climber, Shrubs & Trees. • Vermiculture, Vermicomposting and its applications. <p>Keywords/Tags: <i>Horticulture, Ornamental Gardening, Vermiculture, Vermicomposting</i></p>	18
4	<p>Modern farming Techniques</p> <ul style="list-style-type: none"> • Definition, concepts, tools, techniques and their use in precision agriculture. Soil mapping and fertilizer recommendation using geospatial technologies. Spatial data and their management in GIS. Image processing and interpretation. Global positioning system (GPS), components and its functions; Introduction to crop simulation models and their uses for optimization of agricultural inputs. • Nanotechnology- Definition, concepts and techniques, brief introduction 	18

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	<p>about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.</p> <p><i>Keywords/Tags: Soil mapping, Geospatial technologies, Nanotechnology, Nano - pesticides</i></p>	
5	<p>Organic Farming and challenges of Farming-</p> <ul style="list-style-type: none"> • History, concepts, philosophy, objectives, opportunities and priorities, criticisms. Organic farming and food security, Principles of organic farming. Tools and practices of organic farming: Planned crop rotation, manuring. • Multiple cropping, Intercropping in relation to maintenance of soil productivity. • Challenges of farming/ agribusiness- instability, cropping pattern, the systems and techniques of farming, the marketing of agricultural products, inadequate use of manures and fertilizers, the use of poor quality seeds, inadequate water supply, inadequate use of efficient farm equipment, agricultural credit. <p><i>Keywords/Tags: Organic farming, Planned crop rotation, Agricultural Credit</i></p>	18

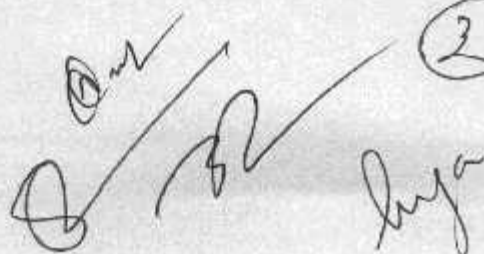
Part C – Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading: Reference Books:

1. Das, P. C., Manures and fertilizers, Kalyani Publishers Pvt. Ltd., New Delhi, Reprint 2015.
2. Gupta, A. K., and Varshney M. L., Practical Manual for Agricultural Chemistry, Kalyani Publishers Pvt. Ltd., New Delhi.
3. Foth, H. D., Fundamentals of Soil Science, John Wiley & Sons, USA, 1991, 8th Edition.
4. Alexander, M., Soil Science-An Introduction, Indian Society of Soil Science, India, 2015.
5. Nagaraj, V. D. and Raghav, J. S., Soil Fertility Management, Kalyani Publishers Pvt. Ltd., New Delhi, Reprint 2015.
6. Katyayan, A., Fundamentals of Agriculture, Volume 1 and 2, Kushi Publications and Distributors, India, 2017
7. Hesse, P. R., Text book of soil chemical analysis, CBS Publishers and Distributors, New Delhi 1998.
8. Chandrasekaran, B., Annadurai, K. and Somasundaram, E., A Textbook of Agronomy. New Age International Publishers, New Delhi, 2018.
9. Introduction to Soil Microbiology, Krieger Pub. Co. USA. 2nd Edition
10. Carter, M. R. Soil sampling and methods of analysis, Boca Raton Lewis publishers, 1993.
11. Wang, H. (editor), Essentials in soil science, Publishers Callisto Reference, 2015.
12. Gershuny, G., Compost, Vermicompost and Compost Tea: Feeding the Soil on the Organic Farm: 3 (Organic Principles and Practices Handbook Series) Chelsea Green Publishing Co.,

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As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023– 2024

2011, ISBN-10 1603583475.

13. Stevens, C., Worms at Work: Harnessing the Awesome Power of Worms with Vermiculture and Vermicomposting (Homegrown City Life), New Society Publishers, 2017.

14. Peter Davies, Vermiculture and Vermicomposting किंडल संस्करण, 2014.

15. Books published by M.P. Hindi Granth Academy, Bhopal.

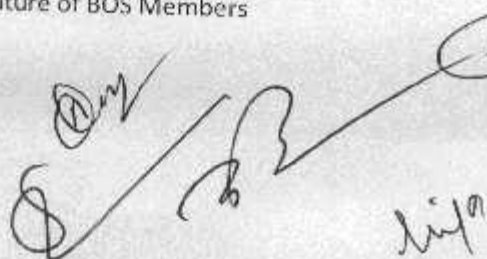
Suggested equivalent online: MOOCs, NPTEL, SWAYAM, HE E-Contents

(all URLs accessed in January/ April 2022)

1. Agriculture - NOC: Soil Science and Technology – NPTEL <https://nptel.ac.in> > courses
2. Machine Learning For Soil And Crop Management by Prof. Somsubhra Chakraborty, IIT Kharagpur - <https://nptel.ac.in/noc/courses/126/>
3. Biotechnology - NOC:Nanotechnology in Agriculture - <https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-bt41/>
4. Organic Farming for Sustainable Agricultural Production, By Prof. Dillip Kumar Swain, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc20_ag05/preview
5. Organic Farming for Sustainable Agricultural Production, By Prof. Dillip Kumar Swain, IIT Kharagpur <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ag04/>
6. https://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html
7. <https://www.biotecharticles.com/Agriculture-Article/Vermiculture-Types-of-Earthworms-and-Applications-3133.html>
8. <https://chloridefree.org/benefits-of-vermicompost-in-agriculture-and-how-it-works/>
9. <http://www.vermico.com/ebooks/>
10. <http://www.mphindigranthacademy.org/>

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks : 100		
Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks		
Internal Assessment : Continuous Comprehensive Evaluation (CCE): 30	Class Test Assignment/Presentation	Total 30
External Assessment : University Exam Section: 70 Time : 03.00 Hours	Section (A) : Objective Type Questions Section (B) : Short Questions Section (C) : Long Questions	Total 70

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Academic Council
 Approved

Syllabus

BSc Part III

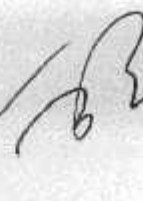
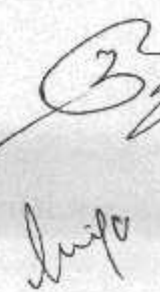
Academic Session 2023-2024

Govt. M H College of Home Science & Science for Women Jabalpur
 As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023–2024

CBCS Annual Pattern
B.Sc. III year
CHEMISTRY– DSE I
Syllabus of Theory Paper

Part A Introduction			
Program: Degree	Class: B. Sc.	Year: Third	Session: 2023-2024
Subject: Chemistry			
1	Course Code	53-CHEM1D	
2	Course Title	Green and Agricultural Chemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/)	Discipline Specific Elective (DSE) Group A Paper I	
4	Pre-requisite (if any)	To study this course, a student must have passed diploma or equivalent course/qualification with Chemistry as a subject.	
5	Course Learning outcomes (CLO)	By the end of this course students will acquire the knowledge of following aspects of green and agricultural chemistry: <ul style="list-style-type: none"> • Basic principles of green and sustainable chemistry. • Understand stoichiometric calculations and relate them to green process metrics. • Learn alternative solvent media, green catalysis and energy sources for chemical processes. • Understand the requirements of manures and fertilizers for various crops and their proper time of application. • Understand to maintain soil fertility for better crop production. 	
6	Credit Value	04	
7	Total Marks	Max. Marks: 30 + 70	Min. Passing Marks : 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week):			
L-T-P:			
Unit	Topics	No. of Lectures	
Unit - 1	Concepts and Principles of Green Chemistry History and evolution of Twelve principles of green chemistry and their explanations with examples. Tools of green chemistry-green solvents, green catalysts, energy efficient processes, environmentally benign products, dry media synthesis (use of sun light, UV, microwaves and ultrasonic energy). Metrics of green chemistry-different metrics relating to the principles of green chemistry, atom economy, percentage yield, reaction mass efficiency, effective mass efficiency, environmental factor, eco scale and biologic tool plots, difference between mass based and impact-based matrices, life cycle assessment (LCA) and environment foot print. Challenges and scope of green chemistry in India. Keywords/Tags: Green chemistry, green solvents, green catalysts, atom economy, environmental factor.	12	

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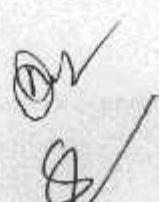
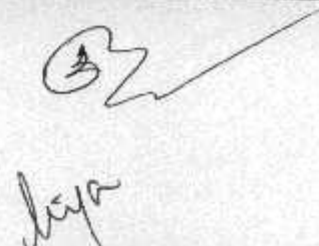




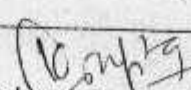

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Syllabus: Chemistry Academic Session 2023–2024

Unit - 2	<p>Green Catalysis and Processes Heterogeneous catalysis, use of zeolites, silica and alumina supported catalysis, biocatalysis: Enzymes, microbes, Phase transfer catalysis (micellar/surfactant). Prevention of chemical accidents, designing greener processes, Strengthening/development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes. Cutting Edge Research in pharma, paint, detergent and other synthetic industries. Green Synthesis of the following compounds: adipic acid & catechol, Microwave assisted reaction in water – Hoffmann elimination, oxidation of toluene and alcohols. Keywords/Tags: Heterogeneous catalysis, zeolites, silica, Phase transfer, greener processes, green synthesis.</p>	12
Unit - 3	<p>Soil Fertility Soil fertility evaluation and soil testing, Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests, Indicator plants. Methods of fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions. Keywords/Tags: Soil fertility, plant analysis, indicator plants, crop, rainfed.</p>	12
Unit - 4	<p>Organic Manuring Classification and importance of organic manures, properties and methods of preparation of bulky manures. Green/leaf manuring, Transformation reactions of organic manures in soil and importance of C:N ratio in rate of decomposition. Keywords/Tags: organic manure, bulky manures, leaf manuring, C:N ratio, decomposition.</p>	12
Unit - 5	<p>Fertilizers Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary and micronutrient fertilizers, complex fertilizers, nano fertilizers. Soil amendments, fertilizer storage and fertilizer control order. History of soil fertility and plant nutrition. Criteria of essentiality. Role, deficiency and toxicity symptoms of essential plant nutrients. Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.</p>	12

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	Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Use of Bio-fertilizers in Agriculture and their Advantages. Keywords/Tags: Chemical fertilizers, nitrogenous, micronutrient, soil, nano fertilizer.	
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Part C-Learning Resources

Text Books, Reference Books, Other resources

- Suggested Readings:**
1. Matlack A.S., Marcel Dekker, "An Introduction to Green Chemistry", 2001.
 2. Anastas P.T. and Wavner J.C., "Green Chemistry: Theory and Practice", Oxford University Press, 1998.
 3. Lancaster M., "An Introductory Text on Green Chemistry", Royal Society of Chemistry, Cambridge, 2002.
 4. R. A. Sheldon, I. Arends, U. Hanefeld, "Green Chemistry and Catalysis", Wiley-VCH, 2007.
 5. Kolb V. M., "Green Organic Chemistry and its Interdisciplinary Applications", CRC Press, 2016.
 6. Das P. C., "Manures and fertilizers", Kalyani Publishers Pvt. Ltd., New Delhi Rept. 2015.
 7. Gupta A. K. and Varshney M. L., "Practical manual for Agril. Chemistry", Kalyani Publishers Pvt. Ltd., New Delhi.
 8. Nagorny V. D. and Raghav J. S., "Soil Fertility Management", Kalyani Publishers Pvt. Ltd., New Delhi, Rept. 2015.

Suggested equivalent online courses:

Part D-Assessment and Evaluation

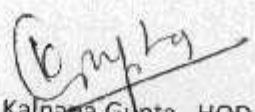
Suggested Continuous Evaluation Methods:
 Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE): 70 marks		
Internal Assessment:	Class Test	
Continuous Comprehensive Evaluation (CCE): 30	Assignment/Presentation	30
External Assessment:	Section(A): Very Short Questions	
University Exam Section:70	Section (B): Short Questions	
	Section (C): Long Questions	70

Any remarks/ suggestions:

Signature of BOS Members

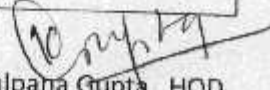



 Dr Kalpana Gupta HOD

CBCS Annual Pattern
B.Sc. III year
CHEMISTRY– DSE 1
Syllabus of Practical Paper

Part A Introduction			
Program: Degree		Class : B. Sc.	Year: Third
		Session: 2023-2024	
Subject: Chemistry			
1	Course Code	S3-CHEM1Q	
2	Course Title	Green and Agricultural Chemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/....)	Discipline Specific Elective Group A Paper 1	
4	Pre-requisite (if any)	To study this course, a student must have passed Diploma or equivalent course/qualification with Chemistry as a subject.	
5	Course Learning outcomes (CLO)	By the end of this course students will acquire the knowledge of following aspects of green chemistry: <ul style="list-style-type: none"> • To learn green synthesis of organic and inorganic compounds. • To learn to prepare green ionic liquids. • To understand soil profile, sampling and study minerals present in soil. • To learn to estimate organic matter content of soil. 	
6	Credit Value	02	
7	Total Marks	Max. Marks: 30 +70	Min. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week):			
L-T-P:			
Practical	Topics	No. of Lectures	
Part - A	<ol style="list-style-type: none"> 1. Green preparations: <ol style="list-style-type: none"> (i) Manganese(III) acetylacetonate complex by using potassium permanganate and acetylacetone in water. (ii) Green preparation of Iron(III) acetylacetonate complex by using ferric trichloride and potassium hydroxide in water. (iii) Preparation of ionic liquid, 1-Pentyl-3-methylimidazolium bromide [pmIm]Br. 2. Green bromination of <i>trans</i>-stilbene by sodium bromide – sodium bromate. 3. Diels-Alder reaction between furan and maleic acid. 4. Benzoin condensation - Coenzyme (Thiamine hydrochloride) catalyzed synthesis of benzoin. <p>Keywords/Tags: Green bromination, Diels-Alder, Coenzyme, Benzoin condensation, green inorganic preparation.</p>	10	

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Part - B	<p>5. Study of soil profile in the field.</p> <p>6. Study of soil sampling tools, collection of representative soil sample, its processing and storage.</p> <p>7. Study of soil forming rocks and minerals.</p> <p>8. Estimation of organic matter content of soil.</p> <p>Keywords/Tags: Soil profile, soil sampling, rock, minerals, organic matter.</p>	10
Part - C	<p>9. Determination of soil pH and electrical conductivity.</p> <p>10. Determination of cation exchange capacity of soil.</p> <p>11. Determination of soil density, moisture content and porosity.</p> <p>12. Determination of soil texture by feel and Bouyoucos methods.</p> <p>Keywords/Tags: Soil, pH, electrical conductivity, cation exchange, soil density, soil texture.</p>	10

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. Rana B. C. (Co-ordinator), "Monograph on Green Chemistry Laboratory Experiments", Green Chemistry Task Force Committee, DST, India.
2. Chopra S.L., Kanwar J.S. Rakshit A., "Analytical Agricultural Chemistry", Kalyani Publishers, India, 2019, Sixth Edition.
3. Jackson M. L., "Soil Chemical Analysis", Pentice Hall, New Delhi, 1973.
4. Piper C. S., "Soil and Plant Analysis", Hans Publication, 1950.

Suggested equivalent online courses:

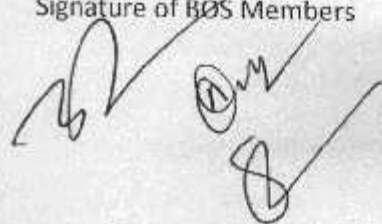
Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
Total Marks: 100			

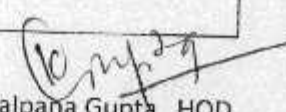
Any remarks/ suggestions:

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CBCS Annual Pattern
B.Sc. III year
CHEMISTRY– DSE 2
Syllabus of Theory Paper

Part A – Introduction			
Program: Degree	Class: B.Sc.	Year: III	Session:2023-24
Subject: Chemistry			
1	Course code	S3-CHEM2D	
2	Course title	Laboratory skill, techniques & management	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective (DSE) Group A Paper II	
4	Pre-requisite (if any)	To study this course, a student must have the subject chemistry in Diploma Course of BSc or equivalent.	
5	Course Learning Outcomes (CLO)	<p>OBJECTIVES</p> <p>This course/paper is intended for persons employed as or aspiring for employment as laboratory technician / attendant in school / college/ other scientific laboratories.</p> <p>MAIN LEARNING OUTCOMES</p> <p>At the end of the course, the learners will be-</p> <ul style="list-style-type: none"> • Familiarized with the basic facilities available in laboratories. • Expected to gain knowledge of the basic skill of organization and management of science laboratories. • Enabled to expertise in the procedures of procurement and storage of laboratory equipment & material. • Trained in the operation and maintenance of simple instruments used in science laboratories. • Enabled to develop skills in common laboratory techniques. • Trained to adopt appropriate disposal procedures and safety methods suitable for Laboratories. 	
6	Credit Value	4 (Theory)	
7	Total Marks-100	Max. Marks (30+70):	Min. Passing Marks:35

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Part B – Content of the course		
Total No. of Lectures (In hours per week):60		
Unit	Topic	No. of Lectures
1	<p>Laboratory organization and management-</p> <ul style="list-style-type: none"> • Science laboratory: scientific temper, scientific reporting, significance values/ accuracy/ attitude, interaction with pupil present in the lab, dignity of work of lab staff • Important components of a science laboratory: features of a science laboratory, services in a science laboratory • Organization of science labs: preparation room, arrangement of stores, safety provisions, Labels- a cautionary note • Day-to-day management of laboratories: day to day cleaning up, routine inspection and maintenance of laboratory, cleaning of laboratory and preparation rooms, colour coding of services, emergency switch services, security and vandalism. • Stock control and purchase: arranging stock, naming and maintenance of stock register, receiving of goods, processing of bills, accounting, controlling budget, information about equipment & miscellaneous records, purchase rules. • File and records: sources of information in the lab, filing system for chemicals, requests for equipment & special files • Use of computer in science laboratory: component of a computer, overall function & application software. <p><i>Key words-</i> Colour coding, Vandalism, Budget, overall function, safety provisions, stock register, purchase rules</p>	12
2	<p>HAZARDS IN LABORATORY & LABORATORY SAFETY-</p> <ul style="list-style-type: none"> • Electricity and gas hazards: electricity hazards in the laboratory (selection of proper fuse, selection of proper flex, safe conduct, earthing & other dangers associated with electrical equipment's), Gas hazards in the laboratory (LPG, high pressure gas hazards, detection and handling of gas leakage & low pressure gas hazards). • Fire hazards: fire hazards in the laboratory, classification of fire, precaution of fire prevention & extinguishing a fire and types of fire extinguishers. • Chemical hazards: classification of hazardous chemicals, handling of chemicals, storage of chemicals, transport of bulk chemicals & transfer from large containers. • Personal safety: Code of behavior for the laboratory staff, personal protective devices, disposal of waste materials, check-in & shut - down sequences & shifting load • Accidents and first aids: accident reporting, procedure, first aid box, general features of first aid procedure, first aid procedures for chemical accidents, first aid treatment for shock & first aid treatment of localized injuries. <p><i>Keywords-</i> Gas hazards, proper flex, LPG, Fire Extinguisher, code of behaviour, First aids.</p>	12

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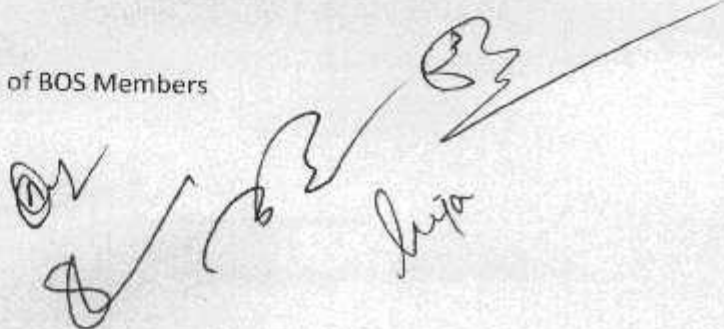



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3	BASIC LABORATORY APPARATUS AND EQUIPMENT IN CHEMISTRY <ul style="list-style-type: none">• BASIC APPARATUS: Identification of apparatus, apparatus for heating (Bunsen burner, water bath, Oil bath, hot plate & heating mantle), laboratory glassware, laboratory centrifuge, use and description• Measuring Apparatus: Measurement in chemistry lab, errors, precision and accuracy of measurement, volume, types of volume, measuring devices, burettes & pipettes, accuracy of burettes & pipettes, volumetric flask, mass and weight, balances analytical and electronic, pH meter and conductometer• Common laboratory glassware: laboratory glass ware and its types, cleaning methods, storage and handling of glass apparatus, assembly of glass apparatus, gas pressure in glass, safety measures for storage, caring & handling of glassware <p><i>Keywords-</i> Water bath, heating mantle, centrifuge, precision, gas pressure</p>	12
4	BASIC LABORATORY TECHNIQUES IN CHEMISTRY <ul style="list-style-type: none">• Solutions and their preparation: Water and its types, types of solution, solubility, concentration of solutions- percentage, molarity, molality, normality & ppm, calculation of mass and volumes to prepare solutions, general guidelines for preparation of solution, general methods of preparation, labeling, exceptions to the general method, notes on other solution reagents for chemistry, bench reagents, standard solutions• Common laboratory techniques: Heating, refluxing, filtration, small scale methods, recrystallization and determination of melting point, distillation and determination of boiling point <p><i>Keywords-</i> Concentration units, labelling, bench reagents, refluxing, recrystallization, melting point, boiling point</p>	12
5	GOOD LABORATORY PRACTICES: BASIC EXERCISES <ul style="list-style-type: none">• Ex. 1 procedure for purchase of laboratory related items, inventory management• Ex. 2 supply of gas, electricity and water in a laboratory• Ex. 3 fire safety measures in a laboratory• Ex. 4 Classification and handling of hazardous chemicals• Ex. 5 disposal of unserviceable and obsolete items• Ex. 6 safe disposal of laboratory wastes• Ex. 7 attending to emergency situation• Ex. 8 preparation of standard of oxalic acid solution• Ex. 9 determination of strength of NaOH• Ex. 10 preparation of stock solutions and dilution• Ex. 11 preparation of water and alcohol based reagents (Fehling A & B, starch solutions)• Ex. 12 preparation of distilled water• Ex. 13 preparation of buffer solution• Ex. 14 determination of pH using pH paper <p><i>Keywords-</i> Inventory, unserviceable, obsolete, Fehling A & B, distilled water</p>	12

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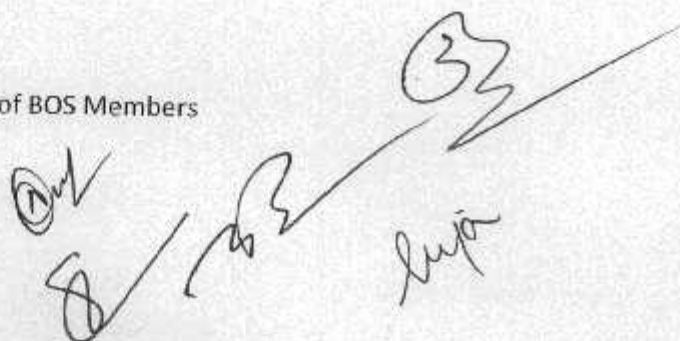
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Syllabus: Chemistry Academic Session 2023– 2024

Part C – Learning Resources
Text Books, Reference Books, Other resources
Suggested Reading: <ol style="list-style-type: none"> 1. Robert H Hill, David C Finster, " Laboratory Safety for chemistry, Willey 2. Sveinbjorn gizurarson, Benjamin R, "Hand book for Laboratory Safety" Elsevier 3. Anthony A Fuscaldo, "Laboratory Safety Theory & Practice" Elsevier 4. Steven I, Brown, " Laboratory Techniques for general chemistry" Hayden Meneil 5. http://ncert.nic.in, kelm202, " Basic Laboratory Techniques" 6. Abigail , " laboratory note book, Slater Press

Part D-Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks : 100		
Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks		
Internal Assessment : Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation	30
External Assessment : University Exam Section:70	Section(A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70

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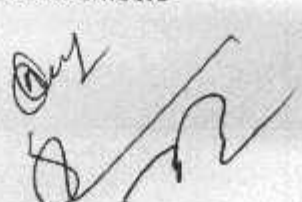
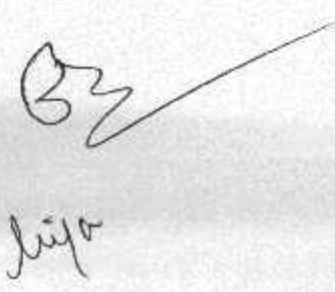

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 Syllabus: Chemistry Academic Session 2023-2024

CBCS Annual Pattern
B.Sc. III year
CHEMISTRY- DSE 2
Syllabus of Practical Paper

Part A Introduction			
Program: Degree	Class: BSc	Year: Third	Session: 2023-24
Subject: Chemistry			
1	Course Code	S3-CHEM2Q	
2	Course Title	Exercises for Development of Lab Skills	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective (DSE) Group A Paper II	
4	Pre-requisite (if any)	To study this course the students must have had the subject Chemistry in Diploma Course of B.Sc. or equivalent	
5	Course Learning outcomes (CLO)	On completion of this course, learners will be able to: Handle and run any chemistry lab skillfully. Students will be able to perform general exercises like- <ul style="list-style-type: none"> • Preparation of standard solutions • Determination of concentration • Determination of MP, pH, Conductivity • Preparation of stock Solutions • Preparation of various reagents 	
6	Credit Value	2 (Practical)	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks:35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week):			
L-T-P:			
Unit	Topics	No. of Lectures	
Unit I	1. Preparation of standard of oxalic acid solution 2. Determination of strength of NaOH 3. Determination of concentration of solutions- percentage, molarity, molality, normality & ppm	06	
Unit II	4. Determination of melting point 5. Distillation 6. Determination of boiling point	06	

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Unit III	7. Preparation of stock solutions and dilution 8. Preparation of water based and alcohol-based reagents (Fehling A & B, starch solutions) 9. Preparation of distilled water	06
Unit IV	10. Preparation of buffer solution-Acidic and Basic Buffers 11. Preparation of Nessler's reagent, Molisch reagent, Schiff's base	06
Unit V	12. Determination of pH using pH paper, pH meter 13. Conductometric titration-Acid Base	06

Keywords/Tags: Standard, Distillation, boiling point, stock solutions, buffer, Conductometric titration, pH

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. "A Skills Training Manual in Basic Chemical Laboratory Techniques", by Soffiantini Vic, Seller-Atlantic Publishers, Publisher: Lulu.com ISBN: 9781471090998, 9781471090998
2. ICSE Chemistry Lab Skills - Laboratory Ethics • Viva Voce, Neha Sharma, ISBN : 9789388653510. 2020, Viva Education
3. Chemistry Laboratory Skills - 1: Alternative to Practical, Shirly Bandarawatta, ISBN-10 : 9554114206 Summer Gate Education; 2nd edition (July 22, 2013)
4. Fundamentals of Chemistry: Laboratory Studies, Third Edition, 1975, Frank Brescia, John Arents, ... Eugene Weiner, Science Direct

Suggestive digital platforms web links:

<https://www.valpo.edu/chemistry/experiential-learning/lab-skills/>

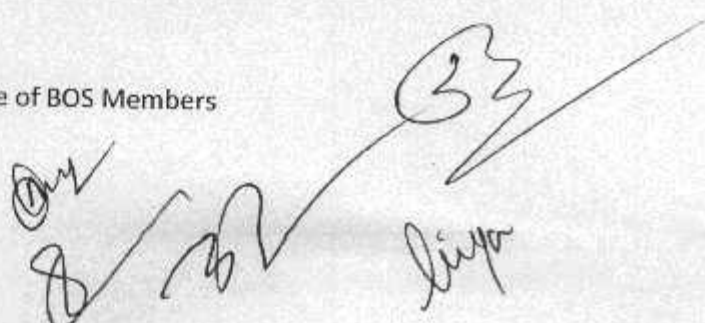
<https://www.cademix.org/chemistry-lab-skills-and-various-strategies-for-developing-them/>


Suggested equivalent online courses:

https://onlinecourses.swavam2.ac.in/ntr20_ed14/preview

<https://www.classcentral.com/course/swavam-analytical-techniques-13896>

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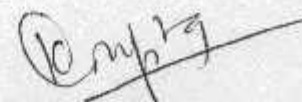
Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
TOTAL MARKS: 100			
Any remarks/ suggestions:			

Signature of BOS Members



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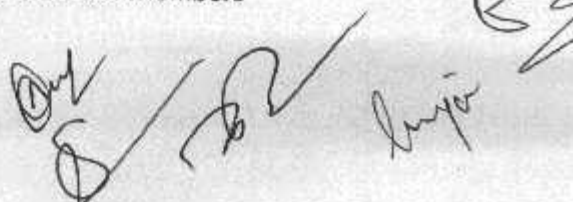
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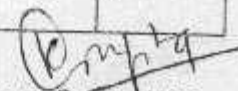
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 Syllabus: Chemistry Academic Session 2023– 2024

CBCS Annual Pattern
B.Sc. III year
CHEMISTRY– DSE 3
Syllabus of Theory Paper

Part A Introduction			
Program: Degree		Class: B.Sc. Year: III	Session: 2023-24
Subject: CHEMISTRY			
1	Course Code	S3-CHEM3D	
2	Course Title	INSTRUMENTAL TECHNIQUES IN CHEMISTRY	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective (DSE) Group B Paper I	
4	Pre-requisite (if any)	To study this course the students must have the subject Chemistry in Diploma Course of B.Sc. or equivalent.	
5	Course Learning outcomes (CLO)	By the end of this course students will learn the following aspects of Instrumental Techniques in Chemistry: <ul style="list-style-type: none"> • Preparation of standard samples for analysis. • Instrumentation for analytical methods of Chemistry. • Instrumentation for various spectroscopic techniques. • Principles and instrumentation of various electro analytical techniques. • Instrumentation used in optical methods of analysis. • Advanced chromatographic techniques. 	
6	Credit Value	4 (Theory)	
7	Total Marks: 100	Max. Marks: 30+70	Min. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 60-0-30			
Unit	Topics	No. of Lectures	
1	Practical Aspects of Chemical Analysis	6	

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	<p>1. Analysis of real samples: Choice of analytical method, Analysis of standard samples, preparing standard samples for analysis, moisture in sample, drying the analytical sample, decomposition and dissolution of sample, source of errors in decomposition and dissolution.</p> <p>2. Automation in Laboratory: Introduction, classification of analytical methods. Types of instrumental methods. Importance of instruments for analysis. Analog & Digital signals, planning for laboratory automation. An overview of automatic instruments & instrumentation. Good laboratory practices. Instrumental standardization, optimization of procedures.</p> <p>Keywords/Tags: <i>Sampling, Analog signals, Digital signals, Standardization</i></p>	
2	<p>Electronic & Vibrational-Rotational Spectroscopy</p> <p>1. Electronic or Ultra-Violet Visible (UV-Vis) Spectroscopy: Basic principles, Instrumentation and Techniques.</p> <p>2. Fourier-transform infrared (FTIR) Spectroscopy: Introduction and basic principle of IR spectroscopy, Instrumentation. Working of FTIR Spectrophotometer, Advantages of FTIR Spectroscopy.</p> <p>3. Raman Spectroscopy: Mechanism of Raman Effect – Quantum theory and classical theory. Instrumentation and techniques. Qualitative treatment of Rotational Raman effect, Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines, their intensity difference, rule of mutual exclusion.</p> <p>Keywords/Tags: <i>FTIR Spectroscopy, UV-Vis Spectroscopy, Raman Effect, Stokes lines, anti-Stokes lines.</i></p>	8
3	<p>Molecular Characterization Techniques</p> <p>1. Nuclear Magnetic Resonance Spectroscopy: Basic principles of NMR, Instrumentation – Magnet, sweep generator, RF generator, RF receiver, signal recorder, calculation of NMR signals.</p> <p>2. Electron Spin Resonance (ESR) spectroscopy: Introduction, principle, instrumentation, selection rules, interpretation of Lande's factor 'g'. Hyperfine and super hyperfine coupling.</p> <p>3. Mass Spectrometry: Theory of mass spectrometry. Principle and operation of mass spectrometer.</p> <p>Ionization techniques- electron impact, chemical ionization, electrospray, electrical discharge, laser desorption, fast atom bombardment.</p> <p>Separation of ions on basis of mass-charge ratio. Analyzers- Magnetic-sector, Electric quadrupole and high-resolution multiple-reflection time of flight (MR-TOF).</p> <p>Keywords/Tags: <i>Sweep Generator, hyperfine coupling, superfine coupling, ionization, absorption, emission, MR-TOF.</i></p>	12
4	<p>Atom Characterization Techniques</p> <p>1. Flame photometry: Flame emission spectroscopy, characteristics of flame, instrumentation & working of flame photometer.</p>	10

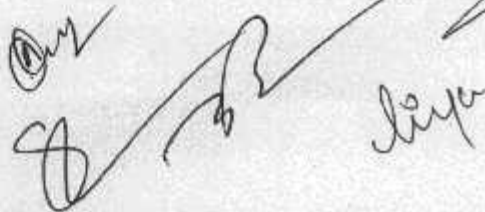
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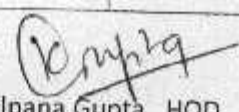
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	<p>2. Atomic Absorption Spectroscopy (AAS): Basic principles, Instrumentation, atomizer, monochromator, detector, sensitivity and detection limits. Interferences in AAS and their elimination.</p> <p>3. Atomic Emission Spectroscopy (AES): Principles, Sources for excitation, Instrumentation, Qualitative and quantitative Analysis.</p> <p>Keywords/Tags: <i>Flame Spectroscopy, Monochromator, Atomizer, Detector</i></p>	
5	<p>Electro analytical techniques</p> <p>1. Polarography: General principles and instrumentation of polarography, half-wave potential, equations for reversible cathodic, anodic and cathodic-anodic waves, analysis of reversible polarographic wave.</p> <p>2. Voltammetry: General principles and instrumentation, Cyclic voltammetry, Linear-scan voltammetry, Pulse voltammetric methods, Voltammetry with ultra-micro electrodes, stripping methods.</p> <p>3. Amperometry: Principles and amperometric titration techniques-Dropping mercury electrode, rotating platinum microelectrode.</p> <p>4. Potentiometry: Introduction, reference and indicator electrodes, ion selective electrodes. Instrumentation and measurement of electro motive force of cell (EMF). Potentiometric titrations.</p> <p>5. Conductometry: Principle, measurement of conductance, conductometric titrations.</p> <p>Keywords/Tags: <i>Cathodic waves, Anodic waves, Amperometric titration, Conductometric titration, Conductance, Electrode.</i></p>	12
6	<p>Optical and Advanced Chromatographic Techniques</p> <p>1. Polarimetry: Polarimeter, optical rotations, measurements of optical rotation.</p> <p>2. Refractometry: Principle of refraction, Snell's law, Construction & working of refractometer.</p> <p>3. Gas Chromatography (GC): Theory, Instrumentation-description of equipment and different parts, columns (packed and capillary columns)</p> <p>Detector specifications, Thermal conductivity detector, Flame ionization detector, electron capture detector, nitrogen-phosphorous detector or thermionic specific detector (TSD), photo ionization detector. Programmed temperature gas chromatography.</p> <p>4. High Performance Liquid Chromatography (HPLC): Theory, Instrumentation, description of the different parts of the equipments, stationary phases (columns), mobile phase, detectors, UV detector, refractive index (RI) detector, Fluorescence detector, Photo Diode Array detector, Evaporative Light Scattering Detector (ELSD), conductometric detector and electrochemical detector.</p> <p>Keywords/Tags: <i>Optical Rotation, UV Detector, RI Detector, TSD, ELSD, Chromatograms.</i></p>	12

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Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

Text Books:

1. Kaur, H., "Instrumental Methods of Chemical Analysis", Pragati Prakashan, 2018
2. Sharma, B.K., "Instrumental Methods of Chemical Analysis", Goel Publishing House, 2011.
3. Khandpur R.S., "Analytical Instrumentation", Tata McGraw Hill, 2006
4. Skoog, D.A., Holler, F.J., Nieman, T.A., "Principles of Instrumental Analysis", Cengage Learning India Ed., 2017
5. Khopkar, S.M., "Instrumental Analysis in BioAnalytical Chemistry", New Age International, 2016.
6. Chatwal, A., "Instrumental Methodology of Analysis", Himalaya Publishing House, 2011.
7. Kalsi, P.S., "Spectroscopy of Organic Compounds", New Age International, 2016.

Reference Books:

1. Galen, E., "Instrumental Methods & Chemical Analysis", McGraw-Hill Publishing Company Ltd., 1985.
2. Christian, G. D., "Analytical Chemistry", John Wiley and Sons. Inc, 1994.
3. Harris, D.C., "Quantitative Chemical Analysis", W.H. Freeman & Co. New York, 2003, 7th Edition.
4. Willard, H.H., Merritt, L.L., Dean, J., Settoe, F.A., "Instrumental Methods of Analysis", Wadsworth Publishing Company Ltd., Belmont, California, USA, 2004, 7th Edition.
5. Drago, R.S., "Physical Methods in Chemistry", W.B. Saunders Co, 1977.
6. Atkins, P.W., "Physical Chemistry", Oxford University Press, 2017.
7. Castellan, G.W., "Physical Chemistry", Narosa, 2004.
8. Day, R.A., Underwood, A.L., "Quantitative Analysis", Prentice-Hall of India Pvt. Ltd., 1985.
9. Jeffery, G.H., Bassett, J., Mendham, J., Denney, R.C., "Vogel's Textbook of Quantitative Chemical Analysis", Pearson, 2017.
10. Ewing, G.W., "Instrumental Methods of Analysis", McGraw Hill, 1992.
11. Kemp, W., "Organic Spectroscopy", Mc Millan, 1991, 3rd edition.
12. Williams, D.H., Fleming, I., "Spectroscopic methods in Organic Chemistry", Mc Graw Hill, 2017, 4th Edition.
13. Banwell, C.N., McCash, E.M., "Fundamentals of Molecular Spectroscopy", Tata Mc Graw Hill, 1995, 4th edition.
14. Webster, F.X., Silverstein, R.M., "Spectroscopic Identification of Organic Compounds", Wiley, 1981.

Web sources (Last Accessed on 07th June, 2021)

1. <https://open.umn.edu/opentextbooks/textbooks/486>
2. <https://rb.gy/aieqvq>
3. <https://rb.gy/0z!ww>

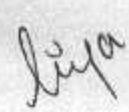
Suggested equivalent online courses:(Last Accessed on 07th June, 2021)

MOOC : <https://freevidelectures.com/course/3029/modern-instrumental-methods-of-analysis>

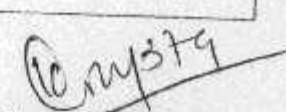
NPTEL:

1. <https://nptel.ac.in/courses/104/105/104105084/>
2. https://nptel.ac.in/content/syllabus_pdf/102101050.pdf

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Govt. M H College of Home Science & Science for Women Jabalpur
As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023– 2024

Part D-Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE): 70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 30	Class Test Assignment/Presentation	30
External Assessment: University Exam Section: 70	Section (A): Very Short Questions Section (B): Short Questions Section (C): Long Questions	70
Any remarks/ suggestions:		

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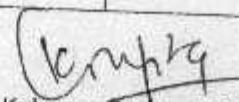
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 As recommended by Central Board of Studies and approved by the Governor of M.P.
 Syllabus: Chemistry Academic Session 2023– 2024

CBCS Annual Pattern
B.Sc. III year
CHEMISTRY- DSE 3
Syllabus of Practical Paper

Part A Introduction			
Program: Degree	Class: B.Sc.	Year: Third	Session: 2023-24
Subject: Chemistry			
1	Course Code	S3-CHEM3Q	
2	Course Title	Instrumental Analytical Techniques In Chemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective (DSE) Group B Paper I	
4	Pre-requisite (if any)	To study this course the students must have had the subject Chemistry in Diploma Course of B.Sc. or equivalent.	
5	Course Learning outcomes (CLO)	By the end of this course students will learn the following aspects of instrumental techniques in chemical analysis: <ul style="list-style-type: none"> Preparation of standard samples for analysis. Determination of concentration of solutions spectrometrically. Determination of stoichiometry and stability constant of complexes. Potentiometric and conductometric titrations. Advanced chromatographic techniques. 	
6	Credit Value	2 (Practical)	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 4			
L-T-P: 60-0-30			
Unit	Topics	No. of Lectures	
1	Spectrophotometry <ol style="list-style-type: none"> 1. Determination of concentration of ferric ions in ferric salicylate complex spectrophotometrically. 2. Simultaneous determination of chromium and manganese by spectrophotometry. 3. Determination of sulphate and phosphate by spectrophotometry. 4. Spectrophotometric determination of pK value of an indicator. 	06	

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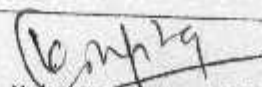
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As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023–2024

	5. Determination of magnesium and calcium in tap water by flame photometry. 6. Spectrophotometric determination of the stoichiometry and stability constants of complexes.	
2	Refractometry & Polarimetry 1. Verification of law of refraction of mixtures (e.g. glycerol and water) using Abbe's refractometer. 2. Determination of the specific rotation of a given optically active compound by polarimetry. 3. Determination of specific rotation of glucose and fructose by polarimetry. 4. Determination of the enzyme catalyzed inversion of sucrose by polarimetry. 5. Determine the concentration of a solution of an optically active substance by polarimetry.	06
3	Potentiometry 1. Determination of the standard EMF and the standard free energy change of Daniel cell potentiometrically. 2. Potentiometric titration of a given hydrochloric acid solution with an alkali solution. 3. Potentiometric titration of given ferrous sulphate solution with potassium dichromate. 4. Determination of solubility product of a sparingly soluble substance.	06
4	Conductometry 1. Conductometric titration of hydrochloric acid with sodium hydroxide. 2. Conductometric titration of hydrochloric acid with ammonium hydroxide. 3. Conductometric titration of acetic acid with ammonium hydroxide.	06
5	Polarography 1. Determination of the half wave potential of metal ion by polarography. 2. Determination of the amount of Cd(II) ions in an unknown solution by polarography.	06
Keywords/Tags: Spectrophotometry, Potentiometry, Conductometry, Polarography, Abbe's refractometer		
Part C-Learning Resources		
Text Books, Reference Books, Other resources		
Suggested Readings:		
Text Books		
1. Furniss, B.S., Hannaford, A.J., Smith, P.W. G., Tatchell, A.R., "Vogel's Text Book of Practical Organic Chemistry", Pearson Education, 2005, 5 th Edn.		

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As recommended by Central Board of Studies and approved by the Governor of M.P.
Syllabus: Chemistry Academic Session 2023–2024

2. Gurthu, J.N., Kapoor, R., "Advanced Experimental Chemistry", S. Chand and Co., 1987.
3. Sundaram, S., Krishnan, P., Raghavan, P.S., "Practical Chemistry (Part II)", S. Viswanathan Co. Pvt., 1996.
4. Shoemaker, D.P., Garland, C.W., Nibler, J.W., "Experiments in Physical Chemistry", McGraw- Hill Book Company, 1989, 5th Edn.
5. Yadav, J.B., "Advanced Practical Physical Chemistry", Goel Publishing House, 2015
6. Ghosh, J.C., "Experiments in Physical Chemistry", Bharati Bhawan Publisher, 2007
7. Kalsi, P.S., "Spectroscopy of Organic Compounds", New Age International, 2016.

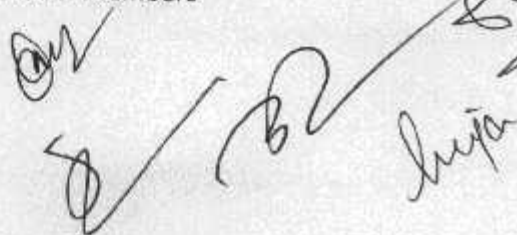
Reference Books

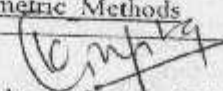
1. Skoog, Douglas., Holler, F.J., Nieman, T.A., "Principle of Instrumental Analysis", Saunders College Publishing, 1998, 5th Edn.
2. Midgley, D., Torrance, K., "Potentiometric Water Analysis", John Wiley & Sons Ltd, 1991, 2nd Edn.
3. Weast, R.C., "CRC Handbook of Chemistry and Physics", CRC Press, 1997, 57th Edition.

Suggestive digital platforms web links

1. <https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1>
2. <http://www.columbia.edu/itc/barnard/biology/biobc2004/edit/experiments/Experiment1-Spec.pdf>
3. http://web.pdx.edu/~ralfw/uploads/1/0/2/6/10260941/pulse_oximetry_laboratory_guide.pdf
4. https://www.chem.purdue.edu/courses/chem224/Lab-Experiments/expt4_GENESYS_v2.pdf
5. http://ecrvind.faculty.mjc.edu/biology_101/101_lab/spectrophotometry/4%20Spectrophotometer%20Fa17.pdf
6. https://www.edaq.com/w/images/6/6c/EXP011_The_pH_Electrode_and_Potentiometric_Titrations_PDF.pdf
7. https://www.philadelphia.edu.jo/academics/ajaber/uploads/CHEM%20540-Chapter%202-Potentiometry_061.pdf
8. <https://www.tau.ac.il/~advanal/PotentiometricTitrations.htm>
9. [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.1_\(Harvey\)/11%3A_Electrochemical_Methods/11.02%3A_Potentiometric_Methods](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.1_(Harvey)/11%3A_Electrochemical_Methods/11.02%3A_Potentiometric_Methods)

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Syllabus: Chemistry Academic Session 2023–2024

10. <https://www.chem.purdue.edu/courses/chem224/Lab-Experiments/Exp8.pdf>
11. https://www.shcollege.ac.in/wp-content/uploads/NAAC_Documents_IV_Cycle/Criterion-II/2.3.2/pp/Dr_Ignatious_ConductometricTitration.pdf
12. https://www.analytik.ethz.ch/praktika/phys_anal/POL/Anleitung_ENG.pdf
13. <https://nph.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1469-8137.1948.tb05089.x>
14. http://chemistry.du.ac.in/study_material/4103-A/MSc_Polarography.pdf
15. https://fac.ksu.edu.sa/sites/default/files/abbe_experiment.pdf
16. <https://web.mst.edu/~tbone/subjects/tbone/chem224/riproc.pdf>
17. http://www.fbml.fi.vu.lt/sites/default/files/7_4_en.pdf
18. <https://wp.optics.arizona.edu/mnofziger/wp-content/uploads/sites/31/2016/05/OPTI202L-Lab10-OMD2.pdf>
19. <http://davjalandhar.com/dbt/chemistry/SOP%20LabManuals/B.Sc.%20BT%20SEM%20IV.pdf>
20. <https://vlab.amrita.edu/?sub=1&brch=195&sim=545&cnt=1>

Suggested equivalent online courses:

1. <https://www.my-mooc.com/en/mooc/basic-analytical-chemistry/>
2. <https://www.my-mooc.com/en/mooc/principles-electronic-biosensors-purdue-nano535x/>

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	

Total Marks: 100

Any remarks/ suggestions:

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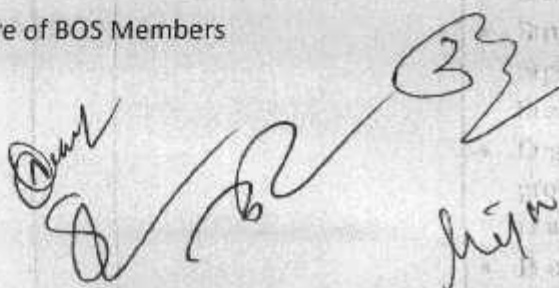
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Syllabus: Chemistry Academic Session 2023– 2024

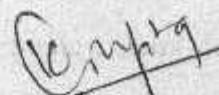
CBCS Annual Pattern
B.Sc. III year
CHEMISTRY– DSE 4
Syllabus of Theory Paper

Part A - Introduction		
Program: Degree	Class: BSc	Year: III
Session:2023-24		
Subject: Chemistry		
1	Course code	S3-CHEM4D
2	Course title	Bio Physical, Bio inorganic and organometallic Chemistry
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective (DSE) Group B Paper II
4	Pre-requisite (if any)	To study this course the students must have the subject Chemistry in Diploma Course of B.Sc. or equivalent.
5	Course Learning Outcomes (CLO)	On completion of this course the students will be able to understand: <ul style="list-style-type: none"> • Biophysical concepts like pH, biological oxidation, bioenergetics. • Magnetic properties and electronic spectra of transition metal complexes. • Structure and bonding analysis of organometallic compounds using the MO theory • Organometallic compounds of main group elements and their structure and bonding analysis • Bio inorganic chemistry and role of metal ions in biological systems.
6	Credit Value	4 (Theory)

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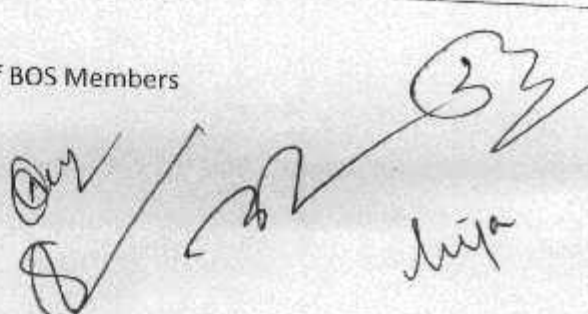


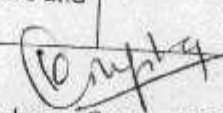
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Syllabus: Chemistry Academic Session 2023-2024

7	Total Marks	Max. Marks (30+70):	Min. Pass. Marks:35
Part B – Content of the course			
Total No. of Lectures-Tutorials-Practical (In hours per week):			
L-T-P:			
Unit	Topic	No. of Lectures	
1	Water, pH & buffer Water as a medium for biological reaction, concept of pH in terms of biological system, effect of pH on a biomolecule, biological buffers system Bonding in biomolecules hydrogen bond, VanderWaal interaction, ionic bond hydrophobic attraction, glycoside linkage peptide bond, phosphodiester linkage Role of different biological buffer system like -Phosphate Buffer, bicarbonate buffer protein amino acid buffer, hemoglobin buffer system Biological oxidation -definition, types of biological oxidation, reduction oxidation by direct action of oxygen, oxidation by loss of hydrogen Electron transport chain, inhibitors of ETC Oxidative phosphorylation - definition, theories inhibitors of oxidative phosphorylation, Un- couplers Bioenergetics -couple reactions, law of thermodynamics, free energy, relationship between standard free energy change and equilibrium constant, general introduction of high energy compounds Structure of ATP as universal currency of free energy in biological systems with example -in muscle contraction, free energy of ATP hydrolysis.	12	
2	Magnetic properties of transition metal complexes Introduction, types of magnetic behaviour: diamagnetism, paramagnetic, ferro magnetism, antiferromagnetism, ferrimagnetism, origin and calculation of magnetism. methods of determining magnetic susceptibility guy, Bhatnagar Mathur, Quincke's, Curie and nuclear Magnetic resonance method, magnetic moment, LS coupling, determination of ground state terms symbol, orbital contribution to magnetic moments and application of magnetic moment data for 3D metal complexes	12	
3	An Introduction to Organometallic Compounds -Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicentre bonds) Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds. Role of triethylaluminium in polymerisation of ethene (Ziegler - Natta Catalyst). Organomagnesium compounds - Grignard reagent, preparations, structure and chemical reactions.	12	

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Syllabus: Chemistry Academic Session 2023–2024

	<p>Organozinc compounds-Preparations and chemical reactions. Organolithium compounds- Preparations and chemical reactions. Organosulphur compounds.Nomenclature, structural characteristics, Thiol, thio-ether, sulphonic acid, sulphonamide and sulphaguanidine-methods of preparations and chemical reactions.</p>	
4	<p>Metal Carbonyls-18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series. Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π-acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding. Zeise's salt: Preparation and structure, evidences of synergic effect and comparison of synergic effect with that in carbonyls.</p>	12
5	<p>Bioinorganic Chemistry- Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals. Sodium / K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine. Iron and its application in bio-systems, Role of Mg^{2+} ions in energy production and chlorophyll. Role of Ca^{2+} in blood clotting Hemoglobin; Storage and transfer of iron.</p>	12


Part C – Learning Resources

Text Books, Reference Books, Other resources

Suggested Reading:

1. Vogel, A.I. Qualitative Inorganic Analysis, Longman, 1972 36
2. Svehla, G. Vogel's Qualitative Inorganic Analysis, 7th Edition, Prentice Hall, 1996-03-07.
3. Cotton, F.A. G., Wilkinson & Gaus, P.L. Basic Inorganic Chemistry 3rd Ed.; Wiley India,
4. Huheey, J. E.; Keiter, E.A. & Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed., Harper Collins 1993, Pearson, 2006.
5. Sharpe, A.G. Inorganic Chemistry, 4th Indian Reprint (Pearson Education) 2005
6. Douglas, B. E.; McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry 3rd Ed., John Wiley and Sons, NY, 1994.
7. Greenwood, N.N. & Earnshaw, A. Chemistry of the Elements, Elsevier 2nd Ed, 1997 (Ziegler Natta Catalyst and Equilibria in Grignard Solution).
8. Lee, J.D. Concise Inorganic Chemistry 5th Ed., John Wiley and sons 2008.
9. Powell, P. Principles of Organometallic Chemistry, Chapman and Hall, 1988.

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Syllabus: Chemistry Academic Session 2023–2024

10. Shriver, D.D. & P. Atkins, Inorganic Chemistry 2nd Ed., Oxford University Press, 1994.
11. Basolo, F. & Person, R. Mechanisms of Inorganic Reactions: Study of Metal Complexes in Solution 2nd Ed., John Wiley & Sons Inc; NY.
12. Purcell, K.F. & Kotz, J.C., Inorganic Chemistry, W.B. Saunders Co. 1977
13. Miessler, G. L. & Donald, A. Tarr, Inorganic Chemistry 4th Ed., Pearson, 2010. • Collman, James P. et al. Principles and Applications of Organotransition Metal Chemistry. Mill Valley, CA: University Science Books, 1987.
14. Crabtree, Robert H. The Organometallic Chemistry of the Transition Metals. j New York, NY: John Wiley, 2000.
15. Spessard, Gary O., & Gary L. Miessler. Organometallic Chemistry. Upper Saddle River, NJ: Prentice-Hall, 1996.
16. Elschenbroich, C., Salzer, A. Organometallics – A Concise Introduction, 2nd Edn., (VCH Publication, 1992).
17. Crabtree, R. H. The Organometallic Chemistry of the Transition Metals, 6th Edn., (John Wiley, 2014).
18. Powell, P. Principles of Organometallic Chemistry, 2nd Edn., (Chapman, London, 1988).
19. Bioinorganic Chemistry, Ivano Bertini, Harry B. Gray, Stephen J. Lippard, Joan Selverstone Valentine. Viva Book Private Books Limited.
20. Biophysical Chemistry, Avinash Upadhyay, Kakoli Upadhyay, Nirmafendu Nath, Himalaya Publishing House.

Suggested equivalent online:

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE):30	Class Test	30
	Assignment/Presentation	
External Assessment : University Exam Section:70	Section(A) : Very Short Questions	70
	Section (B) : Short Questions	
	Section (C) : Long Questions	

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 Syllabus: Chemistry Academic Session 2023-2024

CBCS Annual Pattern
 B.Sc. III year

CHEMISTRY- DSE 4
 Syllabus of Practical Paper

Part A Introduction			
Program: Degree	Class: B.Sc	Year: Third	Session: 2023-24
Subject: Chemistry			
1	Course Code	S3-CHEM4Q	
2	Course Title	Synthesis and Analytical Techniques	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective (DSE) Group B Paper II	
4	Pre-requisite (if any)	To study this course, a student must have the subject chemistry in Diploma of BSc or equivalent.	
5	Course Learning outcomes (CLO)	On completion of this course, learners will be able to: 1. How to synthesis Ferrocene from FeCl_3 2. How to Synthesis of $\text{K}_2[\text{Fe}(\text{C}_2\text{O}_4)_3]$ 3. How to Determine P^{H} of bio sample 4. How to Determine Sugar in blood sample by photometry	
6	Credit Value	2 (Practical)	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks:35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week):			
L-T-P:			
Unit	Topics	No. of Lectures	
1	Synthesis 1. To synthesise Ferrocene from FeCl_3 2. To Synthesize $\text{K}_2[\text{Fe}(\text{C}_2\text{O}_4)_2]$ Complex	10	

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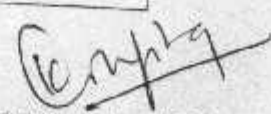


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 As recommended by Central Board of Studies and approved by the Governor of M.P.
 Syllabus: Chemistry Academic Session 2023-2024

	3. Synthesis of $\text{Cr}(\text{C}_5\text{H}_5)_2$ 4. Synthesis of Aceto-Fe Complex 5. Synthesis of triphenyl methanol from benzoic acid using Grignard reagent	
2	Instrumentation 1. Determination of pH of the Bio sample 2. To determine the Sugar in Blood sample by Photometry Method 3. Determination of the Na^+ , K^+ ions in water sample by flame photometry	08
3	Chromatography 1. Determination of R_f values of $\text{Fe}^{+3}/\text{Co}^{+3}/\text{Pb}^{+2}/\text{Ag}^+$ by column Chromatography 2. Determination of R_f Values of $\text{Pb}^{+2}/\text{Cu}^{+2}/\text{Hg}^{+2}$ by TLC	06
4	Polarography 1. To determine EMF of Fe^{+3} and Co^{+3} ions in Bio sample 2. To determine EMF of Pb^{+2} , Cd^{+2} and Hg^{+2} ions by Polarography method	06
Keywords/Tags: Synthesis, Ferrocene, Aceto-Fe Complex, Bio sample, Flame photometry, Chromatography, Polarography, EMF		
Part C-Learning Resources		
Text Books, Reference Books, Other resources		
Suggested Readings: 1. Advanced Inorganic chemistry practical by Gurudeep Raj, Goel publishing house 2. Analytical chemistry and instrumentation Bilard, Willey publication 3. Environmental chemistry by AK De, S chand 4. Advanced Inorganic Chemistry by Jadhav		

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 Syllabus: Chemistry Academic Session 2023– 2024

Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
TOTAL MARKS: 100			
Any remarks/ suggestions:			

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CBCS Annual Pattern
 B.Sc. III year
 CHEMISTRY- Minor/Elective
 Syllabus of Theory Paper

Part A Introduction			
Program: Degree		Class: B.Sc.	Year: III Session: 2023-24
Subject: Chemistry			
1	Course Code	S3-CHEM2T	
2	Course Title	Pharmaceutical and Medicinal Chemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Minor/Elective	
4	Pre-requisite (if any)	To study this course the students must have the subject Chemistry in Diploma Course of B.Sc. or equivalent	
5	Course Learning outcomes (CLO)	After successfully competing this course module students will be able to: <ul style="list-style-type: none"> • Understand importance of pharmaceutical chemistry and pharmacopeia. • Learn intellectual property rights, patents trademark and copyright. • Understand Definition, Classification of the drugs with examples and structures. • Describe the structure activity relation of some important class of drugs. • Describe the overall process of drug discovery and the role played by medicinal chemistry in this process. • Relate the structure and physical properties of drugs to their pharmacological activity. • Explain physio-chemical properties related to QSAR. 	
6	Credit Value	4 (Theory)	

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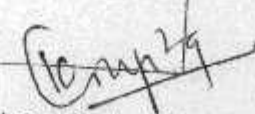
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Govt. M H College of Home Science & Science for Women Jabalpur
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Syllabus: Chemistry Academic Session 2023- 2024

7	Total Marks	Max. Marks: 30+70	Min. Passing Marks:35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 60			
L-T-P:			
Unit	Topics	No. of Lectures	
Unit 1: Pharmaceutical Chemistry	Introduction to pharmacy, career in pharmacy, codes of pharmaceutical ethics, importance of pharmaceutical chemistry, pharmacopeia and its history (IP, BP, USP, NF). Drug and cosmetic act with special reference to schedule M, GMP, GLP, GCP, USFDA, NDA, clinical trial. Concept of quality and total quality management, quality assurance and quality control, IPQA, IPQC. Documentation and maintenance of record, intellectual property rights, patents, trademark, copyright, patent act.	12	
Unit 2: Pharmacognosy	Definition, history, scope and development of Pharmacognosy Classification and Sources of drugs; classification of drugs, sources and uses of natural drug products, biological (plants, animals and microbes), geographical, marine and mineral sources. Drug Receptors: Introduction to drug receptors, nature of drug receptors, different bonding involved in drug-receptor interaction, drug receptor theories. Drug absorption: routes of drug administration, absorption of drugs and factors affecting absorption.	12	
Unit 3: Molecular Modeling and Drug Design	Drug design and development an overview, analogues and prodrugs structure and activity relationship between chemical (SAR), factors governing drug design, approaches to drug design, receptor site theory, introduction to combinatorial synthesis in drug discovery, factors affecting bioactivity, QSAR-Free-Wilson analysis, structure a biological activity Hansch analysis, relationship between Free-Wilson analysis and Hansch analysis.	12	

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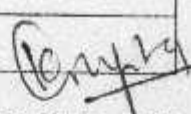



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Unit 4: Antibiotics and Antibacterials	Introduction, Antibiotic β -Lactam Type – Penicillin, Cephalosporins, Antitubercular – Streptomycin, Broad Spectrum Antibiotics – Tetracyclines, Anticancer – Dactinomycin (Actinomycin D)	12
Unit 5: Antifungal and Non-steroidal Anti- inflammatory Drugs	Antifungal: Polyenes, Antibacterial-Ciprofloxacin, Norfloxacin, Antiviral - Acyclovir Antimalarials: Chemotherapy of Malaria SAR, Chloroquine, Chloroguanide and Mefloquine. Non-steroidal Anti-inflammatory Drugs: Diclofenac Sodium, Ibuprofen and Netopam.	12
Keywords/Tags: Pharmacopoeia, patents, trademark, copyright, QA, QC, pharmacognosy, drug design, QSAR, antibiotics, antibacterials, antifungal, anti-inflammatory drugs, antimalarials.		
Part C-Learning Resources		
Text Books, Reference Books, Other resources		
Suggested Readings:		
<ol style="list-style-type: none"> 1. "Pharmaceutical Chemistry Inorganic Vol. I", Chatwal G. R., Himalaya Publishing House, Mumbai, 2010. 2. "Textbook of Pharmacognosy", Wallis T. E., CBS Publishers and Distributors, New Delhi, 2005, Fifth Edition. 3. "Pharmaceutical Chemistry", Choudhary N. C. and Gurbani N. K., Vallabh Prakashan, New Delhi, 2014. 4. "Pharmaceutical Chemistry", Watson D. G., Churchill Livingstone Elsevier, UK, 2011. 5. "Text Book of Professional Pharmacy", Jain N. K. and Sharma S. N., Vallabh Prakashan, New Delhi, 2009, Fifth Edition. 6. "Pharmacognosy and Pharmacobiotechnology", Kar A., New Age International Publishers, New Delhi, 2017, Third Edition. 7. "A Primer on QSAR/QSPR Modelling: Fundamental Concepts", Roy K., Kar S., Das R. N., Springer International Publishing AG Switzerland, 2015. 8. "Medicinal Chemistry", Kar A., New Age International Publishers, New Delhi, 2007, Fourth Edition. 9. "An Introduction to Medicinal Chemistry", Patrick G. L., Oxford University Press, UK, 2013, Fifth Edition. 10. "Medicinal Chemistry", Thomas G., John Wiley & Sons, Chichester, 2007, Second Edition. 		
Suggested equivalent online courses:		

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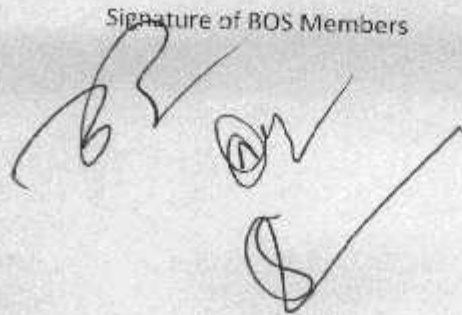


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CBCS Annual Pattern
B.Sc. III year
CHEMISTRY- Minor/Elective
Syllabus of Practical Paper

Part A Introduction			
Program: Degree		Class: B.Sc.	Year: III
		Session: 2023-24	
Subject: Chemistry			
1	Course Code	S3-CHEM2P	
2	Course Title	Pharmaceutical and Medicinal Chemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Minor/Elective	
4	Pre-requisite (if any)	To study this course the students must have the subject Chemistry in Diploma Course of B.Sc. or equivalent.	
5	Course Learning outcomes (CLO)	On completion of this course, learners will be able to: 1. How to prepare Acetanilide 2. How to Isolate the caffeine from tea leaves 3. To learn about preparation of simple syrup as per IP and USP	
6	Credit Value	2 (Practical)	
7	Total Marks	Max. Marks: 30-70	Mfn. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week):			
L-T-P:			
Unit	Topics	No. of Lectures	
I	Practical:- 1. Preparation of Pharmaceutical compounds - a) Acetanilide b) Aromatic water c) Lotion d) Aspirin	8	
II	2. Preparation of pharmaceutical compound a) Tincture Iodine b) Alum c) Ferrous Ammonium sulphate d) Antimony potassium tartrate	6	
III	3. Isolation of caffeine from tea leaves. 4. Extraction of active constituents from extraction method.	4	

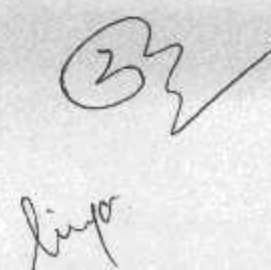
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IV	5. Identification of crude drug. 6. Morphology of turmeric, ginger, Mentha.	4
V	7. Preparation of suspension, Emulsions, ointment. 8. Preparation of simple syrup as per IP and USP. 9. Preparation of pharmaceutical buffer and study of its theoretical and calculated PH. 10. Inorganic preparation of compounds like Zinc Oxide, calcium carbonate, Magnesium Carbonate.	8

a) **Keywords/Tags:** caffeine, Tincture Iodine, pharmaceutical buffer

Part C-Learning Resources

Text Books, Reference Books, Other resources.

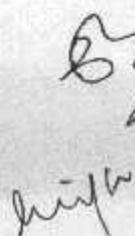
Suggested Readings:

Practical book-

1. Practical Pharmaceutical chemistry by A.I. Beckett and J.B. Stenlake, 4th Edition, Part-II continuum international publishing Group Ltd, 2000.
2. A Practical book of Pharmaceutical Inorganic chemistry by K.B. Patil, N.B. Patil and P.A. Patil, JP Innovative publication, 1st edition, 2019.
3. Pharmaceutical chemistry inorganic by G.R. Chatwal, Himalaya publication, Vol.1.
4. Experimental Pharmaceutical Chemistry by Aneesahmadsiddiqui, seemisiddiqui, Edition I.
5. Pharmacognosy by Dr. C.K. Kokate, volume-I, forty fifth edition, NiraliPrakashan.

Suggestive digital platforms web links

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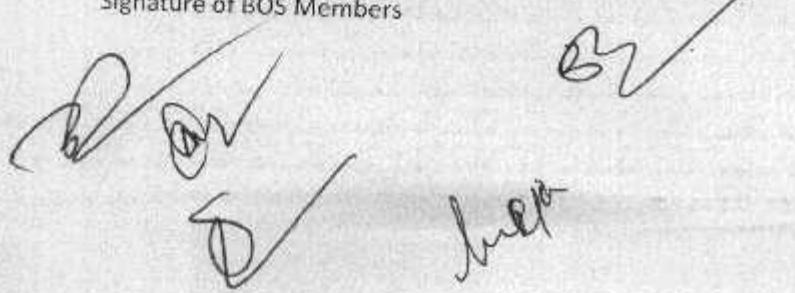



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Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction / Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Tablework / Experiments	
TOTAL MARKS: 100			
Any remarks/ suggestions:			

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CBCS Annual Pattern
 Chemistry-NEP (2020)
 Third Year
 Syllabus of Generic Elective-1

Part A - Introduction			
Program: Degree	Class:	Year: Third	Session: 2023-24
Subject: Chemistry			
1	Course code	S3-CHEMIG	
2	Course title	Processing of Fats and Oils	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Generic Elective	
4	Pre-requisite (if any)	Open for all as an Generic elective	
5	Course Learning Outcomes (CLO)	After completing this course the student will – 1. Gain knowledge about traditional Indian oils and Traditional Indian Oil Processing Methods. 2. Gain the knowledge about importance, types, natural resources of fats and oils and their effect on health. 3. Learn the methods of refining and modifications of fats and oils. 4. Know about the nutritional aspects of fats and oils and their storage and handling. 5. Gain information regarding entrepreneurship in food processing and knowledge of local fat processing industries.	
6	Credit Value	6 (Theory)	
7	Total Marks	Max. Marks (70+30);	Min. Passing Marks:35
Part B – Content of the course			
Total No. of Lectures-Tutorials-Practical (In hours per week): 60			
Unit	Topic		No. of Lectures
1	Indian Traditional oils- mustard, groundnut, sesame (til) and		18

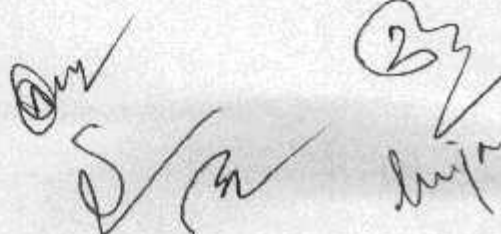
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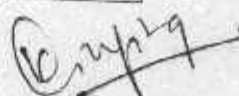
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Syllabus: Chemistry Academic Session 2023– 2024

	<p>coconut (Extraction, availability, properties and uses)</p> <p>Traditional methods of oil processing in India-Traditional Ghani technology, Recent evolution of oil processing, Advantages and disadvantages of ghani crushing</p> <p>Keywords- Extraction, Ghani, processing</p>	
2	<p>Importance of Fats and Oils- Importance of fats in food, Types of fats- Monounsaturated (olive oil, peanut oil), Polyunsaturated (PUFAs) (soybean oils, omega-3 eggs, walnuts), Saturated (full-fat dairy products, butter, coconut oil, ghee, vegetable ghee), Trans fats (burgers, cookies, cakes, chips, French fries), Their examples, Physical properties of Fats and Oils</p> <p>Elementary idea of Chemistry of Fats and Oils Natural Sources, Daily requirement in balanced diet and harmful effect of excess of fats and oils in the body.</p> <p>Keywords- Monounsaturated, PUFA, Trans fats</p>	18
3	<p>Refining and modification of Fats and Oils-Oil and fat processing methods: Pre-treatment, Extraction, Dehydration, hydrogenation, Fractionation, interesterification, Oil Refining</p> <p>Functions of Fats and Oils in Bakery products, Chocolate and confectionery coatings, Ice cream, Frying</p> <p>Keywords- Pre-treatment, hydrogenation, Oil Refining</p>	18
4	<p>Nutritional aspect Fats and Oil- Main nutrients of fats and oils: Vitamin A, D and E (antioxidant), triglycerides</p> <p>Nutritional differences in different types of fats</p> <p>Oil storage and handling – Methods to store cooking oil, rancidity-Definition and methods to avoid rancidity</p> <p>Adulteration in oils and fats- Common adulterants, identification and harmful effect</p> <p>Keywords- Vitamin, rancidity, adulteration</p>	18
5	<p>Entrepreneurship Development in Food Industry- scope, cold storage, Palm oil processing, Seed oil processing, fat and oil for biofuel processing, animal fat processing</p> <p>Main fat and oil processing industries of the area.</p>	18

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Keywords- Entrepreneurship, cold storage, oil processing.
Part C – Learning Resources
Text Books, Reference Books, Other resources
Suggested Reading: <ol style="list-style-type: none"> 1. Fats and Oils Handbook. by Michael Bockisch, 1993 2. The Chemistry of Oils and Fats By F. D Gunstone and Frank D Gunstone 2004 3. Fats and Oils Handbook by Michael Bockisch 1993 4. Fats and Oils: Formulating and Processing for Applications, Third Edition - [Special Indian Edition - Reprint Year: 2020] (English, Richard D. O'Brien) 5. Hand Book of Oils, Fats & Derivatives with Refining and Packaging Technology (English, Board Eri) Engineers India Research Institute 6. Chemistry and Technology of Oils and Fats Paperback – 1 January 2003 by M.M. Chakrabarty Allied Publishers Pvt. Ltd 7. Edible Oils And Fats 2007 by C Ainsworth Mitchell , Kessinger Pub Co
Suggested equivalent online: https://www.ifst.org/resources/information-statements/oils-and-fats

Part D-Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks : 100	
Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks	
Internal Assessment :	Class Test
Continuous Comprehensive Evaluation (CCE):30	Assignment/Presentation
	30
External Assessment :	Section(A) : Very Short Questions
University Exam Section:70	Section (B) : Short Questions
	Section (C) : Long Questions
	70

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 Syllabus: Chemistry Academic Session 2023- 2024

CBCS Annual Pattern
Third Year
Syllabus of Chemistry
Generic Elective-2

Part A - Introduction			
Program: Degree	Class:	Year: third	Session: 2023-24
Subject: Chemistry			
1. Course Code	S3-CHEM2G		
2. Course Title	ENVIRONMENTAL TOXICOLOGY		
3. Course Type	Generic Elective		
4. Prerequisite	Open for all as an Generic elective.		
5. Course Learning Outcomes (CLO)	By the end of this course students are expected to- <ol style="list-style-type: none"> 1. Learn about definition and sources of toxicants 2. Learn about chemical toxicants, biological toxicants and its assessment 3. Learn about different parts of Eco-toxicology i.e Immunotoxicology, Xenobiotics, Neurotoxicology, bioaccumulation, biodegradation etc 4. Learn about the determination of acceptable risks and limits of environmental toxicants and utility of environmental benchmarks 5. Learn about environmental cytotoxicity and genotoxicity 6. Learn about what type of toxic chemicals effects in environment and solid waste management 7. Learn about which factors influence the toxicity 		
6. Credit value	6 (Theory)		
7. Total Marks: 100	Max Marks: 70+30	Min Passing Marks: 35	
Part B - Content of the Course			
Total No. of Lectures-90			
Unit	Topics	No. of Lectures	

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1	<p>Introduction to toxicology</p> <ul style="list-style-type: none"> • Introduction to toxicants - definition and concepts, sources of toxicants, mode of action of toxic substances, distribution on storage of toxins in Human tissues • Chemical toxicants - classes of chemical toxicants, exposure classes, water and soil pollutants, types of classes (food additives, detergents, cosmetics) • Biological toxicants - types of biological toxicants and food intoxication, classification of toxicants present in food, microbial agents; symptoms, effects on health and management, endotoxins and enterotoxins • Toxicity assessment - overview of toxicity assessment, toxic effects, dose responsive assessment, dose response curve, LD50 & LC50, assessing toxicity 	17
2	<p>ECO-TOXICOLOGY</p> <ul style="list-style-type: none"> • Basis of eco- toxicology - definition, testing methodologies, immunotoxicology, hypersensitivity mediated by xenobiotics, neurotoxicology • Toxic - xenobiotics and their environmental persistence, bioaccumulation, biomagnification, assessment of bioaccumulation and biomagnification, biodegradation, biotransformation, bio remediation • Effects of toxicity - types of toxic effects, types of systematic toxic effects, organ specific toxicity, interactions. • Detoxification - definition and concept, mechanism of detoxification in human body, detoxification and excretion 	17
3	<p>ENVIRONMENTAL TOXICITY RISK ASSESSMENT</p> <ul style="list-style-type: none"> • Acceptable limits of toxicants - acceptable limits and global scenario; determination of acceptable risks and limits of environmental toxicants, utility of environmental benchmarks, types of comparison possible in the benchmarking of environmental performance, benefits & limits of environmental benchmarking • Toxicity risk assessment planning - perceiving risk, estimating health risks, risk assessment planning, limitations of toxicity risk assessment, risk benefit analysis, risk management 	16

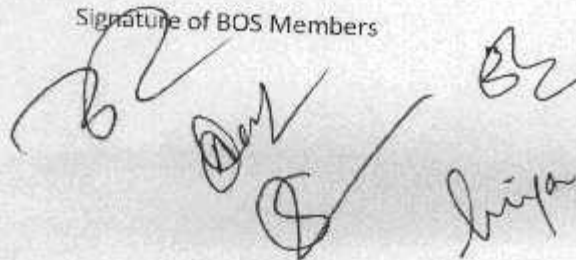
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 Syllabus: Chemistry Academic Session 2023– 2024

	<ul style="list-style-type: none"> • Toxicity remediation 	
4	ENVIRONMENTAL CYTOTOXICITY AND GENOTOXICITY <ul style="list-style-type: none"> • Carcinogenicity - carcinogens, classes of carcinogens, carcinogenesis • Mutagenicity - effects of mutagens, types of mutations, origins of spontaneous mutation, mutagens, DNA repair systems • Teratogenicity - definition and concepts, sources of teratogens and their effects, teratogenesis • Cytotoxicity and Genotoxicity prevention - cytotoxicity, genotoxicity, in vitro • toxicology testing, in Vivo testing, bioassays, biomarkers, biosensors, microorganisms 	16
5	CHEMICAL TOXICOLOGY <ul style="list-style-type: none"> • Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium- Solid waste management. 	12
6	FACTORS INFLUENCE TOXICITY <ul style="list-style-type: none"> • Selective toxicity-metabolic pathways-Enzyme activity-xenobiotic-metabolizing systems-Toxicity tests in animals-individual variations in responses to xenobiotics 	12
Keywords/Tags: Chemical Toxicants, Biological Toxicants, Environmental Cytotoxicity, Environmental Toxicity, Chemical Toxicology, Xenobiotics, Eco-Toxicology, LC50, LD50		
Part C-Learning Resources		
E-Learning Resources	MOOCs, NPTEL, SWAYAM, HE E-Contents	
Suggested Readings	NCERT Exemplar, Class XI Chemistry, Moderns ABC of Chemistry for class 11th and 12th, Modern Publications, Analysis of Foods – H.E. Cox: 13, Chemical Analysis of Foods – H.E.Cox and Pearson. Foods: Facts and Principles: N. Shakuntala Many and S. Swamy, 4th ed. New Age International (1998) Science For 10th Class, by Manjit Kaur, Lakhmir Singh, S.Chand. Engineering Chemistry, by Jain and Jain, Dhanpatrai publishing company. Chemistry Class 10th By Dr.Parul Srivastava, Prachi India Pvt. Ltd. Environmental Chemistry, Anil Kumar De, Wiley Eastern Ltd. Environmental analysis, SM Khopkar (IIT Bombay)	

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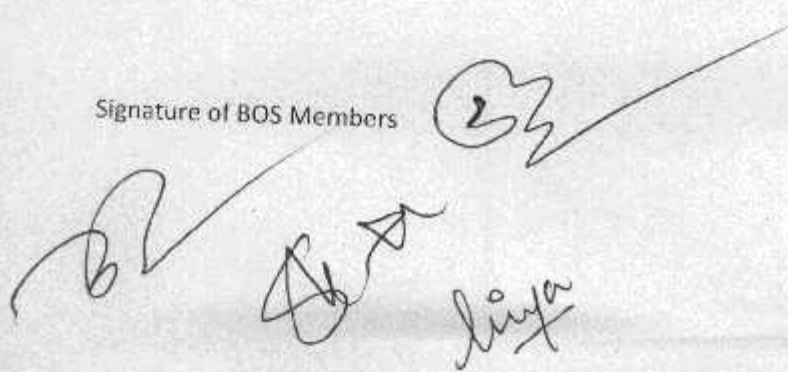

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	Environmental Chemistry by BK Sharma & H Kaur, Goel publishing house. Fundamentals of Environmental Chemistry, Manahan, Stanley. F. Environmental Toxicology 3 rd edition, Sigmund F. Zakrzewski, Oxford university Press
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Part D-Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE) 70 marks		
Internal Assessment:	Class Test	
Continuous Comprehensive Evaluation (CCE):30	Assignment/Presentation	30
External Assessment:	Section(A): Very Short Questions	
University Exam Section:70	Section (B): Short Questions	
	Section (C): Long Questions	70

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