

Remarks	Course	Paper(s)	Semester	Nomenclature of Paper	Credits	Hours /Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A,B, C & D	VOC-4	B23-VOC-222	IV	AgricultureChemistry	3	3	20	50	70	3 hrs.
				Practical	1	2	10	20	30	3 hrs.
Scheme A, B,C & D	VOC	B23-VOC-227	IV	GreenChemistry	3	3	20	50	70	3 hrs.
				Practical	1	2	10	20	30	3 hrs.

VOC

Session: 2023-24			
Part A – Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Agriculture chemistry		
Course Code	B23-VOC-222		
Course Type: (CC/MCC/MD C/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	VOC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1 Thinks about chemistry involved in agriculture 2 Know about chemical composition of soils; 3 Understand impacts of pollutions on soils and its productivity; 4 Critically think regrading sewage effluents. 5*. Practical training of soil analysis		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max. Marks: 70 + 30* Internal Assessment Marks: 20 + 10* End Term Exam Marks: 50 + 20*		Time: Theory: Three Hours Practicum: Three Hours	
(CLO):	1. Thinks about chemistry involved in agriculture		
Part B- Contents of the Course			
Instructions for Paper- Setter Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1) based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.			

Unit	Topics	
I	Plants as producers: Photosynthesis, pesticides, herbicide, insecticide, fungicide, storage and preservation of agriculture produce, food processing, chemicals (alcohol) from agriculture waste, use of polymers in agriculture	12 Hrs
II	Soil fertility and soil productivity: urea cycle, Organic and inorganic nitrogen (Haber Bosch Process), nutrient sources – fertilizers and manures; essential plant nutrients - functions and deficiency symptoms. Micronutrients – critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability.	11 Hrs
III	Chemical (elemental) composition of the earth's crust and soils, Chemistry of acid soils; active and potential acidity; lime potential, chemistry of acid soils; sub-soil acidity; Chemistry of salt-affected soils and amendments; soil pH, ECe, ESP, SAR and important relations; soil management and amendments.	11 Hrs
IV	Nature and sources of pollutants acid rains, oil spills etc.; air, water and soil pollutants - their CPC standards and effect on plants, animals and human beings. Sewage and industrial effluents – their composition and effect on soil properties/health, and plant growth and human beings; soil as sink for waste disposal.	11 Hrs
V*	1. pH of Soil 2. determine carbonate and bicarbonate in soil 3. Determine chloride in the soil sample 4. Determine starch in organic manure 5. Determine nitrate in the soil 6. Determine sulphate in the soil 7. To study Seed germination and viability test.	30 Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		

Internal Assessment: 20+10*=30 > Theory: 20 • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 > Practicum:10 • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.: 05 • Mid-Term Exam: N. A.	End Term Examination: 70(50+20*)
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Part C-Learning Resources

Recommended Books/e-resources/LMS:

- ✓ Bear RE. 1964. Chemistry of the Soil. Oxford and IBH. Bolt GH & Bruggenwert MGM. 1978. Soil Chemistry. Elsevier. Greenland DJ & Hayes MHB. 1981. Chemistry of Soil Processes. John Wiley & Sons.
- ✓ Brady NC & Weil RR. 2002. The Nature and Properties of Soils. 13 Ed. Pearson Edu.
- ✓ Kabata-Pendias A & Pendias H. 1992. Trace Elements in Soils and Plants. CRC Press.
- ✓ Kannaiyan S, Kumar K & Govindarajan K. 2004. Biofertilizers Technology. Scientific Publ.
- ✓ Leigh JG. 2002. Nitrogen Fixation at the Millennium. Elsevier.
- ✓ Mengel K & Kirkby EA. 1982. Principles of Plant Nutrition. International Potash Institute, Switzerland.
- ✓ Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. Micronutrients in Agriculture. 2 Ed. SSSA, Madison.
- ✓ Pierzinsky GM, Sims TJ & Vance JF. 2002. Soils and Environmental Quality. 2 Ed. CRC Press.
- ✓ Stevenson FJ & Cole MA. 1999. Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients. John Wiley & Sons.
- ✓ Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and the Fertilizers. 5 Ed. Prentice Hall of India.
- ✓ Troeh FR & Thompson LM. 2005. Soils and Soil Fertility. Blackwell.

✓ Troeh FR & Thompson LM. 2005. Soils and Soil Fertility. Blackwell

Course type-CC-M4(V)

Session:2024-25

PartA-Introduction

Subject	Chemistry		
Semester	IV		
Name of Course	Green Chemistry		
Course Code	B-23-CHE-227 227 B-23-CHE-227		
Course Type:(MCC/CC /MDC /DSEC/VOC/DS E/PC/AEC/ VAC)	VOC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes(CLO):	- Understand the twelve principles of green chemistry and also build the basic understanding of toxicity, hazard and risk related to chemical substances. - Calculate atom economy, E-factor and relate them in all organic synthesis - Appreciate the use of catalyst over stoichiometric reagents. Learn to use green solvents, renewable feedstock and renewable energy sources for carrying out safer chemistry - Appreciate the use of green chemistry in problem solving skills and critical thinking to innovate and find solutions to environmental problems. - Learn to design safer processes, chemicals and products through understanding of inherently safer design (ISD) - Appreciate the success stories and real-world cases as motivation for them to practice green chemistry		
Credits	Theory	Practical	Total

	3	1	4
Contact Hours	45	30	75
Max.Marks:70+30*	Time:03+03*		
Internal Assessment Marks:20+10*			
End Term Exam Marks:50+20*			
Part B-Content of the Course			
<u>Instructions for Paper-Setter</u>			
Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1) based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator are allowed.			
Unit	Topics		
I	Introduction 10 Hours Definition of green chemistry and how it is different from conventional chemistry and environmental chemistry. ➤ Need of green chemistry ➤ Importance of green chemistry in- daily life, Industries and solving human health problems (four examples each). ➤ A brief study of Green Chemistry Challenge Awards (Introduction, award categories and study about five last recent awards).		
II	Twelve Principles of Green Chemistry: 12 Hours The twelve principles of the Green Chemistry with their explanations, Special emphasis on the following: • Prevention of waste / byproducts, pollution prevention hierarchy. • Green metrics to assess greenness of a reaction: environmental impact factor, atom economy and calculation of atom economy. • Green solvents-supercritical fluids, water as a solvent for organic reactions, ionic liquids, solvent less reactions, solvents obtained from renewable sources. • Catalysis and green chemistry- comparison of heterogeneous and homogeneous catalysis, biocatalysts, asymmetric catalysis and photocatalysis. • Green energy and sustainability. • Real-time analysis for pollution prevention. • Prevention of chemical accidents, designing greener processes, inherent safer design, principle of ISD "What you don't have cannot harm you", greener alternative to Bhopal Gas Tragedy (safer route to carbonyl) and Flixborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation.		

III	Important Applications of Green Chemistry Principles: 12 Hours Concept familiarization and application of green chemistry principles using specific examples 1. Prevention of waste/ by products; waste or pollution prevention hierarchy 2. Green metrics to assess greenness of a reaction: Calculation of atom economy of the rearrangement, addition, substitution, and elimination reactions; calculation of E-factor for industrial processes 3. Prevention/ minimization of hazardous/ toxic products 4. Safer Solvent and Auxiliaries: Problems associated with conventional reaction media Some Common Green solvents: Introduction, application, advantages, and disadvantages of green solvents in organic synthesis (taking suitable examples). Special emphasis on the following: i. Super Critical Fluids (with special reference to carbon dioxide) ii. Water: Concept of In-water, and on-water reactions (with special reference to synthesis of terpinol and linalool in water, Benzoin condensation, Heck reaction) iii. Ionic Liquids: Physical properties and classification of Ionic Liquids (with special reference to Diels Alder reaction and Coumarin synthesis in ionic liquids) iv. Biomass derived Solvents: Physicochemical properties, Use of glycerol and its derivatives (Mizoroki–Heck reaction) and 2-methyltetrahydrofuran (Suzuki–Miyaura reaction). 5. Use of renewable starting materials: Illustrate with few examples such as biodiesel, bioethanol, polymers from renewable resources (PLA from corn), Synthesis and properties of 2-Methyltetrahydrofuran, furfural and 5-Aminolevulinic acid (DALA) from levulinic acid
IV	11 Hours The following Real-world Cases in green chemistry should be discussed: Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments. Designing of environmentally safe marine antifoulant. Rightfit pigment: Synthetic azo pigments to replace toxic organic and inorganic pigments. An efficient, green synthesis of a compostable and widely applicable plastic (polylactic acid) made from corn.
V*	30hours Characterization by melting point, UV-Visible spectroscopy, IR spectroscopy and any other specific method should be done (wherever applicable). 1. Preparation and characterization of nanoparticles of gold using tea leaves/silver nanoparticles using plant extracts. 2. Preparation of biodiesel from waste cooking oil and characterization (TLC, pH, solubility, combustion test, density, viscosity, gel formation at low temperature and IR can be provided). 3. Extraction of D-limonene from orange peel using liquid CO₂ prepared from dry ice. 4. Mechanochemical solvent free, solid-solid synthesis of azomethine using ptoluidine and o-vanillin/p-vanillin. 5. Photoreduction of benzophenone to benzopinacol in the presence of sunlight. 6. Photochemical conversion of dimethyl maleate to dimethyl fumarate (cis-trans isomerisation)

Remarks	Course	Paper(s)	Semester	Nomenclature of Paper	Credits	Hours /Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B & C	VOC	B23-VOC-122	V	Chemistry of Fertilizers and Pesticides	3	3	20	50	70	3 hrs.
				Practical	1	2	10	20	30	3 hrs.
Scheme A, B, C & D	VOC	B23-VOC-123	V	Chemistry of Cosmetics and Perfumes	3	3	20	50	70	3hrs.
				Practical	1	2	10	20	30	3 hrs.
Scheme A, B, C & D	VOC	B23-VOC-321	V1	Green Laboratory Practices	3	3	20	50	70	3 hrs.
				Practical	1	2	10	20	30	3 hrs.

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Session:2023-24			
Part A –Introduction			
Subject	Chemistry		
Semester	V		
Name of the Course	Chemistry of Fertilizers and Pesticides		
Course Code	B23-VOC-122		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Know about fertilizers and nutrients; 2. Understand types of nitrate fertilizers; 3. Understand types of phosphate fertilizers; 4. Get the knowledge about pesticides. 5*.Understand the issues involved in pesticides and fertilizers		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max. Marks: 70 +30* Internal Assessment Marks: 20+10* End Term Exam Marks:Theory: 50+20*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal			

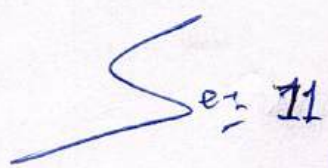
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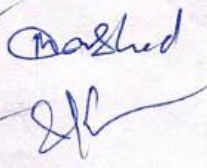
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marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Methods and time of fertilizer applications, tips to get best efficiency of Applied fertilizers, Integrated nutrient management, fertilizers and its relations to plant nutrients, Factors effecting optimum fertilizer dose.	12 Hrs
II	Classification and types of fertilizers, Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride: Introduction, Raw materials, Action of as a fertilizers.	11Hrs
III	Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate. Potassic fertilizers (Types and optimum doses)	11Hrs
IV	Pesticides: Classification, synthesis, structure activity relationship(SAR), mode of action, uses and adverse effects of representative pesticides in the following classes: Organochlorines (DDT, Gammaxene); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and Carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).	11Hrs
V*	- To carryout market survey of potent pesticides with details as follows: a) Name of pesticide b) Chemical name, class and structure of pesticide c) Type of formulation available and Manufacturer's name d) Useful information on label of packaging regarding: Toxicity, LD50 ("Lethal Dose, 50%"), Side effects and Antidotes. - To carryout market survey of potent botanical pesticides with details as follows: a) Botanical name and family; b) Chemical name (active ingredient) and structure of active ingredient; c) Type of formulation available and Manufacturer's name; d) Useful information on label of packaging regarding: Toxicity, LD50 ("Lethal Dose, 50%"), Side effects and Antidotes. - Preparation of simple Organochlorine pesticides. - To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications. - To calculate active ingredient in given sample of pesticide formulations as per BIS specifications. - Preparation of Neem based botanical pesticides. - To study about identification of crops, seeds, fertilizers and pesticides.	30 Hrs






Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS	
Internal Assessment: 20+10*=30 > Theory: 20 • Class Participation:05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam:10 > Practicum: 10 • Class Participation:05 • Seminar/Demonstration/Viva-voce/Labrecords etc.:05 • Mid-Term Exam: N.A.	End Term Examination: 50+20*
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Gopal Rao: Outlines in Chemical Technology. 2. Shukla and Pandey: Introduction to Chemical Technology 3. Perry, A. S.; Yamamoto, I.; Ishaaya, I.; Perry, R.Y. (1998), Insecticides in Agriculture and Environment, Springer-Verlag Berlin Heidelberg. 4. Kuhr, R. J.; Derough, H.W. (1976), Carbamate Insecticides: Chemistry, Biochemistry and Toxicology, CRC Press,USA.	

*Applicable for courses having practical component.

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VOC

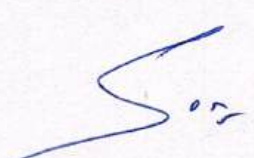
Session:2023-24

PartA –Introduction

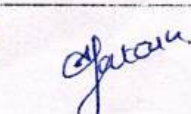
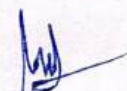
Subject	Chemistry		
Semester	V		
Name of the Course	Chemistry of cosmetics & perfumes		
Course Code	B23-VOC-123		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course,the learner will be able to: 1. Get the knowledge of cosmetics; 2. Logically think regarding preparation strategies and uses of cosmetic products; 3. Understand about preparation strategies and uses of cosmetic creams; 4. Get to know about the essential oils preset in nature & their importance towards industrial uses. 5*.learn about practical hands involved in preparation of cosmetic products.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max. Marks: 70 +30* Internal Assessment Marks: 20 + 10* End Term Exam Marks: 50+20*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
Instructions for Paper- Setter			

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Cosmetics-Definition, History, Classification ,Ingredients, Nomenclature, A general study including preparation and uses of the following: Hair dye, Hairspray, Shampoo, conditioners, Suntan lotions.	12 Hrs
II	Preparation and uses of Face powder, Lipsticks, Talcum powder, Nail enamel.	11 Hrs
III	Preparation and uses of creams (cold, vanishing, and shaving creams), Antiperspirants and Artificial flavours.	11 Hrs
IV	Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, Sandal wood oil, Eucalyptus, Rose oil, 2-Phenylethyl alcohol, Jasmine, Civetone, Muscone.	11 Hrs
V*	1. Preparation of Talcum powder. 2. Preparation of Shampoo. 3. Preparation of Enamels. 4. Preparation of Hair remover. 5. Preparation of Face cream. 6. Preparation of Nail polish. 7. Preparation of Nail polish remover.	30 Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		
Internal Assessment: 20+10* = 30 > Theory: 20 • Class Participation:05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam:10 > Practicum:10 • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab record setc.: 05 • Mid-Term Exam: N.A.		End Term Examination: 50+20*
Part C- Learning Resources		



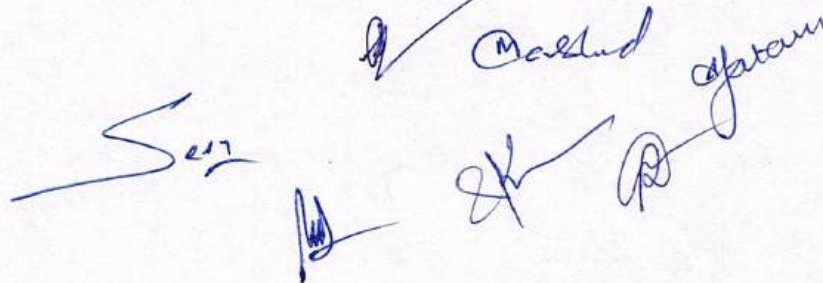


Recommended Books/e-resources/LMS:

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
2. P. C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
3. B. K. Sharma: *Industrial Chemistry*, Goel Publishing House, Meerut.
4. Textbook of Cosmetics; MV imaladevi; CBS Publishers & Distributors; 2015,
5. ISBN 81-239-1103-3
6. Text Book of Cosmetics; Dr Akanksha Garud, Dr PK Sharma, Dr Navneet Garud; Pragati Prakashan; 2012, ISBN 978-93-5006-691-1
7. Pharmaceutics and Cosmetics; Praveen K. Gupta, Sanjeev K. Gupta; Pragati Prakashan; 2011, ISBN 978-81-8398-995-4
8. Chemistry of Cosmetics; R. Kumari; Prestige Publisher, 2018,
9. ISBN 978-81-936512-3-0
10. Formulation Guide For Cosmetics; The Nisshin Oil Iio Group, Ltd.

*Applicable for courses having practical component.

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VOC

Session:2023-24

PartA –Introduction

Subject	Chemistry		
Semester	VI		
Name of the Course	Green laboratory Practices		
Course Code	B23-VOC-321		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to:		
	1. Learn about green chemistry; 2. describe, how injudicious use of chemicals can have an adverse/potentially damaging effect on humans and the environment. 3. Propose ideas for innovative approach to energy challenges. 4. Convert biomass into valuable chemicals through green technologies.		
Credits	5*.Hands on training towards green chemistry		
	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max.Marks: 70 +30* Internal Assessment Marks: 20 + 10* End Term Exam Marks: 50+20*		Time: Theory: Three Hours Practicum: Three Hours	

Part B-Contents of the Course

Instructions for Paper-Setter

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on

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Entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.

Unit	Topics	Contact Hours
I	Scheme for the traditional as well as green method for the synthesis of ibuprofen. Compare the amount and hazards of waste generated in both Green Methods in Chemistry. Preparation of propene by two methods can be studied (I) Hoffman elimination (II) Dehydration of propanol	11 Hrs
II	Prevention/minimization of hazardous/toxic products reducing toxicity. Risk= (function) hazards exposure: (a) Nitration of salicylic acid using green method $\text{Ca}(\text{NO}_3)_2$ (b) Preparation of dibenzalacetone by cross aldol condensation reaction using base catalysed green method (c) Acetylation of primary aromatic amine using the green method. Use of Green solvents and comparison of greenness of solvents: (a) Introduction to water as a solvent for chemical reactions. Preparation of Manganese(III) Acetylacetonate using green method (b) Advantages and application of solvent less processes in organic reactions. (c) Benzil-Benzilic acid rearrangement in solid State under solvent-free Condition.	12 Hrs
III	Energy requirements for reactions – alternative sources of energy: use of microwaves and photochemical energy. (a) Photoreduction of benzophenone to benzopinacol in the presence of sunlight. (b) Microwave assisted ammoniumformate-mediated Knoevenagel reaction: p-anisaldehyde, ethylcyanoacetate, ammoniumformate.	11 Hrs
IV	Importance of using catalytic reagents in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis. (a) Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide (b) Rearrangement of diazoaminobenzene to p-aminoazobenzene using K10 montmorillonite clay	11 Hrs
V*	1. Dehydration of propanol 2. Nitration of salicylic acid using calcium nitrate 3. Photoreduction of benzophenone to benzopinacol in the	30 Hrs

Presence of sunlight 4. Microwave assisted solvent free synthesis of aspirin 5. Synthesis of vitamin D3 using photochemical energy	
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS	
Internal Assessment: 20+10*=30 ➤ Theory: 20 • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum: 10 • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.: 05 • Mid-Term Exam: N.A.	End Term Examination: 70 (50+20*)
Part C- Learning Resources	
Recommended Books/e-resources/LMS: Theory: 1. Anastas, P. T., Warner, J. C. (2014), Green Chemistry, Theory and Practice, Oxford University Press. 2. Lancaster, M. (2016), Green Chemistry: An Introductory Text, 3rd Ed., RSC Publishing. 3. Cann, M. C., Connely, M. E. (2000), Real-World cases in Green Chemistry, American Chemical Society, Washington. 4. Matlack, A. S. (2010), Introduction to Green Chemistry, 2nd Ed., CRC Press. 5. Alhuwalia, V. K.; Kidwai, M. R. (2012), New Trends in Green chemistry, Kluwer Academic Publishers, Springer. 6. Sidhwani, I. T.; Sharma, R. K. (2020), An Introductory Text on Green Chemistry, Wiley India Pvt Ltd. 7. Etzkorn, F. A. (2019), Green Chemistry: Principles and Case Studies, Royal Society of Chemistry. Practicals: 8. Kirchoff, M., Ryan, M. A. (2002), Greener approach to undergraduate chemistry experiment, American Chemical Society, Washington DC. 9. Sharma, R. K., Sidhwani, I. T., Chaudhari, M. K. (2013), Green Chemistry Experiments: A monograph, I. K. International Publishing House Pvt Ltd. New Delhi. 10. Pavia, D. L., Lamponam, G. H., Kriz, G.S.W. (2006), Introduction to organic Laboratory Technique- A Microscale approach, 4th Edition, Brooks-Cole Laboratory Series for Organic chemistry. 11. Sidhwani, I.T. ; Saini, G.; Chowdhury, S. Wealth from Waste: A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated. University of Delhi, Journal of Undergraduate Research and Innovation, Volume 1, Issue 1, February 2015, ISSN: 2395-2334. 12. Sharma, R. K., Gulati, S., Mehta, S. (2012), Preparation of Gold Nanoparticles Using Tea: A Green Chemistry Experiment, Journal of Chemical Education, 89 (10), 1316-1318.	

*Applicable for courses having practical component.

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