Lecture Plan

Name of the college: Government College of Arts, Science and Commerce, Sanquelim- Goa

Name of Faculty: Dr. Rajesh R.Parvatkar	**Subject:** Chemistry	
Paper code: CHC-201	**Program:** S Y BSc	**Division:** A
Academic year: 2024 - 2025	**Semester:** V	**Total Lectures: 30**

Course Objectives: : 1. To understand the preparation of aromatic compounds, organic halides, alcohols, phenols and carbonyl compounds

2. To study the reactions of aromatic compounds, organic halides, alcohols, phenols and carbonyl compounds.

3. To study classical methods of analysis inclusive of principles andinstrumentation of UV Visible spectrophotometry and solvent extraction.

Expected Course Outcome:

Student Learning Outcome: Students will be able to

1. Explain the mechanisms, reactivity and orientation in aromatic electrophilic and nucleophilic substitution reactions
2. Discuss the methods of structure elucidation and synthesis of some alkaloids
3. Explain and apply the spectroscopic methods in IR, NMR and MS in structure elucidation.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
June	28/06/2024	29/06/2024	1			Smart Board/PPT	

				Aromatic hydrocarbons Preparation (case benzene): from phenol, from acetylene. Reactions: (case benzene): electrophilic substitution: nitration,			Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.
July	01/07/2024	06/07/2024	2	halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation): Preparation of toluene, ethylbenzene, isopropylbenzene, acetophenone, propiophenone, butyrophenone, *n*-propylbenzene, *n*-butylbenzene, *t*-butylbenzene, isobutylbenzene.		Smart Board/PPT	Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.
July	08/07/2024	13/07/2024	2	butylbenzene, isobutylbenzene. Side chain oxidation of following alkyl benzenes to benzoic acid: Toluene, ethylbenzene, isopropylbenzene. *o*-xylene to phthalic acid, *p*-xylene to terephthalic acid.		Smart Board/PPT	Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010.

							Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.
July	15/07/2024	20/07/2024	2	**Alkyl and Aryl Halides** Alkyl Halides: IUPAC Nomenclature (examples upto 5 Carbons), Preparation: from alkenes and alcohols.		Smart Board/PPT	I.L.Finar, Organic Chemistry Vols I and II, Orient Longman
July	22/07/2024	27/07/2024	2	Reactions: hydrolysis, nitrite & nitro formation. Types of Nucleophilic Substitution (S_N1 & S_N2) reactions (mechanism without stereochemistry).		Smart Board/PPT	Sykes, P., *A guide book to mechanism in organic chemistry*, 6thed., Longman Scientific & Technical, England, UK,1985. Finar, I. L., *Organic Chemistry*(Vol. I), 6thed., Pearson Education, India, 1973.
July/ August	29/07/2024	03/08/2024	2	Aryl Halides: Preparation: (chloro, bromo and iodobenzene): Sandmeyer reaction. Reactions (Chlorobenzene): Aromatic nucleophilic substitution S_NAr-mechanism (replacement by –OH group to give phenol and effect of nitro substituent).		Smart Board/PPT	Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.

August	05/08/2024	10/08/2024	2	Benzyne Mechanism: KNH_2/NH_3(or $NaNH_2/NH_3$). **3 Alcohols, Phenols, Ethers and Carbonyl Compounds** **Alcohols:** IUPAC Nomenclature (examples upto 5 Carbons),		Smart Board/PPT	Carey, F., *Organic Chemistry*, 4thed., McGraw Hill, New York USA, 2000. Bruice, P. Y., *Organic Chemistry*, 3rded., Pearson Education, Asia, 2014.
August	12/08/2024	17/08/2024	2	Preparation of 1°, 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, Reactions: With sodium, HX (Lucas te st), esterification, oxidation (with PCC, alk. $KMnO_4$).		Smart Board/PPT	Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.
August	19/08/2024	24/08/2024	2	Phenols: Preparation: Cumene hydroperoxide method, from 08 diazonium salts. Reactions: Electrophilic substitution: nitration, diazonium salts. Reactions: Electrophilic substitution: nitration, halogenation and sulphonation. halogenation and sulphonation. Ethers (aliphatic and aromatic): Williamson's synthesis of ethers.		Smart Board/PPT	Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.

				Ethers (aliphatic and aromatic): Williamson's synthesis of ethers. Cleavage of ethers with HI.Cleavage of ethers with HI.			
August	26/08/2024	31/08/2024	2	Aldehydes and ketones (aliphatic and aromatic): (acetaldehyde Aldehydes and ketones (aliphatic and aromatic): (acetaldehyde, , acetone, benzaldehyde and acetophenone) Preparation: from acetone, benzaldehyde and acetophenone) Preparation: from alcohols and acid chlorides. Reactionsalcohols and acid chlorides. Reactions—with HCN, ROH, NHwith HCN, ROH, NH33, 2,4, 2,4--DNP, NHDNP, NH22OH, Iodoform test.		Smart Board/PPT	Finar, I. L., *Organic Chemistry*(Vol. II), 3rded., Longmans, London, UK, 1964. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012.
September	02/09/2024	07/09/2024	2	Aldol condensationOH, Iodoform test. Aldol condensation--only reaction for only reaction for preparation of chalcone.preparation of chalcone. **UV-Visible Spectroscopy**		Smart Board/PPT	Morrison, R.T., Boyd, R.N. and Bhattacharjee, S. K., *Organic Chemistry*, 7thed., Pearson, Bangalore, India, 2010. Bahl, A. and Bahl, B. S., *Advanced Organic Chemistry*, S. Chand, New Delhi, India, 2012. P.S. Kalsi, Spectroscopy of Organic compounds

				Interaction of electromagnetic radiation with matter, Beer's and Lambert's law, derivation of Beer-Lambert's law,			
September	09/09/2024	14/09/2024	**GANESH CHATURTHI BREAK**				
September	16/09/2024	21/09/2024	2	deviations from Beer's law, Quantitative calculations. Principles of instrumentation: Sources, monochromators, cells.		Smart Board/PPT	P.S. Kalsi, Spectroscopy of Organic compounds G. D. Christian, *Analytical Chemistry*, 6th edition, Wiley publication, NewYork 2004
September	23/09/2024	28/09/2024	2	Types of instruments: Photoelectric colorimeters and Spectrophotometers: Single & Double beam; comparison between colorimeter and spectrophotometer; applications: qualitative & quantitative analysis. (*Numericals to be solved*)		Smart Board/PPT	P.S. Kalsi, Spectroscopy of Organic compounds G. D. Christian, *Analytical Chemistry*, 6th edition, Wiley publication, NewYork 2004
September/ October	30/09/2024	05/10/2024	2	**Solvent Extraction** Basic Principle, percentage extraction (derivation not required), role of complexing agents in solvent extraction,		Smart Board/PPT	G. D. Christian, *Analytical Chemistry*, 6th edition, Wiley publication, NewYork 2004

October	07/10/2024	12/10/2024	2	separation factor, types of extraction (batch, continuous, counter current), (Numerical problems are to be solved)			G. D. Christian, *Analytical Chemistry*, 6th edition, Wiley publication, NewYork 2004
October	14/10/2024	19/10/2024	2	Revision		Smart Board/PPT	
October	21/10/2024	21/10/2024	1	Revision			

Practical Plan

Name of the college: Government College of Arts Science & Commerce, Sankhali Goa		
Name of Faculty: Dr. Rajesh R. Parvatkar	**Subject:** Chemistry	
Paper code: CHC -201 Convepts in Organic and analytical Chemistry	**Program: SY BSc**	**Division: Batch I**
Academic year: 2024 - 2025	**Semester: III**	**Total Practicals/Labs: 15 (30 Hours)**
Credits:2		
Course Objectives:		

1. To apply theoretical concepts to experiments.
2. To acquire hands on training in organic preparation experiments.
3. To acquire hands on training in organic qualitative analysis.
4. To evaluate data for central tendency and dispersion.
5. To apply extraction methods to separate given mixtures

Expected Course Outcome:

Student Learning Outcome:

At the end of the course, students will be able to

1. Write the mechanism for substitution reactions of alkyl and aryl halides.
2. Write reactions for preparation and reactivity effects in case of alcohols, phenols, aldehydes, ketones and benzene.
3. Explain the Scope and importance of analytical chemistry and principles involved in Classical methods of analysis, UV-Visible spectrophotometric and Solvent extraction.
4. Synthesize simple organic compounds.
5. Analyse and identify organic compounds using classical qualitative analysis.
6. Solve numericals based on statistical data obtained from experimental results.
7. Compare different methods of quantitative and qualitative analysis.
8. Perform extraction and separation of chemical mixtures.

Month	Practicals/Labs Scheduled Date	No. of Practicals/Labs planned	List of Experiments	Reference books
June	28/06/2024-29/06/2024	1	Practicals not started	
July	01/07/2024-06/07/2024	1	Organic preparations Oxime of Cyclohexanone	Practical Organic Chemistry, N. K. Vishnoi Bansal, R. K., *Laboratory Manual of Organic Chemistry*, 5th ed., New Age
July	08/07/2024-13/07/2024	1	Organic preparations	Practical Organic Chemistry, N. K. Vishnoi

			c) 2,4 dinitrophenylhydrazone of benzaldehyde/acetophenone.	Bansal, R. K., *Laboratory Manual of Organic Chemistry*, 5th ed., New Age
July	15/07/2024-20/07/2024	1	Organic Spotting 1 Benzoic acid	Practical Organic Chemistry, N. K. Vishnoi
July	22/07/2024-27/07/2024	1	Organic Spotting 2 Thiourea	Practical Organic Chemistry, N. K. Vishnoi
July /August	29/07/2024-03/08/2024	1	Organic Spotting 3 para Toluidine	Practical Organic Chemistry, N. K. Vishnoi
August	05/08/2024-10/08/2024	1	Organic Spotting 4 metaditrobenzene	Practical Organic Chemistry, N. K. Vishnoi
August	12/08/2024-17/08/2024	1	Organic Spotting 4 Ethanol	Practical Organic Chemistry, N. K. Vishnoi
August	19/08/2024-24/08/2024	1	**Evaluation of data** 1. Titration of supplied calcium chloride solution with 0.01M EDTA solution. (More than 5 observations to be taken followed by statistical analysis to determine -mean, median, range, accuracy in terms of relative error)	Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989. Mendham,J., Denney,R.C., Barnes, J.D., Thomas,M., *Vogel's Textbook of Quantitative Inorganic Analysis*, 6th Ed., Pearson Education Asia, 2000,
August	26/08/2024-31/08/2024	1	**III. Evaluation of data** 2. Titration of given 0.1N NaOH solution using primary standard 0.1N Succinic acid solution. (5 observations to be taken followed by statistical analysis to determine -Relative Deviation, Average Deviation, Relative Average Deviation (RAD), Standard deviation, Variance and	Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989. Mendham,J., Denney,R.C., Barnes, J.D., Thomas,M., *Vogel's Textbook of Quantitative*

			Coefficient of variance, *True Value to be provided*).	*Inorganic Analysis*, 6th Ed., Pearson Education Asia, 2000,
September	02/09/2024-07/09/2024	1	**IV. UV-Visible spectrophotometry and Colorimetry** 1. Determine $\lambda_{max}$for 0.1M $K_2Cr_2O_7$by spectrophotometry.	Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989.
September	09/09/2024-14/09/2024	1	**IV. UV-Visible spectrophotometry and Colorimetry** 2. Verify Beer's law using $KMnO_4$by colorimetric method and determine molar extinction coefficient.	Mendham,J., Denney,R.C., Barnes, J.D., Thomas,M., *Vogel's Textbook of Quantitative Inorganic Analysis*, 6th Ed., Pearson Education Asia, 2000, Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989.
September	16/09/2024-21/09/2024	1	**IV. UV-Visible spectrophotometry and Colorimetry** 3. Estimation of Cu^{2+}as $[Cu(NH_3)_4]^{2+}$complex in the given unknown solution using Calibration curve method.	Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989. Mendham,J., Denney,R.C., Barnes, J.D., Thomas,M., *Vogel's Textbook of Quantitative Inorganic Analysis*, 6th Ed., Pearson Education Asia, 2000,
September	23/09/2024-28/09/2024	1	**V. Solvent Extraction** 1. Separation of mixture of benzoic acid and β-naphthol using ethyl acetate by solvent extraction method.	Practical Organic Chemistry, N. K. Vishnoi Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989.

September/October	30/09/2024-05/10/2024	1	**V. Solvent Extraction** 2. Determination of partition coefficient of acetic acid in water and n-butyl alcohol.	Practical Organic Chemistry, N. K. Vishnoi Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989.
October	07/10/2024-12/10/2024	1	**V. Solvent Extraction** 3. Extraction of Caffeine from tea leaves decoction using dichloromethane as organic solvent.	Practical Organic Chemistry, N. K. Vishnoi Jeffery, G. H., Bassett, J., Mendham,J., Denney, R. C., *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989.
October	14/10/2024-19/10/2024	1	Revision	
October	21/10/2024-22/10/2024	1	Journal certification	

*** Assessment Rubrics**

Component	Max Marks
ISA 1	10
ISA 2	0
Practical	50
Project	0
Semester End Exam	65