

School of Chemistry
Faculty of Science
University of the Punjab, Lahore
Course Outline



BS Chemistry Semester-V					
Programme	BS Chemistry	Course Code	Chem-331	Credit Hours	2
Course Title	UV & IR Spectroscopy		Course Type	Major	
Course Introduction					
<p>The course is designed to provide an adequate knowledge about the instrumentation, working and applications of UV/Visible and IR spectroscopy and role of these techniques for the characterization of organic compounds.</p> <p>Infra-Red (IR) Spectroscopy Electromagnetic radiations: IR; modes of vibration, sampling techniques, Vibration frequencies of different functional groups, factors influencing the vibration frequencies and applications of IR spectroscopy.</p> <p>Ultra-Violet (UV) and Visible Spectroscopy Ultraviolet (UV) or electronic spectroscopy: electronic transitions; factors influencing the λ_{max}. values, Woodward- Fisher rules for calculations of λ_{max}. Applications of UV-Vis. Spectroscopy.</p>					
Learning Outcomes					
<p>On the completion of the course:</p> <ol style="list-style-type: none"> 1. The students are expected to be familiarized with the instrumentation, working and applications of UV/Visible and IR spectroscopy. 2. They will understand the role of these techniques for the characterization of organic compounds. Students will be able to differentiate compounds by using these spectroscopic techniques. 					
Course Content				Assignments/Readings	
Week 1	Infrared Spectroscopy Electromagnetic Radiations			Enlist effects of EMR and their importance	
	Infrared Radiations				
Week 2	Introduction			Practice modes of vibration of assigned examples	
	Modes of vibration				
Week 3	Modes of vibration			Literature survey	
	Sample techniques				
Week 4	Sample techniques			Problem set	
	Vibration frequencies of different functional groups				
Week 5	Vibration frequencies of different functional groups				
	Factors influencing the vibration frequencies				
Week 6	Interpretation of spectra's			Practice problems	

Week 7	Interpretation of spectra's	Practice problems
	Applications	
Week 8	Mid-Term Week	
Week 9	Ultraviolet Visible Spectroscopy Ultraviolet (UV) or electronic spectroscopy	Search harmful effects and uses of UV in structure elucidation.
	Introduction	
Week 10	Electronic transitions	Practice problems
	Electronic transitions	Practice problems
Week 11	Factors influencing the λ_{\max} values	
	Factors influencing the λ_{\max} values	
Week 12	2.4 Factors influencing the λ_{\max} values	
	Woodward- Fieser rules for calculations of λ_{\max}	Memorize values
Week 13	Woodward- Fieser rules for calculations of λ_{\max}	Memorize values
	Woodward- Fieser rules for calculations of λ_{\max}	Memorize values
Week 14	Woodward- Fieser rules for calculations of λ_{\max}	
	Applications of UV-Vis. Spectroscopy	Literature survey
Week 15	Applications of UV-Vis. Spectroscopy	Literature survey
	Applications of UV-Vis. Spectroscopy	
Week 16	Final-Term Week	

Textbooks and Reading Material

1. Pavia, D.L; Lampman, G.M; Kriz, G.S; Vyvyan, J.R. Introduction to Spectroscopy. Brooks/Cole Cengage Learning, 2009; 4th Ed.
2. Williams, D. and I. Fleming, Spectroscopic Methods in Organic Chemistry, McGrawHill, New York
3. M.Younas, Organic Spectroscopy, Ilmi Kitab Khana, Lahore (2004).
4. Y.C. Ning, Spectral Identification of Organic Compounds with Spectroscopic Techniques, Wiley-VCH, Weinheim (2005).
5. Kemp, W. Organic Spectroscopy. W.H. Freeman & Company: New York, 1991; 3rd Ed.
6. Hollas, J.M. Modern Spectroscopy. John-Wiley & Sons, 2004; 4th Ed
7. M. Hesse, H. Meier and B. Zeeth, Spectroscopic Methods in Organic Chemistry, Georg Thieme Verlag, Stuttgart, Germany (1997).
8. R.M. Silverstein, F.X. Webster and D.J. Kiemle, Spectrometric Identification of Organic Compounds, John Wiley and sons Inc., USA (2005).
9. L.M. Harwood and T.D.W. Claridge, Introduction to Organic Spectroscopy, Oxford University Press Inc., New York (1997).

Teaching Learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work/Numerical problem sets
4. Seminar/ Workshop

Assignments: Types and Number with Calendar

1. Practice questions from the exercises from the recommended textbook.
2. Literature review based assignment relevant to the course will also be given during the course.

Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

BS Chemistry Semester-V					
Programme	BS Chemistry	Course Code	Chem-332	Credit Hour	1
Course Title	Organic Chemistry Lab		Course Type	Major	
Course Introduction					
<p>The course is organized to provide an adequate knowledge about basic concepts of single step organic synthesis and estimation of different reducing sugars in different solutions.</p> <p>Organic synthesis: Benzoic acid from benzaldehyde (Cannizzaro) and from toluene (KMnO₄); ethyl benzene from acetophenone; benzilic acid from benzil and benzil from benzoin, Iodoform reaction. preparation of benzanilide from benzoyl chloride, Succinic anhydride from succinic acid, Phthalimide from phthalic anhydride, Oximes and hydrazones from carbonyl compounds and an ester from a carboxylic acid and alcohol.</p> <p>Estimation of reducing sugars in different solutions.</p>					
Learning Outcomes					
<p>On the completion of the course, the students will:</p> <ol style="list-style-type: none"> 1. Understand the key concepts of organic synthesis 2. Familiarize with organic preparations and quantitative analysis. 3. Student will be able to estimate the amount of reducing sugar in different samples. 					
Course Content				Assignments/Readings	
Week 1	Synthesis of benzoic acid from benzaldehyde			Literature survey	
Week 2	Synthesis of benzoic acid from toluene			Write complete mechanism	
Week 3	Prepare ethyl benzene from acetophenone				
Week 4	Synthesis of dibenzalacetone using acetone and benzaldehyde				
Week 5	Synthesis of benzil from benzoin			Literature survey	
Week 6	Prepare benzilic acid from benzil				
Week 7	Preparation of iodoform			Write complete mechanism	
Week 8	Mid Term Examinations				
Week 9	Preparation of benzoic acid using benzamide			Write complete mechanism	
Week 10	Synthesis of Umbelliferone from resorcinol				
Week 11	Synthesis of aspirin from salicylic acid				
Week 12	Quantitative and Qualitative Analysis of Organic compounds			Search out importance of estimation of glucose in medical field.	
	Estimation of glucose				
Week 13	Estimation of sucrose				
	Estimation of fructose			Search out importance of estimation of glucose in medical field	
Week 14	Estimation of lactose				

Week 15	Estimation of maltose		
Week 16	Final Term Examinations		
Textbooks and Reading Material			
<ol style="list-style-type: none"> 1. Vogel's Textbook of Practical Organic Chemistry (5th Ed.) by A.I. Vogel et al. Longman, UK, 1989. 2. Advanced Practical Organic Chemistry, by J. Leonard, B. Lygo, G. Procter, CRC. 1994. 3. Advanced Practical Organic Chemistry (2nd Ed.) by N.K. Vishnoi, Vikas Publishing House Pvt. Ltd. India, 1996. 4. K.N. Williamson and K.M. Masters, <i>Macroscale and Microscale Organic Experiments</i>, published by Cengage learning, 2011. 5. J.J. Li, C. Limberakis and D.A. Pflum, <i>Modern Organic Synthesis in Laboratory</i>, Oxford University Press, 2007. 6. J. Leonard, B. Lygo and G. Procter Nelson, <i>Advanced Practical Organic Chemistry</i>, Thames Ltd. UK, 2001. 			
Teaching Learning Strategies			
<ol style="list-style-type: none"> 1 Lectures 2 Group Discussion 3 Laboratory work 4 Seminar/ Workshop 			
Assignments: Types and Number with Calendar			
<ol style="list-style-type: none"> 1. Lab activities and practical performance from week 1 to week 16. 2. Literature review based assignment relevant to the course will also be given during the course. 3. Maintain record of all Practicals in note book under the following headings: Theory, Procedure, Chemicals, Observations and Results, Precautions 			
Assessment			
Sr. No.	Elements	Weightage	Details
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2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.