



UNIVERSITI TEKNOLOGI MARA

CHM626: ORGANIC SPECTROSCOPY

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| Course Name (English) | ORGANIC SPECTROSCOPY APPROVED |
| Course Code | CHM626 |
| MQF Credit | 3 |
| Course Description | This course deals primarily with the spectroscopic methods used for structure determination of organic compounds, namely, infrared spectroscopy (IR), 1D and 2D nuclear magnetic resonance spectroscopy (NMR), ultraviolet-visible spectroscopy (UV-Vis) as well as mass spectrometry (MS) including hyphenated techniques. Instructional methods include lectures, problem-based learning and blended learning. The outcomes shall be assessed through a variety of tools which include quizzes, tests, assignments and final examination. |
| Transferable Skills | Structure elucidation of simple organic compounds |
| Teaching Methodologies | Lectures, Presentation, Problem-based Learning |
| CLO | <p>CLO1 Explain the basic theory of IR, UV-Vis, ¹H, ¹³C NMR and mass spectrometry and describe each of their application in structure elucidation of simple organic compounds.</p> <p>CLO2 Elucidate chemical structures of organic compounds from the interpretation of conjoint IR-UV-NMR-MS spectra.</p> <p>CLO3 Elucidate structures of organic compounds from conjoint IR-UV-Vis-NMR-MS spectra Demonstrate communication skills in work collaboratively with peers and communicate effectively with instructor and peers on structure elucidation problems.</p> |
| Pre-Requisite Courses | No course recommendations |
| Topics | |
| 1. 1. Molecular Formulas 1.1) Index of Hydrogen Deficiency, degree of unsaturation 1.2) Rule of Thirteen | |
| 2. 2. Applications of Infrared Spectroscopy 2.1) Correlation Charts and Tables 2.2) Approaching the Analysis of A Spectrum 2.3) A Survey of The Important Functional Groups with Examples 2.4) Factors That Influence the C=O S | |
| 3. 3. Nuclear MAgnetic Resonance (NMR) Spectroscopy 3.1) Principles | |
| 4. 4. NMR: 4.1) Chemical Shift and its measurement | |
| 5. 5. Proton NMR Spectroscopy: 5.1) Spin-spin coupling: Tree diagram | |
| 6. 6. Proton NMR Spectroscopy 6.1) First order and second order, spin systems | |
| 7. 7. NMR Spectroscopy 7.1) Problem based on IR and ¹ H NMR | |
| 8. 8. Carbon ¹³ NMR Spectroscopy 8.1) Principles | |
| 9. 9. NMR Spectroscopy 9.1) problem based on IR, 1D ¹ H and ¹³ C NMR | |

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| 10. 10. 2D NMR Techniques 10.1) COSY |
| 11. 11. 2D NMR Techniques 11.1) HETCOR, HMQC and HSQC |
| 12. 12. 2D NMR Techniques 12.1) HMBC and NOESY |
| 13. 13. NMR Spectroscopy problems 13.1) Based on IR, 1D and 2D NMR |
| 14. 14. Mass Spectrometry 14.1) Principles and instrumentation |
| 15. 15. Mass spectrometry 15.1) Fragmentation patterns |
| 16. 16. Mass spectrometry 16.1) problems with NMR and IR data |
| 17. 17. UV-Vis spectroscopy 17.1) Principles and application |
| 18. 18. Uv-Vis Spectroscopy 18.1) The Woodward Fiser Rules for Dienes and Enones |
| 19. 19. Conjoint IR-UV/VIS-NMR-Mass Spectrometry problems 19.1) N/A |

| Assessment Breakdown | % |
|-----------------------|--------|
| Continuous Assessment | 60.00% |
| Final Assessment | 40.00% |

| Details of Continuous Assessment | Assessment Type | Assessment Description | % of Total Mark | CLO |
|----------------------------------|-----------------|-----------------------------|-----------------|------|
| | Assignment | Assignment and presentation | 20% | CLO3 |
| | Test | Test 2 | 20% | CLO2 |
| | Test | Test 1 | 20% | CLO1 |

| Reading List | Recommended Text |
|--------------|---|
| | <ul style="list-style-type: none"> Donald Pavia, Gary Lampman, George Kriz, James Vyvyan 2008, <i>Introduction to Spectroscopy</i>, Fourth Ed., Cengage Learning |

| Article/Paper List |
|---|
| This Course does not have any article/paper resources |

| Other References |
|---|
| <ul style="list-style-type: none"> Book Phillip Crews, Jaime Rodríguez & Marcel Jaspars 2010, <i>Organic Structure Analysis</i>, Oxford University Press, US Book Robert M Silverstein, Francis X. Webster, David J. Kremling, <i>Spectrometric Identification of Organic Compounds</i> |