

Course Code MED-108	Course Title Organic Chemistry	ECTS Credits 6
School Medical School	Semester Spring (Semester 2)	Prerequisites MED-102 General Chemistry
Type of Course Required	Field Medicine	Language of Instruction English
Level of Course Undergraduate	Year of Study 1st	Lecturer(s) Prof Photos Hajigeorgiou
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are:

- To give students an introduction to the basic principles of organic chemistry.
- To cultivate an appreciation of the role of organic chemistry in everyday life and in biological systems.
- To help develop sound practical skills in the unique laboratory explorations of organic chemistry.

Learning Outcomes:

The following list provides the learning objectives that will be covered in the lectures, lab practicals and tutorials of each week:

Week 1

LOBs covered during lectures:

1. Identify specific functional groups and place molecules in particular families.
2. Convert Lewis structures to skeletal form, and vice versa.
3. Name organic compounds given the structure.
4. Draw chemical structure given the name.

LOB covered during tutorial:

5. Solve a wide selection of problems on functional groups and organic nomenclature.

Week 2

LOBs covered during lectures:

6. Recognize and identify the type of isomerism involved.
7. Derive, draw, and name structural isomers for alkanes and other organic compounds.
8. Draw potential energy diagrams for bond rotation.
9. Apply the proper use of nomenclature for geometric isomers.
10. Identify chiral centres in organic molecules.
11. Discuss the general principles of optical activity.

LOB covered during lab practical:

12. Work safely in the organic chemistry laboratory.

Week 3

LOBs covered during lectures:

13. Determine R or S configuration in chiral centres.
14. Determine the relationship between optical isomers.
15. Discuss physical properties of alkanes and identify their origin.
16. Discuss the chemical reactions of alkanes.
17. Identify the different types of strain energy in alkanes and cycloalkanes.

LOB covered during tutorial:

18. Solve a wide variety of problems on isomers.

Week 4

LOBs covered during lectures:

19. Discuss the relative stability of cycloalkane conformations.
20. Discuss the relative stability of disubstituted cyclohexanes.
21. Identify the degree of unsaturation of organic compounds.
22. Discuss electrophilic addition reactions to alkenes.
23. Identify reagents and products in the principal reactions of alkenes.

LOB covered during lab practical:

24. Synthesize a crystalline organic compound and purify it through recrystallization.

Week 5

LOBs covered during lectures:

25. Discuss the principal method of preparation of alkynes.
26. Identify reagents and products in the reactions of alkynes.
27. Discuss the basic principles of organic spectroscopy.
28. Interpret infrared absorption spectra of organic compounds.

LOB covered during tutorial:

29. Solve a wide variety of problems on alkanes, cycloalkanes, alkenes, and alkynes.

Week 6

LOBs covered during lectures:

30. Discuss the basic principles of mass spectrometry.
31. Identify key spectrometric signals in mass spectra.
32. Discuss the basic principles of NMR spectroscopy.

LOB covered during lab practical:

33. Synthesize the common analgesic Aspirin using an esterification reaction.

MIDTERM EXAM

Week 7

LOBs covered during lectures:

34. Interpret NMR spectra of organic compounds.

LOB covered during tutorial:

35. Solve a wide variety of problems of organic spectroscopy.

Week 8

LOBs covered during lectures:

36. Identify and write the steps of free radical chlorination of alkanes.

37. Write the full mechanism of electrophilic addition to an alkene.

38. Write the full mechanisms for SN1 and SN2 reactions.

39. Identify which reagents undergo SN1 or SN2 reactions according to structure.

40. Draw concise and detailed energy reaction diagrams for reactions considered.

41. Describe physical properties of alcohols on the basis of molecular structure.

42. Discuss methods of preparation of alcohols.

LOB covered during lab practical:

43. Produce soap by reacting a triglyceride (fat) with an alkaline hydroxide solution.

Week 9

LOBs covered during lectures:

44. Identify reactants and products of alcohol reactions.

45. Discuss methods of preparation of aldehydes and ketones.

LOB covered during tutorials:

46. Solve a variety of problems on organic reaction mechanisms.

Week 10

LOBs covered during lectures:

47. Identify reagents and products of a wide variety of aldehyde and ketone reactions.

48. Discuss the physical properties of carboxylic acids.

49. Discuss the effect of chemical structure on the degree of acidity of carboxylic acids.

50. Discuss methods of preparation of carboxylic acids.

51. Identify reagents and products in reactions of carboxylic acids.

LOB covered during tutorial:

52. Solve a variety of problems on alcohols, aldehydes, ketones and carboxylic acids.

Week 11

LOBs covered during lectures:

53. Discuss the physical properties of amines.
54. Discuss the effect of chemical structure on the degree of basicity of amines.
55. Identify reagents and products in reactions of amines.
56. Discuss the special stability of benzene and aromatic compounds.

LOB covered during lab practical:

57. Separate a mixture of acetone and water by using fractional and simple distillation and test the effectiveness of the separation.

Week 12

LOBs covered during lectures:

58. Discuss the requirements for aromaticity and identify aromatic and anti-aromatic compounds.
59. Identify reagents and products of benzene and benzene-containing compounds.
60. Discuss substituent effects in substituted benzenes and synthesize simple benzene compounds.
61. Discuss the principal techniques of organic synthesis.
62. Provide efficient pathways for the synthesis of a wide variety of organic compounds.
63. Solve a wide variety of problems on organic synthesis.

LOB covered during tutorial:

64. Solve a wide variety of problems on benzene and aromatic compounds.

Course Contents:

- Functional groups in organic chemistry, organic nomenclature, skeletal structures, alkyl groups
- Naming of organic compounds
- Isomers - Introduction, Constitutional isomers, tautomers, stereoisomers, conformational isomers
- Isomers - Conformational isomers, Configurational isomers - Geometric isomers
- Isomers - Geometric isomers, optical isomerism
- Isomers - Optical isomers
- Alkanes
- Cycloalkanes
- Alkenes
- Alkynes
- Spectroscopy – IR
- Spectroscopy - Mass spectrometry – NMR
- Spectroscopy - NMR

- Mechanisms
- Alcohols
- Aldehydes and Ketones
- Carboxylic acids
- Nitrogen compounds
- Benzene
- Organic synthesis

Laboratory Practicals:

- Laboratory Safety Demonstrations
- Synthesis of Dibenzalacetone
- Synthesis of Aspirin
- Synthesis of Soap
- Fractional Distillation and Simple Distillation

Tutorials:

- Functional groups and organic nomenclature
- Isomers
- Hydrocarbons
- Spectroscopy
- Mechanisms
- Oxygen containing molecules
- Benzene

Learning Activities and Teaching Methods:

Lectures, Tutorials, Laboratory Practical Sessions.

Assessment Methods:

Laboratory reports (10%), Midterm Exam (30%), and Final Exam (60%). Assessment is by Single Best Answers (SBAs) and Short Answer Questions (SAQs).

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
J. McMurry	Organic Chemistry	Brooks/Cole Publishing Company	2007 7 th Edition	0-534-42005-2

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
S. McMurry	Study Guide and Student Solutions Manual for John McMurry's Organic Chemistry	Thompson Brooks/Cole	2004 6 th Edition	0-534-40934-2

T.W.G. Solomons and C.B. Fryhle	Organic Chemistry	Wiley	2004 8 th Edition	978-0-471- 41799-6
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