North Central
Michigan College

NCMC MASTER COURSE SYLLABUS

Last Date Revised Jan 2003

DIVISION/AREA: Science and Human Services DEPARTMENT: Science

DIVISION DIRECTOR: Polly Flippo, MSN ORIGINATOR: Ralph Christensen, PhD

DEAN OF INSTRUCTION: Timothy Dykstra, Ph.D.

TOTAL HOURS OF INSTRUCTION: LECTURE: 4 LAB: 3 TOTAL CONTACT HOURS: 123

COURSE NUMBER: CEM 102 CREDIT HOURS: 5(4-3)

COURSE TITLE: Fundamentals of Bioorganic Chemistry

TRANSFERABLE YES: x NO: TO:

PREREQUISITE(S)/COREQUISITE(S)/ADVISORY: CEM 101 or equivalent

CATALOG DESCRIPTION: An introductory organic and biochemistry class for student entering allied health fields or wishing to prepare for organic chemistry, CEM 231. Studies the nomenclature of organic compounds, organic functional groups and their reactivities; stereochemistry, major biomolecules and their metabolism, enzymes and chemistry of heredity. Lecture and lab.

GENERAL EDUCATION OUTCOMES:
Think critically and analytically
Apply scientific principles

COURSE OBJECTIVES & OUTCOMES:

1. Describe how organic compounds differ from inorganic compounds.
2. Distinguish between the structural features that identify alkanes, alkenes, alkynes, and aromatic hydrocarbons.
3. Name alkanes, alkenes, alkynes, and aromatic hydrocarbons using IUPAC nomenclature.
4. Identify the physical and chemical properties of alkanes, alkenes, alkynes, and aromatic hydrocarbons.
5. Predict the organic products of the major reactions of alkenes.
6. Explain how polymers are formed and utilized.
7. Identify the general structure of an alcohol, a phenol, and an ether.
8. Classify alcohols as primary, secondary, or tertiary.
9. Describe how various alcohols affect the human body.
10. Name alcohols, ethers and phenols.
11. Explain how the structural features of alcohols and ethers explain the difference in their physical properties.
12. Describe the structure and uses of some common polyhydric alcohols and phenols.
13. Illustrate the structural difference between an aldehyde and a ketone.
14. Use correctly the nomenclature rules for aldehydes and ketones.
15. Describe how aldehydes and ketones are prepared.
16. Illustrate the structural differences between a carboxylic acid, an ester, and an amide.

17. Use correctly the nomenclature rules for carboxylic acids, esters, and amides.
18. Describe some common carboxylic acids and esters and their uses.
19. Classify amines as primary, secondary, or tertiary.
20. Name amines according to both common and IUPAC rules.
21. Describe heterocyclic amines.
22. Explain the differences between structural isomers, stereoisomers, enantiomers, and diastereomers.
23. Describe the relationship between polarized light and optically active compounds.
24. Identify the chiral centers in a given molecule.
25. Classify commonly occurring monosaccharides as aldoses or ketoses and as trioses, pentoses, or hexoses and as a D or a L sugar.
26. Describe the structures of sucrose, lactose, and maltose.
27. Compare and contrast amylose, amylopectin, glycogen, and cellulose.
28. Define and classify lipids.
29. Explain the difference between a saturated, monounsaturated, and polyunsaturated triglyceride.
30 Distinguish between phospholipids, glycolipids, and sphingolipids.
30. Classify amino acids based on the characteristics of their side chains.
31. Describe the four levels of protein structure.
32. Discuss how proteins can be denatured.
33. Describe the active site of an enzyme.
34. Explain how pH, temperature, and the concentration of enzyme and substrate influence enzyme activity.
35. Distinguish between a competitive inhibitor, a noncompetitive inhibitor, and an irreversible inhibitor.
36. Illustrate the composition of nucleotides.
37. Describe how mRNA is synthesized from DNA and how a protein is synthesized from mRNA.
38. Explain how genetic mutations arise.
39. Describe the chemistry of digestion of carbohydrates, fats, and proteins.
40. Discuss the different steps of the Krebs cycle.
41. Describe how muscles obtain their energy.
42. Discuss the different steps of glycolysis.
43. Compare the aerobic and anaerobic fate of pyruvate.
44. Discuss the different steps of gluconeogenesis.
45. Compare the energy storage efficiency of triglycerides compared with glycogen.
46. Describe the complete oxidation of a fatty acid.
47. Describe how a fatty acid is synthesized.
48. Compare the metabolic processes that required amino acids with those that provide amino acids.
49. Describe how excess amino acids are degraded.
50. Discuss how hormones regulate metabolic pathways.

METHODS OF INSTRUCTION: Lecture, Lab, discussion, demonstration, projects, videos

COURSE TITLE AND NUMBER: FUNDAMENTALS OF BIOORGANIC CHEMISTRY CEM 102

METHODS OF EVALUATION: Tests, quizzes, labs, homework, written and oral projects.

REQUIRED TEXTS: Organic and Biochemistry by Blei and Odian

OPTIONAL SUPPLEMENTARY MATERIALS:

Reasonable accommodations may be provided for students with documented physical, sensory, cognitive, systemic, and/or psychiatric disabilities. Please contact the Education Opportunity Program (EOP) at (231) 348-6687 to arrange services for this course.

TIME ALLOWANCE AND SEQUENCE OF INSTRUCTION:

Week:

1. Saturated Hydrocarbons
2. Unsaturated Hydrocarbons
3. Alcohols, Phenols, and Ethers
4. Aldehydes and Ketones
5. Carboxylic Acids and Derivatives
6. Amines and Amides
7. Stereoisomerism
8. Carbohydrates
9. Lipids
10. Proteins
11. Nucleic Acids
12. Metabolism
13. Carbohydrate Metabolism
14. Fatty Acid Metabolism
15. Amino Acid Metabolism
16. Hormones

APPROVED FOR ADOPTION BY THE CRD/AP COMMITTEE ON _____