

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

BASIC ORGANIC AND BIOCHEMISTRY
CHEM 1020

Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 3.0

**Date Revised: Spring
03**

Catalog Course Description:

Alkanes and unsaturated and aromatic hydrocarbons with emphasis on structure, nomenclature and functional groups. Biochemistry: amino acids and proteins, carbohydrates, lipids, nucleic acids. Course includes three hours of lecture and three hours of laboratory application each week.

Entry Level Standards:

The student should have a good understanding of general chemistry. Reading and writing on a college level is also expected. Basic mathematical skills (algebra, logarithms and ratios) are also needed.

Prerequisites:

CHEM 1010

Textbook(s) and Other Reference Materials Basic to the Course:

Bettelheim, Frederick A., Brown, William H. and March, Jerry, *General, Organic and Biochemistry*. 6th edition. Harcourt College Publishers, 2001.

Laboratory Experiments for General, Organic and Biochemistry: CHM 1100, Principles of Chemistry, PSTCC. Harcourt Brace Custom Publishers.

I. Week/Unit/Topic Basis:

Week	Topic
1	Lecture: Organic Chemistry; Ch 10 Alkanes and Cycloalkanes; Ch. 11 Lab: Check-in and Safety Rules
2	Lecture: Alkenes and Alkynes; Ch. 12.1-12.6 Lab: Structure in Organic Compounds: use of molecular models
3	Lecture: Benzene and Its Derivatives; Ch.14 Lab: Identification of Hydrocarbons
4	EXAM 1: Chapters 10-12, 14 Lecture: Alcohols, Ethers and Thiols; Ch.13 Lab: Identification of Alcohols and Phenols

5	Lecture: Amines; Ch.16 Lab: Quantitative Analysis of Vitamin C Contained in Foods
6	EXAM 2: Chapters 13, 16 Lecture: Aldehydes and Ketones; Ch. 17 Lab: Identification of Aldehydes and Ketones
7	Lecture: Carboxylic Acids, Anhydrides, Esters and Amides; Ch. 18.1-18.7 Lab: Carboxylic Acids and Esters
8	EXAM 3: Chapters 17, 18 Lecture: Chirality; Ch. 15.1-15.2, 15.4-15.6 Lab: Preparation of Aspirin
9	Lecture: Carbohydrates; Ch. 19.1-19.7 Lab: Carbohydrates
10	EXAM 4: Chapters 15, 19 Lecture: Lipids; Ch. 20 Lab: Preparation and Properties of a Soap
11	Lecture: Proteins; Ch. 21 Lab: Acid-Base Properties of Amino Acids
12	Lecture: Enzymes; Ch. 22 Lab: Isocitrate Dehydrogenase
13	EXAM 5: Chapters 20-22 Lecture: Chemical Communications: Neurotransmitters and Hormones; Ch. 23 Lab: Nucleic Acids
14	Lecture: Nucleotides, Nucleic Acids, and Heredity; Ch.24 Gene Expression and Protein Synthesis; Ch. 25.1-25.5 Lab: Check-Out/ Review
15	EXAM 6: Chapters 23-25 Lecture: Review Lab: lab final exam
16	Final Exam Period

II. Course Objectives*:

- A. Understand molecular structure and chemical bonding in carbon containing molecules. III.1, III.2
- B. Develop a working knowledge of IUPAC as well as common nomenclature for organic compounds. I.5
- C. Develop a deeper understanding of the Lewis and Bronsted-Lowry definitions for acids and bases and their essential role in organic and biological chemistry. III.2
- D. Understand the difference between constitutional and stereo isomerism and the importance of chirality in biological systems. III.1, III.2
- E. Acquire a knowledge of the reactivity of various functional groups including alkyl halides,

alcohol, ethers, alkenes, alkynes, aromatics, aldehydes, ketones, esters, carboxylic acids, amines and amides as well as methods for preparation of these functional groups. III.1, III.2

- F. Acquire a knowledge of the structures of biological molecules including carbohydrates, lipid, proteins, and nucleic acids and their roles in metabolic and regulatory biochemical processes. III.1, III.2
- G. Understand the factors affecting enzyme activity and the mechanism of enzyme actions. III.1, III.2
- H. Understand the roles of RNA and DNA in protein synthesis. III.1, III.2
- I. Acquire a knowledge of the types of molecules used for communication between cells including: neurotransmitters and hormones. III.1, III.2

*Roman numerals after course objectives reference goals of the university parallel program.

III. Instructional Processes*:

Students will:

1. Collect, tabulate, graph and analyze data from laboratory experiments and prepare lab reports. This will require the use of a variety of information resources. *Communication Outcome, Problem Solving and Decision Making Outcome, Technological Literacy Outcome, Numerical Literacy Outcome, Information Literacy Outcome, Active Learning Strategy*
2. Use critical thinking to solve various problems involving organic reactions and biochemical processes. *Decision Making Outcome, Information Literacy Outcome*
3. Work in small groups both in performing laboratory experiments and problem solving in the classroom to encourage the development of teamwork. *Communication Outcome, Personal Development Outcome, Active Learning Strategies, Transitional Strategies*
4. Be given examples of summaries of reaction pathways which will encourage and aid in the development of their own organizational skills. *Personal Development Outcome*
5. Better understand the chemistry involved in producing the products, both natural and man-made, that they use on a daily basis. These products include soaps and detergents, cosmetics, plastics, pesticides, fabrics, pharmaceuticals and many others. *Personal Development Outcome, Transitional Strategies*
6. Better understand the factors affecting their health and well-being. For students planning to pursue a health professions career, this knowledge and understanding are especially important. *Problem Solving and Decision Making Outcome, Technological Literacy Outcome, Information Literacy Outcome, Personal Development Outcome, Transitional Strategies*

*Strategies and outcomes listed after instructional processes reference Mississippi State's goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Name organic structures using IUPAC rules including stereochemistry as well as draw structures for given names including appropriate stereochemistry. A, B, D
2. Identify functional groups. A
3. Determine the products for a variety of reactions involving alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides based on examples and reaction mechanisms discussed in class. E
4. Determine the reagents necessary to accomplish chemical transformations of the functional groups studied. E
5. Draw and identify structures for important biological molecules including proteins, carbohydrates, lipids and nuclei acids. F
6. Determine the affects of changes in pH on the ionization of amino acids and proteins. F
7. Discuss the factors affecting enzyme activity. G
8. Know the structural charachteristics of classes of neurotransmitters and hormones involved in chemical communication and the mode of action. I
9. Know the steps involved in DNA replication, transcription and translation. H

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures: 75% of grade

You may not miss an exam for any but the most serious problem. Missed exams may be made up only if the instructor is notified within 24 hours and is provided a valid, verifiable excuse. However, missed exams must be made up within 5 days. In all other cases missed exams will be recorded as a zero. Students may not make-up more than one missed exam except under the direst of circumstances. Cheating results in a zero. Students arriving late for an exam will not be given extra time. Six 100 point hour exams will be given. The lowest grade will be dropped.

The lecture grade will be based on the following:

Exams	500
Comprehensive Final	<u>250</u>
Total	750

B. Laboratory Expectations: 25% of grade

Evaluation of the laboratory performance will be based on the following:

Reports	198
Comprehensive Final	<u>52</u>
Total	250

Students must read the assigned lab experiment prior to class and complete any pre-lab assignments. Failure to do so may result in points being taken off of the lab report grade. Attendance is required for all scheduled lab meetings. There are NO MAKE-UP LABS. If you should have to miss a lab due to a serious problem, you must contact the instructor within 24 hours and provide a valid, document able excuse. However, students may be excused from at most one and only one lab meeting if the above conditions are met. In all other cases missed labs will be recorded as a zero.

Laboratory reports are due after the completion of the laboratory assignment. Points will be deducted for laboratory reports turned in late. No laboratory reports will be accepted after the laboratory final examination. Students may not attend another lab section without the permission of both lab instructors.

Students should dress appropriately for the laboratory. Dress requirements as well as other safety rules will be discussed during the first lab meeting. Students who are not appropriately attired for subsequent lab meetings will not be allowed to complete the lab assignment and will receive a zero.

C. Field Work:

N/A

D. Other Evaluation Methods:

N/A

E. Grading Scale:

900 - 1000	A
875 - 899	B+
800 - 874	B
775 - 799	C+
700 - 774	C
600 - 699	D
below 600	F

VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic Affairs, may have requirements that are more stringent.

B. Academic Dishonesty:

With any form of valid proof of dishonesty with regard to student work or testing, the instructor may elect from a range of actions. Academic dishonesty could lead to failure for the entire course or dismissal from the institution.

C. Other Policies:

Students should prepare for class by reading assignments prior to the lecture. Please bring textbooks and other pertinent materials to class.

Classroom disruptions during lecture or laboratory, any form of communication during testing, or any other form of behavior that may prove distracting to others will not be tolerated and may lower the final grade.