

**CHEMISTRY 102**  
**FUNDAMENTAL CHEMISTRY II**

**BULLETIN INFORMATION**

CHEM 102 – Fundamental Chemistry II (4 credit hrs)

**Course Description:**

An introductory survey of organic and biochemistry.

Pre-requisite: 1 year high-school chemistry, CHEM 101, 111, or equivalent

Note: Three lecture, one recitation, and two laboratory hours per week.

**SAMPLE COURSE OVERVIEW**

CHEM 102 provides an introduction to fundamental chemical principles, concepts, and processes, and includes lecture and laboratory experiments/exercises. CHEM 102 is designed for students in the pre-nursing program, and is not available for Chemistry major credit.

**ITEMIZED LEARNING OUTCOMES**

**Upon successful completion of CHEM 102, students will be able to:**

1. Define organic chemistry and identify the families of organic compounds and their functional groups.
2. Describe and write equations for addition, polymerization, and oxidation reactions of alkenes.
3. Describe the properties of alcohols, phenols, ethers, thiols and disulfides.
4. Draw and name aldehydes and ketones and describe the physical properties of both.
5. Draw and name carboxylic acids and their derivatives.
6. Describe the physical properties of amines and write equations to demonstrate the basicity of amines.
7. Distinguish between constitutional isomers and stereoisomers and between chiral and achiral molecules
8. Formulate basic chemical equations and perform calculations with quantitative material.
9. Predict and name products formed from organic reactions.
10. Describe the biological role of carbohydrates, lipids, proteins, and nucleic acids; and recognize and interpret the role of such biomolecules.
11. Describe the transport of oxygen, carbon dioxide, cholesterol, and triacylglycerols in the blood.

**SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS**

*Organic and Biochemistry: Connecting Chemistry to Your Life* by Blei and Odian: *Lab manual and lecture notes* by Freeman, QDE press.

## SAMPLE ASSIGNMENTS AND/OR EXAMS

This course employs a variety of methods to measure student performance and mastery of the concepts and principles presented.

- 1. 3 Hour Exams:** All exams are based on the lectures, the reading assignments, and the laboratory.
- 2. Final Exam:** The Final Exam will be cumulative. All questions come from topics covered in lectures, the reading assignments, and the laboratory
- 3. Lab:** Ten laboratory experiments/exercises supplement the material covered in the lectures. The laboratory experiments/exercises are structured to evaluate student understanding of the scientific method and formulation of conclusions based on scientific evidence gathered from the experiments. Laboratory experiment assignments require students to complete pre-laboratory reports, laboratory data sheets, and post-lab write-ups. Lab assignments also include quizzes. Students must bring laboratory manuals and classroom texts to the laboratory, and must wear close-toed shoes and safety goggles to complete each experiment.
- 4. Homework and quizzes**

## SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ ASSIGNMENTS, EXAMS/PROJECTS

### COURSE OUTLINE

LECTURE	TOPICS	LAB/EXPERIMENT
1	Chapter 1- A review of general chemistry (the properties of atoms and molecules); structure of the atom	
2	Chapter 1- Identify groups of elements on periodic table	
3	Chapter 1- Electron configurations and the octet rule	
4	Chapter 1- Lewis structures and molecular shapes, polar and non-polar bonds and molecules	
5	Chapter 2- Chemical interactions: predict whether a chemical reaction will take place or not, describe rates of reactions and how they are affected, describe equilibrium reactions	
6	Chapter 2- Describe the difference between weak and strong acids, define pH, define buffers	Introduction and Safety
7	Exam 1 (Chapters 1-2)	
8	Chapter 3- Saturated hydrocarbons: define organic chemistry, describe bonding in alkanes	Titration and Buffers
9	Chapter 3- Draw condensed and expanded structural formulas, name alkanes	
10	Chapter 4- Unsaturated hydrocarbons: define	Alkanes and Alkenes

	Alkenes, describe bonding in alkenes, constitutional isomers, naming alkenes, addition reactions in alkenes, carbocations and alternate reaction pathways	
11	Chapter 5- Alcohols, Phenols, Ethers and their Sulfur Analogues: structure of alcohols, bonding in alcohols, constitutional isomers and naming of alcohols.	
12	Chapter 5- Physical properties of alcohols, oxidation and dehydration of alcohols; Chapter 6- Aldehydes and Ketones: identify aldehydes and ketones, what is a carbonyl group?, naming aldehydes and ketones, constitutional isomers of aldehydes and ketones	Reactions of Alcohols
13	Chapter 6- Physical properties of aldehydes and ketones, oxidation reduction reactions of aldehydes and ketones, formation of aldehydes and ketones.	
14	Exam 2 (Chapters 3-6)	Synthesis of Aspirin
15	Review Exam 2	
16	Chapter 7- Carboxylic acids, esters and derivatives: identify the general structure of carboxylic acids, synthesis of carboxylic acids, naming carboxylic acids	Aldehydes and Ketones
17	Chapter 7- Physical properties of carboxylic acids, what are carboxylic salts?, identify esters, identify acid anhydrides	
18	Chapter 8- Define amines and amides, classification of amines and amides, naming amines and amides	Carboxylic Acids
19	Chapter 8- Production of amines and amides, reactions of amines and amides, properties of amines and amides. Chapter 9- Stereoisomerism: distinguish between constitutional isomers and stereoisomers, differentiate between chiral and achiral centers.	
20	Chapter 10- Carbohydrates: define carbohydrates, function of carbohydrates, naming monosaccharides, isomers of carbohydrates and their importance.	Ester Lab
21	Chapter 10- Important mono and disaccharides, cyclic structures of sugars, polysaccharides	
22	Exam 3 (Chapters 7-10)	Starch Test
23	Chapter 11- Lipids: classify lipids, fatty acid molecular structure, structure and reactions of triacylglycerols, hydrolysable and nonhydrolyzable	

	lipids, steroids, eicosanoids, and vitamins	
24	Chapter 12- Proteins/Enzymes: protein/enzyme functions, describe amino acids, zwitterions and peptides, amino acid sequence and constitutional isomers.	Enzyme Activity
25	Chapter 12- Naming peptides and 3-D structures of proteins/enzymes, types of proteins/enzymes and their functions, effect of temperature on proteins/enzymes, hydrolysis of proteins/enzymes.	
26	Chapter 13- Nucleic Acids: naming and formation of nucleotide bases, base pair formation, DNA versus RNA structures	
27	Chapter 13- Information flow from DNA to RNA, replication, transcription, and translation, protein synthesis	
28	Review for Final Exam	
	Final Exam according to University exam schedule	