



# Course Syllabus

## Basics of General, Organic and Biochemistry

CHM 1032 / 81099 / Fall 2026

3 credit hours

Pre-requisites: MAC 1105 or higher

### Contact Information

#### Instructor

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#### Division Chair

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### Course Information

#### Catalog Description:

CHM 1032 is an introduction to the fundamental concepts in general, organic and biochemistry. This study of the fundamentals of chemistry includes atomic theory, periodic properties, gas laws, buffers, nuclear chemistry and the basics of organic structure, reactions and nomenclature, as well as the fundamentals of biochemistry. This course is designed to increase understanding of the chemistry of living organisms and the basics of general and organic chemistry needed for this understanding. The course is particularly directed to health professionals in dental hygiene and nursing.

#### Student Learning Outcomes:

Learning Objectives by chapter

## Elements, Atoms and the Periodic table

### The elements

- Define a chemical element and give examples of the abundance of different elements.
- Represent a chemical element with a chemical symbol.

### Atomic Theory

- Explain how all matter is composed of atoms.
- Describe the modern atomic theory.

### The Structure of Atoms

- Describe the three main subatomic particles.
- State how the subatomic particles are arranged in atoms.

### Nuclei of Atoms

- Define and differentiate between the atomic number and the mass number of an element.
- Explain how isotopes differ from one another.

### Atomic Masses

- Define atomic mass and atomic mass unit

### Arrangements of Electrons

- Describe how electrons are grouped within atoms.

### The Periodic Table

- Explain how elements are organized into the periodic table.
- Describe how some characteristics of elements relate to their positions on the periodic table.

### Nuclear Chemistry

- Define radioactivity and state its common types.
- Balance nuclear reactions.
- Identify major characteristics of radioactivity, including half-life and units of activity.

## Ionic Bonding and Simple Ionic Compounds

### Two types of bonding

- Define the octet rule
- Describe how ionic bonds are formed

## Ions

- Define the two types of ions
- Use Lewis diagrams to illustrate ion formation

## Formulas for Ionic Compounds

- Write the formula for a simple ionic compound
- Recognize polyatomic ions in chemical formulas

## Ionic nomenclature

- Use the conventions for naming ionic compounds

## Formula mass

- Determine the formula mass of a compound

# Covalent bonding and simple molecular compounds

## Covalent Bonds

- Describe how a covalent bond forms

## Covalent Compounds: Formulas and names

- Determine the chemical formula of a simple covalent compound from its name.
- Determine the name of a simple covalent compound from its chemical formula.

## Multiple covalent bonds

- Recognize molecules that are likely to have multiple covalent bonds.

## Characteristics of covalent Bonds

- Compare covalent bonds in terms of length and bond polarity

## Characteristics of Molecules

- Determine the molecular mass of a molecule.
- Predict the general shape of a simple covalent molecule.

# Introduction to Chemical Reactions

## The Law of the Conservation of Matter

- Correctly define a law as it pertains to science.
- State the law of conservation of matter.

## Chemical Equations

- Define *chemical reaction*.
- Use a balanced chemical equation to represent a chemical reaction.

## Quantitative Relationships based on Chemical Equations

- Calculate the amount of one substance that will react with or be produced from a given amount of another substance.

## Some types of Chemical Reactions

- Classify a given chemical reaction into a variety of types.

## Oxidation-Reduction (Redox) Reactions

- Identify a chemical reaction as an oxidation-reduction reaction.

## Quantities in Chemical Reactions

### The Mole

- Define the mole unit

### Atomic and Molar Masses

- Learn how the masses of moles of atoms and molecules are expressed.

### Mole-Mass Conversions

- Convert quantities between mass units and mole units.

### Mole-Mole Relationships in Chemical Reactions

- Use a balanced chemical reaction to determine molar relationships between the substances.

### Mole-Mass and Mass-Mole Problems

- Convert from mass or moles of one substance to mass or moles of another substance in a chemical reaction.

## Energy and Chemical Processes

### Energy and its units

- Define *energy* and *heat*

### Heat

- Relate Heat Transfer to Temperature Change

### Phase Changes

- Determine the heat associated with a phase change

### Bond Energies and Chemical Reactions

- Define *bond energy*.
- Determine if a chemical process is exothermic or endothermic.

### The Energy of Biochemical Reactions

- Relate the concept of energy change to chemical reactions that occur in the body.

## Solids, Liquids and Gases

### Intermolecular Interactions

- Define *phase*.
- Identify the types of interactions between molecules.

### Solids and Liquids

- Describe the solid and liquid phases

### Gases and Pressure

- Describe the gas phase

### Gas Laws

- Predict the properties of gases using the gas laws

## Solutions

### Solutions

- Understand what causes solutions to form

## Concentration

- Express the amount of solute in a solution in various concentration units.
- Use molarity to determine quantities in chemical reactions.
- Determine the resulting concentration of a diluted solution.

## The Dissolution Process

- Describe the dissolution process at the molecular level.

## Properties of Solutions

- Describe how the properties of solutions differ from those of pure solvents.

## Acids and Bases

### Arrhenius Definition of Acids and Bases

- Recognize a compound as an Arrhenius acid or an Arrhenius base

### Brønsted-Lowry Definition of Acids and Bases

- Recognize a compound as a Brønsted-Lowry acid or a Brønsted-Lowry base.
- Illustrate the proton transfer process that defines a Brønsted-Lowry acid-base reaction.

### Water: Both an Acid and a Base

- Write chemical equations for water acting as an acid and as a base.

### The Strengths of Acids and Bases

- Describe the difference between strong and weak acids and bases.
- Describe how a chemical reaction reaches chemical equilibrium.
- Define the pH scale and use it to describe acids and bases.

### Buffers

- Define *buffer* and describe how it reacts with an acid or a base.

## Organic Chemistry Basics

### Organic Chemistry

- Distinguish between organic and inorganic compounds.

- Describe functional groups and explain why they are useful in the study of organic chemistry.

### Straight-Chain Alkanes

- Identify and name straight-chain alkanes given formulas or write formulas for straight-chain alkanes given their names.
- Write condensed structural formulas for alkanes given complete structural formulas.
- Draw skeletal formulas for alkanes given structural formulas.

### Branched-chain Alkanes

- Learn how alkane molecules can have branched chains and recognize compounds that are isomers.

### IUPAC Nomenclature

- Name alkanes by the IUPAC system and write formulas for alkanes given IUPAC names.

### Physical Properties of Alkanes

- Identify the physical properties of alkanes and describe trends in these properties.

### Cycloalkanes

- Name cycloalkanes given their formulas and write formulas for these compounds given their names.

### Halogenated Hydrocarbons

- Name halogenated hydrocarbons given formulas and write formulas for these compounds given names.

### Alkenes, Alkynes, and Aromatic Hydrocarbons

- Identify hydrocarbons as alkanes, alkenes, alkynes, or aromatic hydrocarbons.

### Reactions of Alkenes

- Write equations for the addition reactions of alkenes with hydrogen, halogens, and water.

### Cis-Trans Isomers

- Recognize that some alkenes and cycloalkanes can exist as cis-trans isomers.
- Classify isomers as cis or trans.

# Carbohydrates

## Carbohydrates and Their Functional Groups

- Recognize carbohydrates and classify them as mono-, di-, or polysaccharides.
- Identify the general structure for an alcohol and classify an alcohol as primary, secondary, or tertiary.
- Identify the general structure for an aldehyde and a ketone.

## Classes of Monosaccharides

- Classify monosaccharides as aldoses or ketoses and as trioses, tetroses, pentoses, or hexoses.
- Distinguish between a D sugar and an L sugar.

## Important Hexoses

- Identify the structures of D-glucose, D-galactose, and D-fructose and describe how they differ from each other.

## Cyclic Structures of Monosaccharides

- Define what is meant by anomers and describe how they are formed.
- Explain what is meant by mutarotation.

## Properties of Monosaccharides

- Identify the physical and chemical properties of monosaccharides.

## Disaccharides

- Identify the structures of sucrose, lactose, and maltose.
- Identify the monosaccharides that are needed to form sucrose, lactose, and maltose.

## Polysaccharides

- Compare and contrast the structures and uses of starch, glycogen, and cellulose.

# Lipids

## Fatty Acids

- Recognize the structures of common fatty acids and classify them as saturated, monounsaturated, or polyunsaturated.

## Fats, Oils and Waxes

- Explain why fats and oils are referred to as triglycerides.
- Explain how the fatty acid composition of the triglycerides determines whether a substance is a fat or oil.

- Describe the importance of key reactions of triglycerides, such as hydrolysis, hydrogenation, and oxidation.
- Describe the structure of a wax.

### Membranes and Membrane lipids

- Identify the distinguishing characteristics of membrane lipids.
- Describe membrane components and how they are arranged.

### Steroids

- Identify the functions of steroids produced in mammals.

## Amino Acids, Proteins and Enzymes

### Amino Acids

- Recognize amino acids and classify them based on the characteristics of their side chains.

### Reactions of Amino Acids

- Explain how an amino acid can act as both an acid and a base.

### Peptides

- Explain how a peptide is formed from individual amino acids.
- Explain why the sequence of amino acids in a protein is important.

### Protein Structure

- Describe the four levels of protein structure.
- Identify the types of attractive interactions that hold proteins in their most stable three-dimensional structure.
- Explain what happens when proteins are denatured.
- Identify how a protein can be denatured.

### Enzymes

- Explain what is meant by a catalyst.
- Explain how enzymes are classified and named.
- Describe the interaction between an enzyme and its substrate.

### Enzyme Activity

- Describe how pH, temperature, and the concentration of an enzyme and its substrate influence enzyme activity.

### Enzyme Inhibition

- Explain what an enzyme inhibitor is.
- Distinguish between reversible and irreversible inhibitors.

- Distinguish between competitive and noncompetitive inhibitors.

### Enzyme Cofactors and Vitamins

- Explain why vitamins are necessary in the diet.

## Nucleic Acids

### Nucleotides

- Identify the different molecules that combine to form nucleotides.

### Nucleic Acid Structure

- Identify the two types of nucleic acids and the function of each type.
- Describe how nucleotides are linked together to form nucleic acids.
- Describe the secondary structure of DNA and the importance of complementary base pairing.

### Replication and Expression of Genetic Information

- Describe how a new copy of DNA is synthesized.
- Describe how RNA is synthesized from DNA.
- Identify the different types of RNA and the function of each type of RNA.

### Protein Synthesis and the Genetic Code

- Describe the characteristics of the genetic code.
- Describe how a protein is synthesized from mRNA.

### Mutations and Genetic Diseases

- Describe the causes of genetic mutations and how they lead to genetic diseases.

### Viruses

- Explain how viruses reproduce in cells.

## Energy Metabolism

### ATP – the Universal Energy Currency

- Describe the importance of ATP as a source of energy in living organisms.

### Stage I of Catabolism

- Describe how carbohydrates, fats, and proteins are broken down during digestion.

### Overview of Stage II of Catabolism

- Describe the role of acetyl-CoA in metabolism.

### Stage III of Catabolism

- Describe the reactions of the citric acid cycle.
- Describe the function of the citric acid cycle and identify the products produced.
- Describe the role of the electron transport chain and oxidative phosphorylation in energy metabolism.

### Stage II of Carbohydrate Catabolism

- Describe the function of glycolysis and identify its major products.
- Describe how the presence or absence of oxygen determines what happens to the pyruvate and the NADH that are produced in glycolysis.
- Determine the amount of ATP produced by the oxidation of glucose in the presence and absence of oxygen.

### Stage II of Lipid Catabolism

- Describe the reactions needed to completely oxidize a fatty acid to carbon dioxide and water.

### Stage II of Protein Catabolism

- Describe how excess amino acids are degraded.

### Course Materials & Resources:

*The Basics of General, Organic, and Biochemistry*, Ball, Scott, and Hill, 2025, Flatworld, ISBN:978-1-4533-4114-8

Nonprogrammable scientific calculator (like TI-30A)

External webcam for proctored exams (unless testing with the professor or in the testing center)

Reliable internet access

## Delivery Method:

This is a web-based course. All online courses at GCSC utilize the Canvas Learning System. Students should read all information presented in the Canvas course site and should periodically check for updates--at least every 48 hours. **Remember:** This course is not one in which students may work at their own pace. Each week, there are learning modules, assignments, online lectures, online discussions, and/or online exams with due dates. Refer to the schedule within this syllabus for more information.

## Student Expectations

In this course, communication and feedback will occur through various channels, including GCSC email, Canvas Inbox, Canvas Announcements, Canvas Discussions, Microsoft Teams or Zoom, assignment feedback, and instructor office hours. Review the statements below so that you understand the expectations for communication.

As a student at Gulf Coast State College, you are expected to:

- **Adhere to Course Guidelines:** Follow the guidelines detailed in the course syllabus, along with any additional instructions provided by the instructor. This includes understanding and complying with the course objectives, grading criteria, and academic policies.
- **Maintain Regular Contact:** Keep in touch with your instructor and classmates via your GCSC email or other designated communication channels. Regular contact helps clarify doubts, share ideas, and foster a collaborative learning environment.
- **Active Participation:** Engage actively in class discussions and submit assignments on time. Your active participation is crucial for your academic success and contributes to a vibrant learning community.

As your instructor, my commitment to you is to:

- **Provide Timely Feedback:** I will review and provide feedback on your assignments and submissions promptly. My goal is to help you understand your strengths and areas for improvement, which is crucial for your academic growth.
- **Respond Via Canvas Inbox:** I will respond to your emails or messages within 24-48 hours (excluding weekends), unless otherwise noted. I understand the importance of clear and timely communication in addressing your questions and concerns.
- **Post Regular Announcements:** To keep you updated and help you manage your time effectively, I will send out weekly reminders via announcements. These reminders will include important dates, upcoming assignments, and any changes to the course schedule.
- **Maintain Weekly Office Hours:** I will maintain regular weekly office hours, but I can also be available by appointment. This is to ensure I'm available for any questions or concerns that may come up during the week.

## Course Schedule

Outline of Assignments (title, description, required readings)

Unit 1: Atoms, Elements, Ionic and Molecular Compounds

Ch 1: Elements, Atoms and the Periodic Table

Ch 2: Ionic Bonding and Simple Ionic Compounds

Ch 3: Covalent Bonding and Simple Molecular Compounds

## Unit 2: Chemical Reactions

Ch 4: Introduction to Chemical Reactions

Ch 5: Quantities in Chemical Reactions

Ch 6: Energy and Chemical Processes

## Unit 3: Solids, Liquids, Gases, Solutions, Acids and Bases

Ch 7: Solids, Liquids and Gases

Ch 8: Solutions

Ch 9: Acids and Bases

## Unit 4: Organic

Ch 10: Organic Chemistry Basics

Ch 11: Carbohydrates

Ch 12: Lipids

## Unit 5: Biochemistry

Ch 13: Amino Acids, Proteins, and Enzymes

Ch 14: Nucleic Acids

Ch 15: Energy Metabolism

## Grading

### GCSC Grading Scale

A 100-90

B 89-80

C 79-70

D 69-60

F 59 and Below

### Calculation of Grades

Assessment	Percent
Discussion Boards	10
Homework	30
Exams	40
Final	20
<b>Total</b>	<b>100</b>

## Course Policies

### Accessibility Statement

Gulf Coast State College supports an inclusive learning environment for all students. If there are aspects of the instruction or design of this course that hinder your full participation, reasonable accommodations can be arranged. Prior to receiving accommodations, you must register with Student

Accessibility Resources. Appropriate academic accommodations will be determined based on the documented needs of the student. Please visit [GCSC's Student Accessibility Resource \(SAR\) webpage](#) to learn more. For information regarding the registration process, email [sar@gulfcoast.edu](mailto:sar@gulfcoast.edu) or call 850-747-3243.

## Attendance Policy

Regular class attendance and participation are significant factors that help to promote success in college. Students are expected to attend all class meetings of all courses for which they are registered. For an online course that means participation in all weekly discussion posts and timely completion of all homework assignments.

You are expected to know the instructor's specific attendance policy, as stated in the syllabus for each course. For this course, attendance is determined based on the dates and times of submitted work. If something comes up and you cannot submit your assignment in the allotted time, or you have missed a due date, contact me at once so we can make arrangements for you to submit your assignments.

If your absences in a class become excessive, meaning you have missed an equivalent of 3 weeks (2 weeks for a Summer semester), your professor may contact you, indicating that further absence may result in your withdrawal from the course. Your professor can withdraw you from a course for excessive absences without your permission.

Instructors will monitor attendance at the beginning of each semester. If you are not in attendance during this period, you may be withdrawn from the course. You will be financially responsible for the course and a "W or NS" will appear on your transcript. Withdrawal from a course may also have implications for financial aid.

## Withdrawal Policy

Two withdrawals are permitted per credit course. After that, a grade will be assigned. Please be concerned about withdrawals. When admitting students into certain programs, universities may calculate withdrawals as grades. It is your responsibility to verify the effects of enrollment and/or withdrawal upon your financial assistance (financial aid, scholarships, grants, etc.). There are two kinds of withdrawals---student and administrative.

- *Student Withdrawal (W1)* - Students wishing to withdraw must complete the online Student Withdrawal Form before the scheduled withdrawal deadline as published in the College catalog. Student withdrawals initiated prior to the scheduled withdrawal deadline will be recorded as a grade of "W." The withdrawal deadline for an off-term or condensed term is one week after midterm.
- *Administrative Withdrawal (W2)* – A faculty member may withdraw a student up to the published withdrawal deadline for violation of the class attendance policy in which case the student will receive a grade of "W." The withdrawal deadline for an off-term or condensed term is one week after midterm.

Students cannot withdraw from developmental studies courses (college-preparatory classes) after the drop/add period without written permission from their instructor and/or their academic advisor.

## Academic Integrity

Honest participation in academic endeavors fosters an environment in which optimal learning can take place and is consistent with the college's mission. Academic misconduct, including cheating or plagiarism, is destructive to the spirit of an educational environment. GCSC professors report every instance of student academic misconduct to the college for inclusion on the student's records. Most course syllabi include an academic honesty policy and the consequences for violating this policy. Familiarize yourself with course policies regarding authorized or unauthorized use of AI to avoid the pitfalls of academic dishonesty.

The following definitions will apply:

### "Cheating"

includes but is not limited to use of any unauthorized assistance in taking quizzes, tests, or examinations; dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; the acquisition without permission of tests or other academic materials belonging to a member of the College's faculty.

### "Plagiarism"

includes, but is not limited to, the use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgment as well as the purchase of papers or projects. It can also include overuse of an editing program like Grammarly or submitting work written by an Artificial Intelligence (AI) generator like ChatGPT. Make certain to consult your course syllabi for your instructor's guidelines of AI material.

### "Self-plagiarism"

occurs when a student submits the same or considerably similar document to fulfill requirements in different classes. For example, if a student submits a term paper in Religion they originally wrote for an English class, this is self-plagiarism. Once a paper receives a grade in one class, it cannot be submitted again for another class.

### "Generative Artificial Intelligence (AI)"

is technology that uses machine learning to create new content, such as text, images or code, based on user input. These systems are trained on vast amounts of data, including large language models and image or code generators. Common examples include ChatGPT, GitHub, Copilot, Google Gemini, Perplexity, and the Grammarly AI function.

Sanctions for incidences of academic misconduct, depending on the severity of the incidence and/or its repetition, may range from receiving an F grade (or 0) for the test, assignment, or activity, to failure of the course, to suspension or dismissal from the college.

## Classroom Recording

In accordance with federal and state privacy laws, students may record class lectures for their own personal educational use, in connection with a complaint to the college, or as evidence in internal or external legal proceedings. Students may not publish or upload the recordings or any components thereof without the knowledge and written permission of the faculty member. Failure to obtain permission to publish could lead to the students' having to pay damages, attorney fees, and court

costs. For more information about what can be recorded, please see the guidelines in the GCSC Student Handbook.

## Generative Artificial Intelligence (AI) Policy

The use of generative AI tools in academic work requires clear guidelines to maintain academic integrity. Please review the policy selected for this course regarding the use of AI tools such as ChatGPT, Copilot, Grammarly's AI features, and similar platforms for assignments, research, and other coursework.

See the student handbook for further information. Students with questions about acceptable use should consult their instructor.

### Generative AI Use with Permission and Disclosure

*Students may use basic assistive technologies for spelling, grammar, and formatting (e.g., PaperRater or SpellCheckPlus). Generative AI tools (e.g., ChatGPT, Copilot, Grammarly's AI function, etc.) may also be used for classes and/or assignments where instructors have given explicit permission. Students must clearly disclose and properly cite any AI-generated content used in their work, following course guidelines. Students are permitted to use AI only in the manner and means described by the instructor. Unacknowledged or unauthorized AI use will be treated as a violation of academic integrity and may result in penalties, including a zero on the assignment and additional disciplinary actions as outlined in the college's academic integrity policy.*

## Anti-Discrimination Policy

Gulf Coast State College does not discriminate against any person in its programs, activities, policies or procedures on the basis of race, ethnicity, color, national origin, marital status, religion, age, gender, sex, pregnancy, sexual orientation, gender identity, genetic information, disability, or veteran status. All questions or inquiries regarding compliance with laws relating to non-discrimination and all complaints regarding sexual misconduct or discrimination may be directed to Amanda Reed, Executive Director of Human Resources/Title II/504/Title IX Coordinator and Employment Equity Officer, Gulf Coast State College, 5230 W. US Highway 98, Panama City, FL 32401; 850-769-1551, ext. 3516. Rules, policies, fees, and courses described in this catalog are subject to change without notice.

## Syllabus Policy

For any syllabus posted prior to the beginning of the term, the instructor reserves the right to make minor changes prior to or during the term. The instructor will notify students via e-mail or Canvas announcement when changes are made in the requirements and/or grading of the course.

## Student Support Resources

Gulf Coast State College is committed to providing you with the resources you need for success as a student and beyond. View all the academic and student support resources provided at GCSC on the [Student Services web page](#).

## Course Technology & Support

To successfully participate in this online course, students must have basic computer and digital information literacy skills and meet the following technology requirements:

- **Computer:** Up-to-date web browser that supports the Canvas learning management system; please refer to the system requirements for compatibility and information on using the Canvas app on mobile devices.
- **Internet Speed:** Minimum bandwidth of 8 Mbps upload/download speed to effectively engage in online activities and access multimedia.
- **Office 365 software:** Available for free download through GCSC Information Technology Services (ITS).

If you need technical support, contact the ITS Help Desk, available 24/7 at (850) 913-3303.