

# Chemistry 151 (Section D02/D05)

## General Chemistry I

### Fall 2016

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**Contact Instructions: Please place "CHM 151 Sec #" in Subject Line or use Blackboard Email tool. All emails will be returned within 48 hours excluding weekends.**

*CFCC General Education Competencies will incorporate all or some of the following :*

- |                            |  |
|----------------------------|--|
| ✓ 1. Written Communication | ✓ 5. Global Awareness                  |
| ✓ 2. Oral Communication    | ✓ 6. Quantitative Skills               |
| ✓ 3. Critical Thinking     | ✓ 7. Understanding Scientific Concepts |
| ✓ 4. Computer Skills       | and Application                        |

**This course emphasizes the following general education competencies:**

**Scientific Reasoning:** Students engage in scientific reasoning when they use fundamental scientific concepts and theories to analyze problems, observations, and/or experiments in the life and physical sciences. Students demonstrate scientific reasoning when they:

- Apply appropriate scientific concepts, theories, and language to problems, observations, or experiments
- Utilize scientific data to analyze problems, observations, or experiments
- Apply scientific observations, calculations, and/or measurements to problems or experiments
- Articulate conclusions about problems, observations, or experiments using appropriate scientific concepts and data

**Critical Thinking:** Critical thinking is the deliberate process of questioning, evaluating, and responding to problems, scenarios, and arguments in order to reach sound solutions, decisions, and positions.

Students demonstrate critical thinking when they:

- Ask pertinent questions that clarify and focus a problem, scenario, or argument
- Evaluate the quantity, quality, and usefulness of information
- Articulate a sound solution, decision, or position based on appropriate standards of reasoning
- Monitor and reflect upon the quality and fairness of their reasoning

## Course Overview

**Course Description:** CHM 151 - General Chemistry I.

This course covers fundamental principles and laws of chemistry. Topics include measurement, atomic and molecular structure, periodicity, chemical reactions, chemical bonding, stoichiometry, thermochemistry, gas laws, and solutions. Upon completion, students should be able to demonstrate an understanding of fundamental chemical laws and concepts, as needed in CHM 152. This is a Universal General Education Transfer Component (UGETC) course. [SBCC/BOG 02/21/14]

**Lecture hours per week: 3      Lab hours per week: 3      Semester Credit Hours: 4**

**Prerequisite:** (a) A grade of "C" or better in ENG 095, RED 090, or DRE 098 OR required placement test scores

(b) A grade of "C" or better in MAT 060 OR in DMA 010, DMA 020, and DMA 030

(c) A grade of "C" or better in MAT 080, MAT 090, or MAT 095 OR in DMA 040, DMA 050, DMA 060, DMA 070, and DMA 080 OR successful completion MAT 161, MAT 171, or MAT 175

**Course Objectives:** Upon completion, students should be able to demonstrate a basic understanding of chemistry and their interrelationships of the following topics:

- Matter & Measurement
- Atoms, Molecules, and Ions
- Stoichiometry: Calculations with Chemical Formulas & Equations
- Chemical Reactions and Solution Stoichiometry
- Gases
- Thermochemistry
- Quantum Theory of the Atom
- Periodic Properties of Elements
- Basic Concepts of Chemical Bonding
- Molecular Geometry and Bonding Theories
- Intermolecular Forces, Liquids, and Solids

**Course Structure:** This course is structured to enhance learning and supplement lecture material with hands on application of chemistry topics discussed in the classroom. Exams, reading assignments, and homework assignments will be used to monitor your grasp of the material and identify issues and correct them. There will a Lab assigned each week that will supplement lecture material. Homework will be given through the Pearson My Lab/ Mastering system. There will also be a mandatory cumulative final exam given at the end of the course. *Course outlines available by request.*

## Required Materials

**Required Text:** (2 required texts)

Chemistry: Structure and Properties 1<sup>st</sup> Ed (with My Lab/Mastering Chemistry Access)

Nivaldo Tro

Pearson

General Chemistry Lab Manual 5<sup>th</sup> Edition (101/102, UNCW)

UNCW

Kendall Hunt

## Student Expectations

### **Attendance Policy**

Students are expected to attend all class meetings as scheduled. Students who miss more than 20% of the scheduled class time automatically receive a failing grade (F) for the course. Attendance is mandatory prior to the course Census Date (10%) for a student to remain in any class. Also, expect that attendance will be taken for all class periods.

- Coming in after role is taken or leaving early will result in a tardy. Three tardies will account for one absence. Attendance will be taken daily at the beginning of lecture and lab. Make sure to keep track of your absences.
- Students are responsible for materials & assignments covered in their absence. If you miss a class, get the notes from a classmate.

### **Expected Workload**

You should expect to spend 2-3 hours working outside of class for every hour in class.

### **Contingency Plans**

Lecture: If there is an emergency and the instructor or an appropriate substitute does not meet with the class, wait fifteen minutes. Then, everyone in the class should sign a roll sheet and designate someone to take it to the Department Chair or Secretary in U436.

Technology: It helps alleviate many everyday problems and helps us achieve things we might never have been able to do without it, but each technology that we become dependent on adds another point where something can go wrong. Technology challenges can occur at the most inconvenient times. Students should prepare a plan to deal with these potential challenges. Turning in assigned activities after the due date/time because you could not log into Pearson's My Lab/Mastering or you could not access an assignment is not acceptable. If an activity is due Friday by midnight, do not wait until Friday evening to start it.

If technology does get in the way you should follow the Contingency Plan below:

- If there is an issue with My Lab/Mastering, please notify me immediately of the issue so I may investigate the issue. Scheduled maintenance is not an issue and you should plan accordingly to make sure homework is completed on time.

## Grading

### Course Grade Calculation

- Homework (10%)
- Laboratory (25%)
- Exams (50%)
- Final Exam (15%)

*You can expect coursework to be graded within 1-3 weeks of the submission date.*

### **Grade Scale**

The Grading Scale for CFCC is as follows:

A = 92 - 100

B = 84 - 91

C = 76 - 83

D = 68 - 75

F = 0 - 67

W = Given on or before the 60 percent reporting date of the class

I = Incomplete— Used under Special Circumstances Only! A student has six weeks from the time the class ends to complete the coursework. (Student and instructor must fill out appropriate paper work.) If a student does not complete the coursework within the six-week period, a grade of F will replace the grade of I.

## **GENERAL COURSE REQUIREMENTS AND CLASS POLICY STATEMENTS**

**Things You Need During Class EVERY DAY:** Calculator, Paper, and Writing Utensil

### **A. Testing**

#### Exams (50%)

Four Exams will be given throughout the semester. You will have at least 1 week prior notice of an Exam. The lowest exam grade of the four exams will be dropped.

- Missed Exam: One make-up test for the lecture portion of this course might be allowed but only for an absence due to a valid, documented reason. If a make-up exam is allowed, the exam will be given during my office hours. Any lecture test not taken within one week of the scheduled date, or if the graded lecture test has been returned to the class, the test will be graded as a zero. If you know you are going to miss an exam, let me know in advance and arrangements will be made for you to take it ahead of time.

#### Final Exam (15%)

In addition to the four exams, there will be a final exam. The Final Exam is cumulative and mandatory.

- **Cell phones will not be permitted as a "Calculator Resource" during class, labs, or exams.**

## B. Homework

Homework assignments will be given for each chapter covered in lecture. All homework will be run through Pearson's My Lab/ Mastering. In general, all HW assignments are posted the first day we start the material for the next exam and will be due by 11:59 pm the day before the exam. For example, Exam 1 will cover Chapters 1 and 2, HW 1 and HW 2 pertaining to Chapters 1 and 2 will be posted on the first day we start Chapter 1 and will be due at 11:59pm the night before Exam 1. No late homework assignments will be accepted. The lowest grade on all homework assignments will be dropped.

## C. Laboratory Requirements

Lab work will consist of learning laboratory techniques and procedures, interpreting results, reading, and following directions. There will be Prelab assignment to complete before each lab, which demonstrates that you are prepared for lab, have read, and are ready for the experiment that day. The lowest grade on of all lab assignments will be dropped.

Refer to the Lab syllabus for a more detailed description of requirements.

- Note: One formal lab report will be written during the semester for an experiment during the semester. It will count the same as a normal lab. More information will be provided when the time comes. The formal lab report will **not** be dropped, even if this is your lowest lab grade.

Missed Labs: Any missed labs will result in a "zero" for that lab. There are no make-up labs due to limited lab space and instruction schedule

Tardiness in Lab: If you are more than 15 minutes late to lab you will be counted absent for the day and will receive a zero for the lab.

## D. Class Policies

### Late Assignments/Late Work Policy

All required course work is due on the date and time announced as outlined above, unless specified otherwise by the instructor. Work submitted after the announced due date and time will not be accepted after the due date. The instructor will consider special circumstances with prior notification only. These policies are discussed above.

### Withdrawals

You are responsible for noting the deadline for withdrawal from the course. I will not turn in any withdrawal forms to the registration office. This is your responsibility. Withdrawals will not be given once the guidelines regarding attendance have been exceeded. Please familiarize yourself with the criteria and withdrawal deadline dates in the *CFCC Catalog and Student Handbook*

## **Academic Honesty/Plagiarism Policy**

*Please see Student Catalog for CFCC policy.*

Students are expected to conduct themselves in a professional, academic manner appropriate to the college's mission as an institution of higher education. Examples of academic misconduct are plagiarism and cheating, discrimination, and lying.

*Collaboration*: Collaboration is a natural part of college and students will benefit greatly from working with other students on assigned activities. Collaboration becomes Academic Misconduct when two or more students jointly draft answers to assigned work. For example, students discussing how best to approach a problem or assignment is acceptable and even encouraged; however, students writing the same answer or choosing to copy someone else's answer is not acceptable.

*Plagiarism*: Plagiarism is defined as taking the words, ideas, or thoughts of another and representing them as one's own. If you use the ideas of someone else, provide a complete citation of the source work; if you use the words of another, present the words in the correct quotation notation (indentation or enclosed in quotation marks, as appropriate) and include a complete citation to the source.

Whether intentional or unintentional, plagiarism is not acceptable and will result in the student being assigned a grade of zero for the assignment and/or the course, at the instructor's discretion.

## **Expectations for Interaction**

Students will be held to the highest standards of language and content in all interaction, whether online or in person. Abusive and derogatory language, actions, or content will not be tolerated. This non-discrimination policy includes face-to-face interactions, email, online discussions and all course related content and materials. To learn more about online interaction, please see "The Core Rules of Netiquette", from the book Netiquette by Virginia Shea at: [www.albion.com/netiquette/corerules.html](http://www.albion.com/netiquette/corerules.html)

## **Classroom Etiquette**

There will be no food allowed in the classroom/labs

Cell phone usage is prohibited unless cleared with instructor for emergencies

Students will be prohibited from audio/video recording lectures and/or labs

# Student Services

## **Accommodation of Special Needs Based on Disability**

Any student requesting classroom accommodations because of disability must present documentation to verify his/her disability. Documentation must be furnished to the Disabilities Service Coordinator, and this should be done prior to requesting accommodation by an instructor. On a confidential basis, the student, disabilities services and the instructor will determine the appropriate accommodations which will be provided in a manner that is consistent with the objectives, outcomes, and academic standards of the course. Absences may not exceed any class attendance policy.

## **IT Student HelpDesk**

The IT Services Student Helpdesk provides first-level technical support to all students of Cape Fear Community College. They are available to assist students with basic computer and technical needs, including logging into Blackboard, myCFCC and WebAdvisor.

More information, including Hours, Location, and Contact Information is available at <http://www2.cfcc.edu/studenthelpdesk/>

## **Blackboard Help**

Answers to common Blackboard questions can be found at <http://www2.cfcc.edu/online/bb-faq> or Ask Ray.

## **Learning Resource Center (LRC)**

The LRC is located in the CFCC library and can be found online at <http://cfcc.edu/learninglab>. The LRC provides writing assistance, computer competency skills and tutoring.

## **Learning Resource Center (Library)**

The CFCC Learning Resource Center (Library) provides students with the following resources: Books/Materials, Course Reserves, Computer/Internet Access, Online Databases/Journals, Group Study Space, and a Quiet Study Space.

The Learning Resource Center (Library) is located on the 2nd Floor of the L-Building (Downtown Campus) or on the 1st Floor of the McKeithan Center (North Campus) and can be found online at <http://cfcc.edu/lrc>.

## **Science Learning Lab**

The Science Learning Lab is located in N-407. Tutors are available for all Biology, Chemistry, Geology and Physics courses. You must have your instructor sign a form to verify that you are enrolled in a Science course. You can pick up that form in N-407.

## **MyCFCC - Student Accounts**

This is your student web portal - there you can access your class websites, email, and WebAdvisor (official academic info such as grades, transcripts, schedules, etc). Your official CFCC-provided email account is to be used for all e-mail correspondence with your instructors and CFCC staff.

Some information from CFCC will ONLY be emailed to this address, and not sent through postal mail, so it is very important that you check this account. To access this account, visit the myCFCC portal - there is a link to the portal near the top of the CFCC.edu website. Login and click the Email link. Your username is part of your email address: user@mail.cfcc.edu. (Note if you've had a CFCC email address in the past, this one may differ because we've changed 'email' to 'mail' in the address.) This email account is provided to you as long as you are enrolled in classes (you can take the summer off), and may be used for personal email as well as academic email. The class websites linked from the portal are automatically created for every class - it is up to the instructors to decide whether and how to use them. Even if they are not used, you can send an email to your instructor by clicking the Send Email link on your class homepage.

***Additional Student Support and Academic Services***

For a list of CFCC Student Support and Academic Services, please visit <http://www2.cfcc.edu/online/student-support/>.

Tobacco use is prohibited on all CFCC property.

*Disclaimer: The instructor reserves the right, acting within the policies and procedures of Cape Fear Community College, to make changes, adjustments, additions and deletions in course content, first day handout, or instructional technique, without notice or obligations.*

## **CHM 151 OUTLINE OF INSTRUCTION**

*Chemistry: Structure and Properties 1<sup>st</sup> Ed. (Tro)*

*(Please Note: the schedule is tentative and may be changed at any time)*

### **Chapter 1: Atoms**

- 1.1 A Particulate View of the World: Structure Determines Properties
- 1.2 Classifying Matter: A Particulate View
- 1.3 The Scientific Approach to Knowledge
- 1.4 Early Ideas about the Building Block of Matter
- 1.5 Modern Atomic Theory and the Law the Let to It
- 1.6 The Discovery of the Electron
- 1.7 The structure of the Atom
- 1.8 Subatomic Particles: Protons, Neutrons, and Electrons
- 1.9 Atomic Mass: The Average Mass of an Element's Atoms

### **Chapter 2: Measurements, Problem Solving, and the Mole Concept**

- 2.1 The Metric Mix-up: A \$125 Million Unit Error
  - 2.2 The Reliability of a Measurement
  - 2.3 Density
  - 2.4 Energy and Its Units
  - 2.5 Converting between Units
  - 2.8 Atoms and the Mole: How Many Particles?
- \*Read sections 2.6 and 2.7 on your own

**Exam I: covering Chapters 1 & 2**

### **Chapter 3: The Quantum-Mechanical Model of the Atom**

- 3.1 Schrodinger's Cat
- 3.2 The Nature of Light
- 3.3 Atomic Spectroscopy and the Bohr Model
- 3.4 The Wave Nature of Matter: The de Broglie Wavelength, the Uncertainty Principle, and Indeterminacy
- 3.5 Quantum Mechanics and the Atom
- 3.6 The Shapes of Atomic Orbitals

### **Chapter 4: Periodic Properties of the Elements**

- 4.1 Aluminum: Low Density Atoms Result in Low Density Metal
- 4.2 Finding Patterns: The Periodic Law and the Periodic Table
- 4.3 Electron Configurations: How Electrons Occupy Orbitals
- 4.4 Electron Configurations, Valance Electrons and the Periodic Table
- 4.5 How the Electron Configurations of an Element Relates to Its Properties
- 4.6 Periodic Trends in the Size of Atoms and Effective Nuclear Charge
- 4.7 Ions: Electron Configuration, Magnetic Properties, Ionic Radii, and Ionization Energy.
- 4.8 Electron Affinities and Metallic Character

## **Chapter 5: Molecules and Compounds**

- 5.1 Hydrogen, Oxygen, and water
- 5.2 Types of Chemical Bonds
- 5.3 Representing Compounds: Chemical Formulas and Molecular Models
- 5.4 The Lewis Model: Representing Valence Electrons with Dots
- 5.5 Ionic Bonding: The Lewis Model and Lattice Energies
- 5.6 Ionic Compounds: Formulas and Names
- 5.7 Covalent Bonding: Simple Lewis Structures
- 5.8 Molecular Compounds: Formulas and Names
- 5.9 Formula Mass and the Mole Concept for Compounds
- 5.10 Composition of Compounds
- 5.11 Determining a Chemical Formula from Experimental Data

**Exam II: covering Chapters 3, 4, & 5**

## **Chapter 6: Chemical Bonding I: Drawing Lewis Structures and Determining Molecular Shapes**

- 6.1 Morphine: A Molecular Imposter
- 6.2 Electronegativity and Bond Polarity
- 6.3 Writing Lewis Structures for Molecular Compounds and Polyatomic ions
- 6.4 Resonance and Formal Charge
- 6.5 Exceptions to the Octet Rule: Odd-Electron Species, Incomplete Octets, and Expanded Octets
- 6.6 Bond Energies and Bond Lengths
- 6.7 VESPER Theory: The Five Basic Shapes
- 6.8 VESPER Theory: The Effect of Lone Pairs
- 6.9 VESPER Theory: Predicting Molecular Geometries
- 6.10 Molecular Shape and Polarity

## **Chapter 7: Chemical Bonding II: Valence Bond Theory and Molecular Orbital Theory**

- 7.1 Oxygen: A Magnetic Liquid
- 7.2 Valence Bond Theory: Orbital Overlap as a Chemical Bond
- 7.3 Valence Bond Theory: Hybridization of Atomic Orbitals
- 7.4 Molecular Orbital Theory: Electron Delocalization
- 7.5 Molecular Orbital Theory: Polyatomic Molecules
- 7.6 Bonding in Metals and Semiconductors

## **Chapter 8: Chemical Reactions and Chemical Quantities**

- 8.1 Climate Change and the Combustion of Fossil Fuels
- 8.2 Chemical Change
- 8.3 Writing and Balancing Chemical Equations
- 8.4 Reaction Stoichiometry: How Much Carbon Dioxide?
- 8.5 Limiting Reactant, Theoretical Yield, and Percent Yield
- 8.6 Three Examples of Chemical Reactions: Combustions, Alkali Metals, and Halogens

**Exam III: covering Chapters 6, 7, & 8**

## Chapter 9: Introduction to Solutions and Aqueous Reactions

- 9.1 Molecular Gastronomy
- 9.2 Solution Concentration
- 9.3 Solution Stoichiometry
- 9.4 Types of Aqueous Solutions and Solubility
- 9.5 Precipitation Reactions
- 9.6 Representing Aqueous Reactions: Molecular, Ionic, and Complete Ionic Equations
- 9.7 Acid-Base Reactions
- 9.8 Gas-Evolution Reactions
- 9.9 Oxidation-Reduction Reactions

## Chapter 10: Thermochemistry

- 10.1 On Fire, But Not Consumed
- 10.2 The Nature of Energy: Key Definition
- 10.3 The First Law of Thermodynamics: There Is No Free Lunch
- 10.4 Quantifying Heat and Work
- 10.5 Measuring  $\Delta E$  for Chemical Reactions: Constant Volume Calorimetry
- 10.6 Enthalpy: The Heat Evolved in a Chemical Reaction at Constant Pressure.
- 10.7 Measuring  $\Delta H$  for Chemical Reactions: Constant Pressure Calorimetry
- 10.8 Relationships Involving  $\Delta H_{\text{rxn}}$
- 10.9 Determining Enthalpies of Reaction from Bond Energies
- 10.10 Determining Enthalpies of Reaction from Standard Enthalpies of Formation
- 10.11 Lattice Energies for Ionic Compounds

### Exam IV: covering Chapters 9 & 10

## Chapter 11: Gases

- 11.1 Supersonic Skydiving and the Risk of Decompression
- 11.2 Pressure: the Result of Particle Collisions
- 11.3 The Simple Gas Laws: Boyle's Law, Charles's Law, and Avogadro's Law
- 11.4 The Ideal Gas Law
- 11.5 Applications of the Ideal Gas Law: Molar Volume, Density, and Molar Mass of a Gas.
- 11.6 Mixtures of Gases and Partial Pressures
- 11.7 A Particulate Model For Gasses: Kinetic Molecular Theory
- 11.8 Temperature and Molecular Velocities
- 11.9 Mean Free Path, Diffusion, and Effusion of Gases
- 11.10 Gases in Chemical Reactions: Stoichiometry Revisited

## Chapter 12: Liquids, Solids, and Intermolecular Forces

- 12.1 Structure Determines Properties
- 12.2 Solids, Liquids, and Gases: A Molecular Comparison
- 12.3 Intermolecular Forces: The Forces That Hold Condensed States Together
- 12.4 Intermolecular Forces in Action: Surface Tension, Viscosity, and Capillary Action
- 12.5 Vaporization and Vapor Pressure

- 12.6 Sublimation and Fusion
- 12.7 Heating Curve for Water
- 12.8 Water: An Extraordinary Substance

### **Chapter 13: Phase Diagrams and Crystalline Solids**

- 13.1 sliding Glaciers
- 13.2 Phase Diagrams
- 13.3 Crystalline Solids: Determining Their Structure by X-Ray Crystallography
- 13.4 Crystalline Solids: Unit Cells and Basic Structures
- 13.5 Crystalline Solids: The Fundamental Types
- 13.6 The Structure of Ionic Solids
- 13.7 Network Covalent Atomic Solids: Carbon and Silicates

**Final Exam: Chemistry Departmental Cumulative Multiple Choice**