

Savannah State University
College of Science & Technology

CHEM 1211-04 **PRINCIPLES OF CHEMISTRY I**
Fall Semester 2016

Instructor & Title: Cecil Jones, Ph.D., Professor of Chemistry

Office Location: Drew Griffith-222

Office Hours: Office hours are tabulated on the last page.

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Course Credit Hours: 3

Class Location: Drew Griffith-233

Class Time: Mon., Wed. & Fri.; 1:00 – 1:50 PM

COURSE DESCRIPTION: This is the first course in a two-semester sequence covering the fundamental principles and applications of chemistry for science majors. Topics to be covered include composition of matter, nomenclature, stoichiometry, periodic relationships, atomic structure and bonding, chemical reactions and thermochemistry.

PREREQUISITES: Chemistry Placement Test or successful completion of CHEM 1115 (grade “C” or better).

STUDENT LEARNING OUTCOMES:

1. Students should demonstrate a fundamental understanding of the composition and structure of matter, as well as the changes that matter undergoes in the process of a chemical reaction.
2. Students are expected to recognize common chemical species by systematic nomenclature.
3. Students should understand universal laws and the basic theories governing physical and chemical changes in matter.

COURSE OBJECTIVES:

- A. To introduce the students to the very basic structure of matter which constitutes the whole universe and to give them a fundamental knowledge about the laws and guiding principles of chemistry as experienced in all parts of our everyday life.
- B. To train them in the basic aspects of chemical structure and to enable them to think in terms of chemistry
- C. To make them proficient in the use of chemical nomenclature and language including chemical reactions, and the laws governing these reactions.
- D. To inculcate/instill the knowledge about the historical development of the basic chemical principles including the modern aspects. Effort will be made to impart to the students the scientific truth that the field of Chemistry touches all parts of our lives because of its broadness in scope. They also will gradually learn that there is

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no getting away from chemistry, since a basic knowledge of chemistry is highly essential to learn any other scientific discipline!

REQUIRED TEXTS AND MATERIALS:

OpenStax Chemistry text will be used for this course. Use Google (not explorer) to visit the OpenStax College website: <https://openstax.org/details/chemistry>. You may download a pdf version of the text. There are also options for a print and/or iBook copy. Other open educational materials will be provided during the course.

PEDAGOGICAL APPROACH:

Class Attendance Policy: All students are required to attend class on time! Late arrivals disrupt class activities. Any student who is late by more than five minutes will not be admitted in class. This will represent an absence. According to the Savannah State University Attendance Policy, credit may not be awarded for any course if the number of absences exceeds “**%15 of class hours.**” Students who live **off campus** and have special circumstances that may cause late arrivals should consult with me immediately.

Academic Honesty: We recommend that you use the exact text from the current catalog regarding the Savannah State University Academic Honesty Policy.

Methods of Instruction: Lecture and discussion are the primary means of instructing students in this course. Examples involving basic chemistry applied toward biological and environmental analysis will be discussed. Students are strongly encouraged to actively engage the instructor and their peers regarding concepts of chemistry. .

Examinations: There will be a total of 4 classroom examinations each lasting no more than 1 hour. These exams will be averaged to represent 50% of your course final grade. If time permits, there may be a 5th exam included in the 50% of your final grade. The assigned homework will account for 20% of your grade. The remaining 30% of your grade will be determined by your score on the American Chemical Society (ACS) General Chemistry I Final Examination. The computation of your final grade is shown in the “**Grade Determination**” section. Students will be permitted to see the results of their examinations. However, they will remain with the instructor for record.

SSU’s QEP: In support of the Savannah State University's Quality Enhancement Plan, “The Write Attitude,” and the outcomes of this course, students will produce a minimum of **4** pages of writing during the semester in a variety of forms. A total of 4 points are possible (1/exercise, all or nothing). Active participation in the writing exercises may improve your final grade in the course. The student will be granted 1 point only if a serious effort to complete the assignment has been demonstrated (4 points possible).

Several impromptu (pop) quizzes may be given, usually during the first ten minutes of the class. Quizzes are provided to prepare the student for the classroom examinations. They will not be used for a grade determination. **NO MAKE-UP IMPROMPTU QUIZZES WILL BE GIVEN.**

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Homework: Suggested problems from the textbook are provided for practice and preparation for classroom examinations. Each **completed chapter** is worth 1 point (all or nothing) for a total of 10 points. Students are strongly encouraged to prepare for the learning experience of each lecture by reading ahead.

GRADE DETERMINATION:

Four or five classroom examinations will be averaged to represent 50% of your final grade and homework 20%. The remaining 30% of your grade will be determined by your score on the American Chemical Society (ACS) General Chemistry I Final Examination. QEP assignments can significantly increase your final score.

Computation for the Letter Grade

1. Four classroom examinations..... 50%
2. Homework assignments.....20%
3. X = Points from QEP writing assignments
4. ACS Final Examination..... 30%

$$\frac{\sum_{i=1}^n Exam_i}{n} \times 50\% + \frac{\sum_{i=1}^n Homework_i}{n} \times 20\% + X_{writing\ points} + ACS\ Final\ Exam \times 30\% = Total\ Numerical\ Grade$$

where n = the total number of classroom examinations (4 or 5) and x = the 4 possible points for completed QEP writing assignments.

Students' letter grade will be assigned based on the calculation above and the scale below:

<u>Total Numerical Grade</u>	<u>Letter Grade</u>
90% and above	A
80-89	B
70-79	C
60-69	D
Below 60	F

REQUIRED DISABILITY Statement

Savannah State University is committed to providing reasonable accommodations to students with documented disabilities, as required under federal law. The purpose of disability accommodation is to provide equal access to the academic material and equal access to demonstrate mastery of the material. Students with disabilities must meet all the academic requirements and standards of the class, including the attendance policy. If you have a disability and need accommodations, please contact Amelia Castilian-Moore, Coordinator of Disability Services at 912 358 3115 or moorea@savannahstate.edu. The Office of Counseling and Disability Services is located in King Frazier 233. You will need to meet with Ms. Castilian-Moore, who can help you gather documentation of your disability or refer you to an appropriate resource for assessment. Once documentation of the disability is gathered and approved, Ms. Castilian-Moore will provide you with an Accommodation Letter, detailing the appropriate, approved accommodations, which you should present to me so we can discuss and implement your accommodations.

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COURSE OUTLINE AND READING ASSIGNMENTS

The following outline and readings may change as the course progresses, as the instructor deems necessary given student interests and needs. You are to read the assignments prior to the date in the course outline, present a thoughtful question to enhance dialogue, and be prepared to offer salient points to class discussion.

Tentative Course Schedule & Exam Dates:

Unit I. Chapters 1 & 2: Essential Ideas & Atoms, Molecules and Ions

[Chapter 1](#)

[Chapter 2](#)

Objectives:

1. Think like a chemist.
2. Know the basic metric units and the prefixes used to indicate multiples and sub multiples of the basic units.
3. Explain the difference between the mass and weight of an object.
4. Set up and work unit system conversion problems using dimensional analysis.
5. Distinguish between density and specific gravity, including the unit of each
6. Calculate the density of a substance, given its mass and volume and use density as conversion factor between mass and volume or vice versa.
7. Know and be able to the interrelationship between Fahrenheit, Celsius and Kelvin temperature scales
8. Know and explain the Atomic Theory
9. Know the structure of an atom
10. Know what atomic number, mass number and isotopes are
11. Know the periodic table of elements.
12. Know the difference between molecules and atoms, and how ions are formed from atoms.
13. Know chemical formulas and know how compounds are named.

August 29 ⇌ Exam #1 over chapters 1 & 2.

Unit II, Chapters 3 & 4: Compositions of Substances and Solutions & Stoichiometry

[Chapter 3](#)

[Chapter 4](#)

Objectives:

1. Define and distinguish between atomic mass and molecular mass, gram-atom and gram-mole.
2. Determine the mass of reactants required for a reaction
3. Determine the precise amount of reactant(s) necessary to yield a desired amount of product
4. Determine the concentration of solution in terms of molarity molality and mass percent
5. To learn about occurrence of isotopes of elements and to know the method of calculating the average atomic weight; calculate % weight, empirical and molecular formulas
6. To know about the use of mass spectrometers and method of determining the atomic mass units: mass spectra

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7. To know about moles and molecular weights and calculations involved with these terms
8. To know how to make solutions of definite molarity; know how to dilute a solution of known concentration to give n molar value
9. Know all the various types of chemical reactions; learn to give representative examples for each type of reaction and know how to balance such reactions; know how to calculate the weight of reactants to obtain known weight of product
10. Know how to calculate weight of substance from molarity and molarity from known weight
11. Learn how to calculate and identify the limiting reactant, if the weights of reactants are given.

September 26 ⇌ Exam #2 over chapters 3 & 4.

Unit III. Chapter 9: Gases

[Chapter 9](#)

Objectives:

1. State and explain each law discussed in this unit
2. Discuss briefly the gas laws and equations studied in this unit and learn how to do problems using the gas equation
3. Define ideal gas law and to know how to use the gas equation; to calculate the molecular weight or number of moles of a substance
4. Work out problems dealing with the concepts studied in this chapter.

Unit IV. Chapter 5: Thermochemistry

[Chapter 5](#)

Objectives:

1. Know the basic concepts about enthalpy and its units; know the measurement of heat by calorimetry
2. Understand the terms standard heat of formation of a substance, standard enthalpy (heat) of a chemical reaction, and the calculation of enthalpy from standard tables
3. Learn Hess's Law of heat summation and workout problems using this law, to calculate enthalpies of reactions
4. Know how to measure heat of a reaction by calorimetry.

October 19 ⇌ Exam #3 over chapters 5 & 9.

Unit V. Chapters 6 & 7 partial. Electronic Structure, Chemical Bonding & Molecular Geometry

[Chapter 6](#)

[Chapter 7](#)

Objectives:

1. Know the nature of a wave and explain the terms such as wavelength, frequency and amplitude as they relate to wave.
2. Know the characteristics of electromagnetic waves/radiations and how they are related.
3. Know Aufbau principle and its application in writing correct electron configurations
4. Distinguish between ground state and excited state electronic configurations
5. Know what the quantum numbers are and their significance
6. Know the difference between paramagnetic and diamagnetic species
7. Calculate the energy of a photon with a given wavelength
8. Know the periodic classification of the elements
9. Arrange species (atoms, cations and anions) in order of increasing or decreasing size/radius
10. Know the variation and general trends in chemical properties of the elements

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Unit VI: Chapters 7 remaining & 8. Advance Theories of Covalent Bonding[Chapter 7](#)[Chapter 8](#)

1. Identify different types of intramolecular bonds: ionic, covalent and polar covalent.
2. Understand electronic configuration and valence electrons in different atoms; predict valences of atoms and write the formulas, write Lewis structures of compounds as well as ionic species.
3. To learn about increasing electronegativity towards the right of the periodic chart and the fundamental differences between nonmetals and metals; to discuss Pauling's electronegativity chart representing the periodic table and the guidelines of predicting reactivities of elements.
4. Draw Lewis structures of compounds, identify exceptions of the octet rule in certain compounds and explain the electronic suborbital configuration of such cases.
5. Know the Stretching of bond angles and the VSEPR model and to discuss representative molecules and the bond angles.
6. To learn about bond polarity and dipole moments.
7. Explain how the following differ and how they are similar: (a) molecular orbitals and atomic orbitals, (b) bonding and antibonding orbitals, (c) pi orbitals and sigma orbitals.
8. Draw the molecular orbital energy diagrams for heteronuclear and homonuclear diatomic molecules.
9. Determine the bond orders of representative compounds

November 21 ⇔ Exam #4 over chapters 6-8.

Unit VII. Chapter 11: States of Matter and Intermolecular Forces[Chapter 11](#)**Objectives:**

1. Learn about the major intermolecular forces prevalent in solids and liquids and their definitive role in predicting the reactivity of the substance
2. Understand the importance of dipole interactions, hydrogen bonding and intermetallic bonds
3. Learn to reason out solubilities of substances
4. Understand crystal lattice and shapes and briefly learn about calculation of interatomic distances in a crystal lattice by using x-rays (X-ray diffraction: Bragg equation); William Henry Bragg and his son William Lawrence Bragg shared the Nobel Prize in 1915 for their pioneering work in X-ray crystallography.

Tentative Examination Schedule		
Exams	Chapters	Dates
One	1 & 2	Aug. 29
Two	3 & 4	Sept. 26
Three	5 & 9	Oct. 19
Four	6 - 8	Nov. 21
Final	1 - 11	Dec 4-9

Chemistry 1211 Homework
OpenStax Chemistry, Rice University

Key Homework Problems for Exam Preparation

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To make an excellent grade on any exam, you must be capable of solving all of the exercises listed below. In addition, no more than 8 seconds should be required to determine a strategy for solving the problems. Keep in mind that the examinations are not given to assess your analytical or problem solving skills; that requires more time for figuring an appropriate strategy. Exams are designed instead to assess your understanding of the chemistry concepts we discussed. Problem solving exercises are provided at the end of each chapter under the heading “Exercises”. In addition, improved analytical or problem solving skills are addressed in laboratory exercises.

You must provide the correct answer to the questions below **quickly** to do well on the exams.

Chapter 1

Credit Homework Problem:

- Visit PhET Simulation at the specified web address for Density Determination (<http://openstaxcollege.org/l/16phetmasvolden>)
- Press the “Mystery” tab on “Blocks” in the top left corner.
- Determine the density of the purple and yellow blocks.

Exercises: Odd problems 1- 99.

Chapter 2

Exercises: 1-33 even and 37-61 even.

Chapter 3

Examples 3.19 – 3.21;

Visit web site: (<http://openstaxcollege.org/l/16Phetsolvents>) and explore the dilution concept.

Exercises 1-80 odd.

Chapter 4

Exercises 1-36 even and 42, 46, 48, 50, 53, 55, 57, 59, 60, 61, 62, 67, 70, 73, 78, 80, 87, 89, 91, 93 and 94.

Chapter 5

Exercises 1-12 odd; 16-21 all; 25, 26, 39, 40, 51, 53, 59, 63, 65, 67, 69 and 85..

Chapter 6

Exercises 1-12 even; 17, 22, 26, 29, 31-38 all, 42, 44, 48, 52, 53, 54, 55, 58, 64, 67-80.

Chapter 7

Exercises 1-26 odd; 28, 30, 32, 38, 39, 40, 45, 47, 51, 52, 60, 64, 65, 74, 77, 80, 83, 87, 91, 93, 95, 97, 101, 106, 112, and 114.

Chapter 8

Exercises 1, 4- 14, 16, 20, 24, 26, 27, 30, 35, 36, 37, 38, 39, 40a, c, and f; 50.

Chapter 9

Exercises 4, 6, 13, 15, 22, 28, 31, 33, 35, 36, 42, 45, 48, 52, 53, 55, 57, 59, 65, 66, 69, 72, 78, 85, 88, 91, 95, 96, 99 and 101.

Chapter 10.

Exercises: 1- 10, 15-19, 23, 25, 26, 28, 30, 32, 35, 36, 37, 40, 41, 42, 43, 45, 46, 47, 48, 51- 60, and 64 – 105 odd.

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Note the dates:

- September 5; (Monday) → Labor Day → No classes and offices are closed.
- **October 4;** (Tuesday) → Midterm Grades Due by 5:00 p.m.
- **October 12;** (Wednesday) → Last day to withdraw without academic penalty.
- October 13 & 14; (Thurs - Fri) → Fall Break → No classes
- November 10; (Thursday) → Founders Day
- November 23-27 (Wed – Fri) → Thanksgiving holidays
- December 1 → (Thursday) Last day of classes
- Final exams will be given Dec 4 – 9.
- December 10 → (Saturday) Commencement in Tiger Arena at 10:00 a.m.

Fall Schedule 2016
Dr. Cecil L. Jones

Monday	Tuesday	Wednesday	Thursday	Friday
Research/Office Hours 9:00 – 11:00 AM		Research/Office Hours 9:00 – 11:00 AM	Research 8:00 – 12:00 AM	Research/Office Hours 9:00 – 11:00 AM
CHEM 1301K - 01 Analytical Chemistry 11:00 – 11:50 AM Drew-Griffith Room 220 4.00 Credit Hrs.	Research 8:00 – 2:00 AM	CHEM 1301K - 01 Analytical Chemistry 11:00 – 11:50 AM Drew-Griffith Room 220 4.00 Credit Hrs.		CHEM 1301K - 01 Analytical Chemistry 11:00 – 11:50 AM Drew-Griffith Room 220 4.00 Credit Hrs.
CHEM 1211-04 Principles of Chemistry 1:00 – 1:50 PM Room 233 3.00 Credit Hrs.		CHEM 1211-04 Principles of Chemistry 1:00 – 1:50 PM Room 233 3.00 Credit Hrs.	Research 1:00 – 5:30 PM	CHEM 1211-04 Principles of Chemistry 1:00 – 1:50 PM Room 233 3.00 Credit Hrs.
CHEM 3602K Chemistry Research 3:00 – 5:50 2.00 Credit Hrs.	CHEM 3101L-01 Analytical Chem. Lab 2:00 – 5:20 Drew-Griffith Room 251 1.00 Credit Hrs	Research/Office Hours 2:00 – 5:00 AM		Research/Office Hours 2:00 – 3:00 PM

If I am absent during office hours, then go to my research lab 232 DG.

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