Course Syllabus
Clark Atlanta University
School of Arts and Sciences

Department of Chemistry

COURSE TITLE:	General Chemistry I
COURSE NUMBER:	CCHE 111
LOCATION:	Room 102 Carl and Mary Ware
LECTURE TIME:	9:00-9:50 & 1:00 – 1:50 pm Monday, Wednesday, Friday
PROFESSOR:	Room 2025 Research Center (404) 880-6850
OFFICE HOURS:	TBD and by appointment

COURSE DESCRIPTION

General chemistry is the first course in chemistry for chemistry, biology, engineering and certain pre-professional health majors. This course provides the foundation for subsequent studies in chemistry for majors and other science and engineering fields. This course is designed to acquaint the student with the fundamental laws and theories associated with the properties, structure, and composition of matter. The course will also cover the changes matter undergoes and the energies accompanying these changes. Topics will include measurements, atomic structure, stoichiometry, chemical bonding, molecular structure, solutions, equilibrium, kinetics, thermodynamics, nuclear chemistry, electrochemistry, and the chemistry of selected groups of elements. ***A good understanding of algebra and problem-solving skills are prerequisites for this course.*** **This course consists of three hours of lecture, three hours of laboratory work and three hours of recitation per week.**

Textbook: Chemistry; Openstax college, Rice University:
https://openstax.org/details/chemistry (Free pdf, or you can by a book)
Once downloaded save the text book to your computer and read as an interactive pdf file.

Lab. Textbook: None; however we will be using Late Night Labs; see CANAS for more information.

Methods of Instruction: Lecture, Audio-Visual Aids, Laboratory Experimentation, Problem Sets, Web Based Assignments, Response system (Clickers), Student Class Participation. This class is Web enhanced using CANVAS®

Lecture: Read the textbook assignment **before** the class period. Text material that can be learned by a moderate amount of self-study will not be repeated in lecture. We will use lecture time for explanation of difficult points of the text, for illustrations of the text material in relation to other areas

Attendance will be taken every day.

of interest, and for carrying out example problems. You will be expected to actively participate in class, for example, by solving sample problems. **Always have your calculator with you in class, recitation and lab.**

DETERMINATION OF GRADE

The grade that you receive in this course will reflect your achievement in the course. Evaluation will be based upon a series of examinations and quizzes, labs and lab exams, and assignments and recitation exercises.

Grade	Composite Score
A	90-100
B	80-89
C	70-79
D	60-69
F	59 or lower

Examinations and Quizzes: During the course of the semester, there will be five one-hour examinations and a cumulative final examination. Make-up examinations may be given if you provide an official University excuse as per the *Undergraduate Academic Regulations and Procedure Student Handbook*. You should expect announced and unannounced quizzes in lecture, recitation and laboratory. **Students will not be allowed to make-up missed quizzes or laboratory exercises unless arrangements have been made previously.** You will be allowed to discard your lowest hour exam in determining your final grade if you **have not taken any make-up exams.**

All examinations will be cumulative. The final examination will be comprehensive and cumulative covering the entire course. Due attention should be given to the cumulative nature of the learning process with emphasis placed on major topics and concepts. Your study during the semester should be designed for comprehensive and long-term retention of the factual material, principles, and use of these. "Cramming" for individual exams largely defeats the purpose of a college education.

Exam	Day, Date	Unit	Chapters Covered
Exam 1	Friday, September 2, 2016	1	1, 2 & part of 3
Exam 2	Friday September 23, 2016	2	1 - 4
Exam 3	Friday, October 14, 2016	3	1 - 6 and part of 7
Exam 4	Friday, November 4, 2016	4	1 – 9
Exam 5	Monday, Nov 21, 2016	5	1 - 11
Final Exam, Wednesday Dec. 7, 2016 10:30-12:30 am		Cumulative	Cumulative

The Chem. 112 (second semester) Final Exam will be an American Chemical Society standardized type exam that will cover both semesters.

A short quiz (paper or clicker) will be given at the beginning of each class. Additional quizzes may be given throughout the class, lab, or recitation period or online. If you are late for class you forfeit the opportunity to take the quiz that day.

METHOD OF EVALUATION
The performance of students in the course will be assessed via periodic examinations, quizzes, laboratory exercises, and assignments. The following scheme is utilized in evaluating the student's performance in the course. This evaluation protocol is subject to change by the faculty members of this course.

1. Lecture - Hour Exams (Cumulative) (40%)
2. Lecture –Quizzes and/or Clicker Questions and in Class Participation (10%)
3. Laboratory (15%)
4. Recitation (problem sets, in recitation and take home assignments/participation) (15%)
5. Final Exam - Cumulative & Comprehensive (20%)

Problem Sets: Multiple paper and/or web based problem sets will be assigned. Unit problem sets will be due before the unit exam. If your combined cumulative score on problem sets is 90% for a unit, you will be awarded 10 additional points on the unit exam. Thus, it is possible to earn 10 bonus points for each exam. Additional problem sets will be carried out during recitation. If you text, email, play computer games, or surf the web, etc. during class you forfeit any bonus points that you have earned on the unit.

LABORATORY
We will be utilizing a virtual laboratory this semester using Late Night Labs. **All** students must sign up for and carry out the virtual laboratory.

RECITATION
All students must be enrolled in a Recitation section this semester. Quizzes may be given in each recitation. You will be expected to use recitation time to work problems or conduct other activities individually or in small groups as directed with the assistance of peer tutors and instructors.

ATTENDANCE POLICY
The general University attendance policy is given in the *Undergraduate Academic Regulations and Procedure Student Handbook*. Regular class attendance is extremely important in this course, as it is not possible to succeed in this course with excessive absences. It is equally important that punctuality be observed at all times.

Late work will not be accepted. NO MAKE-UP WORK WILL BE GIVEN WITHOUT AN OFFICIAL UNIVERSITY EXCUSE. USE OF CELL PHONE DURING CLASS IS GROUNDS FOR IMMEDIATE DISMISSAL.

Student Learning Outcomes (SLOs). In addition to the course specific student learning outcomes described below this course also supports students attainment of the university general education SLOs in critical and creative thinking, quantitative skills, and scientific literacy and the history of chemistry of students seeking secondary teacher certification.

By successfully completing CCHE 111 (Grade of "C" or better); students will have demonstrated the ability to apply **critical and creative thinking** to solving chemistry problems.

By successfully completing CCHE 111 (Grade of "C" or better); students will have demonstrated the ability to apply **quantitative skills** to solving chemistry problems.

By successfully completing CCHE 111 (Grade of "C" or better); students will have demonstrated their development of **scientific literacy** in basic chemistry concepts.

By successfully completing CCHE 111 (Grade of "C" or better); students will have demonstrated the ability to apply listening, reading skills in regard to the language of basic chemistry.

By successfully completing CCHE 111 (Grade of "C" or better); students will have demonstrated a knowledge of the development of chemistry theories over time (the history of the development chemistry) in support of secondary teacher certification.

Specific Goals, Learning Outcomes and Topic Outline

Goal: Understand and apply Math and Calculator Skills (Reference Appendix 3 and handouts)

Learning Objectives: Upon completion of this chapter a student should be able to:

0.1 Reviewing order of operations, i.e. +, -, *, ÷, etc.

0.2 Reviewing basic functions on the calculator and use of parentheses.

0.3 Reviewing the use of the EE, log, ln, √, etc functions on the calculator.

- Be proficient in basic math for solving chemistry problems.
- Be proficient in using a scientific calculator to carryout basic math for solving chemistry problems.

Goal: Understand and apply basic concepts of chemistry

Learning Objectives: Upon completion of this chapter a student should be able to:

1.1 Chemistry in Context

- Outline the historical development of chemistry
- Provide examples of the importance of chemistry in everyday life
- Describe the scientific method
- Differentiate among hypotheses, theories, and laws
- Provide examples illustrating macroscopic, microscopic, and symbolic domains

1.2 Phases and Classification of Matter

- Describe the basic properties of each physical state of matter: solid, liquid, and gas
- Define and give examples of atoms and molecules
- Classify matter as an element, compound, homogeneous mixture, or heterogeneous mixture with regard to its physical state and composition
- Distinguish between mass and weight
- Apply the law of conservation of matter

1.3 Physical and Chemical Properties

- Identify properties of and changes in matter as physical or chemical
- Identify properties of matter as extensive or intensive

1.4 Measurements

- Explain the process of measurement
- Identify the three basic parts of a quantity
- Describe the properties and units of length, mass, volume, density, temperature, and time
- Perform basic unit calculations and conversions in the metric and other unit systems

1.5 Measurement Uncertainty, Accuracy, and Precision

- Define accuracy and precision
- Distinguish exact and uncertain numbers
- Correctly represent uncertainty in quantities using significant figures
- Apply proper rounding rules to computed quantities

1.6 Mathematical Treatment of Measurement Results

- Explain the dimensional analysis (factor label) approach to mathematical calculations involving quantities
- Use dimensional analysis to carry out unit conversions for a given property and computations involving two or more properties

Goal: Understand and apply concepts of Atoms, Molecules, and Ions

Learning Objectives: Upon completion of this chapter a student should be able to:

2.1 Early Ideas in Atomic Theory

- State the postulates of Dalton's atomic theory
- Use postulates of Dalton's atomic theory to explain the laws of definite and multiple proportions

2.2 Evolution of Atomic Theory

- Outline milestones in the development of modern atomic theory
- Summarize and interpret the results of the experiments of Thomson, Millikan, and Rutherford
- Describe the three subatomic particles that compose atoms
- Define isotopes and give examples for several elements

2.3 Atomic Structure and Symbolism

- Write and interpret symbols that depict the atomic number, mass number, and charge of an atom or ion
- Define the atomic mass unit and average atomic mass
- Calculate average atomic mass and isotopic abundance

2.4 Chemical Formulas

- Symbolize the composition of molecules using molecular formulas and empirical formulas
- Represent the bonding arrangement of atoms within molecules using structural formulas

2.5 The Periodic Table

- State the periodic law and explain the organization of elements in the periodic table
- Predict the general properties of elements based on their location within the periodic table
- Identify metals, nonmetals, and metalloids by their properties and/or location on the periodic table

2.6 Molecular and Ionic Compounds

- Define ionic and molecular (covalent) compounds
- Predict the type of compound formed from elements based on their location within the periodic table
- Determine formulas for simple ionic compounds

2.7 Chemical Nomenclature

- Derive names for common types of inorganic compounds using a systematic approach

Goal: Understand and apply concepts of Composition of Substances and Solutions

Learning Objectives: Upon completion of this chapter a student should be able to:

3.1 Formula Mass and the Mole Concept

- Calculate formula masses for covalent and ionic compounds
- Define the amount unit mole and the related quantity Avogadro's number Explain the relation between mass, moles, and numbers of atoms or molecules, and perform calculations deriving these quantities from one another

3.2 Determining Empirical and Molecular Formulas

- Compute the percent composition of a compound
- Determine the empirical formula of a compound
- Determine the molecular formula of a compound

3.3 Molarity

- Describe the fundamental properties of solutions
- Calculate solution concentrations using molarity
- Perform dilution calculations using the dilution equation

3.4 Other Units for Solution Concentrations

- Define the concentration units of mass percentage, volume percentage, mass-volume percentage, parts-per-million (ppm), and parts-per-billion (ppb)
- Perform computations relating a solution's concentration and its components' volumes and/or masses using these units

Goal: Understand and apply Stoichiometry of Chemical Reactions

Learning Objectives: Upon completion of this chapter a student should be able to:

4.1 Writing and Balancing Chemical Equations

- Derive chemical equations from narrative descriptions of chemical reactions.
- Write and balance chemical equations in molecular, total ionic, and net ionic formats.

4.2 Classifying Chemical Reactions

- Define three common types of chemical reactions (precipitation, acid-base, and oxidation-reduction)
- Classify chemical reactions as one of these three types given appropriate descriptions or chemical equations
- Identify common acids and bases
- Predict the solubility of common inorganic compounds by using solubility rules
- Compute the oxidation states for elements in compounds

4.3 Reaction Stoichiometry

- Explain the concept of stoichiometry as it pertains to chemical reactions
- Use balanced chemical equations to derive stoichiometric factors relating amounts of reactants and products
- Perform stoichiometric calculations involving mass, moles, and solution molarity

4.4 Reaction Yields

- Explain the concepts of theoretical yield and limiting reactants/reagents.
- Derive the theoretical yield for a reaction under specified conditions.
- Calculate the percent yield for a reaction.

4.5 Quantitative Chemical Analysis

- Describe the fundamental aspects of titrations and gravimetric analysis.
- Perform stoichiometric calculations using typical titration and gravimetric data.

Goal: Understand and apply Thermochemistry

Learning Objectives: Upon completion of this chapter a student should be able to:

5.1 Energy Basics

- Define energy, distinguish types of energy, and describe the nature of energy changes that accompany chemical and physical changes
- Distinguish the related properties of heat, thermal energy, and temperature
- Define and distinguish specific heat and heat capacity, and describe the physical implications of both
- Perform calculations involving heat, specific heat, and temperature change

5.2 Calorimetry

- Explain the technique of calorimetry
- Calculate and interpret heat and related properties using typical calorimetry data

5.3 Enthalpy

- State the first law of thermodynamics
- Define enthalpy and explain its classification as a state function
- Write and balance thermochemical equations
- Calculate enthalpy changes for various chemical reactions
- Explain Hess's law and use it to compute reaction enthalpies

Goal: Understand and apply Electronic Structure and Periodic Properties of Elements

Learning Objectives: Upon completion of this chapter a student should be able to:

6.1 Electromagnetic Energy

- Explain the basic behavior of waves, including travelling waves and standing waves
- Describe the wave nature of light
- Use appropriate equations to calculate related light-wave properties such as period, frequency, wavelength, and energy
- Distinguish between line and continuous emission spectra
- Describe the particle nature of light

6.2 The Bohr Model

- Describe the Bohr model of the hydrogen atom
- Use the Rydberg equation to calculate energies of light emitted or absorbed by hydrogen atoms

6.3 Development of Quantum Theory

- Extend the concept of wave–particle duality that was observed in electromagnetic radiation to matter as well
- Understand the general idea of the quantum mechanical description of electrons in an atom, and that it uses the notion of three-dimensional wave functions, or orbitals, that define the distribution of probability to find an electron in a particular part of space
- List and describe traits of the four quantum numbers that form the basis for completely specifying the state of an electron in an atom

6.4 Electronic Structure of Atoms (Electron Configurations)

- Derive the predicted ground-state electron configurations of atoms
- Identify and explain exceptions to predicted electron configurations for atoms and ions
- Relate electron configurations to element classifications in the periodic table

6.5 Periodic Variations in Element Properties

- Describe and explain the observed trends in atomic size, ionization energy, and electron affinity of the elements

Goal: Understand and apply Chemical Bonding and Molecular Geometry

Learning Objectives: Upon completion of this chapter a student should be able to:

7.1 Ionic Bonding

- Explain the formation of cations, anions, and ionic compounds
- Predict the charge of common metallic and nonmetallic elements, and write their electron configurations

7.2 Covalent Bonding

- Describe the formation of covalent bonds
- Define electronegativity and assess the polarity of covalent bonds

7.3 Lewis Symbols and Structures

- Write Lewis symbols for neutral atoms and ions
- Draw Lewis structures depicting the bonding in simple molecules

7.4 Formal Charges and Resonance

- Compute formal charges for atoms in any Lewis structure
- Use formal charges to identify the most reasonable Lewis structure for a given molecule
- Explain the concept of resonance and draw Lewis structures representing resonance forms for a given molecule

7.5 Strengths of Ionic and Covalent Bonds

- Describe the energetics of covalent and ionic bond formation and breakage
- Use the Born-Haber cycle to compute lattice energies for ionic compounds
- Use average covalent bond energies to estimate enthalpies of reaction

7.6 Molecular Structure and Polarity

- Predict the structures of small molecules using valence shell electron pair repulsion (VSEPR) theory
- Explain the concepts of polar covalent bonds and molecular polarity
- Assess the polarity of a molecule based on its bonding and structure

Goal: Understand and apply Advanced Theories of Covalent Bonding

Learning Objectives: Upon completion of this chapter a student should be able to:

8.1 Valence Bond Theory

- Describe the formation of covalent bonds in terms of atomic orbital overlap
- Define and give examples of σ and π bonds

8.2 Hybrid Atomic Orbitals

- Explain the concept of atomic orbital hybridization
- Determine the hybrid orbitals associated with various molecular geometries

8.3 Multiple Bonds

- Describe multiple covalent bonding in terms of atomic orbital overlap
- Relate the concept of resonance to π-bonding and electron delocalization

8.4 Molecular Orbital Theory

- Outline the basic quantum-mechanical approach to deriving molecular orbitals from atomic orbitals
- Describe traits of bonding and antibonding molecular orbitals
- Calculate bond orders based on molecular electron configurations
- Write molecular electron configurations for first- and second-row diatomic molecules
- Relate these electron configurations to the molecules' stabilities and magnetic properties

Goal: Understand and apply the fundamental concepts of Gases

Learning Objectives: Upon completion of this chapter a student should be able to:

9.1 Gas Pressure

- Define the property of pressure
- Define and convert among the units of pressure measurements
- Describe the operation of common tools for measuring gas pressure
- Calculate pressure from manometer data

9.2 Relating Pressure, Volume, Amount, and Temperature: The Ideal Gas Law

- Identify the mathematical relationships between the various properties of gases
- Use the ideal gas law, and related gas laws, to compute the values of various gas properties under specified conditions

9.3 Stoichiometry of Gaseous Substances, Mixtures, and Reactions

- Use the ideal gas law to compute gas densities and molar masses
- Perform stoichiometric calculations involving gaseous substances
- State Dalton's law of partial pressures and use it in calculations involving gaseous mixtures

9.4 Effusion and Diffusion of Gases

- Define and explain effusion and diffusion
- State Graham's law and use it to compute relevant gas properties

9.5 The Kinetic-Molecular Theory

- State the postulates of the kinetic-molecular theory
- Use this theory's postulates to explain the gas laws

9.6 Non-Ideal Gas Behavior

- Describe the physical factors that lead to deviations from ideal gas behavior
- Explain how these factors are represented in the van der Waals equation
- Define compressibility (Z) and describe how its variation with pressure reflects non-ideal behavior
- Quantify non-ideal behavior by comparing computations of gas properties using the ideal gas law and the van der Waals equation

Goal: Understand and apply the fundamental concepts of Liquids and solids

Learning Objectives: Upon completion of this chapter a student should be able to:

10.1 Intermolecular Forces

- Describe the types of intermolecular forces possible between atoms or molecules in condensed phases (dispersion forces, dipole-dipole attractions, and hydrogen bonding)
- Identify the types of intermolecular forces experienced by specific molecules based on their structures
- Explain the relation between the intermolecular forces present within a substance and the temperatures associated with changes in its physical state

10.2 Properties of Liquids

- Distinguish between adhesive and cohesive forces
- Define viscosity, surface tension, and capillary rise
- Describe the roles of intermolecular attractive forces in each of these properties/phenomena

10.3 Phase Transitions

- Define phase transitions and phase transition temperatures
- Explain the relation between phase transition temperatures and intermolecular attractive forces

- Describe the processes represented by typical heating and cooling curves, and compute heat flows and enthalpy changes accompanying these processes

10.4 Phase Diagrams

- Explain the construction and use of a typical phase diagram
- Use phase diagrams to identify stable phases at given temperatures and pressures, and to describe phase transitions resulting from changes in these properties
- Describe the supercritical fluid phase of matter

10.5 The Solid State of Matter

- Define and describe the bonding and properties of ionic and molecular metallic and covalent network crystalline solids
- Describe the main types of crystalline solids: ionic solids, metallic solids, covalent network solids, and molecular solids
- Explain the ways in which crystal defects can occur in a solid

10.6 Lattice Structures in Crystalline Solids

- Describe the arrangement of atoms and ions in crystalline structures
- Compute ionic radii using unit cell dimensions
- Explain the use of X-ray diffraction measurements in determining crystalline structures

Goal: Understand and apply the concepts of Solutions and Colloids Learning Objectives: Upon completion of this chapter a student should be able to:

11.1 The Dissolution Process

- Describe the basic properties of solutions and how they form
- Predict whether a given mixture will yield a solution based on molecular properties of its components
- Explain why some solutions either produce or absorb heat when they form

11.2 Electrolytes

- Define and give examples of electrolytes
- Distinguish between the physical and chemical changes that accompany dissolution of ionic and covalent electrolytes
- Relate electrolyte strength to solute-solvent attractive forces

11.3 Solubility

- Describe the effects of temperature and pressure on solubility
- State Henry's law and use it in calculations involving the solubility of a gas in a liquid
- Explain the degrees of solubility possible for liquid-liquid solutions

11.4 Colligative Properties

- Express concentrations of solution components using mole fraction and molality
- Describe the effect of solute concentration on various solution properties (vapor pressure, boiling point, freezing point, and osmotic pressure)
- Perform calculations using the mathematical equations that describe these various colligative effects
- Describe the process of distillation and its practical applications
- Explain the process of osmosis and describe how it is applied industrially and in nature

11.5 Colloids

- Describe the composition and properties of colloidal dispersions
- List and explain several technological applications of colloids

Department of Chemistry

COURSE TITLE:	General Chemistry I
COURSE NUMBER:	CCHE 111
LOCATION:	Room 102 Carl and Mary Ware
LECTURE TIME:	9:00-9:50 & 1:00 – 1:50 pm Monday, Wednesday, Friday
PROFESSOR:	Room 2025 Research Center (404) 880-6850

I have received, read, and understand the syllabus and the level of effort and performance expected of me in this class. I understand that academic dishonesty of any kind will not be tolerated and is grounds for the instructor to immediately enter a grade of F and dismiss a student from the course. I understand that I am not allowed to use a cell phone in any manner during class without the explicit permission or instruction from the course instructor.

I am/will currently enroll in CCHE 111 lab and recitation.

Name _____ Signature _____

Print

Date _____

Keep for your records

Course Syllabus
Clark Atlanta University
School of Arts and Sciences

Fall 2016

Department of Chemistry,

COURSE TITLE:	General Chemistry I
COURSE NUMBER:	CCHE 111
LOCATION:	Room 102 Carl and Mary Ware
LECTURE TIME:	9:00-9:50 & 1:00 – 1:50 pm Monday, Wednesday, Friday
PROFESSOR:	Room 2025 Research Center (404) 880-6850

I have received, read, and understand the syllabus and the level of effort and performance expected of me in this class. I understand that academic dishonesty of any kind will not be tolerated and is grounds for the instructor to immediately enter a grade of F and dismiss a student from the course. I understand that I am not allowed to use a cell phone in any manner during class without the explicit permission or instruction from the course instructor.

I am/will currently enroll in CCHE 111 lab and recitation.

Name _____ Signature _____
Print

Date _____

Email address: _____

Complete, sign, and return to Dr. Mintz or Dr. Ingram

Course Syllabus
Clark Atlanta University
School of Arts and Sciences

Department of Chemistry, Fall 2019

COURSE TITLE:	General Chemistry II
COURSE NUMBER:	CCHE 112 Section 02 (CRN: 27405)
LEVEL:	Undergraduate *(General Chemistry)*
LECTURE LOCATION:	Room 316 Carl and Mary Ware
LECTURE TIME:	1:00-1:50 pm Monday, Wednesday, Friday
RECITATION:	TH 9:25 am – 10:40 am at McPheeters-Denn Hall Room 329/319

PROFESSOR: **Olutunde Omotunde, Ph.D.**

Room 2033 Thomas W. Cole, Jr. Research
Center for Science and Technology
(404) 880-6858
oolubi@cau.edu

OFFICE HOURS: Monday, Wednesday, Friday 11:00 am – 1:00 pm *(Tentative)*
Other times will be posted in Canvas

COURSE DESCRIPTION

General chemistry 112 is the second course in chemistry for chemistry, biology, engineering and certain pre-professional health majors. This course provides the foundation for subsequent studies in chemistry for majors and other science and engineering fields. This course is designed to acquaint the student with the fundamental laws and theories associated with the properties, structure, and composition of matter. The course will also cover the changes matter undergoes and the energies accompanying these changes. Topics will include measurements, atomic structure, stoichiometry, chemical bonding, molecular structure, solutions, equilibrium, kinetics, thermodynamics, nuclear chemistry, electrochemistry, and the chemistry of selected groups of elements. ***A good understanding of algebra and problem-solving skills are prerequisites for this course.*** **The course consists of three hours of lecture, three hours of laboratory work and 90 minutes of recitation per week.**

Prerequisites: a student must have passed Chemistry 111 with a least a grade of "D" and have completed Chemistry 111L. A Student who has not completed Chemistry 111L, the laboratory portion of the course, must be concurrently enrolled in Chemistry 111 L.

Textbook: Chemistry; Openstax college, Rice University: https://openstax.org/details/chemistry
(Free pdf, or you can by a book)
Once downloaded save the text book to your computer and read as an interactive pdf file.

Attendance will be taken every day.

Lab. ***(CCHE112L)*****:** It is MANDATORY that students taking the CCHE112 lecture register for the lab component simultaneously. Students who have taken the lab in the past with a grade of C or better may request a lab grade transfer by the second week of class. **Students will be notified in writing if a lab grade transfer is denied or granted.**

Teaching/ Learning Methods/ Classroom Format: Lecture, Audio-Visual Aids, Laboratory Experimentation, Problem Sets, Web Based Assignments, Response system (CHEM101), Student Class Participation. This class is Web enhanced using CANVAS®, KNEWTON, CHEM 101-online app. The cost of CHEM101 IS $15.00. Download the Chem101 app today from the App Store or Play Store. Laptop or mobile app required for course each day. https://www.101edu.co/ Course Access Code to be provided.

Lecture: Students are required to read the textbook assignment **before** the class period. Text material that can be learned by a moderate amount of self-study will not be repeated in lecture. We will use lecture time for explanation of difficult points of the text, for illustrations of the text material in relation to other areas of interest, and for carrying out example problems. You will be expected to actively participate in class, for example, by solving sample problems. Always have your calculator with you in class, recitation and lab. **Always have your calculator with you for class, examinations, recitation and lab.**

COURSE GRADING

The grade that you receive in this course will reflect your achievement in the course. Evaluation will be based upon a series of examinations and quizzes, labs and lab exams, and assignments and recitation exercises.

Grade	Composite Score
A	90-100
B	80-89
C	70-79
D	60-69
F	59 or lower

Examinations and Quizzes: During the course of the semester, there will be **five** 45 minutes examinations and a cumulative final examination. Make-up examinations may be given if you provide an official University excuse as per the *Undergraduate Academic Regulations and Procedure Student Handbook*. You should expect announced and unannounced quizzes in lecture, recitation and laboratory. **Students will not be allowed to make-up missed quizzes.** If you take any make up exams you will **NOT** be allowed to discard your lowest 45 minutes exam in determining your final grade.

All examinations will be cumulative. The final examination will be comprehensive and cumulative covering the entire course, CCHE 111 and 112 **and will be an American Chemical**

Society (ACS) standardized type exam. Your study during the semester should be designed for comprehensive and long-term retention of the factual material, principles, and use of these. "Cramming" for individual exams will not work for you and largely defeats the purpose of a college education. The exam schedule is as follows:

Exam	Day, Date	Planned Chapters Covered
Exam 1	Monday Sep 04, 2019	12, 13
Exam 2	Monday, Sep 23, 2019	14, 15
Exam 3	Monday Oct 14, 2019	16, 17
Exam 4	Monday Nov 04, 2019	18, 19
Exam 5	Monday, Nov 25, 2019	12 – 21 *(except 20)*
Final Exam	**Dec, 2019**	**American Chemical Society standardized type exam**

The materials tested on in each one (1) test is tentative and may change to reflect the progress of the class/ course. Students will only be tested on materials covered up to (and including) the previous Friday.

The Chem. 112 (second semester) Final Exam will be an American Chemical Society standardized exam that will cover both CCHE 111 and CCHE 112.

Short UNANNOUNCED quizzes may be given in class on paper (or CHEM101) at the beginning of each lecture session. Additional quizzes may be given throughout the class, lab or recitation period.

METHOD OF EVALUATION

The performance of students in the course is assessed via periodic examinations, quizzes, laboratory exercises, and assignments. The following scheme is utilized in evaluating the student's performance in the course. This evaluation protocol is subject to change by the faculty members of this course. ***Changes in evaluation and your up-to-date grade will be posted on Canvas.***

1. Lecture – 45minutes Exams [Cumulative] (40%)
2. Laboratory (20%)
3. Lecture - Final Exam - Cumulative & Comprehensive (20%)
4. Recitation (10%)
5. KNEWTON (5%)
6. In-class Quizzes (5%)

The instructor reserves the right to adjust the allocation of grade credit after informing the class in writing.

Problem Sets: Multiple paper and/or nightly and unit problem sets will be administered through CANVAS, and KNEWTON. The nightly problem sets will be assigned after most lectures to be completed before the next lecture. Unit problem sets on CANVAS and KNEWTON will be due before the unit exam. Additional "hard copy" problem sets will be given. If you text, email, play computer games, or surf the web, etc. during class you forfeit any bonus points that you have earned on the unit.

LABORATORY

The laboratory component of this course is MANDATORY. ***Registration in lab is required for this course. If you are not registered in lab, and you finish the course, you will receive an incomplete ("I") for your final grade, which must be removed in Spring 2020.*** *Your grade will then be recalculated to include the lab.*

The lab sessions are held Tuesday sand Thursdays at 8:00 am - 10:40 am in McPheeters-Dennis Hall room 307.

RECITATION

All students will be assigned a Recitation section. Quizzes may be given in each recitation. You will be expected to use recitation time to work problems or conduct other activities individually or in small groups as directed with the assistance of peer tutors and instructors.

ATTENDANCE POLICY

The general University attendance policy is given in the *Undergraduate Academic Regulations and Procedure Student Handbook.* Regular class attendance is extremely important in this course, as it is not possible to succeed in this course with excessive absences. It is equally important that punctuality be observed at all times.

Late work will not be accepted. NO MAKE-UP WORK WILL BE GIVEN WITHOUT AN OFFICIAL UNIVERSITY EXCUSE. USE OF CELL PHONE DURING CLASS IS GROUNDS FOR IMMEDIATE DISMISSAL FROM THE COURSE OR EXPULSION FROM THE CLASS FOR THAT LECTURE.

LEARNING OUTCOMES

I. This course addresses the general learning outcomes relating to communications as follows:

1. Students develop their reading comprehension skills by reading the text and handout materials.
2. Students develop their listening skills through lecture and small group problem solving. Lecture material is presented that is not included in the text or handout material and is included as part of the exams or tests.
3. Students develop their reading and writing skills through the use of problems and activities developed specifically to enhance their understanding of certain principles.
4. Students provide written or oral solutions to these problems in both individual and group format.
5. Students must also develop short-answer type question skills for course exams.

II. This course addresses the general education outcome relating to mathematical concept usage and applies the scientific method as follows:

- Students must apply mathematical concepts in the solution of problems designed to illustrate the chemical principle being taught. Analysis of graphically presented material also tests their mathematical skills as well as their ability to interpret and communicate qualitative data.

III. This course addresses the general education outcome relating to demonstrating effective individual and group problem solving skills by doing problems both in classroom settings and at home.

- Critical thinking skills are encouraged in many ways, one of which is by requesting student responses to question asked during the lecture.

IV. This course addresses the general education outcome relating to recognizing and applying scientific inquiry in a variety of settings as follows:

1. Students apply the scientific method in the set-up and solution of the problems designed to illustrate th chemical principle being taught.
2. Students use models that explain basic scientific phenomena and relate it to everyday situations.
3. Students use conceptual and physical models to explore theory and relate it to preexisting concepts.

EXPECTED EDUCATIONAL OBJECTIVES AND GOALS FOR GENERAL CHEMISTRY 112; FALL 2019

Chapter 11 Solutions and Colloids

Goal: Understand and apply the concepts of Solutions and Colloids

Learning Objectives: Upon completion of this chapter a student should be able to:

11.1 The Dissolution Process

- Describe the basic properties of solutions and how they form
- Predict whether a given mixture will yield a solution based on molecular properties of its components
- Explain why some solutions either produce or absorb heat when they form

11.2 Electrolytes

- Define and give examples of electrolytes
- Distinguish between the physical and chemical changes that accompany dissolution of ionic and covalent electrolytes
- Relate electrolyte strength to solute-solvent attractive forces

11.3 Solubility

- Describe the effects of temperature and pressure on solubility
- State Henry's law and use it in calculations involving the solubility of a gas in a liquid
- Explain the degrees of solubility possible for liquid-liquid solutions

11.4 Colligative Properties

- Express concentrations of solution components using mole fraction and molality
- Describe the effect of solute concentration on various solution properties (vapor pressure, boiling point, freezing point, and osmotic pressure)
- Perform calculations using the mathematical equations that describe these various colligative effects
- Describe the process of distillation and its practical applications
- Explain the process of osmosis and describe how it is applied industrially and in nature

11.5 Colloids

- Describe the composition and properties of colloidal dispersions
- List and explain several technological applications of colloids

Chapter 12 - Rate of Reaction (Kinetics)

Instructional Objectives: The student will be assisted in:

1. Understanding the nature of a reaction rate.
2. Learning to distinguish between an average and instantaneous reaction rate.
3. Understanding how collisions between molecules generate the experimental rate laws and rate constants for simple processes.
4. Understanding simple reaction mechanisms.
5. Learning the difference between integrated and experimental rate laws.
6. Understanding how temperature and catalysis affect the rate of reaction.
7. Understanding the concept of reaction order.
8. Understanding the relationship between temperature and reaction rate.

Behavioral Objectives: Upon the completion of this chapter a student should be able to:
1. Explain the concept of reaction rate and distinguish amongst the types of rates of reaction.
2. Determine the experimental rate law from rate and concentration data.
3. Determine the rate of reaction from concentration-time data.
4. Compute the rate constant from concentration, rate data or the Arrhenius factors.
5. Determine the order of a reaction.
6. Determine mechanisms of simple reactions.
7. Determine rate expressions from reaction mechanisms.
8. Determine activation energy from temperature and reaction rate data.

TOPICS
1. Reaction Rates
2. Reaction Rate and Concentration
3. Reactant Concentration and Time
4. Collision Theory of Reaction Rates
5. Reaction Rate and Temperature
6. Reaction Mechanisms

Chapter 13 - Gaseous Chemical Equilibrium

Instructional Objectives: The student will be assisted in:
1. Learning how to write the equilibrium expression for a chemical equation
2. Learning the relationship between the reaction quotient and equilibrium constant.
3. Learning the various techniques used to determine equilibrium concentrations.
4. Understanding the influence of component on each others in an equilibrium mixture.
5. Understanding the effect of changes in conditions on an equilibrium system

Behavioral Objectives: Upon completion of this chapter, a student will be able to:
1. Write an equilibrium expression for a reaction given the chemical equation
2. Evaluate the equilibrium constant from experimental data
3. Determine the equilibrium concentration of species in equilibrium
4. Determine the concentration of gases in equilibrium with a solid or liquid
5. Predict the effect of changes in concentration or conditions on an equilibrium system

TOPICS
1. Equilibrium Systems
2. The Equilibrium Constant Expression
3. Determination of the Equilibrium Constant
4. Application of the Equilibrium Constant
5. Effect of Changes in Condition on an Equilibrium System.

Chapter 14 - Acids and Bases and Equlibria in Acid-Base Solutions

Chapter 14 A. Acids and Bases

Instructional Objectives: The student will be assisted in:
1. Understanding the Bronsted-Lowry concept of acids and bases.
2. Understanding the concept of pH and pOH.
3. Learning to distinguish between strong and weak acids.

4. Learning to calculate pH of weak acids and pOH of weak bases.
5. Learning to calculate pH of polyprotic weak acids.
6. Learning to predict the pH of a salt solution.

Behavioral Objectives: Upon the completion of this chapter, a student will be able to:
1. Distinguish between a Bronsted acid and base.
2. Identify conjugate acid-base pairs.
3. Calculate the pH and pOH of solutions of strong acid and bases, respectively.
4. Calculate the pH and pOH of solutions of weak acids and bases, respectively.
5. Write the ionization expression for a weak acid or base and calculate K.
6. Predict the pH of a salt solution.

TOPICS
1. Bronsted-Lowry Concept of Acids and Bases
2. Ionization of Water: pH and pOH
3. Strong Acids and Bases
4. Equilibrium Constants For Weak Acids
5. Equilibrium Constants For Weak Bases
6. Acid-Base Properties of Salt Solutions

Chapter 14 B.- Equlibria in Acid-Base Solutions
Instructional Objectives: The student will be assisted in:
1. Learning how to recognize and prepare buffer systems
2. Learning how to use the Henderson-Hesselback equation
3. Understating buffer capacity
4. Understanding how buffers behave
5. Learning how indicators work
6. Understanding autoionization of a solvent
7. Learning the basis of acid-base titrations

Behavioral Objectives: Upon completion of this chapter, a student will be able to:
1. Prepare a buffer solution or determine the pH of a buffer solution
2. Determine the concentration of a substance via titration
3. Determine the concentration of species present in solution during a titration
4. Use the ion product of water in computations
5. Use know equilibrium constants to determine an unknown equilibrium constant

TOPICS
1. Buffers
2. Henderson-Hesselblck equation
3. Acid-Base Indicators
4. Acid-Base Titrations

Chapter 15 – Complex Ions
Instructional Objectives: The student will be assisted in:

1. Learning to recognize complex ions and determine coordination number
2. Understand the relationship between coordination number and geometry of complex ions.
3. Understand the electronic structure of complex ions
4. Learning how to calculate formation constants

Behavioral Objectives: Upon completion of this chapter, a student will be able to:
1. Determine the coordination number and geometry of complex ions
2. Determine the electronic structure of complex ions
3. Calculate formation constants and the solubility of metal ions in ligand solutions

TOPICS
1. Composition of complex ions
2. Lignads; Chelating agents
3. Geometry of Complex Ions and Coordination Number
4. Electronic Structure of Complex Ions
5. Formation Constants of Complex Ions

Chapter 15 - Precipitation Equilibria

Instructional Objectives: The student will be assisted in:
1. Learning how to write the K_{sp} expression for a chemical equation
2. Learning the relationship between the reaction quotient and K_{sp}
3. Learning the various techniques used to determine maximum equilibrium concentrations using K_{sp}
4. Learning how to calculate the solubility of salts using K_{sp}
5. Understanding the influence of common ions on solubility
6. Understanding the effect of changes in conditions on solubility
7. Learning how apply solubility concepts to qualitative analysis

Behavioral Objectives: Upon completion of this chapter, a student will be able to:
1. Write a K_{sp} expression for a reaction give the chemical equation
2. Evaluate K_{sp} from experimental data
3. Determine the maximum concentration of a salt given K_{sp}
4. Predict the effect of changes in concentration or conditions on an solubility

TOPICS
1. Precipitate Formation; Solubility Product Constant (K_{sp})
2. Common Ion Effect
3. Dissolving Precipitates
4. Qualitative Analysis

Chapter 16 – Thermodynamics (Spontaneity of Reaction)

Instructional Objectives: The student will be assisted in:
1. Understanding the factors influencing spontaneous processes.
2. Understanding the concept of entropy.

3. Understanding the concept of free energy and relating it to spontaneity.
4. Understanding standard free energy change for a chemical process.
5. Relating the effect of temperature, pressure, and concentration on reaction spontaneity.
6. Relating free energy change to the equilibrium constant.

Behavioral Objectives: Upon completion of this chapter, a student will be able to:
1. Determine the spontaneity of a process from the energy and randomness of the system.
2. Calculate standard entropy changes for reactions using standard molar entropies.
3. Calculate standard free energy changes for chemical reactions.
4. Determine the spontaneity of a system from the sign of free energy.
5. Calculate the equilibrium constant from standard free energy.
6. Calculate free energy changes from coupled reactions.

TOPICS
1. Spontaneous Processes
2. Entropy
3. Free Energy
4. Standard Free Energy Change
5. Effect of Pressure, Temperature, and Concentration on Reaction Spontaneity.
6. Free Energy Change and the Equilibrium Constant

Chapter 17 - Electrochemistry

Instructional Objectives: The student will be assisted in:
1. Learning how to utilize and oxidation reduction reactions as voltaic cells
2. Understanding how electrochemical cells work
3. Learning how to calculate cell potentials
4. Understanding the relationships between E°, ΔG°, and K
5. Understanding the effect of concentration of voltage

Behavioral Objectives: Upon completion of this chapter, a student will be able to:
1. Determine the potential of voltaic cells
2. Determine the direction of current flow in an electrochemical cell
3. Sketch and diagram an electrochemical cell
4. Utilize the Nernst equation to calculate the E at non-standard conditions

TOPICS
1. Oxidation Reduction Reactions
2. Voltaic Cells
3. Standard Voltages
4. Relations Between E°, ΔG°, And K
5. Effect of Concentration on Voltage
6. Electrolytic Cells
7. Commercial Cells

Chapter 18 - Chemistry of Metals (Section 20.2)

Instructional Objectives: The student will be assisted in:

1. Learning the chemical properties of alkali and alkaline earth metals

Behavioral Objectives: Upon completion of this chapter, a student will be able to:

1. Write chemical equations for the reaction of alkali and alkaline metals with hydrogen, water, and oxygen.

TOPICS

1. Chemical Properties of Alkali and Alkaline Earth Metals
2. Reactions of Alkali and Alkaline Earth Metals With Hydrogen, Water, and Oxygen

Chapter 19- Transition Metals and Coordination Chemistry

Instructional Objectives: The student will be assisted in:

1. Occurrence, preparation, and properties of transition metals and their compounds
2. Coordination chemistry of transition metals
3. Spectroscopic and magnetic properties of coordination compounds

Chapter 21 – Nuclear Reactions

Instructional Objectives: The student will be assisted in:

1. Learning the various modes of radioactive decay.
2. Understanding and writing nuclear equations.
3. Learning about some of the applications of nuclear reactions.
4. Learning about radioactive decay and dating of materials.
5. Understanding nuclear binding energy.
6. Distinguishing between nuclear fission and nuclear fusion

Behavioral Objectives: Upon completion of this chapter, a student will be able to:

1. Distinguish amongst the various modes of radioactive decay.
2. Predict the products and write the equation for a radioactive decay process.
3. Calculate the quantity of radioactive material present.
4. Calculate the time for radioactive decay and age of an object.
5. Calculate the energy equivalent to a given change of mass for a nuclear reaction.
6. Calculate the binding energy for a nuclide.

TOPICS

1. Radioactivity
2. Rate of Radioactive Decay
3. Mass – Energy Relations
4. Nuclear Fission and Fusion

SUPPLEMENTARY READING FOR LABORATORY EXPERIENCE

Appendices A -M

Pages 1209 - 1336

SPECIAL ACCOMMODATIONS

Clark Atlanta University is committed to providing students with a documented disability an equal opportunity to pursue a college education. Efforts will be made to meet requests for reasonable accommodations for those eligible under the Americans with Disabilities Act (ADA) of 2008, the Rehabilitation Act of 1973 and Section 504. Students with disabilities are encouraged to contact the Office of Counseling and Disability Services at (404-880-8044) located on the 3rd floor of Trevor Arnett Hall to discuss accommodations. Once reasonable accommodations are determined, it is the student's responsibility to present the Letter of Accommodation from The Office of Counseling and Disability Services to their professors.

If you have already documented a disability or other condition that would qualify you for special accommodations, or if you have emergency medical information or special needs I should know about, please notify me during the first week of class. You can reach me by phone or e-mail, or you can schedule an appointment to meet with me.

KNEWTON

Introducing Knewton

Providing Context

What is Knewton?

Knewton is an adaptive online learning tool that takes a personalized approach to education. It pinpoints exactly what you need to learn now, and exactly what you need to learn next. Knewton supports and guides you, just like a 1:1 tutor. Your instructor will use Knewton to assign homework, quizzes, and tests. You and your instructor can track your progress and offer additional help if you need it during the course of the semester.

How will I learn with Knewton?

The way you work in Knewton may be different than what you are used to. When you answer a question correctly OR incorrectly it impacts your progress and determines what you will learn next. If you guess or try to skip through an assignment, you will create more work for yourself. Each assignment varies from student to student, so you may answer 10 questions, while your peer answers 12 depending on your understanding and performance.

So remember...

Every answer counts! Do your best to answer questions correctly, in the format that's required. Guessing to move past a question can actually make your assignment take longer! Instead, click "More Instruction." This won't hurt your progress — you'll get extra help with instructions and review questions to help you move forward.

Don't skip ahead! Read assignment instructions and watch the videos as they appear. Skipping instructional materials won't change your grade, but you can miss important information.

Purchase & Registration

You will need to purchase Knewton access. The OpenStax text book is available free of cost for this course.

TO REGISTER THROUGH AN LMS: Within the CANVAS course, click on any assignment link. CANVAS will redirect you to knewton.com and auto-create an account for you using the school email address tied to your LMS. Then proceed to step one on the list below to complete purchase.

How to Get Help

For Technical Problems

Use the "Feedback" button anywhere in Knewton to capture a screenshot and send all relevant technical information to our 24/7 Client Services team.

For Content Errors

Click the stacked dot icon next to any piece of content to Report an Issue. This ensures that the report goes directly to Knewton's content team to be fixed.

For Academic Support

If you're stuck, click "More Instruction" to complete review that DOES NOT impact your progress. If you need additional help, you should reach out directly to your instructor.

Clickable Student Resources

For Students Using Knewton with an LMS

Getting Started with Knewton for Students (LMS)
Knerd Tips for Students (LMS)

For Students Using Knewton without an LMS

Getting Started with Knewton
Knerd Tips for Students

Course Syllabus
Clark Atlanta University
School of Arts and Sciences

Fall 2019

Department of Chemistry,

COURSE TITLE: General Chemistry II

COURSE NUMBER: CCHE 112

I have received, read, and understand the syllabus and the level of effort and performance expected of me in this class. I understand that academic dishonesty of any kind will not be tolerated and is grounds for the instructor to immediately enter a grade of F and dismiss a student from the course. I understand that I am not allowed to use a cell phone in any manner during class without the explicit permission or instruction from the course instructor.

I am also FUULY UNDERSTAND that all exams or tests are timed. At the end of the exam or test my graded materials will be collected. NO TIME WILL BE ADDED in order for me to complete my missing answers. My paper or scantron will be GRADED AS IS at the end of the test or exam period.

I am/will currently enroll in CCHE 112 lab.

Name _____ Signature _____
Print

Date _____

Email address: _____

Keep for your records

Course Syllabus
Clark Atlanta University
School of Arts and Sciences

Fall 2019

Department of Chemistry,

COURSE TITLE: General Chemistry II

COURSE NUMBER: CCHE 112

I have received, read, and understand the syllabus and the level of effort and performance expected of me in this class. I understand that academic dishonesty of any kind will not be tolerated and is grounds for the instructor to immediately enter a grade of F and dismiss a student from the course. I understand that I am not allowed to use a cell phone in any manner during class without the explicit permission or instruction from the course instructor.

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I am/will currently enroll in CCHE 112 lab.

Name _____ Signature _____
Print

Date _____

Email address: _____

Complete, sign, and return course instructor

Request to Use Prior CCHE 112 Lab Grade

I have previously completed CCHE 112L at Clark Atlanta University and desire to use a passing lab grade (P) from a prior semester and not register or enroll in CCHE 112L this semester. Since > 60% is a pass, and the numerical grade I achieved will be used to calculate my final lecture grade. I understand that by utilizing a low passing lab grade from a prior semester it may adversely affect my grade in this course.

I am requesting to use my lab grade for CCHE112 from:

Academic year _____

Semester: Fall, Spring, Summer *(circle one)*

Faculty member that taught the **lab** in the desired year & semester _____

Faculty member that taught the **lecture** in the desired year & semester _____

900 # _____

Name _____ Signature _____
Print

Date _____

Email address: _____

Complete, sign, and return course instructor

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Granted or Denied (circle one). Comments: