MOREHOUSE COLLEGE

CHEM 111 – ELEMENTARY INORGANIC CHEMISTRY I
LECTURE
COURSE REQUIREMENTS
FALL 2019

Class Time: MWF 10:00 – 10:50 am **Lecture Room:** Merrill Hall 111

Professor: Dr. Muhsinah L. Morris **Office:** Merrill Hall 104/Ste. 105A

Phone: 470-639-0443 **e-mail:** muhsinah.morris@morehouse.edu
Cell Phone: 404-290-0361

Office Hours: WF 12-1 pm; Otherwise, by appointment only.

OBJECTIVE: To familiarize students with fundamental principles and topics of elementary general chemistry and its applications.

DESCRIPTION: This is an instructional, lecture-based course in general chemistry for those whose majors or areas of interest are in science, engineering and other technology related fields.

REQUIREMENTS: CHEM 111R (recitation) and CHEM 111L (laboratory) are co-requisites for this course. The Department will confirm the co-requisites for each student in this class. If a student is found to not have the proper prerequisites and co-requisites, they will be immediately and involuntarily withdrawn from the course, regardless of time spent in the course or performance in the course. If you believe that you do not have the proper prerequisites and co-requisites, or you have questions regarding the prerequisites and co-requisites, you should notify your instructor immediately.

TEXT & MATERIALS: The textbook for this course Chemistry, *Steven S. Zumdahl, Susan A. Zumdahl, and Donald J. DeCoste*, 10th edition, Brooks Cole. ISBN-10: 1305957407 ISBN-13: 9781305957404 . The instructor, when appropriate, will provide supporting materials and handouts

COURSE PRESENTATION: Course presentation will be in the form of lectures, demonstrations and presentations. Lectures will consist of reviews from previous readings and lots of problem solving. Make sure to bring notes, problem sets, and additional questions to lecture each class period.

ATTENDANCE: Morehouse college attendance rules will be enforced. The student is REQUIRED to be on time for the class. Any student who is more than *five minutes late will not be allowed to attend the class*. Any student who exceeds three unexcused absences will be withdrawn from the course. Students are expected to attend all class meetings. In the event of absence, it is the student's responsibility to obtain assignments and information covered during the absence. It is also the student's responsibility to complete withdrawal through the Office of the Registrar in the event that this becomes necessary. Students should also plan to arrive to class **on time**. The instructor reserves the right to deny classroom entry of tardy students. Withdrawal from lecture automatically requires withdrawal from the lab and vice versa. A roll sheet may be circulated at the beginning of class. A student who arrives late may sign it at the end of class.

COURSE DESCRIPTION AND GRADING: Students must earn a grade of C or better to pass the course. If a student receives a grade of C- or less, they will not be allowed to register in the next course in the chemistry sequence. All grades are final! No adjustments to grades will be made after the close of semester, except for the grade of incomplete, I (see below). There will be four *hour* exams and the final exam. The final exam is required. **No make-up exams will be given without an official College excuse**. The course grade is obtained by averaging the **three highest hour exams and the final exam**, which weighs twice as heavily as an individual hour exams. If one of the class exams is missed that exam becomes the dropped exam. The grading scale is as follows:

100-93	A+
89-92	A
85-88	A-
82-84	B+
79-82	B
75-78	B-
72-74	C+
69-72	C
65-68	C-
60-64	D+
55-59	D
50-54	D-
0-50	F

Evaluation Scale

Quizzes	25%
Problem Sets	15%
Exams	35%
Final Exam	25%

INCOMPLETE: A grade of incomplete will be given only when a student has completed the majority of the course requirements, as specified by the instructor and provide a written excuse, signed by the appropriate university official excuse (e.g., Dean of Students, Division Dean, etc.) indicating a legitimate reason for not completing the course by the close of semester, is provided by the Vice President of student affairs. The student must complete the required course work in the next semester on or before the date indicated by the Registrar's Office or the grade will be converted into an "F".

ACADEMIC HONESTY: The College's policy on academic honesty will be strictly enforced. Cheating on homework, quizzes, and examinations will not be tolerated and will result in a grade of zero on the assignment for the first offense, and in immediate involuntary withdrawal from the course with a failing grade, for a second offense. Plagiarism is a violation of the Honor Code and will be punished with a grade of zero on the assignment for the first offense and a grade of "F" on the course for the second offense. Cheating and plagiarism will not be tolerated. Cheating or plagiarism will result in a zero for the exam or paper. A second offense will result in an F grade and be reported to the student court.

DISRUPTIVE ACTIONS: Students are expected to act with respect for the professor and fellow students. If late, enter and take a seat quietly. Talking to others in the class during lecture/discussion prevents others from hearing the proceedings. Leaving class during session is disruptive and should occur only in an emergency. Disruptive persons will be warned.

TIME REQUIREMENTS: The amount of time outside of class needed to be successful in this class varies with background, study skills, interest, motivation, and intellectual ability. To be successful, expect 8 or more hours per week outside of class to study and do homework. Students must develop skill in solving problems and this can only be obtained by doing the homework. The laboratory

component is separate and requires additional time. Expect approximately 3 hours at home to prepare for lab sessions, calculate results, and prepare reports. Careful attention and good use of class time can reduce the time required outside of class.

PROBLEM SETS AND QUIZZES: Problem sets and other homework will be collected at the appropriate hour exam on the day of the exam unless told otherwise. Quizzes will be given regularly and are generally announced. There may be unannounced "pop" quizzes in class. It is recommended that you form a study group with classmates that will meet regularly.

DISABILITIES AND IMPAIRMENTS: Morehouse College is an equal opportunity employer and educational institution. The College makes reasonable accommodations for all qualified individuals with disabilities. Any student requesting academic accommodations based on his disability is required to register with our Student Counseling & Disability Center (the "Center") at 104 Sale Hall Annex, Suite 100 every semester. A disability accommodation letter can be obtained from ODS. Students are required to provide a copy of the disability accommodation letter to each of their professors upon approval of their accommodations. Please contact our Coordinator of Disability and Counseling Services with any questions at (470) 639-0231.

DISCLAIMER: The syllabus is not a contract between the instructor and the student, but rather a guide to course procedures. The instructor reserves the right to amend the syllabus when conflicts, emergencies or circumstances so dictate. In such cases, students will be duly notified. Similarly, the instructor reserves the right to alter the course content and assignments based on new materials, class discussions, or other legitimate pedagogical objectives.

EDUCATIONAL OUTCOMES: At the end of this lecture course, students should be able to:

CHAPTER ONE: CHEMICAL FOUNDATIONS

Section One: To appreciate the importance of creative problem solving.
Section Two: To identify the principal operations and limitations of the scientific method. Section Three: To describe the SI system of units and prefixes.
Section Four: To identify causes of uncertainty in measurement. To show how significant figures are used. To compare precision and accuracy in measurement.
Section Five: To show how to determine the number of significant figures in a calculated result.
Section Six: To show a general method of solving problems.
Section Seven: To show how to convert units between the English and metric systems. Section Eight: To demonstrate conversions among the Fahrenheit, Celsius, and Kelvin temperature scales.
Section Nine: To illustrate calculations involving density.
Section Ten: To show how matter can be classified into subgroups.

CHAPTER TWO: ATOMS, MOLECULES, AND IONS

Section One: To give a brief account of early chemical discoveries.

Section Two: To describe and illustrate the laws of conservation of mass, definite proportion, and multiple proportions.
Section Three: To describe Dalton's theory of atoms and show the significance of Gay-Lussac's experiments.
Section Four: To summarize the experiments that characterized the structure of the atom. Section Five: To describe features of subatomic particles.
Section Six: To introduce basic ideas of bonding in molecules. To show various ways of representing molecules.
Section Seven: To introduce various features of the periodic table.
Section Eight: To demonstrate how to name compounds given their formulas and to write formulas given their names.

CHAPTER THREE: STOICHIOMETRY

Section One: To give a brief account of early chemical discoveries.
Section Two: To describe and illustrate the laws of conservation of mass, definite proportion, and multiple proportions.
Section Three: To describe Dalton's theory of atoms and show the significance of Gay-Lussac's experiments.
Section Four: To summarize the experiments that characterized the structure of the atom. Section Five: To describe features of subatomic particles.
Section Six: To introduce basic ideas of bonding in molecules. To show various ways of representing molecules.
Section Seven: To introduce various features of the periodic table.
Section Eight: To demonstrate how to name compounds given their formulas and to write formulas given their names.

CHAPTER FIVE: GASES

Section One: To demonstrate atmospheric pressure and explain how barometers work. To define the various units of pressure.
Section Two: To describe certain laws that relate the volume, pressure, and temperature of a gas and to do calculations involving these laws.
Section Three: To define the ideal gas law. To show how to do calculations involving the ideal gas law.
Section Four: To define the molar volume for an ideal gas. To define STP. To show how to do stoichiometric calculations for reactions involving gases. To show how to calculate molar mass from gas density.
Section Five: To state the relationship between partial pressures and total pressure and between partial pressure and mole fraction. To show how to obtain the molecular formula, given the empirical formula and the molar mass.
Section Six: To present the basic postulates of the kinetic molecular theory. To define temperature. To show how to calculate and use root mean square velocity.
Section Seven: To describe effusion and diffusion. To show the relationship between effusion and diffusion.
Section Eight: To describe how real gases deviate from ideal behavior. To show how van der Waals's equation allows for real conditions.
Section Nine: To characterize several real gases.
Section Ten: To characterize the composition of the atmosphere. To describe some of the chemistry of air pollution.

CHAPTER SEVEN: ATOMIC STRUCTURE AND PERIODICITY

Section One: To characterize electromagnetic radiation in terms of wavelength, frequency, and speed.
Section Two: To introduce the concept of quantized energy. To show that light has both wave and particulate properties. To describe how diffraction experiments were used to demonstrate the dual nature of all matter.
Section Three: To show that the line spectrum of hydrogen demonstrates the quantized nature of the energy of its electron.
Section Four: To describe the development of the Bohr model for the hydrogen atom. Section Five: To show how standing waves can be used to describe electrons in atoms. To describe the Heisenberg uncertainty principle. To explain the significance of electron probability distributions.
Section Six: To explain the quantum numbers n, l, and ml.
Section Seven: To describe the shapes of orbitals designated by s, p, d, and f and to discuss orbital energies.
Section Eight: To define electron spin and the electron spin quantum number. To explain the Pauli exclusion principle.
Section Nine: To show how the quantum mechanical model can be applied to atoms besides hydrogen.
Section Ten: To trace the development of the periodic table.
Section Eleven: To explain the Aufbau principle.
Section Twelve: To show general trends in ionization energy, electron affinity, and atomic radius in the periodic table.
Section Thirteen: To show what types of information can be obtained from the periodic table.

CHAPTER EIGHT: BONDING: GENERAL CONCEPTS

Section One: To explain why an ionic bond is formed. To explain why a covalent bond is formed. To introduce the polar covalent bond.
Section Two: To discuss the nature of a bond in terms of electronegativity.
Section Three: To define the relationship between bond polarity and molecular polarity. Section Four: To show how to predict the formulas of ionic compounds. To discuss the factors governing ion size.
Section Five: To define lattice energy and show how it can be calculated.
Section Six: To show the relationship between electronegativity and the ionic character of a bond.

Section Seven: To discuss the covalent bonding model.
Section Eight: To show how bond energies can be used to calculate heats of reaction. Section Nine: To introduce the localized electron model.
Section Ten: To show how to write Lewis structures.
Section Eleven: To show how to write Lewis structures for certain special cases.
Section Twelve: To illustrate the concept of resonance. To show how to write resonance structures.
Section Thirteen: To describe how molecular geometry can be predicted from the number of electron pairs.

CHAPTER NINE: COVALENT BONDING: ORBITALS

Section One: To show how special atomic orbitals are formed in covalent bonding. Section Two: To show how molecular orbitals are formed in a molecule. To define bond order and demonstrate how to calculate it.
Section Three: To discuss the bonding in certain molecules of the general formula X2. To relate paramagnetism to the filling of molecular orbitals. To correlate bond order, bond energy, and bond length.
Section Four: To use the molecular orbital model to treat bonding between two different atoms.
Section Five: To show how the need for resonance is eliminated if the localized electron and molecular orbital models are combined.
Section Six: To show how photoelectron spectroscopy (PES) can be used to give information about the energies of electrons in molecules.

MOREHOUSE COLLEGE
ELEMENTARY INORGANIC CHEMISTRY 112
COURSE REQUIREMENTS
SPRING 2020

PROFESSOR:	Brian M. Lawrence
OFFICE:	342 Merrill Hall
PHONE NUMBER:	470-639-0700
EMAIL:	brian.lawrence@morehouse.edu

OFFICE HOURS:	F 3:00n – 5:00p (open) and Th 1:00p – 4:00p (by appointment)
LECTURE TIME:	MWF
PLACE:	Merrill Hall Room 111
HOURS:	10:00-10:50

Office hours are a great time to catch up on the week's important topics, ask a question or two, or sometimes just sit and listen in. Students are encouraged to engage with the instructor in this open forum, or when warranted, have a one-on-one meeting.

TEXTBOOK:
Chemistry, 10th Edition, by Steven S. Zumdahl and Susan A. Zumdahl, BROOKS/COLE

COURSE DESCRIPTION:
Designed to give the aspiring scientist/engineer a firm foundation in chemistry with which to begin his/her technical career, this two-semester course sequence (111/112) provides an overview of the different sub-disciplines of Chemistry. This course will demonstrate to students the importance and impact that both science and chemistry, in particular, have on society. Students will become proficient in the application of the basic tools of chemistry; experimentation and measurement (as they relate to the three common states of matter); basic chemical nomenclature and reactivity types; as well as phases of matter and phase changes, solutions and properties therein, rates of reactions, chemical equilibrium, thermodynamics, electrochemistry, and chemical structure.

PRE-REQUISITES:
A grade of C or better in both Chemistry 111 and Chemistry 111L; concurrent registration in Chemistry 112L

> NOTE: The Department will confirm the prerequisites and co-requisites for each student in this class. If a student is found to not have the proper prerequisites and co-requisites, they will be immediately and involuntarily withdrawn from the course, regardless of time spent in the course or performance in the course. If you believe that you do not have the proper prerequisites and co-requisites, or you have questions regarding the prerequisites and co-requisites, you should notify your instructor immediately.

COURSE PRESENTATION:
Course presentation will be in the form of lectures, small group exercises, demonstrations, and on-line presentation/exercises.

COURSE OBJECTIVE:
The student is expected to become proficient in the knowledge of chemistry and its governing scientific principles.

ATTENDANCE:
Morehouse College attendance rules will be enforced. Students are expected to attend each class meeting. Students with more than three (3) unexcused absences will be referred to the Office of Student Success and may be administratively withdrawn from the course. Failure to meet minimum attendance requirements may result in the loss of the student's financial aid in accordance with federal financial aid requirements.

INCLEMENT WEATHER POLICY:
In the event of inclement weather, the College will announce any closures via the emergency notification system and/or through local news outlets. Absent an official closure, students are not excused from attending class due to weather and any absences will be considered unexcused.

EXAMINATION SCHEDULE AND GRADING ALGORITHM

There will be four (4) in-class examinations and one final examination given during this semester. Consult the online course syllabus/calendar for dates and times. Please note that MAKE-UP EXAMINATIONS WILL NOT BE GIVEN UNDER ANY CIRCUMSTANCE. In the event that a student does miss one in-class examination (regardless of the cause), grading option II will be used by default.

In-Class Examination #1	February 10, 2020
In-Class Examination #2	March 6, 2020
In-Class Examination #3	April 3, 2020
In-Class Examination #4	April 29, 2020
Final Examination	May 5, 2020 (tentative)

Course Grading:

Option I		Option II	
Problem Sets	10%	Problem Sets	10%
In-class examinations	60%	In-class examinations	45%
Final examination	30%	Final examination	45%
Composite	87.5 – 100%	Composite	87.5 – 100%
Homework (Sapling)	0 – 12.5%	Homework (Sapling)	0 – 12.5%

There are two (2) grading options available Chemistry 112. The grading option that results in a higher overall score for a student will ultimately be utilized to compute that student's final course grade.

EVALUATION:
Students must earn a grade of "C" or better to pass this course. If a student receives a grade of C- or less in this class, they will not be allowed to register in the next chemistry course along this sequence. Please note that all grades are final. No adjustments to grades will be made after the close of semester, except in the case of the grade of incomplete, "I" (see below) or incorrect grades given due to instructor error.

Grading Scale:	90 – 100	A
	85 – 89	A-
	80 – 84	B+
	75 – 79	B
	70 – 74	B-
	65 – 69	C+
	60 – 64	C
	55 – 59	C-
	50 – 54	D
	Below 50	F

RECITATION:
Recitation is provided to support you in your efforts to be successful in this course. When you register into a lab for this course, you will also be registered into a recitation session for chemistry, as well. This spring, the Department of Chemistry will continue Peer-Led Team Learning, a proven strategy that helps students become more independent thinkers in their chemistry coursework. Participation in these weekly sessions is required to receive full-credit towards your course grade. To receive said credit for Peer-Led Team Learning, it is expected that a student attend and actively participate in each of these weekly sessions.

INCOMPLETE:
A grade of incomplete will be given only when a student has completed the majority of the course requirements, as specified by the instructor. The student must provide a written excuse, signed by the appropriate university official excuse (e.g., Dean of Students, Division Dean, etc.) indicating a legitimate reason for not completing the course by the close of semester, the student must complete the required course work in the <u>next</u> semester on or before the date indicated by the Registrar's Office or the grade will be converted into an "F".

ACADEMIC HONESTY:
Morehouse College students are expected to conduct themselves with the highest level of ethics and academic honesty at all times and abide by the terms set forth in the Student Handbook and Code of Conduct. Instances of academic dishonesty, including, but not limited to plagiarism and cheating on examinations and assignments, are taken seriously and may result in a failing grade for the assignment or course and may be reported to the Honor and Conduct Review Board for disciplinary action. For this course, cheating on homework, quizzes, and examinations will not be tolerated and will result in a grade of zero on the assignment for the first offense, and for a second offense, the student will be immediately and involuntarily withdrawn from the course, and will receive a grade of "F". A second offender will also be reported to the Honor and Conduct Review Board for disciplinary action, including possible dismissal from the College.

HOMEWORK / PROBLEM SETS:
Homework problems from Sapling Learning (*for supplementary credit*) will be assigned at regular intervals. They will be due periodically over the course of the semester, unless specified otherwise. In addition, your instructor requires the completion of original problem sets and/or problems from your textbook (*for credit*) to be completed at the student's own pace. They will be due on the dates corresponding to each in-class examination. Problem sets turned in after the due date/time will receive no credit without exception.

To access online homework, students will need to:

- Visit http://saplinglearning.com. Click/Select "US Higher Ed" button at the top right
- If you already have a Sapling Learning account, log in then skip to the next step. Otherwise, you will need to create an account. If you have Facebook account, you can use it to quickly create a Sapling Learning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and time zone (Eastern), accept the site policy agreement, and click "Create my new account". If you do not have a Facebook account or would rather not create a login this way, click/select "create account" to begin this process. Supply the requested information and click "Create my new account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
- Once you have logged into your account, find your course in the list of courses offered (you may need to expand the subject and term categories) and click the link.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up - and throughout the term - if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling support team is almost always more able (and faster) to resolve issues than your instructor.

Official Course Web Site
All lecture media will be made available via BlackBoard Learn. It is recommended that you check online resources regularly throughout the semester for lectures and other information pertaining to the course. If you require assistance in accomplishing these tasks, please see the instructor.

NOTE: A syllabus is not a contract between instructor and student, but rather a guide to course procedures. The instructor reserves the right to amend the syllabus when conflicts, emergencies, or circumstances dictate, and students will be duly notified of such an event.

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CHEMISTRY 112
ELEMENTARY INÓRGANIC CHEMISTRY II

SPRING 2020 — List of Topics / Examination Schedule

(dates subject to change)

Unit Starts…	Topic of Study

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MOREHOUSE COLLEGE
CHEM 211 – ANALYTICAL CHEMISTRY
LECTURE
COURSE REQUIREMENTS
FALL 2019

CLASS TIME: MWF 11:00 – 11:50 am **LECTURE ROOM:** Merrill Hall 118

PROFESSOR: Dr. Muhsinah L. Morris **OFFICE:** Merrill Hall 103

PHONE: 470-639-0443 **Cell Phone:** 404-290-0361

E-MAIL: muhsinah.morris@morehouse.edu

OFFICE HOURS: WF 12-1 pm
Otherwise, by appointment only.

OBJECTIVE: To familiarize students with fundamental principles and topics of analytical chemistry and its applications.

DESCRIPTION: This is an instructional, lecture-based course in analytical chemistry for those whose majors or areas of interest are in forensic chemistry, environmental science, sustainable energy techniques and methods.

REQUIREMENTS: You must have successfully passed CHEM 111/112 and the accompanying recitation and laboratory with a grade of C or better. The Department will confirm the prerequisites and co-requisites for each student in this class. If a student is found to not have the proper prerequisites and co-requisites, they will be immediately and involuntarily withdrawal from the course, regardless of time spent in the course or performance in the course. If you believe that you do not have the proper prerequisites and co-requisites, or you have questions regarding the prerequisites and co-requisites, you should notify your instructor immediately.

REQUIRED TEXT & MATERIALS:
Quantitative Chemical Analysis. 9th ed,
by Daniel C. Harris.
Publisher W.H. Freeman and Co.

ISBN: 9781464135385. The instructor, when appropriate, will provide supporting materials and handouts. **The study guide for the textbook will include end of chapter problems in the text and classroom problems.**

SUPPLEMENTAL MATERIALS:
COURSE PRESENTATION: Course presentation will be in the form of lectures, demonstrations, and presentations.

HOMEWORK (PROBLEM SETS): Homework is assigned for each chapter at the beginning of the chapter. It's highly recommended that you come to office hours to make sure that you understand all homework problems. All homework assignments are due **BEFORE** the exam for each student to receive full credit. Late homework will **NOT** be accepted.

ATTENDANCE: Morehouse college attendance rules will be enforced. The student is REQUIRED to be on time for the class. Students are expected to attend all class meetings. In the event of absence, it is the student's responsibility to obtain assignments and information covered during the absence. It is also the student's responsibility to complete withdrawal through the Office of the Registrar in the event that this becomes necessary. Students should also plan to arrive to class **on time**. The instructor reserves the right to deny classroom entry of tardy students. Withdrawal from lecture automatically requires withdrawal from the lab and vice versa. A roll sheet may be circulated at the beginning of class. A student who arrives late may sign it at the end of class.

PARTICIPATION
Respectful discussion is encouraged during class. Dr. Morris may also ask questions of individual students during the lecture period. Chemistry can be a complex subject to understand and will require you to read the textbook and ask for help. The goal of participating in lecture is to make sure that learning chemistry is simple, fun, and exciting!

COURSE DESCRIPTION AND GRADING: Students must earn a grade of C or better to pass the course. If a student receives a grade of C- or less, they will not be allowed to register in the next course in the chemistry sequence. All grades are final! No adjustments to grades will be made after the close of semester, except for the grade of incomplete, I (see below). There will be four *hour long* exams and the final exam. The final exam is required. **No make-up exams will be given in this course**. One exam will be dropped at the end of the semester. The grading scale is as follows:

100-93	**A+**
92-89	**A**
88-85	**A-**
84-80	**B+**
79-75	**B**
74-70	**B-**
69-65	**C+**
64-60	**C**
59-55	**C-**
54-50	**D**
49-below	**F**

Category	Percent
Quizzes	15%
Exams	30%
Problem Sets/Homework	10%
Makerspace Project	20%
Final Exam	25%

COURSE PROJECT: Throughout the course, you will be working towards a culminating project using the principles used in each chapter. You will be required to use the **Makerspace at Morehouse College** to complete your final project. You will work on this project individually and in pairs. Each individual will be graded. Details of the final project will be given in class.

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TIME REQUIREMENTS: The amount of time outside of class needed to be successful in this class varies with background, study skills, interest, motivation, and intellectual ability. To be successful, expect 8 or more hours per week outside of class to study and do homework. Students must develop skill in solving problems and this can only be obtained by doing the homework. The laboratory component is separate and requires additional time. Expect approximately 3 hours at home to prepare for lab sessions, calculate results, and prepare reports. Careful attention and good use of class time can reduce the time required outside of class.

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DISABILITIES AND IMPAIRMENTS:
EEO & Disability Statement:
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sent electronically to each of your professors upon approval of your accommodations. Please contact our Director of Student Accessibility Services, Dr. Travis Sadler, with any questions at (470) 639-0252 and/or email SAS@morehouse.edu and/or Travis.Sadler@morehouse.edu

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EDUCATIONAL OUTCOMES: At the end of this lecture course, students should be able to:

- Define & differentiate analytical chemistry, analytical techniques, and instruments.
- Describe the statistical calculations that are used in analytical chemistry.
- Define and distinguish between a hypothesis, theory, and scientific law as it applies to analytical chemistry and techniques.
- State and describe the use of analytical chemistry in environmental science, forensic science, and chemistry.
- List, define, and explain four different types of instruments used in analytical analysis.
- Read, interpret, and present a current research article produced in the Journal of Analytical Chemistry, Environmental Chemistry, or Forensic Science.
- Define mixture, pure substance, element, and compound, heterogeneous, homogeneous.
- Develop of method of testing the precision of differently sized containers for liquid and solid ingredients.
- Define and understand the difference between physical and chemical changes.
- Provide examples of and classify physical and chemical changes.
- Define and distinguish the difference between physical and chemical properties.
- Define energy, work, kinetic energy, potential energy, thermal energy.
- State and interpret the law of conservation of energy.

- Define system of measurement, English system, metric system, International System (SI).
- Calculate mean, standard deviations, and distribution factors for a set of data.
- Perform student T-tests, ANOVA, and Tukey statistical test given a set of data.
- Use Excel to carry out various analytical calculations and generate graphs.
- Create graphs using Excel (or other graphing software) from a given set of data that depict values on X-axis, Y-axis, and legends.

TENTATIVE SCHEDULE FOR FALL 2017

	Read Chapters	Topic	Notes
		1st Day of Class Syllabus Review and Expectations	
		Pre-Assessment Exam	
	Chapter 0 The Analytical Process	The Analytical Chemist's Job	
	Chapter 0 The Analytical Process	General Steps in a Chemical Analysis	
	Chapter 1 Chemical Measurements	SI Units; Chemical Concentrations	
	Chapter 1 Chemical Foundations	Preparing Solutions; Stoichiometry Calculations for Gravimetric Analysis	
	Chapter 7 Let the Titrations Begin	Titrations; Titration Calculations, End Point Detection	
	Chapter 0, 1, and 7 Problem Set	Problem Set #1	Work Problems in Class
		NO CLASS Labor Day	

	Chapters 0, 1, and 7	Problem Set #1	Work Problems in Class
	Chapters 0, 1, and 7		Quiz #1
	Chapters 0, 1, and 7	Problem Set #1	Work Problems in Class
	Chapters 0, 1, and 7	***Exam #1***	
	Chapter 2 Tools of the Trade	Safe, Ethical Handling of Chemicals and Waste; The Lab Notebook; Analytical Balance; Burets; Volumetric Flasks; Pipets and Syringes; Filtration; Drying; Calibration of Volumetric Glassware	
	Chapter 2 Tools of the Trade	Introduction to Microsoft Excel; Graphing with Microsoft Excel	Bring Laptop to class
	Makerspace Project Module 1	Learning the Software for 3D Design	
	Makerspace Project Module 2	Touring the Makerspace; Learning how Analytical Calibrations are done on Measuring Equipment	
	Chapter 3 Experimental Error	Significant Figures; Significant Figures in Arithmetic; Types of Errors	Quiz #2 Chapter 2 Tools of the Trade

	Chapter 3 Experimental Error	Types of Error; Propagation of Uncertainty from Random Error	
	Chapter 3 Experimental Error	Propagation of Uncertainty from Systematic Error	
	Chapter 2 and 3	Problem Set #2	Work Problems in Class
	Chapter 2 and 3	Problem Set #2	Work Problems in Class
	Chapters 2 and 3	***Exam #2***	
	FALL BREAK	***NO CLASS***	
	Chapter 4 Statistics	Gaussian Distribution; Comparison of Standard Deviations using the F Test	
	Chapter 4 Statistics	Confidence Intervals; Comparison of Means using Student's t-test	
	Chapter 4 Statistics	Grubb's Test for an Outlier; The Method of Least Squares; Calibration Curves	
	Chapter 4 Statistics	Problem Set #3	Work Problems in Class
	Chapter 4 Statistics	Problem Set #3	Work Problems in Class
	Chapter 5 Quality Assurance and Calibration Methods	Basics of Quality Assurance; Method Validation	Quiz #3 Chapter 4
	Chapter 5 Quality	Standard Addition; Internal	

	Assurance and Calibration Methods	Standards	
	Chapter 5 Quality Assurance and Calibration Methods	Problem Set #4	Work Problems In Class
	Chapter 4 and 5 Review Problems	Work Problems in Class	
	Chapters 4 and 5	***Exam #3***	
	Chapter 6 Chemical Equilibrium	The Equilibrium Constant; Equilibrium and Thermodynamics	
	Chapter 6 Chemical Equilibrium	Solubility Product; Complex Formation	
	Chapter 6 Chemical Equilibrium	Protic Acids and Bases; pH; Strengths of Acids and Bases	
	Chapter 6 Chemical Equilibrium	Problem Set #5	Work Problems in Class
	Chapter 6 Chemical Equilibrium	Problem Set #5	Work Problems in Class
	Exam #4	***Chapter 6***	
	Makerspace Module #3	Printing Prototypes	
	Makerspace Module #4	Testing Prototypes	
		Thanksgiving Holidays	***NO CLASS***
		Thanksgiving Holidays	***NO CLASS***

	Chapters 0-7	Exam Review; Final Exam Study Review	Turn in Makerspace Papers
	Makerspace Project Presentations	***Final Project Presentations***	
	Chapters 0-7	**Final Examination**	

HCHE211L
Introduction to Analytical Chemistry Lab
Fall 2019
Course Syllabus

Classroom: Merrill Hall 203 **Class hours: Mondays 1:00 PM-4:00 PM**

Instructor: Dr. Muhsinah Morris **Email**: muhsinah.morris@morehouse.edu **Phone:** 470-639-0443

Office: Merrill Hall Suite 105A, Room 104 **Cell Phone:** 404-290-0361

A. Course Description

HCHE 211L is the introduction to analytical chemistry laboratory, designed to run in parallel with HCHE 211 lecture. You will be performing experiments using a variety of quantitative chemical analysis methods and techniques. Experiments done in this lab are typical for analytical chemists in everyday scientist jobs.

B. Required supplies

1. *Introduction to Analytical Chemistry Laboratory Manual* (Berry/Lichter/Martinez, 2010, edited by Morris 2016)
2. A bound laboratory notebook with numbered pages
3. Calculator
4. Safety goggles or glasses, and protective clothing
5. Ball point pen (any color except red)

C. Pre and Co-requisites

Pre-reqs: HCHE111/112 and HCHE 111L/112L
Co-req: HCHE211

D. Lab schedule

Date	Experiment (Chapter)
9-9	Check-In; Safety, Review of Lab techniques
9-30	Gravimetric determination of Phosphorus
10-21	Statistics and prepare dry Na_2CO_3 for following week
10-28	Acid base Titrations
11-4, 11-11	Makerspace 3D Printing
11-18	Testing of 3D Printed Materials for Precision and Accuracy
11-25	Final Presentation of Makerspace Projects

E. Grading Scheme

Students will be graded with the following percentages

1. Lab Reports	60%	
2. Makerspace Design		30%
3. Lab technique and skill		10%
Total:	60% + 30% + 10%	= 100 %

******LAB is worth 25% of your lecture grade!**

Reports (60%)

For each of the experiments you perform you will be handing in a lab report. Each lab report is given a point value indicated on the calendar (front page). The lab report must include the title, procedure, data/observations, calculations, conclusions/discussion and any excel files associated with the lab. Your lab report grade will also include your grade for pre-lab questions. Pre-lab questions are found in each chapter of the lab manual, usually before the procedure. **You must answer the pre-lab questions before lab or you will not be allowed entry, resulting in a zero for that lab.** If you forget to hand in a lab report, there will be a 20% per day penalty for handing it in late.

Makerspace Design (30%)

There will be a Makerspace Project Design grade given based on the Makerspace Project that you will be working on in class and lab. The design and how well it is executed will count towards your lab grade.

Lab technique (10%)

Each week that you come to lab, you will have your performance, your technique and your skill in the laboratory evaluated. The rubric for lab technique includes the following elements you will be evaluated upon:

– Always wear goggles?	– Punctual with their attendance?
– Always dressed appropriately for lab?	– Properly dispose of waste?
– Can set up apparatus correctly?	– Kept a good lab notebook?
– Work well independently?	– Utilize their time efficiently and leave on time?
– Did not use cell phone during lab?	– Always clean their area following experiment?
– Maintained proper safety measures?	– Show consideration for others?

F. Attendance policy

- **Attendance is mandatory to all sessions!**
- Any student who shows up without the required materials will not be allowed to do the lab. This means all of the requirements listed in section B AND the pre-lab.
- Missing a lab will lead to a zero for the report AND for the pre-lab.
- **Missing 3 labs or lab reports, automatically results in an F in the lab!!**
- Due to the space requirements and necessity of different chemicals for each lab, the stockroom cannot leave labs out after they are finished. Therefore, **each lab is only available to be performed during the week of lab.**

G. Honor code

Please remember that as a Morehouse College student you must abide by the provisions of the honor code (found in the *Morehouse College Bulletin* and *Student Handbook*) which prohibits any plagiarizing, copying work from

classmates, or cheating on exams. If I suspect that you have acted against the honor code you will be dealt with accordingly.

H. Disabilities

EEO & Disability Statement:

Morehouse College is an equal opportunity employer. As a Private Educational Institution, Morehouse College provides equal access to all qualified students with disabilities. If you are a student who is concerned you have a accessibility-related condition that is impacting your academic progress, you are required to register with our Student Accessibility Services at 104 Sale Hall Annex, Suite 100 at any time throughout the semester (Preferably in the beginning of the semester). An accessibility accommodation letter can be obtained from the Student Accessibility Services office. A copy of the accommodation letter will be sent electronically to each of your professors upon approval of your accommodations. Please contact our Director of Student Accessibility Services, Dr. Travis Sadler, with any questions at (470) 639-0252 and/or email SAS@morehouse.edu and/or Travis.Sadler@morehouse.edu

I. Suggestion for success

1. COME PREPARED TO LAB (read and understand the lab beforehand, prepare your lab notebook, bring all your required attire and materials). Make sure to go over chapter 1 of the lab manual to understand how to prepare your pre-lab.
2. Do not miss a single lab. Your score will be heavily affected by missing just one lab.
3. Keep a good lab notebook. This means writing the pre-lab up and filling in the data and observations and conclusions after each lab.
4. Prepare for lab with classmates. Discuss with your classmates the procedure and if possible ask students in the lecture if they have performed the lab and ask them for helpful hints so that you do not end up spending the full period (or more) to perform the lab that week. However, *do not copy other's procedures or lab reports!!!*
5. Treat this lab with respect and come to lab with a healthy attitude.