

**NORTH CAROLINA CENTRAL UNIVERSITY
DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY**

**CHEM 3200: INORGANIC CHEMISTRY
COURSE SYLLABUS FALL 2022**

Instructor:	Dr. A. Mohammed	E-mail:	amohammed@nccu.edu
Course number:	CHEM 3200	Office:	3202 Mary Townes
Course Title:	Inorganic Chemistry	Office Hours:	TR 2-3; W 10-12 (by appt.)
Phone:	(919) 530-6351	Lecture:	TR 11:35-12:50 SC 1223
Recitation:	M 1:00-1:50 SC 1233	Laboratory:	M 2:00-4:50 SC 3111

CATALOG DESCRIPTION: A systematic study of both the fundamental principles and the descriptive chemistry needed to understand the properties of the main group elements and their compounds. (Three lecture, one recitation, and three laboratory hours per week) Prerequisites: CHEM 1200.

GENERAL OBJECTIVE:

- To give the student an in-depth understanding of Inorganic Chemistry.

COURSE OBJECTIVES:

This course is a systematic study of both the fundamental principles and the descriptive chemistry needed to understand the properties of the main group elements and their compounds. The laboratory portion of the course will introduce some of the important techniques of synthesis and characterization that are used in inorganic, organometallic, and bioinorganic chemistry.

STUDENT LEARNING OUTCOMES:

1. Students will have the ability to use the Periodic Table as a tool to predict the type of bonding present in elements and simple binary compounds.
2. Students will apply VSEPR theory to determine molecular geometry, bond angles, and polarity.
3. Students will construct thermodynamic cycles to calculate unknown bond energies or reaction enthalpies.
4. Students will be able to determine the symmetry and points groups of simple molecules.
5. Students will assign oxidation states to all the atoms in a substance using the Periodic Table as a guide.
6. Students will be able to balance oxidation-reduction reactions in acidic or basic solutions.
7. Students will be able to synthesize, isolate, purify, and characterize different types of inorganic compounds in the laboratory.

REQUIRED TEXTBOOK: Inorganic Chemistry, 5th Edition by Gary L. Miessler, Paul J. Fisher, and Donald A. Tarr. Pearson Publishers, 2014

RECOMMENDED TEXTBOOK: Descriptive Inorganic Chemistry, 6th Edition by Geoff Rayner-Canham, and Tina Overton. W.H. Freeman and Company, 2014.

RECOMMENDED TEXTBOOKS (FREE)

1. [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_\(Miessler_Fischer_Tarr\)](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_(Miessler_Fischer_Tarr))
2. [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_\(Housecroft\)](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_(Housecroft))
3. https://en.wikibooks.org/wiki/Introduction_to_Inorganic_Chemistry
4. [OpenStax - Chemistry 2e](#)

INORGANIC MOLECULAR MODEL KIT

As an additional course resource, I encourage you to purchase an inorganic molecular model kit in order to best see and understand 3D molecular shapes, which is an important concept for the course.

APPROXIMATE SCHEDULE OF TOPICS

<u>TOPIC</u>	<u>CHAPTER</u>
Atomic Structure and Periodic Properties	2
Simple Bonding Theory	3
Molecular Orbitals	5
Acid-Base and Donor-Acceptor Chemistry	6
The Crystalline Solid State	7
Oxidation and Reduction	GR-C/TO
Symmetry and Group Theory	4
Chemistry of Main Group Elements	8
Coordination Chemistry I: Structures and Isomers	9
Coordination Chemistry II: Bonding	10
Coordination Chemistry III: Electronic Spectra	11
Coordination Chemistry IV: Reactions and Mechanisms	12

LABORATORY EXPERIMENTS (TENTATIVE LIST):

1. Introduction to Computational Chemistry
2. Computational Chemistry, Part II
3. Preparation of an Explosive: Nitrogen Triiodide Ammoniate ($\text{NI}_3 \cdot \text{NH}_3$)
4. Microscale Synthesis of $\text{MoO}_2(\text{acac})_2$
5. Exploring Photographic Chemistry
6. Intermolecular Forces
7. Thermochemistry and Complex Ions
8. Preparation and Properties of an Aqueous Ferrofluid

Some of the experiments may require more time than the laboratory period. The handouts usually state the estimated time required for the experimental procedures, so plan before coming to the lab. Unlike organic chemistry, many of the materials we will be using cannot simply be stored until the next lab period, so you must finish what you start. BE PREPARED! READ THE LAB BEFORE CLASS!

REPORTS: A report will be required for each experiment. Separate documents will discuss both the format and requirements. The quality of your report will be a major factor in grade assignment. Ask questions if you are not sure of the proper format! Reports will be word-processed.

SAFETY: While you are in the laboratory, SAFETY GOGGLES WILL BE WORN AT ALL TIMES. Failure to do so will result in expulsion from the laboratory and you will receive a “zero” for the experiment. Avoid wearing open-toed shoes, shorts, or contact lenses to the laboratory. Dispose of wastes in the properly labeled container - NOT down the sink!! Eating and drinking are NOT ALLOWED in the laboratory.

COURSE ACTIVITIES AND MEANS BY WHICH THE OBJECTIVES WILL BE

ACHIEVED: The course will be styled in a lecture-discussion format. Students are expected to attend lectures, recitations, and laboratory sessions. There will also be problem-solving sessions and online assignments. Students are also expected to write one research paper on an assigned topic from the current literature in inorganic chemistry and deliver an oral presentation on the assigned topic. Each written research paper should be typewritten and should be between five to eight pages in length. Homework assignments on in class and out of class materials will be given and graded regularly.

POLICIES: This class will be conducted per the Honor Code policies of NCCU. The Honor Code is available in the latest version of the University Undergraduate Catalog. NO cell phones, etc., are allowed out during exams. You will be told if calculators are allowed for an exam. Violation of rules will result in a zero on the exam. Please inform the instructor of excused absences well in advance. Missing more than two laboratory sessions will result in an "F" for the course. History has shown that those who miss class end up with low grades.

EXAMINATION, QUIZ, AND HOMEWORK SCHEDULE: Three one-hour examinations will be given during the semester. These will be in **Early September, Early October and Early November.** The date for the final examination will be announced. A two- (2) hour final examination will be given during the final examination period. The final exam will be COMPREHENSIVE; therefore, you will be responsible for the mastery of all material covered during the semester. Quizzes will be given every week unless otherwise specified. Also, pop-quizzes may be given at any time on any lecture day. These quizzes will be graded, returned, and used in your final grade evaluation. There will be assigned homework for each chapter. Homework assignments will be due one week after the assignment is given unless otherwise specified.

MAKE-UP POLICY FOR EXAMINATIONS: Makeup Exams will be COMPREHENSIVE and your instructor may use one-half of your score on the final exam as your one-hour make-up exam score. To be eligible for make-up, an OFFICIAL EXCUSE for a missed exam must be presented to the instructor no later than one week after the missed exam. Permissible reasons for requesting makeup of required work are described in the *Student Handbook*. NOTE: Other reasons for requesting makeup are not acceptable. **Documentation** - Please refer to the *Student Handbook* for acceptable verification documents for make-up work.

GRADING PROCEDURE: The final course grade will be a composite of the overall grades received during the semester.

Three (3) One-Hour Exams	360 points
One Cumulative Final Exam	200 points
Quizzes/Computational	100 points
Homework/LOs	100 points
Lab Expts/Simulations	200 points
Research Paper	40 points
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Total	1000 points
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A	900 – 1000 points
B	800 – 899 points
C	700 – 799 points
D	600 – 699 points
F	< 600 points

CLASS ATTENDANCE: The instructor strongly believes that regular and punctual class attendance is essential to the student's optimum scholastic achievement. Class attendance will be taken during every class. Regular class attendance is a student obligation, and a student is responsible for all the work, including tests and written work, of all class meetings.

ACADEMIC DISHONESTY: Please refer to the *Student Handbook*

STUDENT SUPPORT/OMBUDSPERSON

The Student Ombudsperson is available to assist students in navigating unexpected life events, (e.g. short-term illness/injury, loss of a loved one, personal crises) and guide them to the appropriate University or community resources. Students may also receive assistance with resolving some emergency financial concerns, understanding NCCU policies, or general problem-solving strategies. Schedule an appointment by contacting the Student Ombudsperson in the Office of the Dean of Students, G-06 Student Services Building, at (919) 530-7492 or bsimmons@ncu.edu.

COVID-19 HEALTH AND SAFETY

Please be advised that face coverings are encouraged while on campus and during in-person instruction as per NCCU's guidelines, and the State of North Carolina's Executive Order 147.

Statement of Inclusion/Non-Discrimination

North Carolina Central University is committed to the principles of affirmative action and non-discrimination. The University welcomes diversity in its student body, its staff, its faculty, and its administration. The University admits, hires, evaluates, promotes, and rewards on the basis of the needs and relevant performance criteria without regard to race, color, national origin, ethnicity, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran's status, or religion. It actively promotes diversity and respectfulness of each individual.

Student Accessibility Services

Students with disabilities (physical, learning, psychological, chronic or temporary medical conditions, etc.) who would like to request reasonable accommodations and services under the Americans with Disabilities Act must register with the Office of Student Accessibility Services (SAS) in Suite 120 in the Student Services Building. Students who are new to SAS or who are requesting new accommodations should contact SAS at (919) 530-6325 or sas@nccu.edu to discuss the programs and services offered by SAS. Students who are already registered with SAS and who would like to maintain their accommodations must renew previously granted accommodations by visiting the NCCU Accommodate Website at <https://nccu-accommodate.symplicity/students/index.php> and logging into their Eagle Accommodate Student Portal. Students are expected to renew previously granted accommodations at the beginning of each semester (Fall, Spring & Summer sessions). Reasonable accommodations may be requested at any time during the semester for all students; however, accommodations are not retroactive. Returning semester requests for returning students are expected to be done within the first two weeks of the semester. Students are advised to contact their professors to discuss the testing and academic accommodations that they anticipate needing for each class.

Students identifying as pregnant or other pregnancy-related conditions who would like to request reasonable accommodations and services must register with SAS.

Confidentiality and Mandatory Reporting

All forms of discrimination based on sex, including sexual harassment, sexual assault, dating violence, domestic violence, and stalking offenses, are prohibited under NCCU's Sexual Harassment Policy (NCCU POL 01.04.4). NCCU faculty and instructors are considered to be mandatory reporters and are required to promptly report information regarding sexual harassment to the University's Title IX Coordinator. The Sexual Harassment Policy can be accessed through NCCU's Policies, Regulations and Rules website at www.nccu.edu/policies. Any individual may report a violation of the Sexual Harassment Policy (including a third-party or anonymous report) by contacting the Title IX Coordinator at (919) 530-7944 or TitleIX@nccu.edu, or submitting the online form through the Title IX Reporting Form, located at www.nccu.edu/titleix.

Other Campus Programs, Services, Activities, and Resources

Other campus resources to support NCCU students include:

- Student Advocacy Coordinator. The Student Advocacy Coordinator is available to assist students in navigating unexpected life events that impact their academic progression (e.g., homelessness, food insecurity, personal hardship) and guide them to the appropriate University or community resources. Contact Information: Student Services Building, Room G19, (919) 530-7492, studentadvocacy@nccu.edu.
- Counseling Center. The NCCU Counseling Center is staffed by licensed psychologists and mental health professionals who provide individual and group counseling, crisis intervention, substance abuse prevention and intervention, anger management, and other services. The Counseling Center also provides confidential resources for students reporting a violation of NCCU's Sexual Misconduct Policy. Contact Information: Student Health Building, 2nd Floor, (919) 530-7646, counseling@nccu.edu.

- **University Police Department.** The University Police Department ensures that students, faculty and staff have a safe and secure environment in which they can live, learn, and work. The Department provides a full range of police services, including investigating all crimes committed in and around its jurisdiction, making arrests, providing crime prevention/community programs, enforcing parking regulations and traffic laws, and maintaining crowd control for campus special events. Contact Information: 2010 Fayetteville Street, (919) 530-6106, nccupdinfo@nccu.edu.

Attendance Verification Policy:

Before Financial Aid is disbursed each semester, NCCU must confirm that you have begun attendance in all of your courses. Your instructor must validate your attendance for each course.

Changes to the Syllabus: The instructor reserves the right to make changes to this syllabus at any time. Any change will be announced in class or through email.

Tentative Schedule of Lectures, Laboratories & Learning Objects (LOs)		
Week	Topics/Labs	Chapter/ Exams
Week 1: August 15	Atomic Structure and Periodic Properties LO_Problem Set: Atomic Structure and Periodicity	Chapter 2
Week 2: August 22	Simple Bonding Theory Lab 1: Introduction to Computational Chemistry	Chapter 3
Week 3: August 29	Simple Bonding Theory (Continued) Lab 2: Computational Chemistry, Part II	Chapter 3
Week 4: September 5 (Labor Day 9/5)	Molecular Orbitals No Lab (Labor Day)	Chapter 5
Week 5: September 12	Molecular Orbitals (Continued) Lab 3: Preparation of an Explosive: Nitrogen Triiodide Ammoniate ($\text{NI}_3 \cdot \text{NH}_3$)	Chapter 5 Exam #1
Week 6: September 19	Acid-Base and Donor-Acceptor Chemistry Lab 4: Microscale Synthesis of $\text{MoO}_2(\text{acac})_2$ (Part I) LO_In-Class Activity: Predicting Reactivity with the HSAB Principle LO_In-Class Activity Predicting Solubility with HSAB and Bronsted Acid/Base Strength LO_Literature Discussion: A Stable Monomeric SiO_2 Complex with Donor-Acceptor Ligands:	Chapter 6
Week 7: September 26	The Crystalline Solid State Lab 4: Microscale Synthesis of $\text{MoO}_2(\text{acac})_2$ (Part II)	Handout/ GR-C/TO
Week 8: October 3	Oxidation and Reduction Lab 5: Exploring Photographic Chemistry (Part I)	Handout/ GR-C/TO Exam #2
Week 9: October 10 (Fall Break 10/10 to 10/11)	Symmetry and Group Theory No Lab (Fall Break)	Chapter 4
Week 10: October 17	Symmetry and Group Theory (Continued) Lab 5: Exploring Photographic Chemistry (Part II)	Chapter 4
Week 11: October 24	Chemistry of Main Group Elements Lab 6: Intermolecular Forces	Chapter 8
Week 12: October 31	Coordination Chemistry Lab 7: Thermochemistry and Complex Ions	Chapters 9 & 10
Week 13: November 7	Coordination Chemistry Lab 8: Preparation and Properties of an Aqueous Ferrofluid	Chapter 11 Exam #3
Week 14: November 14	Coordination Chemistry LO_Literature Discussion: Enhancement of the Thermal Stability and Thermoelectric Properties of $\text{Yb}_{14}\text{MnSb}_{11}$	Chapter 12
Week 15: November 21	Review	
Week 16:	Final Exam	Final Exam

GR-C/TO: Descriptive Inorganic Chemistry, 6th Edition, by Geoff Rayner-Canham and Tina Overton

ATTENTION!!

***SIGNING AND SUBMITTING THIS FORM MEANS YOU HAVE READ THE SYLLABUS,
UNDERSTAND IT, AND WILL ABIDE BY IT!!***

STATEMENT OF RECEIPT OF COURSE SYLLABUS

*I have received a copy of the syllabus for **CHEM 3200-Fall 2022 (Dr. Mohammed)** and agree to abide by its terms and conditions.*

*I have also read and I understand the **Policy on Academic Dishonesty and the Policy on Student Code of Conduct.***

Student's Signature

Date

Student's Name (printed)