

**SYLLABUS**  
**CHEM 201 - Inorganic Chemistry 1**  
**Section 1**  
**IAI Course Number CHEM911**  
**9:00<sup>am</sup> - 9:50<sup>am</sup> Monday, Wednesday, and Friday**  
**Currens Hall 203**  
**Spring 2016**

**Instructor:** Dr. John Determan, Chemistry Instructor, Department of Chemistry

**Office and Office Hours:** The instructor's office is 519C. Office hours are Monday 10:00 a. m. -12:00 p. m., Tuesday 12:00 p.m.-2:00 p.m., Wednesday 3:00-5:00 pm and by appointment by either calling: 298-1727 or emailing (Preferred): [jdeterman@wiu.edu](mailto:jdeterman@wiu.edu)

**Laboratory Director:** Dr. John Determan, Instructor, Department of Chemistry

**Expense Materials Required:** Costs for these materials are the responsibility of the student.

Textbook. Chemistry: The Molecular Nature of Matter, @ 6<sup>th</sup> edition, by Jespersen, Brady and Hyslop. John Wiley & Sons, publishers. ISBN: 978-0-470-57771-4.

Laboratory Manual. CHEM 201: Inorganic Chemistry 1, @ by R.R. Bahr and J.S. McConnell. Thomson Custom Solutions, publishers. ISBN-13: 978-0-495-47758-7.

Material Safety Data Sheets (MSDS) information about all chemicals utilized in the laboratory can be found at the following web site.  
<http://avogadro.chem.iastate.edu/MSDS/>. E-copies are free of charge.

Approved personal eye protection is required for the laboratory component of CHEM 201. The student must purchase safety goggles.

A simple scientific calculator without extensive memory functions (i.e. Texas Instruments model 30, equivalent, or less sophisticated models).

Students enrolled in this course are levied a non-refundable laboratory usage fee of \$35 to cover the cost of consumable supplies utilized during the semester.

**The Primary Goals of CHEM 201 are:**

1. Education of students about the basic fields of chemistry.
2. Develop study skills that students need to succeed in university-level science courses.
3. Preparation of students for professional positions in chemistry.
4. Develop critical thinking skills enabling students to solve chemistry problems that incorporate their cumulative knowledge.

5. Preparation of students for classes that require CHEM 201 as a prerequisite.

**Prerequisites for CHEM 201:** CHEM 201 students must have completed MATH 100 and either one year of high school chemistry or CHEM 100 prior to enrolling in CHEM 201.

**Co-requisites for CHEM 201:** CHEM 201 students must be taking or have completed MATH 101, 102, 106, 123 or 128; or a math course that requires one of the previous as a prerequisite.

**Testing and Grading:** Anything covered in lecture or in the textbook is considered to be fair game for exams and quizzes.

There will be approximately eight (8) short quizzes periodically during the semester. Only five (5) quizzes will be used to determine your grade. Your total number of points possible from the five quizzes will be 150 points. (If you miss a quiz, it will be counted as a zero. If you miss more than 5 quizzes your grade will start to suffer). Your total number of points possible from the five quizzes will be 150 points.

There will be approximately eight (8) homework assignments periodically during the semester. Only five (5) of the homework assignments will be used to determine your grade. Your total number of points possible from the five homework assignments will be 100 points.

Twelve laboratory exercises are planned for this semester. Only your ten best laboratory exercises will be counted toward your final grade. The labs will be worth 25 points per lab. Your total number of points possible from labs will be 250 points. You must score a minimum of 130 points in the laboratory exercises to pass CHEM 201.

Four semester examinations will cover the lecture materials presented during the regular semester. The exams will be worth approximately 125 points each. Only your three best semester examinations will be counted toward your final grade. Your total number of points possible from regular semester examinations will be 375 points.

To accommodate all absences (excused and unexcused) a comprehensive make-up examination will be given on the last day of class. You may use this to make up the second, and only the second, missed examination. The make-up exam will be comprehensive over all materials covered in CHEM 201. Students who miss more than one exam should seriously consider dropping CHEM 201.

The American Chemical Society (ACS) First Term General Chemistry Examination will be the Final Examination for CHEM 201. The Final Exam will be worth approximately 125 points and cover all materials of CHEM 201.

No make-up quizzes, homework, or laboratory exercises will be given. If it is necessary to be absent during a quiz or laboratory exercise, your score will be zero and your low grade. Missing more than one exam; having fewer than the required number of quizzes or homework assignments; or missing three laboratory exercises will ensure a zero will be incorporated into your final grade. **DO NOT MISS MORE THAN THE ALLOWED NUMBER.**

Exceptions to the above rules will only be made for University sponsored functions that require your presence during the class period (i.e. WIU band trips, field trips in other WIU classes, WIU athletics, etc.), and military commitment. Notification of the official WIU sponsored function, in the form of a signed memo from the faculty sponsor or coach, must be submitted to the instructor one week prior to the expected absence. Evidence of military commitment should be presented as soon as possible.

There are approximately 1,000 points possible during the Spring Semester. Your letter grade will be based on your total accumulated points NOT on percentages. Please note: the following grading scale is rigorously followed. Grades are based on point totals at the end of the semester. No Unearned credit of any sort will be given to any student.

**Forewarning Regarding the CHEM 202 Final:** The American Chemical Society (ACS) Examination in General Chemistry will be the Final Examination for CHEM 202. The Final Exam will be worth approximately 100 points and cover all materials for both CHEM 201 and 202. The ACS offers a study guide for the comprehensive test at: [http://www4.uwm.edu/chemexams/guides/details\\_guides.cfm?ID=162](http://www4.uwm.edu/chemexams/guides/details_guides.cfm?ID=162)

### Course Grading Scale:

<u>Total Points</u>	<u>Percentage (%)</u>	<u>Grade</u>
≥ 920	92 - 100	A
880 - 919	88 - 92	A-
840 - 879	84 - 88	B+
800 - 839	80 - 84	B
760 - 799	76 - 80	B-
720 - 759	72 - 76	C+
680 - 719	68 - 72	C
640 - 679	64 - 68	C-
600 - 639	60 - 64	D+
560 - 599	56 - 60	D
520 - 559	52 - 56	D-
≤ 519	0 - 52	F

Please be aware that most Department of Chemistry courses require the grade of a "C" or better to progress to the next course. A grade of "C-" is **NOT** satisfactory.

An incomplete grade will **NOT** be given to a student with a failing grade. No incomplete will given to a student without documented evidence of an emergency that requires that the student be away from the university or requires that the student miss the final examination. Students shall notify the instructor of the emergency as soon as possible and prior to the final examination.

**Attendance Policy:** You are expected to attend class regularly and punctually. You are responsible for all information and materials in sessions and classes whether you are present or not. Any student who receives six or more absences may be dropped from this course without notice. I will not take attendance but do note that homework will be turned in during class periods, and quizzes and exams are given during lecture times.

Any student arriving more than ten minutes late for any exam, laboratory exercise, or the final examination may not be allowed to take or complete the assigned work at the instructor's discretion. Any student attempting to turn in a homework assignment more than ten minutes late may not be allowed to turn in the assigned work at the instructor's discretion. Leaving the classroom prior to completion of a quiz or an exam is prohibited. When a student leaves the classroom, the exam or quiz is complete. If the student leaves the classroom with an exam or quiz without submitting the exam or quiz for grading, the value of the exam or quiz is zero. Additionally, the student may be prosecuted for academic dishonesty.

**Classroom and Course Policies:** Any student convicted of academic dishonesty will receive a failing grade and may be subjected to further academic penalty, including expulsion. See the WIU academic dishonesty policy (<http://www.wiu.edu/policies/acintegrity.shtml>). **CHEATING WILL NOT BE TOLERATED.**

Data storage or data transfer devices (including but not limited to: notes, cell phones, graphing calculators, iPods, and similar devices) are **NOT** to be used in CHEM 201. Cell phones should be turned off and put away during all class meetings. The use of any data storage or data transfer devices during any quiz, laboratory exercise, test or the final examination shall constitute **CHEATING**.

Simple scientific calculators without extensive memory functions (i.e. Texas Instruments model 30 and less sophisticated) may be used.

No head covering of any sort (including but not limited to: hats, caps, hoods, and scarves) may be used during the taking of a quiz, exam, or the final examination without specific permission of the instructor.

Assigned seating, rearrangement of seats, and closing of selected seats and areas of the classroom are the option of the instructor.

**Work Requirements for CHEM 201 Outside the Classroom:** Students are expected to read, review, study and learn all material discussed in class and lab; read assigned chapters in the textbook; work all homework assignments; and work the questions and problems at the end of each chapter of the text book. A minimum of two to three hours of study time outside of class is generally required for each one hour of class time in CHEM 201.

**Review Sessions and the Chemistry Resource Center (CRC):** Review sessions for CHEM 202 will be scheduled and held one or two nights a week in the afternoons or evenings. Days, times, and locations will be posted on Western.

The Chemistry Resource Center (Currens Hall 107) is usually open 8:00-5:00 Monday -Thursday, and 8:00 -12:00 Friday.

**Emergency Preparedness:** WIU Office of Risk Management and Emergency Preparedness provides resources on how to respond to emergency situations. Please view the video resources at <http://www.wiu.edu/rmep/> (Click "Resources" on the right side of the page).

**Students with disabilities :** In accordance with University values and disability law, students with disabilities may request academic accommodations where there are aspects of a course that result in barriers to inclusion or accurate assessment of achievement. To file an official request for disability-related accommodations, please contact the Disability Resource Center at 309-298-2512, [disability@wiu.edu](mailto:disability@wiu.edu) or in 143 Memorial Hall. Please notify the instructor as soon as possible to ensure that this course is accessible to you in a timely manner.

**The Following Action is Prohibited under the Student Conduct Code:** Disorderly Conduct. Disorderly conduct is defined as any behavior which disrupts the regular or normal functions of the University community, including behavior which breaches the peace or violates the rights of others.  
(<http://sjp.wiu.edu/CodeOfConduct/index.asp>)

**Student Rights and Responsibilities:** Student rights and responsibilities are listed on the WIU website (<http://www.wiu.edu/provost/students/>).

### **Tentative Course Content, Chapter Assignments, and Projected Exams (Subject to Change)**

**Topics to be covered in CHEM 201:** Safety in the Chemical laboratory, The Periodic table, introductory quantum theory, Stoichiometry (within compounds and reaction stoichiometry), atomic structure, chemical bonding, coordination compounds, the phases of matter, solution chemistry, acid-base chemistry, solution equilibrium, thermodynamics and thermochemistry.

Chapter	Title
1	Chemistry and the Atomic/Molecular View of Matter <u>Topics Include-</u> Scientific method, the states of matter, compounds, mixtures, physical changes, chemical changes, atomic theory, atoms, molecules, chemical formulas, compound stoichiometry, reaction stoichiometry, and conservation of mass.
2	Scientific Measurements <u>Topics Include-</u> physical properties, chemical properties, intensive properties, extensive properties, S.I. Units, significant figures, accuracy, precision, dimensional analysis (unit conversion), density, and specific gravity.
3	Elements, Compounds and the Periodic Table <u>Topics Include-</u> structure of an atom, subatomic particles, atomic number, mass number, relative atomic mass, isotopes, the periodic table, properties of metals, properties of nonmetals, properties of metalloids, ionic compounds, nomenclature of ionic compounds, molecular compounds, and nomenclature of molecular compounds.

### **EXAMINATION 1** (Mid-February)

#### Learning Outcomes:

1. Demonstrate the proper technique and use for safety equipment.
  2. Demonstrate the proper technique for measuring experimental data and recording that data.
  3. Properly fill out the laboratory sheets such that the experiment conducted is clear and understandable to a person reading it.
  4. Observe properties and characteristics of matter and relate those properties to the concept of atoms and molecules.
  5. Discuss the compounds of carbon and hydrogen and basic alkanes they form.
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|---|--|
| 4 | The Mole and Stoichiometry<br><u>Topics Include-</u> the mole concept, empirical formulas, molecular formulas, conversions from laboratory scale to atomic scale, chemical formulas, percentage composition, empirical formulas from experimental mass percentages, chemical reactions, balancing chemical reactions, calculations using chemical reactions, limiting reagents, theoretical yield, and percentage yield. |
| 5 | Molecular View of Reactions In Aqueous Solutions   |

Topics Include- describing solutions, electrolytes, weak electrolytes, nonelectrolytes, types of chemical reactions, balanced ionic reactions, net ionic reactions, description of acids, descriptions of bases, reactions of acids, reactions of bases, acid-base nomenclature, precipitation reactions, solubility rules, predicting reactions, molarity, dilution calculations, solution stoichiometry, titrations, and chemical analysis.

## **EXAMINATION 2** (Mid-March)

### Learning Outcomes:

1. Apply the concept of a mole to perform calculations involving all states of matter and determine information (such as yield) from chemical reactions.
2. Discuss how a balanced chemical reaction changes the connectivity of the atoms involved while maintaining mass and absorbing or releasing energy.
3. Discuss electrolytes and how their strength alters the properties of a solution.
4. Describe the difference between an acid and a base.
5. Use the solubility rules to predict chemical reactions or the electrical conductivity in aqueous solution.
6. Apply the concept of molarity to help determine the change in concentration of a reactant after a reaction has occurred.

## 6 Oxidation–Reduction Reactions

Topics Include- oxidation-reduction reactions, oxidation numbers, oxidation states, oxidizing agent, reducing agent, assigning oxidation numbers, balancing oxidation-reduction (redox) reactions in acidic media, balancing oxidation-reduction (redox) reactions in basic media, redox reactions of acids, redox reactions of metals, activity series of metals, and molecular oxygen as an oxidizing agent.

## 7 Energy And Chemical Change

Topics Include- energy, work, potential energy, kinetic energy, internal energy, average molecular kinetic energy, state functions, measuring heat, energy of chemical reactions, endothermic reactions, exothermic reactions, the three laws of thermodynamics, heat capacity, calorimetry, heats of reaction, thermochemical equations, enthalpy, and Hess' law.

## **EXAMINATION 3** (Mid-April)

### Learning Outcomes:

1. Balance an oxidation-reduction reaction in either acid or basic media.
2. Discuss what occurs in an oxidation-reduction reaction.
3. Discuss the energy of a reaction.
4. Demonstrate knowledge of the three laws of thermodynamics by applying them to a chemical system.
5. Calculate the heat of a reaction using the calorimeter method.
6. Calculate enthalpy by applying the concept of Hess' law.

8 The Quantum Mechanical Atom

Topics Include- electromagnetic radiation, wavelength, frequency, electromagnetic spectrum, photons, line spectra, atomic transitions, Rydberg equation, Bohr theory, wave-mechanical model, electron spin, quantum numbers, Pauli exclusion principle, ground state electronic configurations for atoms, ground state electron configurations for ions, abbreviated electron configurations, periodicity of atomic electron configurations, valence shell electronic configurations (noble gas configurations), atomic orbitals, periodic trends in atomic radii, periodic trends in ionic radii, periodic trends in ionization energy, periodic trends in electron affinity, irregularities in electron configurations, periodicity in chemical properties, and irregularities in periodic trends.

9 The Basics of Chemical Bonding

Topics Include- ionic bonding, lattice energy, electron configuration of ions, the octet rule, Lewis symbols, Lewis structures, covalent bonding, bond polarity, electronegativity, periodic trends in electronegativity, formal charge, bond enthalpy, bond order, coordinate covalent bonds, resonance structures, and stability from resonance.

**EXAMINATION 4** (Early May)

Learning Outcomes:

1. Discuss how the model of the atom was developed with particular attention paid to the subatomic particles of atoms, ions, and isotopes.
2. Demonstrate your knowledge of the periodic table to elucidate chemical and physical properties of the elements by applying your knowledge of periodic trends.
3. Apply valence theory to determine chemical bonding through the use of Lewis structures.
4. Demonstrate the compounds of carbon and hydrogen by discussing the alkane and ring structures they form.
5. Determine how bond order or resonance structures can alter the stability of a compound.



**COMPREHENSIVE MAKE-UP EXAMINATION FOR CHEM 201**  
(Early May)

Early May, **ACS COMPREHENSIVE FINAL EXAMINATION FOR CHEM 201**  
Finals **Final Exam Schedule may be found at**  
Week **<http://www.wiu.edu/registrar/exams.php>**

**THE FINAL FOR CHEM 202 WILL BE THE AMERICAN CHEMICAL SOCIETY (ASC) COMPREHENSIVE EXAMINATION. THE FINAL FOR CHEM 202 WILL COVER MATERIALS FROM BOTH CHEM 201 AND CHEM 202.**

**ALL LECTURE NOTES, HAND OUTS, TESTS, QUIZZES, HOMEWORKS, AND LABORATORY MATERIALS FROM BOTH CHEM 201 AND CHEM 202 WILL BE NEEDED FOR THE CHEM 202 FINAL.**

**DO NOT DISPOSE OF YOUR CHEM 201 MATERIALS.**

**IT IS STRONGLY SUGGESTED THAT STUDENTS COMPLETE THE CHEM 201/202 (CHEM 911/912) SEQUENCE AT WESTERN ILLINOIS UNIVERSITY PRIOR TO TRANSFERRING.**

**Important Dates:**

<u>Date (Spring, 2016)</u>	<u>Event</u>
January 19, Tues	Classes begin
February 12, Fri	Lincoln's Birthday - No classes
March 14-18, Mon-Fri	Spring Break -- No classes
May 9-13, Mon-Fri	Final Exam Week

**Any situation, condition, or circumstance not covered in the syllabus is subject to the decisions of the instructor, only.**

**Chemistry Lab Safety Rules**  
**WIU CHEMISTRY DEPARTMENT**

The chemistry laboratory can be a place of discovery and learning. However, by the very nature of laboratory work, it can be a place of danger if proper common-sense precautions aren't taken. While every effort has been made to eliminate the use of explosive, highly toxic, and carcinogenic substances from the experiments which you will perform, there is a certain unavoidable hazard associated with the use of a variety of chemicals and glassware. You are expected to learn and adhere to the following general safety guidelines to ensure a safe laboratory environment for both yourself and the people you may be working near. Additional safety precautions will be announced in class prior to experiments where a potential danger exists. Students who fail to follow all safety rules may be asked to leave the lab or suffer grading penalties.

## Attire

1. Safety goggles must be worn at all times while in the laboratory. This rule must be followed whether you are actually working on an experiment or simply writing in your lab notebook. You must wear safety goggles provided by the chemistry department.
2. Contact lenses are not allowed. Even when worn under safety goggles, various fumes may accumulate under the lens and cause serious injuries or blindness.
3. Closed toe shoes and long pants must be worn in the lab. Sandals and shorts are not allowed.
4. Long hair must be tied back when using open flames.
5. Wear clothes that cover your torso and your legs and ankles. Clothing will protect your body against chemical spills.

## Conduct

1. Eating, drinking, and smoking are strictly prohibited in the laboratory.
2. Do not engage in horseplay in the laboratory.
3. No unauthorized experiments are to be performed. If you are curious about trying a procedure not covered in the experimental procedure, consult with your laboratory instructor.
4. Never work alone in the lab.
5. Do not work in the laboratory in the absence of your laboratory instructor or his/her authorized representative.
6. Never taste anything. Never directly smell the source of any vapor or gas; instead by means of your cupped hand, waft a small sample to your nose. Do not inhale these vapors but take in only enough to detect an odor if one exists.
7. Coats, backpacks, etc., should not be left on the lab benches and stools. There is a hook rack along the back wall at either end of the lab. There are coat racks just inside the each entrance to the balance room at the back of the lab. Beware that lab chemicals can destroy personal possessions.
8. Always wash your hands before leaving lab.
9. Learn where the safety and first-aid equipment is located. This includes fire extinguishers, fire blankets, and eye-wash stations.
10. Be aware of your neighbors. Are they obeying the safety rules? A neighbor's accident may not hurt him/her but may injure you..
11. Do not violate any other safety rule given in the laboratory or by your instructor.
12. Notify the instructor immediately in case of an accident or spill.

## Proper Handling of Chemicals and Equipment

1. Consider all chemicals to be hazardous unless you are instructed otherwise. Material Safety Data Sheets (MSDS) are available in lab for all chemicals in use

(<http://avogadro.chem.iastate.edu/MSDS/>). These will inform you of any hazards and precautions of which you should be aware.

2. Know what chemicals you are using. Carefully read the label twice before taking anything from a bottle. Chemicals in the lab are marked with hazardous labels when necessary. Assume all chemicals to be hazardous.
3. Use a hood when required. The instructor will indicate when a hood (or other similar device) is needed.
4. Excess reagents are never to be returned to stock bottles. If you take too much, dispose of the excess.
5. Many common reagents, for example, alcohols and acetone, are highly flammable. Do not use them anywhere near open flames.
6. Always pour acids into water. If you pour water into acid, the heat of reaction will cause the water to explode into steam, sometimes violently, and the acid will splatter.
7. If chemicals come into contact with your skin or eyes, flush immediately with copious amounts of water and consult with your instructor.
8. Never point a test tube or any vessel that you are heating at yourself or your neighbor--it may erupt like a geyser.
9. Dispose of chemicals properly. Waste containers will be provided and their use will be explained by your TA. Unless you are explicitly told otherwise, assume that only water may be put in the lab sinks.
10. Handle glass tubing with care. Glass tubing is easily broken. When tubing (including thermometers) is to be inserted through a rubber stopper, the tubing must be lubricated with water or glycerol. Hold the tubing with a cloth or a paper towel near the end that will be inserted, and use a twisting motion during insertion.
11. Clean up all broken glassware immediately and dispose of the broken glass properly.
12. Contact the instructor for clean-up of mercury spills.
13. Never leave burners unattended. Turn them off whenever you leave your workstation. Be sure that the gas is shut off at the bench rack when you leave the lab.
14. Beware of hot glass--it looks exactly like cold glass.
15. Never pipette a liquid by mouth. Use a pipette bulb.
16. Do not use cracked or broken glassware.
17. Never remove chemicals from the lab. Students who remove chemicals from the lab without authorization will be charged with theft of hazardous materials.

**I, \_\_\_\_\_ (printed name) acknowledge that I have read and understand the Chemistry Lab Safety Rules, and I agree to follow the Chemistry Laboratory Safety Rules as described above throughout my chemistry course.**

**Signed \_\_\_\_\_ Date \_\_\_\_\_**