

**NEOSHO COUNTY COMMUNITY COLLEGE  
MASTER COURSE SYLLABUS**

**COURSE IDENTIFICATION**

Course Code/Number: CHEM 215

Course Title: College Chemistry I Lecture

KRSN: CHM 1011 – Chemistry I for Majors  
(Kansas Regents Shared Number)

Please visit the Kansas Board of Regents website for more information.

Division:  Applied Science (AS)     Liberal Arts (LA)     Workforce Development (WD)  
 Health Care (HC)     Lifetime Learning (LL)     Nursing     Developmental

Credit Hour(s): 3

Effective Date: Summer 2013

Assessment Goal Per Outcome: 70 %

**COURSE DESCRIPTION**

The course is designed for those students needing a strong chemistry background for more advanced courses in chemistry. Course work consists of lectures, discussion, and laboratory work on the fundamental principles in general inorganic chemistry. Topics covered include atomic structure, bonding, solutions, acid-base theory, gas laws, electrolytes, equilibrium, oxidation-reduction, and some descriptive chemistry. Problem solving is stressed in this course.

A series of laboratory activities will be conducted to assist the learning of inorganic chemistry.

**MINIMUM REQUIREMENTS/PREREQUISITES AND/OR COREQUISITES**

One year of high school algebra, and one year of high school chemistry (or introduction to chemistry course CHEM 105) and/or physical science. Concurrent with CHEM 216.

**TEXTS**

The official list of textbooks and materials for this course is found on [myNeosho](#).

## **GENERAL EDUCATION OUTCOMES**

1. Practice Responsible Citizenship through:
  - identifying rights and responsibilities of citizenship,
  - identifying how human values and perceptions affect and are affected by social diversity,
  - identifying and interpreting artistic expression.
2. Live a healthy lifestyle (physical, intellectual, social) through:
  - listing factors associated with a healthy lifestyle and lifetime fitness,
  - identifying the importance of lifetime learning,
  - demonstrating self-discipline, respect for others, and the ability to work collaboratively as a team.
3. Communicate effectively through:
  - developing effective written communication skills,
  - developing effective oral communication and listening skills.
4. Think analytically through:
  - utilizing quantitative information in problem solving,
  - utilizing the principles of systematic inquiry,
  - utilizing various information resources including technology for research and data collection.

## **COURSE OUTCOMES/COMPETENCIES**

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

Content of the course will prepare students to:

1. Explain the processes involved in the scientific method, and be able to apply it to investigate natural phenomena and solve problems.
2. Explain the design and significance of experiments that led to the adoption of modern atomic theory.
3. Recognize and interpret isotopic notation; understanding the relationship between average atomic masses and isotopic masses (example: calculating the average mass of an element given isotopic masses and natural abundance).
4. Relate atomic mass to composition in terms of subatomic particles.

5. Descriptive chemistry of ionic and covalent compounds.
  - a. Learn the names and symbols (or formulas) for often-used elements, simple and polyatomic ions, Arrhenius acids and bases, and simple ionic and covalent compounds.
  - b. Describe and identify Arrhenius, Bronsted-Lowery, and Lewis acids and bases.
  - c. Identify conjugate acids and bases.
  - d. Determine the valence electron configuration of the s and p block elements and the 3d metals.
  - e. Determine oxidation states and assign oxidation numbers of atoms in simple ions, and the central atoms of polyatomic ions and covalent compounds.
  - f. Use the valence electron configuration to predict common oxidation numbers of group 1, 2, 13, 16, and 17 elements.
  - g. Define periodic trends in electronegativity, ionization energy and electron affinity, and relate them to the electron configuration of the element.
  
6. Solutions.
  - a. Describe general properties of solutions.
  - b. Understand the forces that affect the aqueous solubility of materials.
  - c. Calculate the molar concentration of a solute.
  - d. Describe procedures for preparing a solution of known molarity.
  
7. Chemical reactions and stoichiometry.
  - a. Classify chemical reactions and predict whether simple chemical reactions will proceed.
  - b. Employ stoichiometric reasoning in evaluating reactions of gases, liquids and solids.
  - c. Perform calculations that employ relationships involving masses, formula units, and the mole relationships.
  - d. Determine empirical and molecular formula from appropriate data.
  - e. Demonstrate the ability to balance chemical equations.
  - f. Discuss solubility rules
  - g. Write net ionic equations based on solubility rules.
  - h. Balance simple acid base reactions
  - i. Define oxidation and reduction.
  - j. Balance simple redox reactions and determine the identity of the oxidizing and reduction agents.
  - k. Determine limiting reagents from stoichiometric data; calculate the maximum product yield, and leftover reagent.
  - l. Calculate theoretical yield from stoichiometric data.
  
8. Properties of solids, liquids, and gases
  - a. Describe the origins and relative magnitudes of intermolecular forces.
  - b. Relate phase behavior to nature of intermolecular forces.
  - c. Compare general properties of solids, liquids and gases; including density, compressibility, heat capacity, and randomness intermolecular forces.
  - d. Describe phase transitions and phase diagrams (e.g. triple point and critical point).
  - e. Understand general properties of gases.
    1. Describe properties and temperatures of gasses to kinetic molecular theory.

2. Understand and employ ideal gas laws.
  - f. Understand general properties of liquids.
  - g. Understand general properties of solids.
    1. Compare and contrast properties of ionic, molecular and metallic solids.
9. Describe, define, and perform calculations involving the following basic concepts of thermodynamics:
- a. Heat capacity.
  - b. Calorimetry.
  - c. Heat/Work/Energy.
  - d. Enthalpy/Standard states.
  - e. Hess's Law.
  - f. Heat of formation.
  - g. Phase changes/Energy.
  - h. Use of other thermodynamic cycles in the determination of thermodynamic quantities, such as the lattice energy of an ionic solid.
10. Conceptually and quantitatively relate spectroscopic observation of atoms to quantum mechanical theories.
- a. Describe the historical development of and distinction between classical and wave mechanics.
  - b. Describe the radial and angular dependence of solutions to the Schrodinger equation for hydrogen-like atoms (s, p, d orbitals).
  - c. Describe the behavior of photons and electrons during electronic transitions between principle quantum levels and calculate the wavelength and frequency of light involved in these transitions.
  - d. Using the Aufbau principle, write the electron configuration of many electron atoms and monatomic ions.
  - e. Relate quantum mechanical theory to the organization of the periodic table and the periodic properties of elements.
11. Molecular Bonding and Structure.
- a. Describe the characteristics of ionic and covalent bonding.
  - b. Draw Lewis dot structures for atoms, simple ionic and molecular compounds.
  - c. Predict the shape of simple molecules and ions using VSEPR theory.
  - d. Explain how electronegativity differences relate to bond polarity.
  - e. Identify polar and non-polar molecules.
  - f. Understand valence bond descriptions of molecular structure and bonding.
  - g. Understand hybridization, including  $sp^3$ ,  $sp^2$  and  $sp$  hybridization.
  - h. Predict hybridization from VSEPR structures.
  - i. Determine bond orders and relate them to relative bond strength.
  - j. Describe the MO theory description of bonding and antibonding orbitals.
  - k. Relate MO theory to concepts such as the structural, energetic, spectroscopic, and magnetic properties of molecules.

## **MINIMUM COURSE CONTENT**

The following topics must be included. However, the course is not limited to these topics. The order of topics is up to the discretion of the instructor.

1. Chemistry: The Study of Change
2. Atoms, Molecules, and Ions
3. Mass Relationships in Chemical Reactions
4. Reactions in Aqueous Solutions
5. Gases
6. Thermochemistry
7. Quantum Theory and the Electronic Structure of Atoms
8. Periodic Relationships among the Elements
9. Chemical Bonding I: Basic Concepts
10. Chemical Bonding II: Molecular Geometry and Hybridization of Atomic Orbitals

## **STUDENT REQUIREMENTS AND METHOD OF EVALUATION**

90 – 100 %	→ A
80 – 89 %	→ B
70 – 79 %	→ C
60 – 69 %	→ D
Below 60%	→ F

## **ASSESSMENT OF STUDENT GAIN**

The purpose of assessing student learning at Neosho County Community College is to ensure the educational purposes of the institution are met and appropriate changes are made in program development and classroom instruction to allow for student success. The instructor(s) of this course will determine the methods of assessment most appropriate and complete an assessment report at the end of the course.

## **ATTENDANCE POLICY**

1. NCCC values interactive learning which promotes student engagement in the learning process. To be actively engaged, the student must be present in the learning environment.
2. Unless students are participating in a school activity or are excused by the instructor, they are expected to attend class. If a student's absences exceed one-eighth of the total course duration, (which equates to one hundred (100) minutes per credit hour in a face-to-face class) the instructor has the right, but is not required, to withdraw a student from the course. Once the student has been dropped for excessive absences, the registrar's office will send a letter to the student, stating that he or she has been dropped. A student may petition the chief academic officer for

reinstatement by submitting a letter stating valid reasons for the absences within one week of the registrar's notification. If the student is reinstated into the class, the instructor and the registrar will be notified. Please refer to the Student Handbook/Academic Policies for more information

3. Absences that occur due to students participating in official college activities are excused except in those cases where outside bodies, such as the State Board of Nursing, have requirements for minimum class minutes for each student. Students who are excused will be given reasonable opportunity to make up any missed work or receive substitute assignments from the instructor and should not be penalized for the absence. Proper procedure should be followed in notifying faculty in advance of the student's planned participation in the event. Ultimately it is the student's responsibility to notify the instructor in advance of the planned absence.

### **ACADEMIC INTEGRITY**

NCCC expects every student to demonstrate ethical behavior with regard to academic pursuits. Academic integrity in coursework is a specific requirement. Definitions, examples, and possible consequences for violations of Academic Integrity, as well as the appeals process, can be found in the College Catalog, Student Handbook, and/or Code of Student Conduct and Discipline.

### **ELECTRONIC DEVICE POLICY**

Student cell phones and other personal electronic devices not being used for class activities must not be accessed during class times unless the instructor chooses to waive this policy.

### **NOTE**

Information and statements in this document are subject to change at the discretion of NCCC. Students will be notified of changes and where to find the most current approved documents.

### **ACCOMMODATIONS**

If you are a student with a disability who may need accommodation(s), in compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990, please notify the Dean of Student Services in the Student Services Office, Sanders Hall, 620-432-0304, on the Chanute Campus, or the Dean for the Ottawa and Online Campuses, 785-248-2798, on the Ottawa Campus as soon as possible. You will need to bring your documentation for review in order to determine reasonable accommodations, and then we can assist you in arranging any necessary accommodations.

## **NON-DISCRIMINATION POLICY**

The following link provides information related to the non-discrimination policy of NCCC, including persons with disabilities. Students are urged to review this policy.

<http://www.neosho.edu/Departments/NonDiscrimination.aspx>

## **SEXUAL MISCONDUCT POLICY (TITLE IX)**

At NCCC, it is the responsibility of an instructor to help create a safe learning environment in the classroom, including both physical and virtual classrooms. All instructors are considered mandatory reporters at NCCC, therefore any information regarding sexual misconduct that is shared by a student in one-on-one meetings with the instructor must be reported to appropriate personnel at the College. Instructors will keep the information private to the greatest extent possible, but it is not confidential. Generally, climate surveys, classroom writing assignments or discussions, human subjects research, or events such as Take Back the Night events do not provide notice that must be reported to the Coordinator by employees, unless the reporting party clearly indicates that they wish a report to be made.

The following link provides information related to the sexual misconduct policy of NCCC, including resources, reporting options, and student rights. Students are urged to review this policy.

<http://www.neosho.edu/TitleIX.aspx>

## **COURSE NOTES**