Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: CHEM 107 **Year: 2020-2021**
Course Title: General Chemistry I **Credit Hours: 4**

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

This is a more thorough study of basic principles than CHEM 101. Topics include atoms, molecules, ions, chemical formulas, equations, stoichiometry, gases, electronic structure of atoms, periodic table, bonding, physical properties, phase changes, and thermochemistry. Laboratory experiments are hands-on, wet-lab, performed in a traditional chemistry lab under supervision of a chemistry professor. Substantial outside preparation for the laboratories is required. CHEM 107 fulfills the SUNY General Education Natural Sciences requirement. A student may only apply credit earned in CHEM 101 or CHEM 107 toward degree requirements. **PREREQUISITES:** MATH 120 and college prep chemistry or CHEM 101; RDNG 099 if required by placement testing; ENGL 099 or prior completion or concurrent enrollment in ESL 120, 121, and 122 (or prior completion of ESL 103) if required by placement testing. 4 Cr. (3 Lec. 2 Lab.) Fall semester.

Course Context/Audience

This course is part of the Liberal Arts Math/Science curriculum and can be used to fulfill a laboratory science requirement. It is a required course in the Engineering Science A.S. degree program.

Basic Skills/Entry Level Expectations

Writing: W2 Student should have completed ENGL 099 (if needed). The course requires short written responses and/or short papers without documentation, particularly personal reflection or narrative.

Math: MC College level math skills – Course requires college level math skills. See course description for co-requisite and/or prerequisite requirement(s).

Reading: R2 Before taking this course, students must have a C or better in RDNG 099 or assessment indicating that RDNG 099 was not required.

Course Goals

As a result of taking General Chemistry I a student should be able to:

1. Demonstrate an understanding of matter, units of measurement, significant figures and scientific notation and perform calculations using these.
2. Demonstrate an understanding of atomic structure, molecules, ions, covalent bonding, polarity and the periodic table.
3. Name and write chemical formulas for simple inorganic molecules.
4. Demonstrate an understanding of the mole concept and perform stoichiometric calculations.
5. Demonstrate an understanding of the kinetic theory of gases and the gas laws and perform calculations using these.

6. Write and balance chemical equations for simple chemical reactions.

7. Demonstrate an understanding of the quantum mechanical description of atomic structure and how it relates to the periodic table.

8. Demonstrate an understanding of the molecular structure and physical properties of liquids and solids.

9. Recognize and properly use simple chemical equipment in the chemical laboratory.

10. Demonstrate an understanding of thermochemistry, heat flow, calorimetry, and enthalpy.

Course Objectives/Topics

Objective/Topic	# Hours
Topic 1. Matter and Measurement - Upon completion of this topic, a student should be able to: 1. Describe the three states of matter in terms of molecular or ionic structure and physical properties; 2. Know the common metric units used in chemistry; 3. Convert units; 4. Use scientific notation and significant figures.	4.5 Hours
Topic 2. Atoms, Molecules, Ions - Upon completion of this topic, a student should be able to: 1. Distinguish among atoms, molecules, and ions; 2. List and describe the components of an atom; 3. Use and explain the periodic table; 4. Name and write chemical formulas of simple inorganic molecules.	6 Hours
Topic 3. Stoichiometry - Upon completion of this topic, a student should be able to: 1. State the two fundamental definitions of the mole; 2. Understand mass relations in chemical formulas and chemical reactions; 3. Perform stoichiometric calculations involving moles and mass.	4.5 Hours
Topic 4. Gases - Upon completion of this topic, a student should be able to: 1. Understand the kinetic theory of gas; 2. Perform calculations involving the gas laws; 3. Define: partial pressure, temperature, ideal gas, standard temperature, and standard pressure; 4. Explain how and why real gases differ from ideal behavior.	6 Hours
Topic 5. Electronic Structure - Upon completion of this topic, a student should be able to: 1. Define: light, photon, electronic energy levels, orbitals, electron spin, quantum numbers; 2. Write the complete electron configuration for any atom; 3. Write the orbital diagram for any atom; 4. Explain the relationship of the quantum mechanical description of the atom to the arrangement of the periodic table.	7.5 Hours
Topic 6. Covalent Bonding and Molecular Structure - Upon completion of this topic, a student should be able to: 1. Write Lewis structures for simple inorganic molecules; 2. Determine the polarity and orbital hybridization for simple inorganic molecules; 3. Identify the molecular shape (linear, bent, pyramidal, triangular, planar, or tetrahedral) of simple molecules; 4. Understand orbital hybridization.	6 Hours
Topic 7. Liquids and Solids - Upon completion of this topic, a student should be able to: 1. Understand liquid-vapor equilibrium; 2. Draw a phase diagram for a substance; 3. Identify and explain the type of intermolecular force in a substance; 4. Identify the type of structure (ionic, molecular, network covalent, metallic, amorphous) of a solid.	6 Hours
Topic 8. The Laboratory - Upon completion of this topic, a student should be able to: 1. Recognize, use, and distinguish among simple chemical laboratory equipment such as: beaker, Erlenmeyer flask, graduated cylinder, buret barometer, thermometer, centigram, balance, electronic milligram balance, and Bunsen burner; 2. Perform simple chemical laboratory experiments; 3. Follow proper safety procedures and techniques.	28 Hours
Topic 9. Thermochemistry – Upon completion of this topic, a student should be able to: 1. Relate heat flow to specific heat, mass and temperature change; 2. Relate enthalpy change to forward and reverse reactions; and 3. Calculate heat for a reaction from colorimetric data.	1.5

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	HOW DOES THE COURSE ADDRESS THE OUTCOMES (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
Students will be able to ➢ develop meaningful questions to address problems or issues. ➢ gather, interpret, and evaluate relevant sources of information. ➢ reach informed conclusions and solutions. consider analytically the viewpoints of self and others.	Students will be presented problems in which they have to use the basic principles of chemistry to get the solution. For example, students will be asked to calculate the mass of a product such as carbon dioxide that is produced by the combustion of a given mass of a hydrocarbon fuel.
SOCIAL/GLOBAL AWARENESS OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
➢ Students will begin to understand how their lives are shaped by the complex world in which they live. ➢ Students will understand that their actions have social, economic and environmental consequences.	Students will learn about how chemistry is involved in and affects the physical world and society. For example, the role of hydrocarbon fuels in contributing to the greenhouse effect.

Instructional Methods
Classroom, lectures, textbook reading, reviews of solutions to homework problems and laboratory experiments are appropriate instructional methods for this course.

Methods of Assessment/Evaluation

Method	% Course Grade
Major Tests	49%
Final Exam	24%
Lab	15%
Quizzes	11%
Homework	1%

Text(s)

Chemistry: Principles and Reactions, William L. Masterton, Cecile N. Hurley, and Edward J.Neth 7th Edition, © 2012 Brooks/Cole Publishing (Required)

Student Solutions Manual, , Maria Cecilia D. De Mesa and Thomas D. McGrath 7th Edition, © 2012 Brooks/Cole Publishing.
To accompany main textbook

CHEM 107 Lab Manual, Bickford, Frank, Latest Edition, To accompany main textbook

Bibliography

Introductory Chemistry, Nivaldo Tro, Second Edition, © 2009: Prentice Hall.

Journal of Chemical Education, past and present issues

Scientific American, past and present issues

Other Learning Resources

Audiovisual No resources specified
Electronic YouTube – Dr. Quantum – Double Slit Experiment; YouTube – Professor Martyn Polikoff demonstrates supercritical fluids
Other No resources specified