Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: CHEM 102 **Year: 2025-2026**
Course Title: Principles of Chemistry II **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 course is a continuation of CHEM 101 including studies of liquids, solids, chemical equilibrium, electrochemistry, aqueous solutions, gases, organic chemistry, acids and bases. 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. A student may only apply credit earned in CHEM 102 or CHEM 108 toward degree requirements. CHEM 102 fulfills the SUNY General Education Natural Sciences requirement. Prerequisites: CHEM 101; MATH 095 or MATH 098 and 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.) Spring 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 satisfies the SUNY requirement in the natural sciences and should be of interest to anyone wanting to learn about chemistry.

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: M4 Completed MATH 095(if needed) - Course requires the use of basic mathematical skills plus basic algebra skills.

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 successfully completing Fundamentals of Chemistry, a student should be able to:

1. Demonstrate an understanding of the molecular structure and physical properties of solids and liquids.
2. Demonstrate an understanding of solutions and perform calculations involving concentration units.
3. Explain the concept of chemical equilibrium and how it is affected by various stresses.
4. Define acid, base, Ka, Kb, Kw, pH, titration, buffers and solve problems involving these.
5. Balance oxidation reduction equations and understand the relation between redox reactions and voltaic cells.

Course Objectives/Topics

Objective/Topic	# Hours
Topic 1. Solids and Liquids - Upon completion of this topic, the student should be able to: 1. Understand molecular forces; 2. List the physical properties of liquids and solids; 3. Distinguish between crystalline and amorphous solids; 4. Calculate the energy requirements for phase changes.	4 Hours
Topic 2. Solutions - Upon completion of this topic, the student should be able to: 1. Understand the colligative properties of solutions; 2. List the factors affecting solubility; 3. Define molarity, normality, percentage by weight or volume; 4. Define dilution, electrolyte, non-electrolyte; 5. Compare the properties of solutions of electrolytes and non-electrolytes; 6. Use solubility rules; 7. Solve problems involving concentration and colligative properties.	8 Hours
Topic 3. Chemical Equilibrium - Upon completion of this topic, the student should be able to: Write equilibrium expressions for reactions; 1. State LeChetelier's principle; 2. Determine the effect of stresses on chemical equilibria; 3. Solve problems involving chemical equilibria.	4 Hours
Topic 4. Acids and Bases - Upon completion of this topic, the student should be able to: 1. Define Ka, Kb, Kw, pH titration, buffer; 2. Solve problems involving acids and bases.	6 Hours
Topic 5. Oxidations and Reduction - Upon completion of this topic, the student should be able to: 1. Define oxidation, reduction, activity series, E0; 2. Balance redox equations; 3. Diagram a voltaic cell and tell how the voltage is affected by various factors; 4. Understand the role of electrochemistry in corrosion; 5. Explain why salt rusts cars.	6 Hours
Topic 6. Gases - Upon completion of this topic, the student should be able to: 1. Define pressure, volume, temperature, Avogadro's number, standard temperature and pressure, Kelvin temperature; 2. Given three of the four fundamental gas variables (pressure, temperature, volume, number of moles); 3. Calculate the fourth variable; 4. State the combined gas law formula, the ideal gas law and perform calculations involving these; 5. Understand the kinetic theory of gases and how this relates to the properties and characteristics of gases.	6 Hours
Topic 7. Organic Chemistry - Upon completion of this topic, the student should be able to: 1. Define organic chemistry; 2. Define hydrocarbon, alkane, alkene, alkykne, aromatic, isomerism, functional group, optical activity, saturated, unsaturated, polymer, amino acid; 3. Write structural formulas and names for simple hydrocarbons and functional group compounds; 4. Understand the significance of organic chemistry to life and everyday living.	8 Hours
Topic 8. The Laboratory - Upon completion of this topic, the student should be able to: 1. Perform titrations, construct a voltaic cell, make aspirin, determine a melting point, and determine a molar mass by freezing point depression; 2. Follow proper safety procedures and techniques.	28 Hours

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 determine the volume of a gas at conditions of temperature and pressure from those of the given volume of gas.
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, how a battery works, and the role of electrochemistry in corrosion.

Instructional Methods

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

Methods of Assessment/Evaluation

Method	% Course Grade
Quizzes	5%
Major tests	49%
Homework	4%
Final Exam	25%
Lab	17%

Text(s)

CHEM 101 Lab Manual, Frank Bickford, Latest Edition, Tompkins Cortland Community College
Required:

Selected Solutions Manual for Introductory Chemistry, Nivaldo Tro, Latest Edition, © 2009 Prentice Hall, Inc.
Required:

Introductory Chemistry, Nivaldo Tro, Latest Edition, © 2009 Prentice Hall, Inc.
Required:

Bibliography

The Physics of Grandmother's Peerless Homemade Ice-Cream by Jearl Walker, Scientific American, © April, 1984, pp. 150-153.

Other Learning Resources

Audiovisual No resources specified
Electronic Compact disc that accompanies text.
Other No resources specified