GROSSMONT COLLEGE

 COURSE OUTLINE OF RECORD

 Curriculum Committee Approval: 04/26/2022

 GCCCD Governing Board Approval: 06/14/2022

CHEMISTRY 141 – GENERAL CHEMISTRY I

 1. Course Number Course Title Semester Units

 CHEM 141 General Chemistry I 5

Semester Hours

3 hours lecture: 48-54 hours 96-108 outside-of-class hours

6 hours lab: 96-108 hours 240-270 total hours

 2. Course Prerequisites

A “C” grade or higher or “Pass” in Chemistry 120 or equivalent or a “C” grade or higher or “Pass” in Mathematics 110 or equivalent or appropriate placement beyond intermediate algebra **and** the Chemistry 141 assessment.

Corequisite

None

Recommended Preparation

None

 3. Catalog Description

Basic principles and calculations of chemistry with emphasis in stoichiometry, gas laws, kinetic molecular theory, basic equilibrium including gas phase and solution phase, pH atomic and molecular structures, chemical bonding, and application of the First Law of Thermodynamics. The laboratory is an introduction to classical and instrumental analysis, the principles of equilibrium, and atomic and molecular structures.

 4. Course Objectives

 The student will:

 a. Solve stoichiometry problems involving mass, moles, mixtures, gas volumes, and limiting reactants.

 b. Solve gas problems using the ideal gas, combined gas, Dalton’s partial pressure, and Graham’s effusion laws.

 c. Demonstrate proficiency in chemical nomenclature.

 c. Identify and balance net ionic equations for oxidation reduction, acid base and precipitation reactions.

 e. Demonstrate quantitative and qualitative understanding of chemical equilibrium.

 f. Demonstrate understanding of chemical periodicity in terms of quantum mechanics and atomic structure.

 g. Analyze the bonding in chemical compounds in terms of Lewis structures, VSEPR, valence bond theory, molecular orbital theory.

 h. Calculate enthalpies of reactions using Hess’ Law, bond energies, and calorimetry.

 i. Apply the first and second laws of thermodynamics to chemical systems.

 j. Solve colligative property problems and explain solution properties in terms of vapor pressure and intermolecular interactions.

 k. Demonstrate ability to analyze a phase diagram.

 l. Apply science methodology in a laboratory setting.

 m. Demonstrate proficiency in quantitative chemical analysis techniques.

 n. Apply kinetic molecular theory to describe the properties of solid, liquids and gases.

 o. Demonstrate correct documentation of experimental data in laboratory notebook and presentation of analysis in a formal lab report.

 p. Solve problems involving the relationship of pH, pOH and Kw in aqueous solution.

5. Instructional Facilities

1. Standard classroom
2. Wall mounted Periodic Chart
3. Facilities for lecture demonstrations including a lecture table with gas, air, water, vacuum, and sink.

 d. Laboratory classroom with drying ovens, pH meters, fume hoods, hot plates, magnetic stir plates, triple beam balances, analytical balances, Bunsen burners and microburners, and UV-vis spectrometer.

 e. Individual student drawers containing: standard laboratory equipment including but not limited to beakers, Erlenmeyer flasks, graduated cylinders, filter flasks, Buchner funnels, glass funnels, pipets, test tubes, test tube racks, glass sample vials, drying tubes, and assorted scoopulas, stir rods and spatulas.

6. Special Materials Required of Student

 a. Laboratory apron or jacket.

 b. Scientific calculator with exponential and logarithmic functionality.

 c. Approved safety glasses or goggles.

7. Course Content

 a. Matter and measurement.

 b. Atoms molecules and ions.

 c. Formulas equations and moles.

 d. pHstrong acid base.

 e. Reactions in aqueous solution, net ionic equations.

 f. Balancing oxidation reduction reactions.

 g. Atomic structure and quantum numbers.

 h. Periodicity and atomic structure.

 i. Ionic bonding and Born Haber cycle.

 j. Main groups and covalent bonding.

 k. Lewis and VSEPR.

 l. Valence bond theory and molecular orbital theory.

 m. Energy work phase changes and calorimetry heats of formation and bond energies, Hess law entropy.

 n. Gas laws, PV=nRT, and gas stoichiometry.

 o. Kinetic molecular theory and real gases.

 p. Liquids and solids vapor pressure.

 q. Crystals and phase diagrams.

 r. Solutions and solubility.

 s. Intermolecular forces, Raoult’s law and colligative properties.

 t. Equilibrium calculations and concentrations.

 u. Le Châtelier’s principle and predictions.

 v. Hydrogen oxygen and water.

 w. Weak acid and weak base equilibria calculations.

 x. Experimentation, data gathering and interpretation in the chemical laboratory.

 8. Method of Instruction

 a. Lecture with an emphasis on quantitative and qualitative problem solving**.**

 b. Integration of appropriate web-based and computer audiovisual materials such as animations, PowerPoints, videos, and other multimedia, silent and non-silent polls, group work, exit tickets, etc.

 c. Computer assisted instruction.

 d. Inquiry based laboratory experience.

9. Methods of Evaluating Student Performance

 a. Written quizzes, midterms and final examswhich may include fill-in-the-blank, short answer, multiple choice, and essay questions.

 b. Laboratory reports such as descriptions and analysis of chemical reactions or analytical determinations.

 c. Laboratory techniques to include proper safety procedures, use of laboratory equipment, and complete documentation of data.

 d. Essays/presentations on topics such as experimental results, descriptive chemistry or current issues in chemistry.

 e. Homework and various assignments are used to teach and emphasize content including, but not limited to reading texts, watching videos**,** solving problems out of the textbook or computer aided instructional exercises, surveys, peer review, discussions, etc.

10. Outside Class Assignments

 a. Homework - both text and computer based.

 b. Laboratory reports such as descriptions and analysis of chemical reactions or analytical determinations.

1. Essays/presentations on topics such as experimental results, descriptive chemistry or current issues in chemistry.

11. Representative Texts

 a. RepresentativeText(s):

 1) Tro, Nivaldo. *Chemistry, A Molecular Approach*.Fifth Edition**.** Cranberry, New Jersey: Pearson, 2020.

 2) Lehman, Jeff, et.al. *Chemistry 141 Lab Manual*, 7thedition, El Cajon, California: Grossmont College, 2019.

 b. Supplementary texts and workbooks:

 None

 Addendum: Student Learning Outcomes

 Upon completion of this course, our students will be able to do the following:

1. Demonstrate a working knowledge of the language of chemistry.
2. Apply quantitative reasoning to chemical problems
3. Apply laws and theories to explain and predict the properties of atoms and molecules.
4. Employ laboratory equipment and techniques to collect, organize and evaluate experimental data.