GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: CHEM 1A DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Fall 2016 CURRICULUM APPROVAL DATE: 11/23/2015

SHORT TITLE: GEN CHEMISTRY L/L

LONG TITLE: General Chemistry

Units	Number of Weeks	Type	Contact Hours/Week	Total Contact Hours
5	18	Lecture:	4	72
		Lab:	3	54
		Other:	0	0
		Total:	7	126

COURSE DESCRIPTION:

This is the first semester of a year-long general chemistry course designed for science, engineering and pre-professional majors. Topics include properties of matter, atomic structure, the Periodic Table, stoichiometry, elements and compounds, bonding, molecular structure, chemical reactions, states of matter, as well as the properties of gases and solutions. (C-ID: CHEM 110) (C-ID: CHEM 120S: Chem 1A + Chem 1B) ADVISORY: Eligible for English 250 and English 260. PREREQUISITE: Chemistry 30A with a grade of 'C' or better, or high school chemistry with a grade of 'B' or better completed within the last five years, and Mathematics 233 with a grade of 'C' or better.

PREREQUISITES:

Completion of CHEM 30A, as UG, with a grade of C or better.
AND (Completion of MATH 233, as UG, with a grade of C or better.
OR
Completion of MATH 233B, as UG, with a grade of C or better.
OR
Completion of MATH 235, as UG, with a grade of C or better.
OR
Completion of MATH 240, as UG, with a grade of C or better.
OR
Completion of MATH 242, as UG, with a grade of C or better.
OR
Completion of MATH 3, as UG, with a grade of C or better.
OR
Completion of MATH 5, as UG, with a grade of C or better.
OR
Completion of MATH 6, as UG, with a grade of C or better.

OR
Completion of MATH 7, as UG, with a grade of C or better.
OR
Completion of MATH 8A, as UG, with a grade of C or better.
OR
Completion of MATH 8B, as UG, with a grade of C or better.
OR
Completion of MATH 12, as UG, with a grade of C or better.
OR
Completion of MATH 14, as UG, with a grade of C or better.
OR
Completion of MATH 1A, as UG, with a grade of C or better.
OR
Completion of MATH 1B, as UG, with a grade of C or better.
OR
Completion of MATH 1C, as UG, with a grade of C or better.
OR
Score of 2600 on Accuplacer Math)

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES
L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:
02 - Lecture and/or discussion
03 - Lecture/Laboratory
04 - Laboratory/Studio/Activity

STUDENT LEARNING OUTCOMES:

1. Demonstrate proficiency in using scientific notation, significant figures, and measurement units.
2. Design strategies to approach and solve problems using dimensional analysis.
3. Use the periodic table to gain information about atoms, elements and predict their properties and reactivities.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2008

4. Differentiate among the three basic classifications of matter: elements, compounds and mixtures as well as their formation and physical properties.
5. Demonstrate and analyze the concepts of moles and molarity.
6. Identify the major class of reactions, balance equations and predict their products

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2008

7. Determine and write the chemical names and formulas of ionic and molecular compounds.

8. Develop strategies to approach, comprehend and solve problems involving stoichiometry.

9. Evaluate the chemical properties of electrolytes, acids and bases.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2008

10 Demonstrate and analyze the formation, products and properties of solutions.

11. Recognize oxidation-reduction reactions and assignment of oxidation numbers.

12. Writing and balancing equations for oxidation-reduction reactions for both acidic and basic solutions.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2015

13. Distinguish between exothermic/endo-thermic reactions and evaluate chemical systems and thermal properties.

14. To prepare, manipulate and interpret thermochemical equations, enthalpy diagrams and use Hess's Law to calculate enthalpy changes.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2015

15 Distinguish the main features of atomic theory and apply the fundamental organi-zation of the atom including the electron orbitals.

16. Relate the electron configuration of elements to their location in the periodic table and the element's corresponding properties.

17. Determine how ionic and molecular compounds are formed from their elements and what factors cause elements to form an ionic or molecular compound.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2015

18 Draw Lewis diagrams for the structures of molecules and polyatomic ions and deter-mine the polarity of bonds based upon the difference in electronegativity.

19. Compare and contrast the Valence Bond and VSEPR theories and predict the geometries of molecules.

20. Compare and contrast Hybrid Orbital and Molecular Orbital theories to explain multiple bonds and the shapes of molecules.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2008

21 Use the Imperical Gas Laws to quantita-tively describe gaseous behavior.

22. Explain the Kinetic-Molecular theory of gases and relate it to the properties of gases.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2016

23 Describe the differences between the intermolecular forces and predict which forces will affect a given sample and determine its properties.

24. Apply Le Chatelier's principle of dynamic equilibrium to chemical reactions.

25. Explain how atoms, ions or molecules can be arranged in crystalline solids and predict their properties.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

GE-LO: B1, B3, B5, B6, A6

Year assessed or anticipated year of assessment: Fall 2016

26 Collect and analyze laboratory experi-mental data ans solve related chemical problems.

27. Examine chemical concepts through peer interaction and written laboratory reports.

28. Relate classroom and laboratory experi-ences to phenomena outside the classroom.

Measure: Homework, Quiz, Exam and Laboratory Reports

PLO:

ILO: 2, 1, 4, 6

GE-LO: B4, B7, B8, A5

Year assessed or anticipated year of assessment: Fall 2008

PROGRAM LEARNING OUTCOMES:

Employing the scientific method as a basis for evaluation theoretical and laboratory derived information, students will gain an understanding of the biological and/or physical worlds. Students will also gain a working familiarity with mathematics and an understanding of mathematics as it applies to modeling in the sciences.

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 11/23/2015

10 Hours

Chapter-1 Fundamentals of Chemical Change

The scientific method. Matter, energy and chemical changes. Measured quantities and their units. Computations, dimensional analysis and significant figures. Properties of substances; density and specific gravity.

Homework problems from text and instructor.

Laboratory Experiment: Locker Check-In and Safety.

Demonstrate proficiency in using scientific notation, significant figures,

and measurement units.

Design strategies to approach and solve problems using dimensional analysis.

18 Hours

Chapter-2 The Periodic Table and Some Properties of the Elements

Elements, compounds and mixtures. Atoms, chemical symbols, formulas and equations. The structure of matter; atoms and subatomic particles. Periodic law and the periodic table. Metals, nonmetals and metalloids. Reactions of the elements; formation of ionic and molecular compounds. Properties of ionic and molecular compounds. Ionic and molecular nomenclature.

Homework problems from text and instructor.

Laboratory Experiment: Techniques and Measurements.

Use the periodic table to gain information about atoms, elements and predict their properties and reactivities.

Differentiate among the three basic classifications of matter: elements, compounds and mixtures as well as their formation and physical properties.

Determine and write the chemical names and formulas of ionic and molecular compounds.

18 Hours

Chapter-3 Stoichiometry: Quantitative Chemical Relationships

The mole concept. Measuring moles of elements and compounds. Empirical and molecular formulas. Percentage composition. Writing and balancing chemical equations. Using chemical equations in calculations. Limited reactant calculations. Theoretical yield and percentage yield. Reactions in solutions and molar concentration. Stoichiometry of reactions in solution.

Homework problems from text and instructor.

Laboratory Experiment: Empirical Formula of an Oxide.

Identify the major classes of chemical reactions, balance equations and predict their products.

Demonstrate and analyze the concepts of moles and molarity.

Develop strategies to approach, comprehend and solve chemical problems involving stoichiometry.

10 Hours

Chapter-4 Reactions Between Ions in Aqueous Solutions

Electrolytes and nonelectrolytes. Equations for ionic reactions. Predicting reactions that produce precipitates. Strong and weak acids and bases. Acid-Base neutralization. Ionic reactions that produce gases. Predicting when ionic reactions actually occur. Stoichiometry

of ionic reactions.

Homework problems from text and instructor.

Laboratory Experiment: Limiting Reagents.

Evaluate the chemical properties of electrolytes, acids and bases.

Demonstrate and analyze the formation, products and properties of solutions.

18 Hours

Chapter-5 Oxidation-Reduction Reactions

Oxidation-reduction reactions. Balancing redox equations by the ion-electron method. Reactions of metals with acids. Displacement of one metal by another from compounds. Molecular oxygen as an oxidizing agent. Stoichiometry and redox reactions.

Homework problems from text and instructor.

Laboratory Experiment: Reaction Types.

Recognize oxidation-reduction reactions and assignment of oxidation numbers.

Writing and balancing equations for oxidation-reduction reactions for both acidic and basic solutions.

18 Hours

Chapter-6 Energy and Thermochemistry

Kinetic and potential energy. The kinetic theory of matter. Energy changes in chemical reactions. The First Law of Thermodynamics: heat and work. Measuring energy changes; calorimetry. Enthalpy changes in chemical reactions. Combining thermochemical equations; Hess's Law. Standard heats of formation and Hess's Law.

Homework Problems from text and instructor.

Laboratory Experiment: Cation Identification.

Distinguish between exothermic/endothermic reactions and evaluate chemical systems and thermal properties.

To prepare, manipulate and interpret thermochemical equations, enthanlpy diagrams and use Hess's Law to calculate enthalpy changes.

10 Hours

Chapter-7 Atomic and Electronic Structure

Electromagnetic raqdiation. Atomic spectra and the Bohr model of the hydrogen atom. Wave properties of matter and wave mechanics. Electron spin and the Pauli Exclusion Principle. Electronic structures of multielectron stoms. Electron configurations and the periodic table. Unexpected electron configurations. Shapes of the atomic orbitals. Variation of atomic properties with electronic structure.

Homework Problems from text and instructor.

Laboratory Experiment: Calorimetry.

Distinguish the main features of atomic theory and apply the fundamental organization of the atom including the electron orbitals.

Relate the electron configuration of elements to their location in the periodic table and the corresponding properties of many elements.

18 Hours

Chapter-8 Chemical Bonding: General Concepts

Electron transfer and the formation of ionic compounds. Wlectron bookkeeping and Lewis symbols. Electron sharing and the formation of covalent bonds. Some important compounds of carbon. Electronegativity and the polarity of bonds. Electronegativity and the reactivities of metals and nonmetals. Drawing Lewis structures and the Octet Rule. Formal charge and the selection of Lewis structures. Resonance; when a single Lewis structure fails. Coordinate covalent bonds.

Homework Problems from text and instructor.

Laboratory Experiment: Spectrophotometric Iron Analysis.

Determine how ionic and molecular compounds are formed from their elements and what factors cause elements to form ionic and molecular compounds.

Draw Lewis diagrams for the structures of molecules and polyatomic ions and determine the polarity of bonds based upon the differences in electronegativity.

18 Hours

Chapter-9 Chemical Bonding and Molecular Structure

Common molecular structures and geometry. Predicting the shapes of molecules; VSEPR Theory. Molecular shapes and molecular polarity. Wave mechanics and covalent bonding; Valence Bond Theory. Hybrid orbitals. Double and triple bonds. The Molecular Orbital Theory. Delocalized molecular orbitals. Bonding in solids.

Homework Problems from text and instructor.

Laboratory Experiment: Chemical Periodicity.

Compare and contrast the Valence Bond and VSEPR theories.

Compare and contrast Hybrid Orbitals and Molecular Orbital theories to explain multiple bonds and the shapes of molecules.

10 Hours

Chapter-10 Properties of Gases

Properties common to all gases. Pressure; its measurement and units. Pressure-, Volume-, Temperature-relationships for a fixed amount of gas. The Ideal Gas Law. Stoichiometry of chemical reactions between gases. Dalton's Law of Partial Pressure. Grahamn's Law of Effusion. Kinetic theory and the gas laws. Real gases; deviations from the Ideal Gas Law.

Homework Problems from text and instructor.

Laboratory Experiment: Hard Water Analysis.

Use the gas laws to quantitatively describe gaseous behavior.

Explain the Kinetic-Molecular Theory of Gases and relate it to the properties of gases.

14 Hours

Chapter-11 Intermolecular Attractions and the Properties of Liquids and Solids

Why gases differ from liquids and solids. Intermolecular attractions. Some general properties of liquids and solids. Changes of state and dynamic equilibrium. Vapor pressures of liquids and solids. Boiling points of liquids. Energy changes during a change of state. Dynamic equilibrium and Le Chatelier's Principle. Phase diagrams. Crystalline solids and

X-ray diffraction. Crystal types and their physical properties. Noncrystalline solids.

Homework Problems from text and instructor.

Laboratory Experiment: Molar Mass of a Volatile Liquid.

Describe the differences between the intermolecular forces and predict which forces will affect a given sample and determine its properties.

Apply Le Chatelier's principle of dynamic equilibrium.

Explain how atoms, ions or molecules can be arranged in crystalline solids and predict their properties.

2 Hours

Final Examination (cumulative)

Comprehensive over the entire course with evaluation of each of the areas previously examined.

METHODS OF INSTRUCTION:

Instruction is by lecture, class discussion, lecture demonstration, small

group problem solving, laboratory work projects and homework.

METHODS OF EVALUATION:

CATEGORY 1 - The types of writing assignments required:

Percent range of total grade: 20 % to 30 %

Written Homework

Lab Reports

Other: Extra credit report on a Chemistry topic.

CATEGORY 2 -The problem-solving assignments required:

Percent range of total grade: 70 % to 80 %

Homework Problems

Lab Reports

Quizzes

Exams

CATEGORY 3 -The types of skill demonstrations required:

Percent range of total grade: 0 % to %

CATEGORY 4 - The types of objective examinations used in the course:

Percent range of total grade: 0 % to %

CATEGORY 5 - Any other methods of evaluation:

Percent range of total grade: 0 % to %

REPRESENTATIVE TEXTBOOKS:

Required:

N.E. Jespersen, J.E. Brady, A. Hyslop, "Chemistry: The Molecular Nature of Matter" 6th ed., J. Wiley Publishing, 2012, ISBN: 978-0-470-57771-4

D. Clark, G. Burce, E. Kilby, "Gavilan College Chem 1A Laboratory Manual," 2nd ed., Premium Source Publishing, 2015, ISBN: 978-1-63434-276-6

Recommended:

N.E. Jesperson, J.E. Brady, A. Hyslop, "Study Guide For Chemistry: The Molecular Nature of Matter," 6th ed., J. Wiley Publishing, 2012, ISBN: 978-0-470-57772-1

N.E. Jesperson, J.E. Brady, A. Hyslop, "Student Solutions Manual for Chemistry: The Molecular Nature of Matter,"6th ed., J. Wiley Publishing, 2012, ISBN: 978-0-470-57773-8

Or other appropriate college level text.

Reading level of text, Grade: 13.0

Verified by: D. Clark

Other textbooks or materials to be purchased by the student: None

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B1, effective 201070

GAV B3, effective 201070

CSU GE:

CSU B1, effective 201070

CSU B3, effective 201070

IGETC:

IGETC 5A, effective 201070

IGETC 5C, effective 201070

CSU TRANSFER:

Transferable CSU, effective 201070

UC TRANSFER:

Transferable UC, effective 201070

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN: CHEM2

CAN Sequence: CHEM SEQ A

CSU Crosswalk Course Department: CHEM

CSU Crosswalk Course Number: 1A

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: E
Maximum Hours:
Minimum Hours:
Course Control Number: CCC000071527
Sports/Physical Education Course: N
Taxonomy of Program: 190500