GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: CHEM 1B 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 second semester of a year-long general chemistry course designed as a continuation of Chemistry 1A. Topics include solutions, thermodynamics, chemical kenetics, the equilibria of acids and bases, solubility systems, complex ions, electrochemistry, the chemistry of metals and nonmetals, as well as nuclear chemistry. (C-ID: CHEM 120S: Chem 1A + Chem 1B) PREREQUISITE: Chemistry 1A with a grade of C or better.

PREREQUISITES:

Completion of CHEM 1A, as UG, with a grade of C or better.

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. Describe the effects of temperature and pressure on the solubility of solutions.

2. Compare and contrast the colligative properties of solutions including osmotic pressure.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2011

3. Explain the First, Second and Third Laws of Thermodynamics and solve problems based on the laws of thermodynamics.

4. Determine the spontaneity of a reaction and relate the free energy of a reaction to its equilibrium constant

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2011

5. Determine the rate law for a reaction based on the reaction mechanism and explain the dependence of reaction rate on concentration and temperature.

6. Compare and contrast the Collision and Transition-State Theories and solve problems based on the Arrhenius equation.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2016

7. Determine the extent of a molecular reaction through the study of chemical equilibria.

8. Apply Le Chatelier's Principle to chemical equilibria and solve problems based on equilibria data.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2011

9. Compare and contrast Arrhenius, Lewis and Bronsted-Lowry acids and bases.

10. Describe the self-ionization of water and compute the pH of a solution of a strong acid or strong base.

11. Solve problems based on the ionization of a weak acid or weak base, as well as salt 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: Spring 2011

12. Describe the preparation of a buffer and perform buffer solution calculations.

13. Determine the solubility product expressions for sparingly soluble ionic solids.

14. Perform calculations based on solubility product expressions.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2016

15. Compare and contrast electrolytic cells with voltaic cells and use standard reduction potentials to calculate a specific cell's potential.

16. Solve stoichiometric calculations based on electrolysis.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2011

17. Describe the formation and structure of complex-ions and coordination compounds as well as determining the nomenclature of complex-ions and coordination compounds.

18. Describe the Valence Bond Theory and the Crystal Field Theory of complexes.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2016

19. Define radioactivity and describe the different types of radiation.

20. Balance nuclear reaction equations and solve problems based on the rate of the radioactive decay of an isotope.

Measure: Homework, Quiz and Exam

PLO:

ILO: 2, 1, 7

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

Year assessed or anticipated year of assessment: Spring 2016

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

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

23. Relate classroom and laboratory experiences 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: Spring 2016

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

18 Hours

Chapter-12 Solutions

Formation and heats of solutions. Solubility and the effect of temperature. Effect of pressure on solubilities of gases. Effects of solutes on vapor pressures, as well as freezing and boiling points of solutions. Colligative properties of solutions of electrolytes. Osmotic pressure.

Homework problems from text and instructor.

Laboratory Experiment: Locker Check-In and Safety.

Describe the effects of temperature and pressure on the solubility of solutions.

Compare and contrast the colligative properties of solutions including osmotic pressure.

18 Hours

Chapter-18 Thermodynamics

Enthalpy changes and spontaneity. Enthalpy and spontaneous change. The Second Law of Thermodynamics and Gibbs free energy. The Third Law of Thermodynamics. Standard free energy change. Free energy and maximum work. Free energy and equilibrium. Calculating equilibrium constants from thermodynamic data. Bond energies and heats of reaction.

Homework problems from text and instructor.

Laboratory Experiment: Isolation of Caffeine from Tea.

Explain the First, Second and Third Laws of Thermodynamics and solve problems based on the laws of thermodynamics

Determine the spontaneity of a reaction and relate the free energy of a reaction to its equilibrium constant.

10 Hours

Chapter-13 Kenetics: The Study of Rates of Reactions.

Speeds at which reactions occur. Factors that affect reaction rates. Measuring the rate of a reaction. Concentration and rate. Concentration and time. Theories about reaction rates and mechanisms. Measuring the activation energy. Catalysts in a reaction.

Homework problems from text and instructor.

Laboratory Experiment: Molar Mass Determination / Freezing Point Depression.

Determine the rate law for a reaction based on the reaction mechanism and explain the dependence of reaction rate on concentration and temperature.

Compare and contrast the Collision and Transition-State Theories and solve problems based on the Arrhenius equation.

18 Hours

Chapter-14 Chemical Equilibrium-General Concepts

Dynamic equilibrium in chemical systems. Reactin reversability. The equilibrium law for a chemical reaction. Significance of the magnitude of "K." Relationship between Kp and Kc. Heterous equilibria. Le Chatelier's principle and chemical equilibria. Chemical equilibrium calculations.

Homework problems from text and instructor.

Laboratory Experiment: Rate Law Determination / Kinetics.

Determine the extent of a molecular reaction through the study of chemical equilibria.

Apply Le Chatelier's Principle to chemical equilibria and solve problems based on equilibria data.

18 Hours

Chapter-15 Acids and Bases: A Second Look

Bronsted-Lowry acids and bases. Strengths of Bronsted-Lowry acids and bases as we;; as their periodic trends. Lewis acids and bases. Acid-Base properties of the elements and their oxides. Ionization of water and the pH concept. Solutions of strong acids and bases.

Homework problems from text and instructor.

Laboratory Experiment: Le Chatelier's Principle / Chemical Equilibrium.

Compare and contrast Arrhenius, Bronsted-Lowry and Lewis theories of acids and bases.

Describe the self-ionization of water and compute the pH of a solution of a strong acid or strong base.

18 Hours

Chapter-16 Equilibria in Solutions of Weak Acids and Bases

Ionization constants for weak acids and bases. Equilibrium calculations. Solutions of salts and ions as weak acids and bases. Buffers and the control of pH. Ionization and solutions of polyprotic acids. Acid-Base solution titrations.

Homework problems from text and instructor.

Laboratory Experiment: Acid - Base Titrations.

Solve problems based on the ionization of a weak acid or weak base, as well as salt solutions.

Describe the preparation of a buffer and perform buffer solution calculations.

10 Hours

Chapter-17 Solubility and Simultaneous Equilibria

Solubility equilibria for salts, metal oxides and sulfides. Separating metal ions by selective precipitation. Complex-ions and their equilibria in aqueous solutions.

Homework problems from text and instructor.

Laboratory Experiment: Solubility Constant and Common-Ion Effect.

Determine the solubility product expressions for sparingly soluble ionic solids.

Perform calculations based on solubility product expressions.

18 Hours

Chapter-19 Electrochemistry

Electrolysis. Stoichiometric relationships in electrolysis. Galvanic cells. Cell potentials and reduction potentials. Calculations using standard reduction potentials. Cell potentials and thermodynamics. Effect of concentration on cell potentials.

Homework problems from text and instructor.

Laboratory Experiment: The Electrolytic Cell / Electrochemistry.

Compare and contrast electrolytic cells with voltaic cells and use standard reduction potentials to calculate a specific cell's potential.

Solve stoichiometric calculations based on electrolysis.

10 Hours

Chapter-20 Properties of Metals and Metal Complexes

Preparation of metals from compounds. Covalent / Ionic nature of metal compounds. Complex-ions of different metals. Nomenclature of metal complexes. Coordination numbers and structure. Isomers of coordination complexes. Bonding in transition metal complexes. The role of metal ions in biological systems.

Homework problems from text and instructor.

Laboratory Experiment: Coordination Compounds / Metal Complexes.

Describe the formation and structure of complex-ions and coordination compounds as well as determining the nomenclature of complex-ions and coordination compounds.

Describe the Valence Bond Theory and the Crystal Field Theory of complexes.

10 Hours

Chapter-22 Nuclear Reactions and Their Role in Chemistry

Conservation of mass-energy. Nuclear binding energies. Radioactivity and transmutation. The three naturally occurring types of radiation. Detecting and measuring radiation. Application of radioactivity. Half-life calculations. Nuclear fission.

Homework problems from text and instructor.

Laboratory Experiment: Locker Check-Out.

Define radioactivity and describe the different types of radiation.

Balance nuclear reaction equations and solve problems based on the rate of the radioactive decay of an isotope.

2 Hours

Final Examination (cumulative).

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

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 1B Laboratory Manual," 2nd ed., Premium Source Publishing, 2015, ISBN: 978-1-63434-142-4

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: CHEM4

CAN Sequence: CHEM SEQ A

CSU Crosswalk Course Department: CHEM

CSU Crosswalk Course Number: 1B

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: CCC000322648
Sports/Physical Education Course: N
Taxonomy of Program: 190500