

Course Outline

COURSE: CHEM 30A **DIVISION:** 10 **ALSO LISTED AS:**

TERM EFFECTIVE: Summer 2020 **CURRICULUM APPROVAL DATE** 05/12/2020

SHORT TITLE: ELEM CHEMISTRY L/L

LONG TITLE: Elementary Chemistry

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
4	18	Lecture:	3	54
		Lab:	3	54
		Other:	0	0
		Total:	6	108

COURSE DESCRIPTION:

This is a first semester college chemistry course designed for majors preparing to take Chemistry 1A, nursing and allied health students, as well as general education. The course will cover the principles of chemistry including properties of matter, energy, atomic theory, the Periodic Table, stoichiometry, elements and compounds, the properties of bonding, molecular structure, chemical reactions, states of matter, acidity, solutions and gases, as well as an introduction to organic chemistry. (C-ID: CHEM 101) **PREREQUISITE:** Mathematics 430 or skills equivalent to those in an Elementary Algebra course.

PREREQUISITES:

- Completion of MATH 205, as UG, with a grade of C or better.
- OR
- (Completion of MATH 205A, as UG, with a grade of C or better.
- AND Completion of MATH 205B, as UG, with a grade of C or better.)
- OR
- Completion of MATH 206, as UG, with a grade of C or better.
- OR
- Completion of MATH 233A, 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 430, 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 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 8A, 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
Completion of MATH 2, as UG, with a grade of C or better.
OR
Score of 17 on Elementary Algebra
OR
Score of 15 on Intermediate Algebra
OR
Score of 2500 on Accuplacer Math
OR
Score of 2600 on MM CCCApply Math
OR
Score of 2600 on MM Placement Tool 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
04B - Laboratory - LEH 0.75
05 - Hybrid
72 - Dist. Ed Internet Delayed
73 - Dist. Ed Internet Delayed LAB
73B - Dist. Ed Internet LAB-LEH 0.75

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Derive and apply the fundamental organization of the atom.
2. Develop strategies to approach, solve and comprehend problems that involve stoichiometry.
3. Identify the major classes of reactions, and predict their products.
4. Use the gas laws to quantitatively describe gaseous behavior.
5. Compare and contrast the concept of pH, and the quantitative aspects of acid-base strength.
6. Demonstrate proficiency in using scientific notation, significant figures, and measurement units.
7. Design strategies to approach and solve problems using dimensional analysis.
8. Describe the various different classes and states of matter.
9. Distinguish between exothermic and endothermic reactions and relate to the heat flow in a chemical change.
10. Use the periodic table to gain information about the elements and predict their properties and reactivities.
11. Describe the formation and properties of ionic and molecular compounds.
12. Demonstrate understanding and analyze the concepts of grams, moles and molarity.
13. Demonstrate knowledge of the formation and properties of solutions.
14. Evaluate the reactions and chemical properties of electrolytes, acids and bases.
15. Describe conceptually what the equilibrium state represents, and identify factors that affect equilibrium reactions. Homework, Group activities, Quizzes, and Exams.
16. Demonstrate understanding and distinguish between chemical and nuclear reactions, and describe the various types of nuclear decay.
17. Demonstrate knowledge of, as well as compare and contrast simple organic molecules and functional groups.
18. Collect and analyze laboratory experimental data and solve related chemical problems.
19. Examine chemical concepts through peer interaction and written laboratory reports.
20. Relate classroom and laboratory experiences to phenomena outside the classroom.

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

Curriculum Approval Date 05/12/2020

3 LEC HOURS

Chapter 1: Goals, Methods, and Measurements

Topics:

1. The scientific method.
2. Properties and the states of matter.
3. Physical quantities, measurement, significant figures, and scientific notation.
4. Dimensional analysis in calculations.
5. Density and specific gravity.

Assignments: Homework problems from text and instructor.

6 LEC HOURS

Chapter 2: Matter and Energy

Topics:

1. States and kinds of matter.
2. Atoms, chemical symbols, and equations.
3. Kinetic and potential energy.
4. Heat and molecular kinetic energy.

Assignments: Homework problems from text and instructor.

6 LEC HOURS

Chapter 5: Quantitative Relationships in Chemical Reactions

Topics:

1. The mole concept.
2. Atomic, formula, and molecular masses.
3. Balanced chemical equations and stoichiometry.
4. Reactions in solution.
5. Molar concentration.
6. Preparing dilute solutions from concentrated solutions.

Assignments: Homework problems from text and instructor.

4 LEC HOURS

Chapter 3: Atomic Theory and the Periodic Table

Topics:

1. The nuclear atom.
2. Periodic law and the periodic table.
3. Electron orbital diagrams.
4. Electronic configurations and atomic orbitals.

Assignments: Homework problems from text and instructor.

6 LEC HOURS

Chapter 4: Chemical Compounds and Chemical Bonds

Topics:

1. Electron transfer and ionic compounds.
2. Oxidation-reduction reactions.
3. Electron sharing and molecular compounds.
4. Lewis structures and the octet rule.
5. Writing Lewis structures of molecules and polyatomic ions.
6. Geometry of molecules and polarity.

Assignments: Homework problems from text and instructor.

6 LEC HOURS

Chapter 6: States of Matter and the Kinetic Theory

Topics:

1. Pressure- Volume- Temperature relationships and the gaseous state.
2. The ideal gas law.
3. Dalton's law of partial pressure.
3. The kinetic theory of gases.
4. The liquid state.
5. Vapor pressure, dynamic equilibria, and changes of state.
6. Water and the hydrogen bond.
7. The solid state.

Assignments: Homework problems from text and instructor.

3 LEC HOURS

Chapter 7: Solutions and Colloids

Topics:

1. Types of homogeneous mixtures.
2. Aqueous solutions and how they form.
3. Solubilities of gases.
4. Expressions of percentage concentration.
5. Osmosis and dialysis.

Assignments: Homework problems from text and instructor.

6 LEC HOURS

Chapter 8: Acids, Bases, and Ionic Compounds

Topics:

1. Strong and weak electrolytes.
2. Acids and bases as electrolytes.
3. Chemical properties of aqueous acids and bases.
4. Bronsted-Lowry acids and bases.
5. Salts.

Assignments: Homework problems from text and instructor.

6 LEC HOURS

Chapter 9: Reaction Kinetics and Chemical Equilibria

Topics:

1. Acid-Base Equilibria.
2. Factors that affect reaction rates.
3. Kinetic theory and chemical reactions.
4. Acid-Base chemical equilibria.
5. The ion product constant of water and the pH concept.
6. Acid-Base ionization constants.
7. The pKa & pKb concepts.
8. Some quantitative aspects of buffer.
9. Acid-Base titrations.

Assignments: Homework problems from text and instructor.

3 LEC HOURS

Chapter 10: Radioactivity and Nuclear Chemistry

Topics:

1. Atomic radiation.
2. Ionization radiation - dangers and precautions.
3. Units to describe and measure radiation.

4. Synthetic radionuclides.
5. Radiation technology in medicine and the food industry.
6. Atomic energy and radionuclides.

Assignments: Homework problems from text and instructor.

3 LEC HOURS

Chapter 11: Organic Chemistry. Saturated Hydrocarbons and Selected Topics

Topics:

1. Some structural features of organic compounds.
2. Isomerism.
3. Functional groups.
4. Alkanes and cycloalkanes.
5. Nomenclature of alkanes and cycloalkanes.
6. The chemical properties of alkanes.

Assignments: Homework problems from text and instructor.

2 LEC HOURS

Final Examination (cumulative).

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

Lab Content

3 LAB HOURS

Laboratory Experiment: Locker Check-In and Safety.

Objectives:

1. Demonstrate proficiency in using scientific notation, significant figures, and measurement units.
2. Design strategies to approach and solve problems using dimensional analysis.

6 LAB HOURS

Laboratory Experiment: Measurement of Volume.

Laboratory Experiment: Measurement of Mass.

Objectives:

1. Describe the different classes and states of matter.
2. Distinguish between exothermic and endothermic reactions and relate to heat flow in a chemical change.

6 LAB HOURS

Laboratory Experiment: Mass Relations in Chemical Changes.

Exam #1

Objectives:

1. Identify the major classes of reactions, balance equations and predict products.
2. Develop strategies to approach, solve and comprehend problems involving stoichiometry.
3. Demonstrate and analyze the concepts of moles and molarity.

3 LAB HOURS

Laboratory Experiment: Effect of Limiting the Concentration of a Reactant.

Objectives:

1. Derive and apply the fundamental organization of the atom.
2. Use the periodic table to gain information about the elements and predict their properties and reactivities.

6 LAB HOURS

Laboratory Experiment: Reactions of Acid with Magnesium.

Laboratory Experiment: Partial Pressure of Oxygen in Air.

Objectives:

1. Describe the formation and properties of ionic and molecular compounds.

6 LAB HOURS

Laboratory Experiment: Molecular Models and Molecular Structure.

Exam #2

Objectives:

1. Use the gas laws to quantitatively describe gaseous behavior.

3 LAB HOURS

Laboratory Experiment: Popcorn and the Effect of Water Vapor

Objectives:

1. Demonstrate the formation and properties of solutions.

6 LAB HOURS

Laboratory Experiment: Predicting Reactions Using Solubility Rules / Testing Various Ions.

Laboratory Experiment: Determination of pH.

Objectives:

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

6 LAB HOURS

Laboratory Experiment: Acid-Base Titrations.

Exam #3

Objectives:

1. Describe conceptually what the equilibrium state represents, and identify factors that affect equilibrium.
2. Compare and contrast the concept of pH, and the quantitative aspects of acid-base strength.

3 LAB HOURS

Laboratory Experiment: Acid-Base Titrations (continued).

Objectives:

1. Distinguish between chemical and nuclear reactions and describe the various types of nuclear decay.

3 LAB HOURS

Laboratory Experiment: Locker Check-Out.

Objectives:

1. Compare and contrast simple organic molecules and functional groups.

3 LAB HOURS

Objectives:

1. Review for final exam.

METHODS OF INSTRUCTION:

Instruction is by lecture, class discussion, lecture demonstration, small group problem solving, laboratory work projects, homework and exams.

OUT OF CLASS ASSIGNMENTS

Required Outside Hours: 78

Assignment Description:

Lecture homework and online equivalent assignments

Required Outside Hours: 30

Assignment Description:

Lab reports or online equivalent

METHODS OF EVALUATION:

Writing assignments

Percent of total grade: 25.00 %

Percent range of total grade: 20 % to 30 % Written Homework Lab Reports Other: Extra credit report on a chemistry topic.

Problem-solving assignments

Percent of total grade: 75.00 %

Percent range of total grade: 70 % to 80 % Homework Problems Lab Reports Quizzes Exams

REPRESENTATIVE TEXTBOOKS:

D. Clark, G. Burce, E. Kilby. Gavilan College Chem 30A Laboratory Manual, 2nd ed.. Premium Source Publishing,2015.

ISBN: 978-1-634-34141-7

Reading Level of Text, Grade: 12 Verified by: D. Clark

McMurry, J., Ballantine, D.S., Hoeger, C.A., Peterson, V.E.. Fundamentals of General, Organic, and Biological Chemistry, 8th ed.. Pearson/Prentice Hall Publishing,2017.

Updated ISBN and year

ISBN: 9780134261393

Reading Level of Text, Grade: 12 Verified by: D. Clark

Recommended Representative Textbooks

J. McMurry, D.S. Ballantine, C.A.Hoeger, V.E Peterson. Study Guide & Solution Manual, 8th ed.. Pearson/Prentice Hall Publishing,2016.

ISBN: 978-0-321-77616-7

Reading Level of Text, Grade: 12 Verified by: D. Clark

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B1, effective 201370

GAV B3, effective 201370

CSU GE:

CSU B1, effective 201370

CSU B3, effective 201370

IGETC:

IGETC 5A, effective 201370

IGETC 5C, effective 201370

CSU TRANSFER:

Transferable CSU, effective 201370

UC TRANSFER:

Transferable UC, effective 201370

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN: CHEM6

CAN Sequence: CHEM SEQ B

CSU Crosswalk Course Department: CHEM

CSU Crosswalk Course Number: 101

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: CCC000288847

Sports/Physical Education Course: N

Taxonomy of Program: 190500