Course Outline
CHM 1046C
General Chemistry with Qualitative Analysis II

General Course Information

Common Course Number: CHM1046C
Course Title: General Chemistry with Qualitative Analysis II
Prerequisite(s): Prerequisite: CHM 1045C with C or better.
Contact Hour Breakdown: CR 4 CLASS 3 LAB 3
Discipline: Chemistry
Catalog Description: Prerequisite: CHM 1045C with C or better. Continuation of CHM 1045C dealing mainly with equilibrium theory, thermodynamics, chemical kinetics and electrochemistry. Laboratory illustrates principles of ionic equilibria within framework of qualitative analysis. (Special Fee: $35.00)

Major Topics/ Concepts/ Skills/ Issues

- Expand students' chemical vocabulary, understanding of concepts, and problem-solving skills from CHM1045C.
- Further develop students' ability to communicate chemical concepts and problem-solving processes from CHM1045C.
- Deepen students' appreciation of the scientific method as an effective problem-solving approach
- Students will apply scientific method principles to solve personally relevant real-world problems.
- Lab activities will provide students with kinesthetic support for mastering conceptual learning outcomes as well as providing essential experience in lab techniques necessary for subsequent course work and laboratory careers.
-

Major Learning Outcomes with Evidence, Core Competencies and Indicators

Students Will Apply the Concepts of Mass Action Relationships to Solve Chemical Equilibria Problems.

Corresponding Evidence of Learning

- Student will be able to Students will set up chemical equilibria expressions from balanced equations and solve for the equilibria species concentrations (given initial conc/K), equilibria constant values (given relevant equilibria conc), and molar solubility.
- Student will be able to Students will determine if a system is in equilibrium, explaining their answer using their understanding of the difference between nonequilibrium (Q) and equilibrium (K) conditions.
- Student will be able to Students will demonstrate an understanding of Le Chatelier's Principle by predicting the affect on equilibrium composition upon the addition of common ions, strong acids/bases, and/or ligands (Lewis bases).
- Student will be able to Students will be able to distinguish between the various rate and equilibrium constants (k, Kc, Kp, Ksp, Ka, Kb, Kf, Kd, Kw, and Kth) and apply them appropriately.
- Student will be able to Students will predict equilibrium species concentrations of overall chemical equation resulting from two or more interelated chemical equilibria and net equilibrium constant values.

Core Competency: Think

Indicators	Assessments
• employ the facts, formulas, procedures of the discipline	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz

Students Will Apply the Concepts of Thermodyanamic and Kinetic Control to Predict the Affect of Reaction Conditions and Pathways upon Chemical Reactions.

Corresponding Evidence of Learning

- Student will be able to Students will understand and explain the factors (concentration, temperature, presence and concentration of a catalyst, and surface area) that affect reaction rate.
- Student will be able to Students will be able to compare and contrast thermodynamic versus kinetic control of reactions, under varying reaction conditions, given an energy diagram(s).
- Student will be able to Using empirical data (rate and temperature), students will be able to calculate values for energies of activation and rate constants as reaction conditions vary.

Core Competency: Think	
Indicators	**Assessments**
• analyze data, ideas, patterns, principles, perspectives	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz

Students Will Utilize the Relationship Between Equilibria, Electrochemical, and Thermodynamic Data to Predict Reaction Spontaneity.

Corresponding Evidence of Learning

• Student will be able to Students will apply their understanding of the relationship of reaction spontaneity to equilibria, electrochemical, and thermodynamic data through calculation of Gibbs free energy.
• Student will be able to Based upon composition, calorimetric, and electrochemical data, students will predict reaction spontaneity.

Core Competency: Think	
Indicators	**Assessments**
• analyze data, ideas, patterns, principles, perspectives	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Problem-solving quiz

Core Competency: Communicate	
Indicators	**Assessments**
• communicate your understanding of concepts and their ramifications	• Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz • Lab report

Students Will Distinguish Between Various Acid/Base Theories and be Able to Apply Them to Equilibria Systems.

Corresponding Evidence of Learning

• Student will be able to Students will compare and contrast the Arrhenius, Bronsted-Lowery, and Lewis acid/base models as well as apply the Bronsted/Lowry concept to explain amphoteric behavior of substances.
• Student will be able to Students will predict relative acid/base strength based upon molecular structure and apply this understanding to explain the autoionization of water and its equilibrium constant expression.
• Student will be able to Students will calculate hydronium or hydroxide ion concentrations, given the pH/pOH of an aqueous solution as well as be able to reverse this process.

Core Competency: Communicate	
Indicators	**Assessments**
• employ methods of communication appropriate to your audience and purpose	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz • Lab report

Core Competency: Act	
Indicators	**Assessments**
• implement effective problem-solving, decision-making, and goal-setting strategies	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz • Lab report

Students Will Predict the Physical Properties of Solutions, Understanding their Source and Relevance.

Corresponding Evidence of Learning

• Student will be able to Students will demonstrate an understanding of the nature of colligative properties and be able to calculate the molecular weight of an unknown solute from their measurement.
• Student will be able to Students will develop and describe a procedure to prepare solutions of known concentration (including appropriate concentration unit conversions)as well for preparing given volumes of buffers of specified pH values.
• Student will be able to Students will distinguish between intramolecular and intermolecular attractive forces and be able to predict the properties of solutions based upon this understanding.

Core Competency: Think

Indicators	Assessments
• employ the facts, formulas, procedures of the discipline	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz

Core Competency: Act

Indicators	Assessments
• implement effective problem-solving, decision-making, and goal-setting strategies	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz • Lab report

Students Will Distinguish Between Chemical and Nuclear Processes.

Corresponding Evidence of Learning

• Student will be able to Students will differentiate among the different nuclear processes and compare them to chemical processes.
• Student will be able to Students will write a nuclear equation demonstrating an understanding of probable nuclear processes.
• Student will be able to Students will demonstrate an understanding of the relationship between nuclear processes and matter/energy.

Core Competency: Communicate

Indicators	Assessments
• employ methods of communication appropriate to your audience and purpose	• Essay less than 1000 words • Knowledge recall quiz • Locally developed exam/essay • Performance or Demonstration • Problem-solving quiz

Core Competency: Act

Indicators	Assessments
• implement effective problem-solving, decision-making, and goal-setting strategies	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Problem-solving quiz

Students Will Demonstrate Knowledge of Introductory Vocabulary and Concepts of Organic Chemistry.

Corresponding Evidence of Learning

• Student will be able to Students will name and identify the main organic functional groups,the first ten straight chain alkanes, and C1-C5 alkyl substituents, and C1-C6 cycloalkanes and be able to write a formula for each.
• Student will be able to Students will demonstrate an understanding of the ramifications of carbon's valency upon orbital hybridization.
• Student will be able to Students will be able to relate the chemical formula of an alkane to the number of possible isomers.

Core Competency: Communicate

Indicators	Assessments
• employ methods of communication appropriate to your audience and purpose	• Knowledge recall quiz • Problem-solving quiz

Students Will Apply the Scientific Method to Solve Complex Problems.

Corresponding Evidence of Learning

• Student will be able to Students will identify the components of complex solutions using separation schemes and be able to create separation schemes in order to identify complex solution components.
• Student will be able to Students will create separation schemes in order to be able to identify components of complex solutions.
• Student will be able to Students will envision, design, implement, collect data, and analyze the results of an experiment with personal ramifications.
• Student will be able to Students will identify the components of the scientific method within a published experiment.

Core Competency: Value

Indicators	Assessments
• distinguish among personal, ethical, aesthetic, cultural, and scientific values	• Essay less than 1000 words • Locally developed exam/essay

	• Performance or Demonstration • Project
Core Competency: Act	
Indicators	**Assessments**
• implement effective problem-solving, decision-making, and goal-setting strategies	• Knowledge recall quiz • Locally developed exam/essay • Locally developed exam/objective • Performance or Demonstration • Project
Students will Demonstrate Proficiency in Fundamental Lab Techniques.	
Corresponding Evidence of Learning	
• Student will be able to Students will complete confirmation labs to internalize chemical concepts for practical application. • Student will be able to Students will apply chemical concepts for new situations during inquiry labs. • Student will be able to Students will master essential laboratory techniques critical to his or her success in future classes/careers. • Student will be able to Students will demonstrate an awareness of the importance of mastery of fundamental lab techniques in laboratory and medical careers.	
Core Competency: Act	
Indicators	**Assessments**
• implement effective problem-solving, decision-making, and goal-setting strategies	• Performance or Demonstration • Lab report

Shared Assessment(s) in this Course

- Exams
- Quizzes
- Lab reports

Addenda

- Sample Syllabus Version 1
- Sample Syllabus Version 2
- sample%201046%20syllabus%20version%201.pdf

College Curriculum Committee Website

Office of the Vice President for Academic Affairs & Chief Learning Officer
Valencia Community College
Orlando, Florida